Firm Investment and Bank Health: Evidence from Malaysian Listed Firms

(Pelaburan Firma dan Kekukuhan Bank: Bukti dari Firma-firma Tersenarai di Malaysia)

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ABSTRACT

This paper examines the impact of bank financial health on firm investment. The firm-level data are obtained from firms that were listed on Bursa Malaysia between 2000 and 2007. This paper aims to provide additional empirical evidence based on an original paper by Fukuda, Kasuya and Nakajima (2005). This paper also extends the previous literature by using unbalanced panel data methodology. In order to have a robust result, the GLS estimation method is used, instead of OLS. In measuring the bank health, this study uses the core capital ratios (CCR), risk weighted capital-adequacy ratios (RWCR) and non-performing loans (NPL) figures. The findings indicate that: first, CCR and RWCR have positive impact on investment by firms. The possible explanation is that when CCR and RWCR deteriorate, bank lending is reduced; resulting in reduced investment of firms. Second, NPLs have positive impact on firm investment. When banks' NPLs are low due to government interventions during the Asian financial crisis, investments of firms also deteriorate due to falling aggregate demand. Third, financial variables have positive impact on firm investment. This finding is consistent with previous empirical evidence which suggests that a firm is likely to have a larger investment when it has good investment opportunities.

ABSTRAK

Kajian ini menguji impak kekukuhan kewangan bank terhadap pelaburan firma. Data dari syarikat yang tersenarai di Bursa Malaysia dari tahun 2000 hingga 2007 telah digunakan. Kajian ini bertujuan memberikan pembuktian empirik tambahan berdasarkan kajian asal oleh Fukuda, Kasuya dan Nakajima (2005). Kajian ini juga adalah hasil lanjutan dari kajian lepas yang menggunakan kaedah data panel tidak seimbang. Bagi mendapatkan keputusan yang kukuh, kaedah penganggaran GLS digunakan berbanding OLS. Dalam mengukur kekukuhan kewangan bank, nisbah modal utama (CCR), nisbah kecukupan modal wajaran risiko (RWCR)dan pinjaman tidak berbayar (NPL) telah digunakan. Dapatan kajian menunjukkan: pertama, CCR dan RWCR menunjukkan impak positif ke atas pelaburan firma. Ini mungkin dapat dijelaskan apabila kedudukan CCR dan RWCR merosot, pinjaman dari bank menurun dan ini memberi kesan kepada penurunan dalam pelaburan firma. Kedua, NPL menunjukkan impak positif ke atas pelaburan firma. Apabila NPL bank rendah disebabkan campurtangan kerajaan berikutan krisis kewangan Asia, pelaburan firma juga menurun disebabkan kejatuhan dalam permintaan agregat. Ketiga, pembolehubah kewangan mempunyai impak positif ke atas pelaburan firma. Dapatan kajian ini selari dengan bukti empirik lepas bahawa firma mempunyai pelaburan yang tinggi apabila ada peluang pelaburan yang baik.

INTRODUCTION

The motivation for this study is related to the involvement of banks in economic development. The role of bank health can be seen through the bank lending channel. Bank lending channel shows that banks play a special role in the financial system because they are well resourced to solve information problems in the credit market. Banks also provide credit channel to firms in fixed investment. Problems of investing in fixed capital are the center to our understanding of real economic activities because the volatility of investment expenditures is the main contributor to aggregate fluctuations that affect economic growth.

Therefore, this paper is an empirical exploration of the relationship between bank health and firm investment.

The earlier studies that discuss this relationship focus on the theoretical research of the financial and economic development as conducted by Goldsmith (1969), Gurley and Shaw (1955), McKinnon (1973), Tobin (1956), and Schumpeter (1911). These theoretical researches emphasize on two aspects. First, the key roles of financial intermediaries are related to entrepreneurial selection and the financing of investments. Second, the key roles of financial intermediaries lead to efficient banking activity, resulting in capability to supply credit for firms' investment. The earlier studies that relate to the health of bank and fixed investment by firms are such as the ones by Gibson (1995, 1997) and Sekine (1999). The health of bank will affect the fixed investment by firms which subsequently promotes economic growth.

The more recent studies, for example are the ones conducted by Fukuda, Kasuya and Nakajima (2005) and Yuan and Motohashi (2008). Yuan and Motohashi (2008) also look at the health of bank in the context of bank loan ratio and fixed investment by firms; but Fukuda et al. (2005) look at a more comprehensive relationship between several bank health measures and firms' investment. They believe that bank health measures are the main factors that influence the performance of firms' investment. In addition, Fukuda et al. (2005) use financial variables such as Tobin's q, cash-flow and debt-asset ratio of firm to explain the impact on firm investment. While, the proxy variables to measure the bank health are regulatory capital ratio (CAR) and non performing loans (NPLS).

