

This article was downloaded by:

Publisher: KKG Publications

Registered office: 18, Jalan Kenanga SD 9/7 Bandar Sri Damansara, 52200 Malaysia

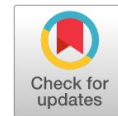


Key Knowledge Generation

Publication details, including instructions for author and subscription information:

<http://kkgpublications.com/business/>

Banking Fragility Sector Index and Determinants: A Comparison between Local-Based and Foreign Based Commercial Banks in Malaysia



NORYATI AHMAD ¹, NURUL FARHANA MAZLAN ²

^{1,2} Universiti Teknologi Mara, Shah Alam, Malaysia

Published online: 21 June 2015

To cite this article: Ahmad, N., & Mazlan, N. F. (2015). Banking fragility sector index and determinants: A comparison between local-based and foreign-based Commercial Banks in Malaysia. *International Journal of Business and Administrative Studies*, 1(1), 05-17.

DOI: <https://dx.doi.org/10.20469/ijbas.10002>

To link to this article: <http://kkgpublications.com/wp-content/uploads/2015/12/IJBAS10002.pdf>

PLEASE SCROLL DOWN FOR ARTICLE

KKG Publications makes every effort to ascertain the precision of all the information (the "Content") contained in the publications on our platform. However, KKG Publications, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the content. All opinions and views stated in this publication are not endorsed by KKG Publications. These are purely the opinions and views of authors. The accuracy of the content should not be relied upon and primary sources of information should be considered for any verification. KKG Publications shall not be liable for any costs, expenses, proceedings, loss, actions, demands, damages, expenses and other liabilities directly or indirectly caused in connection with given content.

This article may be utilized for research, edifying, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly verboten.

BANKING FRAGILITY SECTOR INDEX AND DETERMINANTS: A COMPARISON BETWEEN LOCAL-BASED AND FOREIGN-BASED COMMERCIAL BANKS IN MALAYSIA

NORYATI AHMAD ^{1*} NURUL FARHANA MAZLA ²^{1,2} Universiti Teknologi Mara, Shah Alam, Malaysia**Keywords:**Bank Fragility Sector (BSF) Index
Asset Quality Management
Management Quality**Received:** 13 March 2015**Accepted:** 17 May 2015**Published:** 21 June 2015

Abstract. A series of crises has led banks' liabilities and assets side into fragile and ultimate in a bankruptcy state. It is pertinent that banks can recognize the early distress stage and identify factors influencing their fragility. Thus, this paper attempts to track the trend of the bank fragility of locally-based and foreign-based commercial banks operating in Malaysia using the BSF Index. In addition, using the constructed Banking Fragility Sector Index, this paper also intends to identify the determinants of the bank fragility of these groups of banks. The study covers the period between 1996 until 2011. A sample of seven local-based commercial banks and eight foreign-based commercial banks are identified. Information gathered from the BSF index constructed indicates that the local-based commercial banks are in a more fragile phase during the financial crisis of 1997 relative to the world crisis of 2008. On the contrary, foreign-based commercial banks operated in Malaysia are hardly affected by the financial crisis of 1997. The world crisis of 2008, particularly between 2010 and 2011, appears to impact these banks. The estimated results of the Pooled Ordinary Least Square (POLS) regression model suggest that asset quality management, management quality and sensitivity to the market risk are the main factors of bank fragility for local-based commercial banks. In contrast, foreign-based commercial banks are not affected by any of the determinants. Macroeconomic factors (interest rate and gross domestic product) are not the cause of bank fragility for both banks.

©2015 KKG Publications. All rights reserved.

INTRODUCTION

The tasks of banking institutions have turned out to be more challenging as banking operations become more technologically sophisticated and globalized. Distress from both liabilities and assets side of the banks not only affect the financial industry, but also the country's economic condition. A sound banking regulatory framework and good corporate governance are required to ensure the stability of the financial system. For the past two decades, banks have been subjected to systemic banking crises due to a series of economic and financial crises. Kibritcioglu (2003) described the bank to be in a systemic condition when it is confronted with excessively high liquidity, credit, interest rate or exchange-rate risk that cause "the bank to suspend the internal convertibility of its liabilities". Due to the massive costs incurred from banking system instability, central banks must prudently regulate the banking sector. However, before appropriate policies are instilled, there is a need for central banks to detect when these banks are in fragility state and subsequently lead to the point of bankruptcy. Bernoth and Pick (2011) defined bank fragility as a situation in which bank is

encountered with the likelihood of default. Previous studies have also established indices to predict or identify early warning system of bank failure (Kaminsky & Reinhart, 1999; Caprio & Klingbiel, 2003). Kaminsky and Reinhart (1999) and Caprio and Klingbiel (2003) are among the researchers that have used the event-based method to identify banking fragility period. However, Von Hagen and Ho (2007) argued that this method has its limitation as it identified bank fragility stage after certain events have taken place such as high non-performing loan and bank closures. In other words, eventbased method is not capable of detecting the severity of crisis before and at different phases.

To overcome the shortcomings of the event-based method (Eichengreen, Rose & Wyplosz, 1994; Kibritcioglu, 2003; Bayraktaroglu, Ege & Yazici, 2013) constructed banking sector indices. Eichengreen et al. (1994) developed the Speculative Pressure Index (SPI) and Index of Currency Market Turbulence (ICMT) in an attempt to explain the currency crisis. On the other hand, Kibritcioglu (2003) introduced BSF Index, while

*Corresponding author: Noryati Ahmad

†Email: noryatia@salam.uitm.edu.my



Bayrakdaroglu et al. (2013) applied Excessive Risk Index (ERI) in their studies to capture different levels of the banking crisis. Apart from developing indices to identify bank fragility, empirical studies have also been attracted to identify important determinants of bank fragility (Gonzalez-Hermosillo, 1999; Mohamed Sami & Mohamed Bechir, 2009; Festic, Kavkler & Repina, 2011; Degryse, Elahi & Penas, 2013). Capital adequacy, asset quality, management soundness, earnings and profitability are among the factors identified to have linked with bank fragility. Nevertheless, the relationships are found to mixed and inconclusive due to different bank fragility measurement used, the different type of banking crises as well as different development of banking structure in different countries. Besides and Günsel, (2012), Festic et al. (2011) and Gyntelberg and Woolbridge (2008) discovered that macroeconomic factors also attribute to bank fragility.

