

AN EMPIRICAL ANALYSIS OF CASH FLOW AND INVESTMENT FLUCTUATIONS USING FIRM-LEVEL PANEL DATA*

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Since the pioneering work of Gurley and Shaw (1955), the attempt has been done to justify money as a primary focal point of macroeconomic theorizing. However, other researchers argue that variables such as financial development and indicators are also important to be linked with macroeconomic performance. Here, if money can be thought as means of production and consumer goods as the ultimate end toward which production is directed, and then capital also occupies a position that is both logically and temporarily intermediate between original means and ultimate ends. This temporarily intermediate status of capital is not in serious dispute, but its significance for macroeconomic theorizing is rarely recognized. The firms' decision to acquire funds through debt and equity financings affects the capital structure, and, in the firm's balance sheet, the impact of capital appears to influence the inventory investment. Hence, the significance of capital structure –induced inventory distortions in the context of firm-level is the basis for our article. The sample for our analysis is compiled from the balance sheets of listed syariah firms in the Kuala Lumpur Stock Exchange for the period 1995-2000.

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Introduction

Most of macroeconomic theory is based on the idea of perfect capital markets, that is, smooth functioning of financial systems that justifies abstraction from financial considerations. Beginning with the seminal work of Modigliani and Miller (1958), the idea that financial structure was indeterminate and irrelevant for investment decisions has heavily influenced modern theory. The major developments in investment research in the 1960's, the neoclassical and q models,¹ made use of Modigliani-Miller proposition of isolation between real firm decisions and financial factors.

However, empirical work has traditionally produced results inconsistent with the notion of "financial irrelevance." In particular, evidence has been found on: (a) the role of breakdowns in financial trade in historically important economic contractions, (b) the role of movements in internal finance in predicting investment, (c) persistent differences in the way certain types of firms raise finance, and (d) the regular cyclical movements of financial variables (e.g., balance sheet positions, liquidity ratios, and bank credit).

In order to reconcile theory and empirical studies in finance and investment, recent research has made use of models in which informational asymmetries between "borrowers" and

"lenders" introduce incentive problems in financial relationships, creating informational frictions and making financing and investment decisions interdependent in specific ways. Then Blanchard and Fischer (1989) point out that the work attempting to account for certain features of the financial markets from the viewpoint of asymmetric information is extremely important and that it will be increasingly integrated in complete macroeconomic models.

Later, much of this research has proceeded in two agendas, modeling: (a) the role of asymmetric information in linking movements between finance and investment, holding constant underlying opportunities, and (b) the importance of information problems in accounting for observed differences in financing patterns and mechanisms for corporate control.

Based on this background, the motivation of this paper is to produce the empirical evidence of investment that is expected to be more sensitive to current cash flow than a frictionless neoclassical model would predict, with results stronger for fixed effects. The rest of the paper is organized in the following way: the next section explains the theoretical background; the model used, data sources and estimation procedure are outlined in the third section; empirical results are examined in the fourth section; and the fifth section summarizes the conclusions.

¹ For the neoclassical model, see Hall and Jorgenson (1967). On q models some references are Brainard and Tobin (1968), Tobin (1969), and subsequent developments in Hayashi (1982), Summers (1981), and Abel and Blanchard (1986).

Finance and Investment

The severity of the Great Depression, as argued by Fisher (1933), was partly attributed by the heavy burden of debt (i.e. high leverage of borrowers) and consequently, business downturn precipitated a wave of bankruptcies, enhancing the downturn. Then, the macroeconomics literature following the General Theory (i.e. Keynes 1936) largely ignored potential links between output behavior and the performance of credit markets. He emphasized the indirect connection between financial markets and real activity resulting from Keynes's liquidity preference theory, shifting the emphasis to money as the financial variable most relevant to aggregate economic behavior.