This study aims to examine the relationship between measures of bank financial health on firm investment in the Malaysian context. Many empirical studies on the relationship between firm investment and bank health are dominated by developed countries; while there are insufficient surveys being done on developing countries. Although the findings of these studies provide a useful guide to the bank-firm investment relationship, it is difficult to verify the results using data from developing countries due to lack of data and information. In spite of this shortfall, Malaysia has been chosen in this study to represent a developing country. Although Fukuda et al. (2005) have already discovered that several measures of bank health have significant impact on firm investment their survey focuses only on a developed country using Japanese banks and firm-level data. On the other hand, this study focuses on Malaysian commercial banks and listed firms data. In brief, this paper also contributes to the literature by using a panel data analysis approach and focuses on Malaysia.

In this study, Malaysian firms' investment is regressed against both the bank health measures and financial variables using unbalanced panel fixed-effect estimator. The bank health measure variables consist of core capital ratios (CCR), risk weighted capital-adequacy ratios (RWCR) and non-performing loans (NPLS). The financial variables are Tobin's q, cash-flow, debt-asset ratio and sales. Motivation for this study lies on the possibility that bank health measures have adverse impacts on the willingness of banks to supply credit to the economy. For example, if the regulatory capital ratios (RWCR and CCR) have positive impact on firm investment, the occurrence of capital crunch might reduce firms' investment as deterioration of these ratios would tighten supply of bank lending.

This issue will consequently reduce the activity of bank lending. For example, the depreciation of the Malaysian ringgit (RM) in 1998 caused instability in the Malaysian banking sector and other financial institutions. The instability of the banking sector had caused many corporate sectors to experience a significant loss of wealth as the value of real estates and equities used as bank collateral fell along with demand. This implies that the stability of the banking sector, i.e. bank health, is important in providing a healthy environment in the banking sector.

This is because the effects of instability and shrinking loan supply have the potential to reduce aggregate investment and increase macroeconomic fluctuations (Nier & Zicchino 2006).

In addition, when corporate incomes declined due to the financial crisis, some corporations were unable to service their debts. The government had been urged to step in and as a result, an asset management company was established under the name of Danaharta. Therefore, findings from literature review have shown that bank's balance sheet and firm investment are interrelated. In this case, it is important to investigate how the condition of bank's balance sheet may affect the Tobin's q (firm investment). This issue can be described meticulously in bank health measure and bank-firm relationship. Bank health is one of the important elements because banks exist to provide the flow of credit or loans to firms. Therefore, the bank-firm relationship exists to solve the problem of asymmetric information in financial markets. Hence, bank plays an effective role as a transmission channel of monetary policy to the economy.

This study utilizes the data of Malaysian commercial banks and listed firms from 2000 to 2007. This study finds evidence of the impact of bank health using measures of CCR, RWCR and NPLS on investment of Malaysian firms. The results show that: first, the CCR and RWCR have positive impact on investment of firms. The results support the earlier findings by Fukuda et al. (2005) in the Japanese economy. The findings consistently indicate that bank health measures specifically CCR and RWCR have positive impact on firm investment. This implies that when that bank health (as measured by CCR and RWCR) deteriorates, bank lending is tightened and consequently, the investments of firms decline.

Second, the NPLS measure also has a positive impact on firm investment. The result of NPLS is contrary to the finding by Fukuda et al. (2005). However, it is similar to Mahani and Rajah (2009) who find that when the percentage of bank's NPLS is reduced, investment of firms also reduces due to falling aggregate demand. This measure shows that government intervention has positive impact on investment of firms. In Malaysia, government intervenes the banking system by implementing prudent and conservative regulations on investment banks and finance houses which are designed to reduce NPLS following the 1997-1998 Asian financial crisis. During the crisis, despite sufficient financing firms still face a great difficulty in making profits basically because of the reduction in aggregate demand. This is evident from the trend in firms' investment which also continues to decline.

Third, the financial variables which are Tobin's q, cash-flow and sales have positive impact on firm investment. This finding is consistent with previous empirical evidence which states that firms are likely to invest more when good investment opportunities arise. Back to our earlier argument, investment is high when aggregate demand is on the rise.