Commercial banks act as intermediary, liquidity provider and payment servicer that make the commercial banking sector different and special from the other financial sectors. Among the main activities of the commercial banks are retail banking services, trade financing facilities, treasury services, cross border payment services and custodial services. However, in order to fulfill their obligations, these banks are faced with several risks such as asymmetric information, bank run, adverse selection and moral hazard. These risks could lead to bank fragility as well as aggravate the potential of failure within the banking system.

Bank Negara Malaysia began to reexamine and restructure its banking institution after the 1997 currency crisis. The Financial Sector Blue Print (FSB) was laid out to offer the continuity of policy formulation and new evolution of the financial sector. For instance, Bank Negara Malaysia's (BNM) execution of CAMELS framework and three pillars Basel Accord consisted of Basel I, II and III assisted the central bank in identifying and monitoring the presence of systemic risk within the banking sector. In addition, the aftermath of the crisis has further accelerated the effort of the governments in Asia including Malaysia to relook at their strict regulation related to the entry and operation of foreign banks (Pigott, 1986). Prior to this, participation of foreign banks in Malaysia was limited to offering loans together with locally based banks and are allowed to hold 30% of their joint venture ownership. Since 2009, BNM has encouraged foreign equity participation in Malaysia's financial services sector through the liberalization of investment banking, the insurance and Takaful sectors as well as Islamic finance. These changes have brought about new foreign competitors in the local financial sector and consequently, have expanded their presence significantly in several developing economies such as Malaysia, Thailand, Indonesia, Chile, the Czech Republic,

Hungary, and Poland. Most of these foreign-controlled banks have more than half of total banking assets in the host countries that they have operated Kim and Lee (2004) and Lensink and Hermes (2004) have investigated the impact of foreign banks' entry on the banking sector. They concluded that the presence of foreign banks' entry provides benefits to local banks. Among the benefits are lower interest costs, improve in banking service efficiency and increase in the diversity of products and services among the local-based banking institutions.

Several researchers have used the index method to trace the phases of bank fragility in the countries such as Mexico, United States and UK; however, research of similar nature is still relatively scarce in Malaysian context. Generally, the event-study is a common method used to detect bank fragility, which Von Hagen and Ho (2007) had earlier mentioned did have its limitations. Thus, this paper is the first attempt to construct the Banking Sector Fragility Index (BSFI) proposed by Kibritcioglu (2003) and examine whether the BSFI constructed can be used to detect the phases of fragility of two groups of commercial banks studied. In addition, using the computed BSFI value, the study will also identify the determinants of bank fragility that affect these two groups of banks. Previous studies have applied logistic regression model to examine determinants of bank fragility. However, in this study, the authors will use the constructed BSFI value to identify the bank fragility determinants. The remaining paper is structured as follows: Firstly, the results of related previous studies are analyzed that lead to the theoretical framework being set. Second, model specification and econometric method are discussed. Third, estimated results are presented and discussed and finally, in conclusions, the findings and implication of the study are summarized.

LITERATURE REVIEW

Previous studies have shown that the possibility of bank failures and contractions of bank credit is due to unwanted withdrawals of deposits (Radelet & Sahas, 1998; Tussing, 1967) the adverse macroeconomic consequences of bank disappearance (Calomiris & Mason, 2003; Caprio & Klingebiel, 1996) or bank balance sheet contraction (Mishkin, 1999; Gavin & Hausmann, 1996; Ivashina & Scharfstein, 2010). Two of the key questions facing policymakers today are how to reduce the risk of bank instability and how to cope with it when it occurs. Hence, the most important thing is to determine the early warning signal to the level of bank fragility. Event-based method and index method are commonly applied to identify the level of fragility. Kaminsky and Reinhart (1999) and Caprio and Klingebiel (2003) are among the researchers that have used event-based method in their study. However, this method has its shortcomings. In this method, the knowledge of the occurrence

of the crisis is required and therefore could possibly lead to the ability to detect a banking crisis is rather too late. Besides, event-method does not segregate different phases of banking fragility. Kibritcioglu (2003), Von Hagen and Ho (2007) and Shen and Chen (2008) have constructed bank fragility index to identify different phases of banking crisis.

Banking Sector Fragility Index

Gonzalez-Hermosillo, Pazarbasioglu and Billings (1997) highlighted that an index could acts as early signal for financial crash. They used indicators of fragility of individual banks to construct an index of fragility for the banking system. However, this research considered indicators from risk factors to construct an index of fragility namely BSF Index. The BSF Index is based on previous studies of (Kibritcioglu, 2003; Shen & Chen, 2008). Similar to Joosten (2004) who discovered crisis occurred or will occur when index value passed a certain threshold value; Kibritcioglu (2003) also developed different levels of bank fragility. The author categorized the different level of bank fragility into not fragile, medium fragility and highly fragility. BSF index applied by the author is a weighted banking sector fragility index to measure the changes in bank's vulnerability to crisis which is referred to as risks effect and that contributed to bank failure.

Risk Associated with Bank Fragility Index

Financial imbalances are related to the process of growing fragility and are associated with aggressive risk-taking. Acharya and Naqvi (2012) pointed out that liquidity risk is considered as a seed of a crisis. While, Festic et al. (2011) in their study proved that credit risk is a significant factor in determining bank failure. In addition, Kalemli-Ozcan, Sorensen and Yesiltas (2012) also found that market risk is another excessive risk that attributed toward bank fragility. Therefore, the main component in the computation of BSF index in this research takes into account these three excessive risks, which are, credit, liquidity, and market risks.

Determinants of Bank Fragility

As documented in previous empirical findings, bank failure is the result of micro and macro effect. Although banking crisis may be unique to a specific bank, however Degryse et al. (2013) are of opinion that most banks shared similar banking system and economic variables characteristics. Gonzalez-Hermosillo (1999) and Gonsel (2012) confirm that both micro and macro factors are important in determining bank fragility.