Then, Gurley and Shaw (1955) began to redirect attention toward the overall interaction between financial structure and real activity, emphasizing financial intermediation, and particularly the role of financial intermediaries in the *credit supply process* as opposed to the money supply process.² Noting the differences in financial sophistication between developed and underdeveloped countries, they came to the conclusion that the role of intermediaries in improving the efficiency of intertemporal trade was an important factor governing economic activity. A corollary argument was that restricting attention to the money supply made it impossible to properly

characterize the link between real and financial activity. Gurley and Shaw argued that more relevant to macroeconomic behavior than the money stock was the economy's overall "financial capacity," that is, the measure of borrower's ability to absorb debt without having to reduce either current spending or future spending commitments. The behavior of balance sheets, as key determinants of financial capacity, assumed an important role, and intermediaries were relevant because they extended borrower's financial capacity.

The change in macroeconomic views appeared in 1958, Modigliani and Miller (later known as MM theorem) derived the formal proposition that real economic decisions were independent of financial structure in a setting of perfect capital markets. As a result, financial variables started disappearing from empirical investment equations in the frictionless markets. Another factor that helped to take attention away from financial factors was the methodological revolution in macroeconomics in the 1970's, that emphasized the development of macroeconomic models explicitly from individual optimization (e.g. Blanchard and Fischer 1989, and Diamond 1965). However, the modification of individual optimization (i.e. the introduction of heterogeneity among agents and money) become the motivation for trade in the business cycle theory.

² Several important papers that supported this idea are Kuh and Meyer (1963), Tobin and Dolde (1963) Brainard and Tobin (1963), Minsky (1975) and Kindleberger (1978), and Tobin (1975).

A renovated interest in studying the financial aspects appears to explain the business cycle theory. This interest arises as a result of progress in the economics of information and incentives. Both provide with useful techniques for formalizing financial markets frictions. The basic insight of the new work is that inefficiencies in trade could arise due to the existence of *asymmetric information* between the agents participating in the market, that is, the existence of informational advantages for either of the agents involved in the transaction. In addition, this type of informational problems could be solved, or at least minimized, creating *incentives* with the use of contracts or other types of institutional devices such as screening or monitoring.

The existence of asymmetric information has encouraged other researchers (e.g. Hubbard 1990; and Hubbard 1997) to advance the investment process in the presence of imperfect capital market. He explains that interest by contemporary researchers in links between “internal funds” and investment decisions reflects two main concerns, one “micro” and one “macro.” The “micro” concern relates to consequences of informational imperfections in credit markets. Problems of asymmetric information between borrowers and lenders create a gap between the cost of external and internal financing that gives internal finance an essential role in the investment decision of the firm. Moreover, the level of internal net worth becomes

a critical determinant of the terms under which firms can borrow, holding constant true investment opportunities.

The “macro” concern is that cyclical movements in investment appear too large to be explained by market indicators of expected future profitability or the user cost of capital. As Hubbard (1990) states, to the extent that a sufficient number of firms must raise finance in markets lacking perfect information, microeconomic market failures can generate correlations in aggregate data different from those suggested by standard models of investment or the consequences of macroeconomic policies. In particular, interest rates are de-emphasized as the main determinant of borrowing and investment, with movements in internal net worth of corporate borrowers (i.e., cash flows) being relatively more important. This has led to identify financial factors in propagating relatively small shocks.

The micro concern is extended further by Romer (1996) especially on the allocative effects of informational problems in financial markets. As he describes, when firms and investors are equally well informed, financial markets function efficiently, and investments are valued according to their expected payoffs and riskiness. However, in practice, firms are much better informed about their investment projects than potential outside investors are. In addition, the existence of intermediaries between the ultimate investors and firms means that there is

a two-level problem of asymmetric information: between intermediaries and firms, and between individuals and intermediaries.³

The literature on the economics of information and incentives distinguishes two general types of informational problems that generate frictions in capital markets and can then be used to explain why lenders may ration credit rather than raise interest rates to clear markets. These problems are: *first*, adverse selection, following Gale (1987) and Mas-Colell et al. (1995), this problem arises when an informed individual's trading decisions depend on her privately held information in a manner that adversely affects uninformed market participants. In this case, asymmetries of information exist between individuals *at the time* of contracting. With imperfect information about the quality or riskiness of the borrowers' investment projects, adverse selection creates a gap between the cost of financing in an uninformed capital market (which incorporates a "lemon" premium, see Akerlof 1970), and internally generated funds.