The remaining of the paper is organized as follows. Section two discusses on the bank-firm investment relationship within the theoretical framework. Section three presents the model specification and data description. Empirical results are documented in section four and finally, section five provides the conclusion and policy implication.

THEORETICAL FRAMEWORK

This section builds upon the relevant literature that examines the relationship between firm investment and bank's balance sheet. The literature includes those studies that examine bank-firm relationship in investment of firms either theoretically or empirically.

As a result of information problems in credit markets, two types of monetary transmission channels have emerged. First, bank lending channel focuses more on the effect of monetary policy on the supply of loans by depository institutions. Second, the balance sheet channel focuses on the potential impact of changes in monetary policy on borrowers' balance sheet and income statement, net worth, liquid assets and cash flow. Studies of these credit views can be found in Bernanke and Bernanke (1993), Cecchetti (1995), Gertler (1995) and Hubbard (1995). According to these views, investment may depend on financial factors and internal cash flow may affect investment spending because of financing hierarchy. The financing hierarchy causes firms with internal cash flow to enjoy lower cost on new debt or equity financing, and subsequently increases the firm's investment activity. The literature that includes consequences of policy actions through a financing hierarchy is from Angelopoulou and Gibson (2009) and Fazzari et al. (1988).

The investment activity of firms can also be discussed in the presence of Tobin's q. In financing hierarchy or pecking order theories, a firm's manager is assumed to have full information on the value of the firm's assets and the returns from new investment projects. These ideas are related to the problem of equity finance (Myers 1984; Myers & Majluf 1984). This financing hierarchy has also a number of implications for the q values and investment behavior. The q values will differ as each firm has different information characteristics. For example, for firms with asymmetric information, the observed q value will be the value assigned by the imperfectly informed market. From the perspective of financing hierarchy model, the value of q must be higher to induce investment for new shares issue of limited-information firms than those full-information firms. Therefore, firms with higher the value of q are expected to have greater ability to increase their investments through bank borrowings. A group of literature agrees that Tobin's q will affect a firm's investment, among them are Ahn and Denis (2006), Aivazian et al. (2005), Fukuda et al. (2005), Gibson (1995), Lang et al. (1996), McConnel and Servaes (1995), Sekine (1999), and Yuan and Motohashi (2008).

In addition, small firms face problem in obtaining credit or loan from the bank to increase their investments. These firms also have fewer external funding options. An important result of this implication is that monetary policy will have a greater effect on expenditure by smaller firms which are more dependent on bank loans, compared to larger firms which can easily access the credit markets. These problems have been discussed in Degryse and Cayseele (2000), Gertler and Hubbard (1988), Gertler and Gilchrist (1994), Gibson (1997), Motonishi and Yoshikawa (1999), and Sekine and Nagahata (2005). In this case, the theory suggests that engaging in a bank-firm relationship can mitigate the asymmetric information problem. In addition, Stiglitz and Weiss (1981) point out that the models of equilibrium credit rationing have moral hazard and adverse selection problems. These small firms with opportunities to invest in positive net present value projects may have to let go off the opportunities because potential providers of external fund cannot readily verify that the firms have access to a quality project (adverse selection problem) or ensure that the funds will not be diverted to an alternative project due to moral hazard problems.

As noted earlier, these bank-firm relationships have been explored in a lot of literature, specifically in relation to bank's balance sheet to firm investment. Previous literature has also shows that a loan or leverage has a significant negative effect on investment; implying that items in bank's balance sheet play an important role in the firms' investment decision. Therefore, in providing loans to firms, the bank health may be affected. The bank health is an important determinant because bank exists to solve asymmetry information and to provide credit to the economy through lending in credit market. Past literature reveals that problems in banks can affect firm investment through declining credit supply. These problems have been highlighted in Gibson (1995), Sekine (1999) and Sekine and Nagahata (2005). Gibson (1995) finds that the problems in the credit market of the banking sector affect firm investments. This is reflected through the banking sector's loans activities. His argument is based on the bank-firm relationship which suggests having a healthy bank and good investment opportunities (q) are equally important for firm. He shows that when the balance sheet of main bank is weak, there will be low supply of loans to the firms.

Sekine (1999) conducts a more comprehensive survey on bank health and investment of Japanese firms. He uses a q-type investment function and error correction specification for the balance sheet variables for both firm and main bank. He finds that small firms face liquidity constraints and have difficulties in obtaining fund to increase their investment. These problems have been discussed by many researchers; among them are Gertler and Gilchrist (1994) and Kashyap et al. (1994). Sekine (1999) finds that the small firms' investment in Japan has been discouraged by the deterioration of their main bank's balance-sheet. Later, Sekine and Nagahata (2005)

also show that when faced with such problem, even a small firm with healthy balance-sheet will have to reduce its investment. They also find that collateral requirement on loans is lower for established firms that are already strongly affiliated with their main bankers.