Bank Specific Determinants

Cole and Gunther (1995) and Mohamed Sami and Mohamed

Bechir (2009) and Festic et al. (2011) have used CAMELS framework to investigate the bank specific factors influencing bank fragility. The framework comprises of selected financial ratios such as capital adequacy, asset quality, management soundness, earnings and profitability, liquidity and sensitivity to market risk.

Capital adequacy measures the financial strength of a bank. Bank with high capital ratio is less likely to default and therefore failed (Samad, 2011). Arena (2008) stated that capital adequacy is a primary component of a bank's capital and is measured as capital to assets ratio (CAR). The ratio specifies the extent to which assets are funded by other than own funds and represents the capital adequacy of the bank. Although, CAR reflects the stability of the bank, it is however, negatively related to a possible failure. Asset quality of the bank measures the risk level of assets and rate of financial strength within a bank. It shows the current condition as well as future financial capacity of the bank. Several proxies are used for asset quality are loan-loss provision to total loans and loans to total assets (Arena, 2008; Boyacioglu, Kara & Baykan, 2009). A high ratio implies lower asset quality of a bank and high possibility for bank to be in a fragile situation.

Management soundness is indicative of ability of management to detect, monitor and control risk exposures in order to ensure the safety and efficient operation of the bank financial activities. In measuring the bank management soundness, this research uses proxy proposed by (Dincer, Gencer, Orhan & Sahinbas, 2011) that is, deposit interest expense (expense primarily includes interest expense related to banking deposits and investment certificates) to total expenses. In their study, they found this ratio to be directly related to the possibility of bank's failure.

Return on Assets (ROA) is employed as a proxy for earnings and profitability of the bank. High return on assets shows high-level bank's operational efficiency and high profitability. Previous empirical findings reported conflicting relationship between ROA and bank probability of failure. Findings from Mohamed Sami and Mohamed Bechir (2009) showed that ROA is positively related to the probability of default. Lanine and Vennet (2006) argued that ROA is associated with strong and healthy banks, which should decrease the probability of bank to be fragile. In contrast, Molina (2002) found that there is a negative contribution of ROA to the banking failure.

Bank liquidity implies proportion of cash held by banks to the total banks assets. Specifically, it shows the responsiveness of the bank to unexpected demands for cash. Bank with higher liquidity position is in a better position to handle deposit run (Molina, 2002). Mayes and Stremmel (2012) used Loan-to-Deposit (LTD) ratio as a proxy for bank liquidity. The formula

for LTD is bank's gross loans divided by total deposits and indicates the percentage of a bank's loans funded through deposits. A greater percentage of LTD reflects that a bank has less of a cushion to fund its growth and to protect itself against a sudden recall of its funding. Mayes and Stremmel (2012) found the high LTD ratio indicates the lack of liquidity and probability to default in payment obligations. Therefore, LTD ratio has a direct relationship with bank fragility.

Mayes and Stremmel (2012) explained that when the ratio of liabilities to total assets is low, then the greater is the bank's sensitivity to market risk. This led to the bank to become more fragile. Dincer et al. (2011) related sensitivity to market risk of a bank to its asset size. Bank with larger asset size tend to be less sensitive to market risk and therefore decrease probability of being in a fragile stage. In addition, Carey and Stulz (2007) claimed that larger banks usually hold more diversified portfolios than smaller banks and are more stable.

Macroeconomic Determinants

Past literatures have also examined the relationship between macroeconomic factors with bank fragility (Gunsell, 2012; Festic et al., 2010; Gyntelberg & Woolbridge, 2008). Gunsell (2012) theoretically and empirically argued that an increase in Gross Domestic Product (GDP) would influence market performance and prevent banks from being fragile. Gan (2010) indicated that a higher growth of GDP would ensure the banking sector development in tough condition and strengthen against fragility. On the other hand, Gyntelberg and Woolbridge (2008) used

interbank rate to explain the relationship between bank fragility. The authors found that during the turmoil in 2007 global recession, the interbank rate fixing seems to diverge to an unusual extent.

In sum, evidences from past studies indicate that bank-specific factors such as capitalization, banks loans and assets quality, management efficiency, profitability, liquidity level and banks sensitivity are linked to bank insolvency. In addition, there are also previous researchers who found macroeconomic factors to contribute to the probability of bank fragility.

RESEARCH METHODOLOGY

After the 1997 financial crisis, Malaysian financial institutions undergo major restructuring. Between the years 2001 until 2004, several banking institutions went through merging exercise that eventually led to only 10 local commercial banks. During that period, foreign-based commercial banks were allowed to operate in Malaysia. Further merging was carried out and in 2008 there was only eight local-based commercial banks operating. Subjected to availability and completeness of the data, seven local-based commercial banks and six foreign-based commercial banks operating in Malaysia are identified as the sample of the study (Table 1). The sample covers the annual data from the year 1996 until 2011. The list of these banks is retrieved from the Bank Negara Malaysia website Annual data is used instead of monthly data to avoid from the risk of incoherent monthly data for all selected variables.

TABLE 1
Name of Local-Based and Foreign-Based Commercial Banks Studied

No.	Locally-Based Commercial Bank	Foreign-Based Commercial Bank
1	Affin Bank Bhd	Bank of Tokyo
2	Alliance Bank Malaysia Bhd	Bank of America
3	CIMB Bank Bhd	United Overseas Bank
4	Hong Leong Bank Bhd	OCBC Bank Bhd
5	Malayan Banking Bhd	Citibank Berhad
6	Public Bank Bhd Bank	of Tokyo
7	RHB Bank Bhd	

Construction of BSF Index

Since the first objective of the research is to examine the trend of bank fragility for local-based and foreign commercial banks, therefore this research started with the computation of the index

method constructed in Kibritcioglu (2003). The main component of this index consists of three excessive risk factors. They are Credit Risk (CR), Liquidity Risk (LR) and Market Risk (MR). Table 2 provides the proxies for these risk factors.