In addition, Motonishi and Yoshikawa (1999) find that the deterioration of collateral of small firms also reduces their investments and finally, many banks suffer from bad loans (NPLS). This in turn reduces the ability and willingness of banks to supply new loans and eventually this leads to reduction in aggregate investment in Japan. Similarly, studies on the response of bank lending to monetary policy have also been done by many researchers; among them are Bernanke and Blinder (1992) and Kakes et al. (1999). However, Raabe et al. (2006) find that bank lending is more responsive to changes in industry-specific bank credit demand than to changes in monetary policy. For instance, in order to protect the liquidity of the German banking system in supplying credit to the borrowers, the KWG (Kreditwesengesetz) and the Supervisory Authority impose certain requirements with respect to capital adequacy and liquidity of banks (Baum & Gruson 1993). In addition, Morrison and White (2001) find that the regulator has two tools to address adverse selection and moral hazard in banking system, one of which is capital adequacy requirements (CAR). The CAR is the alternative measure on bank's financial health that affects borrower's investment. This CAR is useful mainly in restricting banks from committing moral hazard problems and promoting them to apply more transparent accounting procedures.

In relation to this capital adequacy requirement (CAR), Fukuda et al. (2005) find alternative measures on bank financial health that affect firm investment. The alternative measures on bank financial health are CAR and NPLS. From their findings, both the Tobin's q and cash-flows have positive impacts. Their results show that when these two measures, CAR and NPLS, deteriorate, bank lending is reduced; and consequently investment of firm also declines. Yuan and Motohashi (2008) also look at bank financial health in the context of bank loan ratio and fixed investment of firms. Their findings show that the Chinese banks are in good health because they have better ability to supervise and monitor the investment activities of firms than other creditors. However, Yuan and Motohashi (2008) look only at the narrow scope of bank loan ratio on fixed investment. For example, their study does not include the sale variable that is related to profit. According to Fazzari et al. (1988), Lang et al. (1996) and Aivazian et al. (2005), this variable is statistically significant in affecting the standard investment equation. Similarly, Yuan and Motohashi (2008) do not identify the effect of the Regulatory Capital Ratio and Non-Performing Loans which are important indicators to the health of banking sector.

Therefore, this study reduces the gap in the literature by providing a more comprehensive link between bank health measures and investment of firms in Malaysian economy. As explored by Fukuda et al. (2005) bank health measures are the main factors that influence firm investment in the Japanese economy. This study will adopt the firm investment model applied by Fukuda et al. (2005). The variables involved are the CCR, RWCR, NPLS, market value of capital stock, Tobin's q, cash-flow, total debt, long term debt, sales and amount of investment.

METHODOLOGY

In this section, the discussion concentrates on the regression model, specifically on the effects of various measures of bank financial health on investment among the Malaysian listed firms. The dependent variable is the percentage of investment over net fixed assets of firm ($I_{i,t}/K$). The independent variables consist of financial variables and bank financial health measure variables. Panel regression analysis is employed to examine the relationship between firm investment and bank financial health measures in the period from 2000 to 2007 using 300 listed firms. The advantage of panel data analysis is because it allows for the investigation of both cross sectional and time series effect that simply cannot be observed in pure cross-section or pure time series (Baltagi 2008).

The basic model for bank health and firm investment which follows Fukuda et al. (2005) and Aivazian et al. (2005) is written as follows:

$$I_{i,t}/K_{i,t-1} = \alpha + \lambda_t + \beta Q_{i,t-1} + \gamma \left(CF_{i,t}/K_{i,t-1}\right) + \qquad (1)$$
$$\delta DA_{i,t-1} + \psi BH_{i,t-1} + \mu_i + \varepsilon_{i,t}$$

where $I_{i,t}$ is the net investment of firm i at time t, $K_{i,t-1}$ is lagged net fixed assets, $Q_{i,t-1}$ is lagged Tobin's q, $CF_{i,t}$ is cash-flow of firm i at time t, α is a constant, $DA_{i,t-1}$ is lagged debt-asset ratio (total debt and long term debt), and $BH_{i,t-1}$ is lagged bank health measures (*CCR, RWCR and NPLS*), λ_t is a set of time dummy controlling for possible differences in the macroeconomic environment for each year, μ_i is the individual effect of firm i, and $\varepsilon_{i,t}$ is the error term. The variables of Investment (*I*) and cash flow (*CF*) have been deflated by lagged net fixed assets (*K*) to reduce the problem of non constant variances across firms (Aivazian et al. 2005). The first two independent variables are literature's standards. Under the assumption of perfect capital markets, financial structure is irrelevant for real economy variables. Thus, Tobin's q would be the only relevant variable for investment. However, when information is incomplete, the inability of banks to perform their intermediary role would constraint the real economy by disrupting the flow of credits. This is because cash flow is associated to changes in available internal funds; higher investment cash flow sensitivities can be considered as evidence of greater liquidity constraints.

In addition, the added debt-asset ratio ($DA_{i,t}$) would thus be expected to have a significant negative impact on investment of firms. Additional debt is expected to influence investment negatively because managers reduce their debt in anticipation of future investment opportunities. Debt or leverage is a signal of management's

information about investment opportunities. This negative impact is clearly shown, particularly when Tobin's q is low (Fukuda et al. 2005). Sales variable is added to the basic equation estimation in (1), which is not included in Fukuda et al. (2005). The addition of this variable (sales) is to capture the relationship between investment and the future profitability of the firm. The inclusion of sales variable in the regression can improve the prediction of this relationship because cash flow is correlated with sales and profit; hence, it can predict the future profitability of the firms (Schiantarelli & Georgoutsos 1990). In addition, Aivazian et al. (2005) also include this sales variable in their investment equation.

The new equation in the model is written as:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta Q_{i,t-1} + \gamma(CF_{i,t}/K_{i,t-1}) + \delta DA_{i,t-1} + \quad (2)$$
$$\psi BH_{i,t-1} + \Phi(Sale_{i,t}/K_{i,t-1}) + \mu_i + \varepsilon_{i,t}$$

where $Sale_{i,t-1}/K_{i,t-1}$ is the net sales of firm i and the explanation of other variables still remain as in equation (1). The time dummy that controls for possible differences in the macroeconomic environment for each year (λ_t) is not included in this study. We assume there is no temporal effect on the panel regression model specification. This is because there is no time effect in the investment equation. $BH_{i,t-1}$ is the lagged of bank financial health measures (*CCR*, *RWCR and NPLs*).

Further, the investment equations are as follow:

Model 1:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta Q_{i,t-1} + \gamma(CF_{i,t}/K_{i,t-1}) + \delta DA_{i,t-1} \quad (3)$$
$$+ \psi CCR_{i,t-1} + \Phi(Sale_{i,t}/K_{i,t-1}) + \mu_i + \varepsilon_{i,t}$$

Model 2:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta Q_{i,t-1} + \gamma(CF_{i,t}/K_{i,t-1}) + \delta DA_{i,t-1} \quad (4)$$
$$+ \psi RWCR_{i,t-1} + \Phi(Sale_{i,t}/K_{i,t-1}) + \mu_i$$
$$+ \varepsilon_{i,t}$$

Model 3:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta Q_{i,t-1} + \gamma(CF_{i,t}/K_{i,t-1}) + \delta DA_{i,t-1} \quad (5)$$
$$+ \psi NPLs_{i,t-1} + \Phi(Sale_{i,t}/K_{i,t-1}) + \mu_i + \varepsilon_{i,t}$$

To identify which empirical methodology, random effect or fixed effect model is more suitable, the Hausman specification test (Hausman 1978) is used to choose between the fixed effect and the random effect models. If the model is correctly specified and individual effects are uncorrelated with the independent variables, then, the fixed effect and random effect estimators should not be statistically different. The test statistics developed by Hausman test have an asymptotic χ^2 distribution. If the null hypothesis is rejected, the random effect model is inappropriate because the random effects are probably correlated with one or more regressors (Greene 2008).

In estimating equations (1) to (5), firm-level data on financial variables and data on bank financial health measures are used. The use of the bank financial health measures and financial variables are to detect the bank-firm relationship in firm investment. In gathering data for bank health and firm investment, there are two sources of data that need to be considered; firms' financial variables and bank financial health variables.

FIRM'S FINANCIAL VARIABLES

The main source of firm data is the WorldScope Full Company Reports (Worldscope) in Thomson One Banker and Datastream. The Worldscope contains annual balance sheet, income statement and cash flow for each firm's fiscal year. The sample comprises of firms from various sectors. First, by selecting firms' data for regression, problems of heteroscedasticity (not equal variance) are reduced. Heteroscedasticity arises as a result of the presence of outliers. The inclusion or exclusion of such outliers, especially if the sample size is small, can substantially alters the result of regression analysis. Therefore, by selecting firms for this study, problems due to outliers are avoided.