TABLE 2
Construction Variables for BS Index

Economic	Risks Proxy	Data Source
CR Bank's	Credit to local-based private sector (NPL)	Bank Scope (2012)
LR Bank's	Real total deposits (DEP)	Bank Scope (2012)
MR Bank's	Financial leverage, Time-Interest-Earned Ratio (TIER)	Bank Scope (2012)

$$BSF\ INDEX_t = \frac{\left(\frac{NPL_t - \mu_{npl}}{\alpha_{npl}}\right) + \left(\frac{DEP_t - \mu_{dep}}{\alpha_{dep}}\right) + \left(\frac{TIER_t - \mu_{tier}}{\alpha_{tier}}\right)}{3} \tag{1}$$

$$CR_{i,t} = \left[\left(\frac{NPL_t - NPL_{t-1}}{NPL_{t-1}} \right) \right] \tag{2}$$

$$LR_{I,t} = \left[\left(\frac{DEP_t - DEP_{t-1}}{DEP_{t-1}} \right) \right] \tag{3}$$

$$MR_{i,t} = \left[\left(\frac{TIER_t - TIER_{t-1}}{TIER_{t-1}} \right) \right] \tag{4}$$

BSF index in equation (1) is the average standardized values of CR, LR and MR of bank, *i*, at time, *t*, μ_{npl} , μ_{dep} , and μ_{tier} are the arithmetic average of the respective variables and α_{npl} , α_{dep} , and α_{tier} represent the standard deviation. In equations (2), (3) and (4), CR, LR and MR stand for the annual changes of liquidity risk (NPL), credit risks (DEP) as well as market risk (TIER) in year, *t*, respectively.

Kibritcioglu (2003) explained that bank went through five different stages of fragility. Each phase summarizes the fragile stages, reaction of banks behaviors' and the direction of the change in value of index. Stage I is when the bank considers excessively risk for profitability purpose and is described as booming phase and the value of BSF index appears to be above zero. This is normally due to stability in economic environmental for that particular country. In stage II, there is an increasing sign of likelihood of the bank being in fragile situation and the value of the BSF index starts to decline. At this juncture, bank starts

to take necessary action to avoid the risk. Bank is in stage III (moderately fragile), when the index value is less than zero or it has negative value. The critical situation is shown in phase IV when the bank is in a highly fragile stage as the BSF index value turns negative and is below -0.5. Therefore, in phase III and IV, the bank is said to be in the risk avoiding stage. Bank is in stage V when the BSF index value begins to increase and moves above the zero index point as the economic and financial system of the particular country is in a stable condition. Therefore, it can be concluded that the banking system is considered to be in medium fragility stage when BSF index is between 0 and -0.5 (-0.5 < BSF Index < 0) and in a highly fragility stage when BSF index is equal to or lower than -0.5 (BSF Index ≤ -0.5).

Statistical Analysis

The study proceeds by identifying the banking fragility determinants for the local-based and foreign-based banks, using the computed BSF index as the independent variable. Bank specific determinants identified are Capital Adequacy (CAR), Assets Quality (AQ), Management Quality (MQ), Earnings Ability (EA), Bank Liquidity (BL) and Bank Sensitivity (BS), while macroeconomic variables used are Gross Domestic Product (GDP) and Interbank Rate (IR). Several statistical tests such as normality of the data (descriptive analysis), multicollinearity (Spearman rank order correlation) and stationary of the data through Im, Pesaran and Shin (IPS) W-stat unit root test are carried out. Test of equality is also run to check for the reliability of the data through *F*-test analysis. Table 2 presents the identified determinant variables and the proxies utilized.

TABLE 3
Determinant Variables and Proxies

Variables	Proxies	Predicted Relationship
Bank-specific variables:		
Capital adequacy	Capital Assets Ratio(CAR)	+
Asset quality	Total Loans to Total Assets (TL/TA)	-
Management quality	Deposit Interest Expenses to Total Expenses (DIE/TE)	-
Earning ability	Net Income as a Percentage of Total Assets (ROA)	+
Liquidity	Loans/ Customer Deposits (TL/TD)	-
Sensitivity to market risk	Size (LSZ)	+
Macroeconomic variables:		
Interest rate	Malaysian Interbank rate	-
GDP	Malaysian GDP growth rate (% Change in GDP)	-/+

Pooled Ordinary Least Square Method (POLS)

This study applies the Pooled Ordinary Least Square Method (POLS) to investigate the relationship between bank fragility and the bank specific and macroeconomic factors. Three POLS regressions are estimated. The first regression model (Equation 5) estimated the bank specific factors and macroeconomic factor for all commercial banks. A Dummy Variable (DUM) is used to differentiate between the two groups of banks studied. A value of one represents foreign-based commercial bank and zero for local-based commercial bank. Equation 6 estimates the relationship of all those determinants factors for local-based and foreign commercial banks on bank fragility respectively.

Pooled Ordinary Least Square Equation is expressed as:
 $BSF_{i,t} = \alpha + \beta_1 CAR_{i,t} + \beta_2 AQ_{i,t} + \beta_3 MQ_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LB_{i,t} + \beta_6 SA_{i,t} + \beta_7 GDP_{i,t} + \beta_8 IR_{i,t} + \beta_9 DUM_{i,t} + \epsilon_{i,t}$
 (5)

Where:

α = constant

β = coefficients

ϵ = error terms

$BSF_{i,t}$ = Banking Sector Fragility Index Value of bank i at time, t

$CAR_{i,t}$ = capital adequacy of bank i at time, t

$AQ_{i,t}$ = asset quality of bank i at time, t

$MQ_{i,t}$ = management quality of bank i at time, t

$ROA_{i,t}$ = earnings ability of bank i at time, t

$LB_{i,t}$ = liquidity of bank i at time, t

$SB_{i,t}$ = sensitivity of bank i at time, t

$GDP_{i,t}$ = the percentage change in GDP

$IR_{i,t}$ = Malaysian interbank rate (IR)

$DUM_{i,t}$ = Dummy variable (where 1 = foreign-based banks and 0 = local-based banks)

Group regression model:

$$BSF_{i,t} = \alpha + \sum_{k=1,2,3...k} \beta_2 \text{bank specific}_{kit} + \sum_{k=1,2,3...k} \beta_3 \text{macroeconomic}_{kit} + \epsilon_{i,t} \quad (6)$$

$BSF_{i,t}$ Value of BSF Index for either local-based or foreign-based commercial banks

$i = 1,2,3 \dots N$, represents a cross-sectional unit

$t = 1,2,3, \dots T$, represents annual time-series

$k = 1,2,3, \dots K$, represents a specific potential explanatory variables

ϵ_{it} = error term

α = constant

β_2, \dots, β_k = estimated coefficients for the respective independent variables studied