Second, firms selected in this study are observed between the fiscal year of 2000 to 2007. The firms are included as sample only if they have complete observations for each year, with the data from year 2000 are used for constructing lag variables. The omitted firms are those which are suspended and fail to produce their annual report. Third, the market value of the firm is calculated as the sum of total liabilities, the value of the common stocks and the estimated value of preferred stocks. The value of preferred stock is estimated as preferred dividend multiplied by 10. Himmelberg et al. (1999) and Aivazian et al. (2005) use the same definition. The market value of common stock is calculated as average stock price multiplied by number of shares of the firm.

Fourth, investment is measured as capital expenditure minus depreciation of the firm divided by the lagged net fixed assets, in accordance to Aivazian et al. (2005). Fifth, in measuring debt, two widely used alternatives are employed; long-term debt divided by total assets and total liabilities divided by total assets. The second measure does not distinguish between short-term debt and long-term debt, while the first emphasizes on the dominant role of long-term debt as a determinant of investment (Aivazian et al. 2005). Cash flow is measured as the sum of earnings before extraordinary items and depreciation divided by the lagged net fixed assets (Aivazian et al. 2005; Fazzari et al. 1988). Sales are measured as net sales deflated by net fixed assets.

Sixth, since availability of data is limited, it is difficult to calculate the replacement value of assets. According to Perfect and Wiles (1994) replacement value of the firms' assets is difficult to estimate because active markets for used capital goods do not generally exist and cost reductions due to technological innovations are difficult to estimate. Therefore, this study uses only Tobin's q according to the definition of Simple q as in Perfect and Wiles (1994). The book value of total assets is used rather than the replacement value of total assets, as the denominator of simple q. Finally, firms that have no long term debt are excluded due to partial data during

the estimation period. Therefore, the unbalanced panel data analysis is used for estimation. The unbalanced panel data structure consists of 2091 observations for estimation after checking and screening for outliers and missing variables.

BANK FINANCIAL HEALTH VARIABLES

There are two steps that need to be taken to measure bank financial health. The first step is to identify the name of commercial banks in Malaysia and match them with the firms which they extend their long-term loans to. The relevant financial data were collected from Financial Statements of all commercial banks published by BNM.

The second step is to identify the regulatory capital ratio. In Malaysia, the regulatory capital ratio is implemented with the aim of rebuilding and strengthening the balance sheet of commercial banks through management of capital adequacy positions that comply with the BNM requirement. All banks are required to adopt a minimum standard of capital adequacy ratio (CAR) of 8 percent to prevent banks from going overboard in granting loans. The CAR is measured based on the amount of total equity divided by total weighted assets (risk). In the simplest formulation, a bank's CAR is the 'cushion' for potential losses, protecting the bank depositors or other lenders and thereby maintaining confidence in the banking system.

In measuring CAR, two alternatives are used; core capital ratios (CCR) and risk weighted capital-adequacy ratios (RWCR). Both measures are normally used in the literature to test the robustness of the result. Since data availability for main banks in Malaysia is limited, this study cannot match each firm with its main bank like studies on the main bank-firm relationship in other countries like Japan. In Japan, the name for the main bank of firms is accessible from CD Eyes supplied by TSR Database Service. Every year, CD Eyes provides a list of major lenders for each unlisted companies and it defines the major bank as the bank that appears first in the list of the respective firms. In this study the CAR data is collected from notes to the Financial Statements of all

commercial banks published by the BNM. The average bank health measures (CCR and RWCR) of 22 Malaysian commercial banks are then matched with 300 listed firms in Bursa Malaysia.

Lastly, the ratios of non-performing loans (NPLs) in commercial banks in Malaysia are identified. In measuring the NPLs for each bank, the method is similar to the one used to determine the CAR. However, we are unable to match each firm with its main bank. This problem is solved by using the average ratio of non-performing loans net of specific provision and interest-in-suspense (IIS) to total loans from notes to the Financial Statements of 22 commercial banks published by the BNM. These average ratios are matched with 300 listed firms.