DATA ANALYSIS AND DISCUSSION

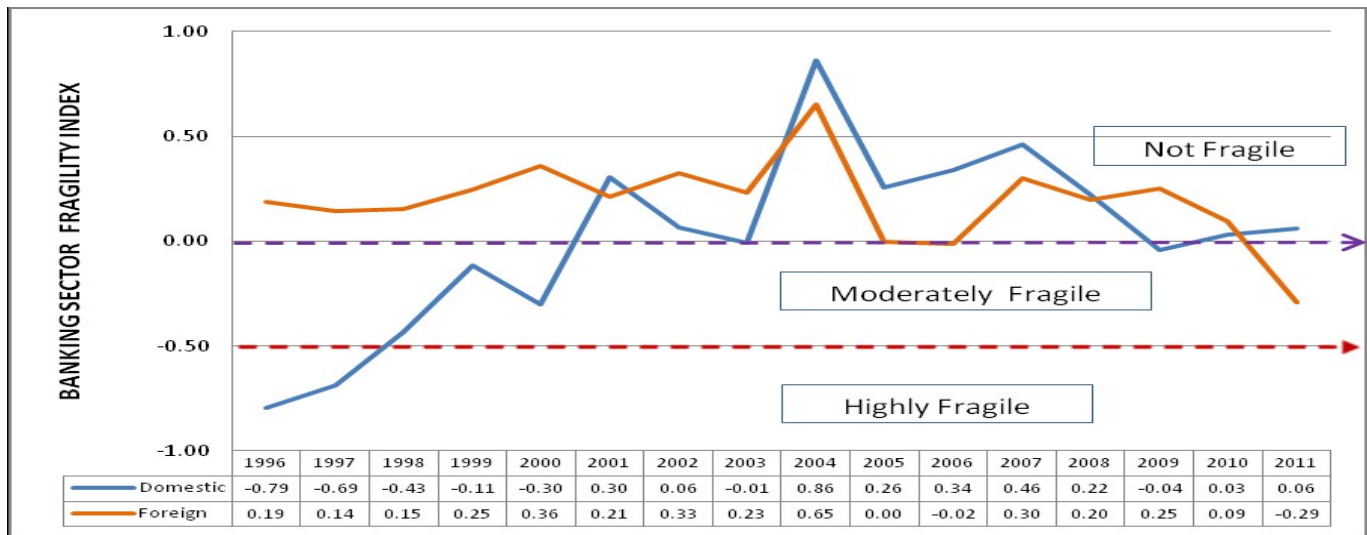
Trend of Bank Fragility

The trend of fragility of constructed BSF index for local-based and foreign commercial banks are displayed in Figure 1. A bank is classified to be in a fragile situation if BSF index value is less than zero, in medium fragility stage if the BSF index value is between less than 0 but greater than and equals to -0.50 and is said to be highly fragile if the BSF index value is less than -0.50. As expected, Malaysian local-based commercial banks were in a highly fragility condition between 1996 until 1997 due to the Asian financial crisis and slowly crawled into the medium fragility zone in 1998. It remained to be in that condition until the year 2000. It was also during that medium fragility stage that Bank Negara Malaysia took several drastic measures to restore the badly hit condition of the local-based banking sector. Among the measures taken were the restructuring and merging of local-based banks that began in the year 1999. In March 2001, the first Financial Sector Master Plan (FSMP) for the

period 2001-2010 was introduced to stabilize and strengthen the local-based banking sector. Under the plan, the country has started to liberalize its financial policies and allowed increase participation from foreign banks into its banking system. At the same time, BNM was also aggressive in ensuring the progress of the Islamic banking industry that operates parallel to the conventional banking system. By the year 2004, there were only

26 financial institution comprising of six finance companies, ten merchant banks and ten local-based commercial banks. The efforts taken appeared to be fruitful when the BSF index value showed positive sign in the year 2001 and 2002. The local-based commercial banks slipped back into the moderate fragility situation in 2003 due to the upcoming general election that took place in March 2004.

FIGURE 1
BSF Index for Local-Based and Foreign Commercial Banks (1996-2012)



From the year 2004 until 2008, the local-based commercial banks were not in any fragile condition. However, the local-based banks were in a medium fragility stage in 2009 because of the 2007-2009 world economic crises that has badly affected US and the European countries. It is observed that the impact of the global financial crisis on the local-based banks was rather minimal. Since being badly affected by the 1997 financial crisis, BNM has laid out several financial strategies to rectify and strengthen the banking institutions. Among them are the merger and acquisition exercise of local-based banks that was carried out in 1999, introduction of the Financial Sector Master.

The trend of fragility for foreign-based commercial banks operating in Malaysia depicted a different picture. From 1996 until 2005, none of these foreign banks is in the fragile condition. Plausible explanation is that these foreign banks are subsidiaries and are being controlled and monitored by their respective parent banks, which are headquartered in the countries that they are established. Their banking activities focus more on institutional clients rather than retail clients and therefore do not have high level of regional liquidity or high regional capitalization in the host country that they operate (Degryse et al., 2013). Hence, any financial/economic crisis that is specific to the region that

they operated has a marginal impact on their banking activities. However, these foreign banks were in a highly fragility zone due to the global financial crisis that started in US in the year 2007. The crisis eventually spread to the European countries and eventually in 2011, the European banking system was faced with the credit crisis. In sum, the constructed BSF index is able to explain the level of fragility of both the local-based commercial banks in Malaysia.

Table 4 shows the descriptive statistic of the variables as well as the univariate test statistics of both local-based and foreign commercial banks. On average the Capital Adequacy (CAR), earnings ability (ROA) and liquidity (TL/TD) of foreign banks are greater than local-based banks. While, at mean level, local-based banks have higher asset quality (TL/TA), management quality (DIE/TE) and sensitivity to market risk (LSZ). To determine whether the difference of variables between the two groups of banks is statistically significant, a univariate t-test is conducted. Based on p-value of the univariate statistic tests, only management quality (DIE/TE), earnings ability (ROA) and sensitivity to market (LSZ) are statistically significant. This implies that local-based banks have a slightly better competencies and expertise in running the banking operations than the foreign

banks. The result is as expected as these local-based banks have long been established and operated in their own country financial system. Hence, the management of the local-based banks is therefore well versed with the rules and regulation and banking policies implemented. Assets sizes of local-based banks are also slightly larger than foreign-based bank. Data series for capital adequacy, earnings ability and liquidity of local-based banks and the asset quality, management quality and sensitivity to market risk of foreign banks are negatively skewed. Overall, the data series have kurtosis greater than zero.

Results of Unit Root Tests

The Im, Pesaran, Shin W-statistics was carried out to test the null hypothesis of non-stationarity (Table 4). Initially all the data series are run at level. For the local-based banks, data series of CAR, TL/TD and GD are found to be stationary at level, while data series of TL/TA, DIE/TE, Log Size (LSZE) and IR are stationary at first difference. Data series for foreign banks that do not have unit root at level are ROA and GDP, while the others do not have unit root at first difference. Hence, when the equations are estimated, the variables are transformed accordingly.

Descriptive Statistics

TABLE 4
Descriptive Statistic of Data Series

Series	No. Obs	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera p-value	t-test p-value
CARDa	112	12.5511	3.8938	-1.9912	7.5387	170.1454 0.0000	-1.4954 0.1363
CARFb	96	13.8701	8.3361	1.0653	3.0535	18.1686 0.0001	
TL/TAD	112	7.9883	6.9316	2.0451	8.6760	228.4149 0.0000	-0.0578 0.9539
TL/TAF	96	0.8613	0.0834	-1.0653	3.0535	18.1686 0.0001	
DIE/TED	112	0.6026	0.1019	0.5045	2.9009	4.7974 0.0908	4.0978 0.0001***
DIE/TEF	96	0.5332	0.1415	-0.4357	3.0933	3.0720 0.2152	
ROAD	112	0.9601	0.7422	-2.7492	22.3315	1885.0570 0.0000	-2.7061 0.0074***
ROAF	96	1.4021	1.5318	-2.3687	22.9350	1679.3980 0.0000	
LSZD	112	4.3638	0.6076	0.1727	1.7552	7.7879 0.0204	6.0693 0.0000***
LSZF	96	3.8416	0.6312	-0.1273	1.6209	7.8669 0.0196	
TL/TDD	112	85.8436	14.9057	-0.2489	2.8471	1.2653 0.5312	-0.0578 0.9539
TL/TDF	96	86.0208	28.1716	-0.4198	4.4386	11.0981 0.0039	
GDP	-	4.7625	4.1502	-1.6483	5.3403	76.2805 0.0000	Na
IR	-	4.0519	2.0208	1.6426	4.2847	58.0684 0.0000	Na

D is Local-based banks, F is Foreign-based banks; ***significant at 1% level

Table 4 shows the descriptive statistic of the variables as well as the univariate test statistics of both local-based and foreign commercial banks. On average the CAR, earnings ability (ROA) and liquidity (TL/TD) of foreign banks are greater than local-based banks. While, at mean level, local-based banks have higher asset quality (TL/TA), management quality (DIE/TE) and sensitivity to market risk (LSZ). To determine whether the difference of variables between the two groups of banks is statistically significant, a univariate t-test is conducted. Based on *p*-value of the univariate statistic tests, only management quality (DIE/TE), earnings ability (ROA) and sensitivity to market (LSZ) are statistically significant. This implies that local-based banks have a slightly better competencies and expertise in running the banking operations than the foreign banks. The result is as expected as these local-based banks have long been established and operated in their own country financial system. Hence, the management of the local-based banks is therefore well versed with the rules and regulation and banking policies implemented. Assets sizes of

local-based banks are also slightly larger than foreign-based bank. Data series for capital adequacy, earnings ability and liquidity of local-based banks and the asset quality, management quality and sensitivity to market risk of foreign banks are negatively skewed. Overall, the data series have kurtosis greater than zero.

Results of Unit Root Tests

The Im, Pesaran, Shin W-statistics was carried out to test the null hypothesis of non-stationarity (Table 4). Initially all the data series are run at level. For the local-based banks, data series of CAR, TL/TD and GD are found to be stationary at level, while data series of TL/TA, DIE/TE, Log Size (LSZE) and IR are stationary at first difference. Data series for foreign banks that do not have unit root at level are ROA and GDP, while the others do not have unit root at first difference. Hence, when the equations are estimated, the variables are transformed accordingly.

TABLE 5
Results of Im, Pesaran and Shin W-Statistics Tests

Series	Local-based Banks	Series	Foreign Banks
	<i>t</i> -stat		<i>t</i> -stat
	<i>p</i> -value		<i>p</i> -value
CAR	-4.5496 [0.0000]***	D(CAR)	-3.7495 [0.0000]***
D(TL/TA)	-4.2122 [0.0000]***	D(TL/TA)	-3.7495 (0.0001)***
D(DIE/TE)	-6.0169 [0.0000]***	D(DIE/TE)	-2.7614 (0.0029)***
D(ROA)	-4.2884 [0.0000]***	ROA	-3.7933 (0.0001)***
TL/TD	-3.6648 [0.0000]**	D(TL/TD)	-5.3630 (0.000)***
D(LSZ)	-3.2375 [0.0000]**	D(LSZ)	-7.2583 (0.0000)***
GDP	-9.47928 [0.0000]***	GDP	-8.7761 (0.0000)***
D(IR)	-7.7714 [0.0000]***	D(IR)	-4.9037 (0.0000)***

***significant at 1% level

Estimated Results of Pooled OLS Equations

Table 5 presents the estimated results of the pooled OLS equations of overall commercial banks, local-based banks and foreign-based banks respectively. These regressions used the

BSF index value as the dependent variable. Autoregressive lag one are included in all the three equations to mitigate the problem of serial correlation. Results of the overall estimated equation show that CAR, asset quality of banks (TL/TA) and

Bank Size (SZ) are positive and significantly related to bank fragility. The results concur with those of (Boyacioglu et al., 2009; Mannasoo & Mayes, 2009; Shen & Hsieh, 2004). None of the macroeconomics variables have any significant relationship with bank fragility. The dummy variable used as a proxy for different group of bank (where 1 = foreign-based banks, 0

= local-based banks) is also not statistically significant. This indicates the relationship between bank specific variables and macroeconomic variables with bank fragility are similar irrespective if the commercial banks are local-based or foreign based.