EMPIRICAL RESULTS

Table 1 presents the results of the descriptive statistics as well as other statistical properties of the data. The data have been explored using several techniques which are the mean-median comparison, standard deviation, skewness, kurtosis and Jarque Bera. These procedures are to determine whether the sample data are normally distributed. Nevertheless, the findings on the descriptive statistics indicate that the sample data are not normally distributed. The skewness measures indicate that the data are positively skewed, for example, as in the case of variables I/K_{t-1} and CF/K_{t-1} where the values of these variables are 20.705 and 23.695, respectively. The kurtosis shows a leptokurtic distribution with a sharper peak and fatter tails such as for variables I/K_{t-1}, CF/K_{t-1}, $Sale/K_{t-1}$ and Q_{t-1} where the values are 627.25, 679.48, 169.44 and 476.48, respectively. Finally, the Jarque Bera statistics show that the data do not follow normal distribution. Therefore, these initial findings indicate that the estimation of the determinants of the investment model could not produce reliable results with the Ordinary Least Squares (OLS) estimation method. Hence, the Generalized Least Square (GLS) method is used to address this issue.

TABLE 1. Descriptive statistics

Variables	Mean	Median	Standard deviation	Skewness	Kurtosis	Jarque-Bera
I/K_{t-1}	0.049665	-0.001928	0.348287	20.70520	627.2502	34101003 (0.0000)
CCR_{t-1}	670.8753	644.0800	207.2569	1.704848	4.512189	1212.148 (0.0000)
$RWCR_{t-1}$	722.9379	697.6700	205.7912	1.706133	4.519565	1215.623 (0.0000)
$NPLS_{t-1}$	132.1907	122.6900	39.23223	0.173301	1.673702	163.7252 (0.0000)
CF/K_{t-1}	0.223056	0.132381	1.468730	23.69469	679.4779	40066004 (0.0000)
$Sale/K_{t-1}$	2.722815	1.556089	5.008305	10.49153	169.4434	2452020 (0.0000)
$(Debt\ 1)_{t-1}$	0.449800	0.425316	0.245456	1.400654	7.913930	2787.480 (0.0000)
$(Debt\ 2)_{t-1}$	0.096403	0.048527	0.118066	1.670842	5.749905	1631.750 (0.0000)
Q_{t-1}	1.017939	0.883826	1.131965	19.36717	476.4765	19662400 (0.0000)

Note: Figure in parenthesis is the p value

The regression analysis using GLS estimation technique is implemented on the panel data using fixed effect model after the results of the Hausman specification test (Hausman 1978) supports the fixed-effect as opposed to random effect models. The statistics, as reported at the bottom of Table 2, show that the null hypothesis is rejected at the 1percent significance level. The unbalanced panel data analysis is used for estimation since some data are missing during the estimation period. In order to avoid the problem of instantaneity bias, the lags of one period for the independent variables are considered.

Table 2 reports the regression results for the investment equation using CCR, RWCR and NPLs. The results show that bank financial health measures (CCR and RWCR) have positive impact on firms' investment at the 1 percent significant level. The possible explanation is that when banks' financial health deteriorates, they tend to reduce supply of lending and consequently the investments of firms decline as firms have to borrow at less favorable terms. This result supports the finding of Fukuda et al. (2005) that banks try to improve these regulatory measures by decreasing the firm investment through the reduction in bank lending activities. This is because bank financial health is one of the main factors that influences the firms decision to invest. This is particularly true in developing markets like Malaysia where firms rely heavily on banks for funding. If the balance sheet of bank is weakened, it will reduce the ability of banks to extend their loans to firms. In addition, coupled with instability and lesser cash reserves, banks will be more selective in giving out loans to firms to finance their investments. Consequently, firms' investments reduce and in aggregate this condition leads to the macroeconomic fluctuations in a market (Nier & Zicchino 2006).

The coefficients of other variables on investment have the expected signs; both Tobin's q and cash-flow have positive impacts which are statistically significant. This is consistent with previous empirical evidence which state that a firm is likely to have a larger investment when it has good investment opportunities (high q). This finding implies that firms which suffer from asymmetric information and financial constraints (referring to cash flow and liquidity) are more likely to be affected by movements of investment and aggregate economy. It also supports the existence of liquidity constraint (Aivazian et al. 2005; Fazzari et al. 1988; Fukuda et al. 2005). The total debt asset ratio (Debt 1) shows a negative impact on firm investment at 1 percent significant level. The coefficient range is between -0.0467 and -0.0489, suggesting that investment per RM capital decreases about 0.0047 to 0.0049 when the debt level increases by 0.1. This result is similar to Aivazian et al. (2005) and Fukuda et al. (2005).