TABLE 6
Estimated Results of Pooled OLS Equations as Overall, Local-Based Banks and Foreign-Based Banks

DEPENDENT VARIABLE: BSF INDEX VALUE						
Variables	OVERALL		LOCAL-BASED BANKS		FOREIGN BANKS	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
CAR	0.0228	0.0203**	-0.0064	0.6449	0.0175	0.2071
TLTA	0.3007	0.0321**	0.03738	0.0002***	-0.1033	0.9470
DIETE	0.2322	0.2494	1.3889	0.0006***	0.4570	0.3543
ROA	0.0144	0.6088	0.01582	0.5642	0.0522	0.1120
TLTD	0.1671	0.2376	-0.0046	0.2538	-0.0004	0.8089
LSZ	4.8204	0.0000***	1.3482	0.0000***	0.2486	0.7567
GDP	-0.0080	0.2330	0.0007	0.2602	0.0045	0.7270
IR	-0.0015	0.9889	-0.0007	0.6586	0.0324	0.8377
DUM	-0.0207	0.9103	-	-	-	-
C	-0.1291	0.4960	0.5870	0.1997	-0.0875	0.7720
AR(1)	0.6418	0.0000***	0.6696	0.0000***	0.7194***	0.0000***
Adj R-squared	0.4557		0.6421		0.5342	
F-statistic	5.4861		20.3378		11.5792	
Prob(F-statistic)	0.0000***		0.0000***		0.0000***	
DW Statistic	2.0077		1.8997		2.1048	

***and ** denote 1% and 5% level of significance

Interestingly the results are distinct when the equations are estimated based on bank group, that is, local-based banks and foreign banks. Estimated results of the local-based banks equation suggest that bank specific variables such as asset quality management (TLTA)), bank management quality (DIETE) as well as size (LSZ) has significant positive relationships with bank fragility. As the percentage of asset quality management increases, the higher the BSF index value implying less sign of fragility for local-based banks. Festic et al. (2011) reported similar results in their study. Similarly, when local-based bank's management quality improved then the banks are in less fragile condition. The large banks as reflect in their assets size are more stable and therefore are not likely to be in a fragile stage as oppose to smaller banks. This finding is in line with the study of (Dincer et al., 2011). In contrast, none of the bank specific determinants is significantly related to bank fragility for foreign-based banks. This is because these foreign-based banks are controlled and monitored by their parent banks and will be

in the fragile situation if their parent banks are affected by those bank specific determinants. At macro level, foreign-based banks are likely to be fragile when their parent banks are affected by specific macroeconomics factors occurred in their respective countries as well as the extent of the regulatory framework being in place. The F-statistics for all equations are statistically significant at 1% level, suggesting that the equations are well specified.

CONCLUSION

This study aims to examine two objectives. Firstly, it attempts to explain the trend of bank fragility of both local-based and foreign-based banks by developing a BSF index. Information from the BSF index value reveals that domestic banks are more fragile during the 1997 financial crisis as opposed to the World economic crisis in 2008. On the other hand, foreign banks in Malaysia appear to be more affected by the 2008 crisis relative to the domestic banks. In sum, the computed BSF index is capable of tracking the trend of bank fragility of local-based

commercial banks in Malaysia. The second objective examines the relationship between bank specific variables and macroeconomic variables with bank fragility. Table 6 summarizes the results of the estimated POLS equations. Generally, overall estimated results reveal that higher capital adequacy and asset quality reduce bank fragility. At individual level, both bank

specific variables and macroeconomic variables do not have any effect on the foreign-based banks' fragility. In the case of local-based banks, asset quality ratio, management quality and bank asset size are significant determinants for the bank fragility.

TABLE 7
Summary of the Estimated Results of Pols Equations

Variable/Proxy	Measurement	Overall	Domestic Bank	Foreign Bank
Bank Specific Determinants				
Capital adequacy	Capital Assets Ratio(CAR)	+ Significant	- Not significant	+ Not significant
Asset quality	Total Loans to Total Assets (TL/TA)	+ Significant	+ Significant	- Not significant
Management quality	Deposit Interest Expenses to Total Expenses (DIE/TE)	+ Not significant	+ Significant	+ Not significant
Earning ability	Net Income as a Percentage of Total Assets (ROA)	+ Not significant	+ Not significant	+ Not significant
Liquidity	Loans/ Customer Deposits (TL/TD)	+ Not significant	- Not significant	- Not significant
Sensitivity to market	risk Size (SZ)	+ Significant	+ Significant	+ Not significant
Macroeconomic Determinants				
Interest rate	Malaysian Interbank rate	- Not significant	- Not significant	+ Not significant
GDP	Malaysian GDP growth rate (% Change in GDP)	- Not significant	+ Not significant	+ Not significant

Based on the empirical evidences, policy makers and regulators need to be aware of the timing of implementing relevant guidelines and policies to ensure that banks do not enter into a very fragile zone. Implementation of policies when the banks are in a very fragile zone could actually exacerbate bank fragility condition and perhaps push them to bankruptcy. As for the local-based bank managers, they must closely monitor these three bank-specific determinants asset quality management, bank management and assets size since they are the determinants factors for bank to be fragile. For future research, it is proposed that the sample of banks could extend to investment banks as well as examining the bank fragility at regional level. As Is-

lamic banks are now rapidly expanding and growing, it is also worth to investigate whether the level of bank fragility differ for Islamic banks since these banks have to adhere to different regulatory framework. In conducting the research, the authors faced with several limitations. Ideally, in constructing the BSF index, exchange-rate risk could be incorporated in the computation. However, due to unavailability of foreign liabilities data to measure exchange-rate risk, the authors had to exclude the risk in developing its BSF index. Secondly, this study had to use annual data instead of monthly data as suggested by (Kibritcioglu, 2003) as most data are available annually instead of monthly.