Sales show a positive impact on investment at 1 percent significance level. This relationship exists when the estimation is carried out on a contemporaneous manner (no lag for sales variable). This impact shows that when firms' sales are increasing, there will be an increase in the future profitability of the firms; and consequently higher investment ability. This finding is consistent with Lang et al. (1996), Fukuda et al. (2005), and Aivazian et al. (2005).

The NPLs also have a positive impact on investment of firms at 5 percent significance level. This result is contrary to the finding by Fukuda et al. (2005) whereby NPLs show a negative impact on investment. For the Malaysian case, Mahani and Rajah (2009) argue that this finding may imply that when percentage of NPLs of bank's total loans is reduced, investment of firms also deteriorates because of falling aggregate demand. In their study, they generate statistics that depicts the percentage of NPLs in total loans decrease from 4.4 percent in March 2007 to 2.2 percent in December 2008, and in March and June 2009. This reduction may be due the decision of the Malaysian government to implement expansionary policies to expand domestic demand during this period.

The positive impact of NPLs on investment in Malaysia can also be possibly attributed by the government intervention. Following the 1997/98 Asian financial crisis, the government of Malaysia has implemented prudent and conservative regulations on investment banks and finance houses which are designed to reduce the NPLs. This was done by injecting a large amount of capital into financially

TABLE 2. Regression result of investment equation using GLS

	Model 1	Model 2	Model 3
Intercept	0.0044 (0.0049)	0.0030 (0.0050)	0.0137 (0.0049)
$(\text{Debt}1)_{i,t-1}$	-0.0467*** (0.0071)	-0.0467*** (0.0071)	-0.0489*** 0.0053
$(\text{Debt}2)_{i,t-1}$	-0.0059 (0.0098)	-0.0059 (0.0099)	-0.0032 (0.0105)
Tobin's $Q_{i,t-1}$	0.0161*** (0.0038	0.0161*** (0.0038	0.0189*** (0.0039)
Cash flow/NFA$_{i,t-1}$	0.0212*** (0.0039)	0.0212*** (0.0039)	0.0241*** (0.0037)
Sale/NFA$_{i,t-1}$	0.0110*** (0.0009)	0.0110*** (0.0026)	0.0106*** (0.0009)
CCR$_{i,t-1}$	0.0023*** (0.0003)		
RWCR$_{i,t-1}$		0.00235*** (0.0003)	
NPL$_{i,t-1}$			(0.00371)** (0.0019)
Hausman test	75.362***	75.369***	76.108***
Observations	2091	2091	2091
Adjusted R^2	0.5527	0.5526	0.5217
Durbin Watson	1.9359	1.9360	1.9544

Notes: The Hausman specification test is used to the test fixed-effect model versus the random effect model.
Debt 1 = (Total liabilities/Total asset)t-1 and Debt 2 = (Long term debt/Total asset)t-1.
***, **, * indicate of significance at the 1 percent, 5 percent and 10 percent level, respectively.
Standard errors are given in parentheses.

distressed banks, moving NPLs out of banks by setting up rescue government organizations to deal with NPLs. As a result, the NPLs over total loans ratio were extremely low after to this conservative regulation.

CONCLUSION

This study examines the impact of bank financial health on firm investment. This study uses data of 300 Malaysian firms for the period between 2000 and 2007. This study extends the previous literature by using unbalanced panel data methodology and robust panel using a GLS estimation method. The findings indicate that first the CCR and RWCR have a positive impact on firm investment. The possible explanation is that when these measures deteriorate, it indicates that the bank lending activity is reduced, resulting in a reduction in investment of firms. Second, the NPLs measure has a positive impact on firm investment. One possible explanation is the government intervention that was designed to reduce NPLs following the 1997/98 Asian financial crisis. Third, other financial variables that include the Tobin's q, cash-flow and sales have positive impacts on firm investment.

The management implication of this study is that a negative relationship between debt and firm investment may arise because managers reduce their debt in anticipation of future investment opportunities. Thus, debt becomes a signal of management's information about future investment opportunities. The positive relationships between financial variables such as Tobin's q, cash-flow and sales in firm investment are consistent with empirical evidences that a firm is likely to have a larger investment when it has good investment opportunities.

Findings from this study are expected to provide some insights to the theoretical as well as policy implications. The positive bank financial health and firm investment relationship implies that the effects of monetary policy can be effectively transmitted via bank lending policy and these effects would particularly be felt by bank-dependent firms. It also suggests the importance of continuously monitoring that supply of bank loans are sufficient because such shortage tends to adversely affect firm investment which ultimately might negatively affect the health of the economy.

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