REFERENCES

- Acharya, V., & Naqvi, H. (2012). The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle. *Journal of Financial Economics*, 106(2), 349-366.
- Arena, M. (2008). Bank failures and bank fundamentals: A comparative analysis of Latin America and East Asia during the nineties using bank-level data. *Journal of Banking & Finance*, 32(2), 299-310.
- Bayraktaroglu, A., Ege, I., & Yazici, N. (2013). A panel data analysis of capital structure determinants: Empirical results from Turkish capital market. *International Journal of Economics and Finance*, 5(4), 131-140.
- Bernoth, K., & Pick, A. (2011). Forecasting the fragility of the banking and insurance sectors. *Journal of Banking & Finance*, 35(4), 807-818.

- Boyacioglu, M. A., Kara, Y., & Baykan, O. K. (2009). Predicting bank financial failures using neural networks, support vector machines and multivariate statistical methods: A comparative analysis in the sample of savings deposit insurance fund (SDIF) transferred banks in Turkey. *Expert Systems with Applications*, 36(2), 3355-3366.
- Calomiris, C.W., & Mason, J. R. (2003). Fundamentals, panics, and bank distress during the depression. *American Economic Review*, 93(5), 1615-1647.
- Caprio, G., & Klingebiel, D. (2003). Bank insolvency: Bad luck, bad policy, or bad banking? Paper presented at *Annual World Bank conference on development economics*, The World Bank, Washington, US.
- Carey, M., & Stulz, R. M. (2007). Introduction to "The risks of financial institutions". In *the risks of financial institutions* (Eds). Chicago, US: University of Chicago Press.
- Cole, R. A., & Gunther, J. W. (1995). Separating the likelihood and timing of bank failure. *Journal of Banking & Finance*, 19(6): 1073-1089.
- Degryse, H., Elahi, M. A., & Penas, M. F. (2013). Determinants of banking system fragility: A regional perspective.
- Dincer, H., Gencer, G., Orhan, N., & Sahinbas, K. (2011). A performance evaluation of the Turkish banking sector after the global crisis via CAMELS ratios. *Procedia-Social and Behavioral Sciences*, 24, 1530-1545.
- Eichengreen, B., Rose, A. K., & Wyplosz, C. (1994). *Speculative attacks on pegged exchange rates: An empirical exploration with special reference to the European Monetary System*, (No. w4898). National Bureau of Economic Research.
- Festic, M., Kavkler, A., & Repina, S. (2011). The macroeconomic sources of systemic risk in the banking sectors of five new EU member states. *Journal of Banking & Finance*, 35(2), 310-322.
- Gan, J. (2010). Housing wealth and consumption growth: Evidence from a large panel of households. *Review of Financial Studies*, 23(6), 2229-2267.
- Gavin, M., & Hausmann, R. (1996). The roots of banking crises: The macroeconomic context.
- Gonzalez-Hermosillo, B., Pazarbasioglu, C., & Billings, R. (1997). Determinants of banking system fragility: A case study of Mexico. *Staff Papers-International Monetary Fund*, 44(3), 295-314.
- Gonzalez-Hermosillo, M. B. (1999). *Determinants of ex-ante banking system distress: A macro-micro empirical exploration of some recent episodes*. International Monetary Fund.
- Gunsel, N. (2012). Micro and macro determinants of bank fragility in North Cyprus economy. *African Journal of Business Management*, 6(4), 1323-1329.
- Gyntelberg, J., & Wooldridge, P. (2008). International banking and financial market developments. *BIS Quarterly Review*, (8).
- Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics*, 97(3), 319-338.
- Joosten, W. (2004). *The Asian financial crisis in retrospect: What happened? What can we conclude?* Working paper no. 87. CPB Netherlands Bureau for Economic Policy Analysis.
- Kalemli-Ozcan, S., Sorensen, B., & Yesiltas, S. (2012). Leverage across firms, banks, and countries. *Journal of International Economics*, 88(2), 284-298.
- Kaminsky, G. L., & Reinhart, C. M. (1999). The twin crises: the causes of banking and balance-of-payments problems. *American Economic Review*, 89(3), 473-500.
- Kibritioglu, A. (2003). Monitoring banking sector fragility. *The Arab Bank Review*, 5(2), 51-66.
- Kim, H. E., & Lee, B. Y. (2004). *The effects of foreign bank entry on the performance of private domestic banks in Korea*. Bank of Korea Institute of Monetary and Economic Research.
- Lanine, G., & Vennet, R. V. (2006). Failure prediction in the Russian bank sector with logit and trait recognition models. *Expert Systems with Applications*, 30(3), 463-478.
- Lensink, R., & Hermes, N. (2004). The short-term effects of foreign bank entry on domestic bank behaviour: Does economic development matter? *Journal of Banking & Finance*, 28(3): 553-568.
- Mayes, D. G., & Stremmel, H. (2012). The effectiveness of capital adequacy measures in predicting bank distress. Paper presented at *Financial Markets & Corporate Governance Conference*.
- Mishkin, F. S. (1999). Lessons from the Asian crisis. *Journal of International Money and Finance*, 18(4), 709-723.
- Mohamed Sami, B. A., & Mohamed Bechir, C. (2009). Financial liberalization and banking fragility within Tunisian financial sector. *International Journal of Business and Management*, 2(2), 161- 176.
- Molina, C. A. (2002). Predicting bank failures using a hazard model: The Venezuelan banking crisis. *Emerging Markets Review*, 3(1): 31-50.

- Pigott, C. A. (1986). Financial reform and the role of foreign banks in Pacific Basin Nations. In: Cheng, H.S. (Eds.), *Financial Policy and Reform in Pacific Basin Countries*. Lexington, Lexington Books.
- Radelet, S., & Sachs, J. (1998). *The onset of the East Asian financial crisis*. Working paper no. 6680. National Bureau of Economic Research.
- Samad, A. (2011). Is capital inadequacy a factor for bank failure? Evidence from US banking. *Journal of Accounting and Finance*, 11(4), 105-110.
- Shen, C.H., & Chen, C. F. (2008). Causality between banking and currency fragilities: A dynamic panel model. *Global Finance Journal*, 19(2), 85-101.
- Tussing, A.D. (1967). The case for bank failure. *Journal of Law and Economics*, 10, 129-147.
- Von Hagen, J., & HO, T. K. (2007). Money market pressure and the determinants of banking crises. *Journal of Money, Credit and Banking*, 39(3), 1037-1066.

— This article does not have any appendix. —