Second, the principal-agent problem (refer to Grossman and Hart 1983, and Hart and Holstrom 1987), in this case, asymmetries of information develop *subsequent* to the signing of a contract. Two types of problems have been distinguished in this setting: those resulting from *hidden actions*, also known as *moral hazard*, produced by the inability of, for example, the owner of a firm to observe how hard his manager is working; and those resulting from *hidden information*, in which the manager possesses superior information about the firm's opportunities. In the credit market framework, it is the second type of problem, hidden information, the one that is considered in the literature.⁴ Due to the presence of incentive problems and costly monitoring of managerial actions, external suppliers of funds to firms require a higher return to compensate them from these monitoring costs and the potential hidden information problems associated with manager's control over the allocation of investment funds.

A problem of the models discussed thus far is that they are highly sensitive to exogenous restrictions

³ The role of intermediaries in overcoming imperfections in markets which transfer funds between savers and investors has been stressed by models of financial intermediation, that apply first principles to explain the existence and structure of intermediaries, and to describe how these institutions may interact with aggregate real activity. Some important references are Fama (1980 and 1985), Diamond (1984), Williamson (1986 and 1987a), Boyd and Prescott (1986), Moore (1987), Morgan (1987), Gorton and Haubrich (1986), Diamond and Dybvig (1983), Bhattacharya and Gale (1987), Bernanke and Gertler (1987).

⁴ As Mas-Colell et al. (1995) note, the literature's use of the term *moral hazard* is not entirely uniform. Some authors use it to refer to either of the hidden action or hidden information variants of the principal agent problem (for example, Hart and Holstrom 1987). Here we will use it only for the hidden actions case.

made in the form of the relevant financial contracts, since they use a very restrictive form of debt contract.⁵ This raised the question of the robustness of the credit-rationing result, encouraging other researchers such as Townsend (1979), Gale and Hellwig (1985), and Williamson (1987), that attempt to explore the effects of financial market inefficiencies without making a priori assumptions about financial structure. Under this approach, the real/financial interaction is a purely endogenous outcome.

The endogenous interaction between financial structure and real activity in a market with a general type of lemons problem is further explored by Bernanke and Gertler (1990). This lemons-induced rise in borrowing costs reduces the efficiency of the investment process and in severe cases may induce an investment collapse. An important implication is that informational distortions can, in theory, have quantitatively *significant* effects on investment behavior. In addition, the conclusions extend beyond situations where simple debt contracts are the exclusive financial instruments.

Why incorporate credit market imperfections into mainstream models of macroeconomic fluctuations? Although Bernanke, Gertler and Gilchrist (BGG henceforth) (1997) state several

reasons, but in the context of standard dynamic macroeconomic models, they show that credit market frictions may significantly amplify both real and nominal shocks to the economy. This *financial accelerator* effect is a step toward resolving the “small shocks, large cycles” puzzle traditional in business cycle analysis: large fluctuations in aggregate economic activity arise from what appear to be relatively small impulses (such as modest changes in real interest rates induced by monetary policy).⁶ Moreover, credit market frictions help to explain a broader class of cyclical phenomena, such as changes in credit extension and the spreads between safe and risky interest rates.

BGG and other studies (for example, Calomiris and Hubbard 1990; Gertler 1992; Kiyotaki and Moore 1995; Fischer 1996; and Carlstrom and Fuerst 1997) share the idea that, in the analysis of macroeconomic dynamics, balance sheet indicators should be thought of as state variables. That is, financial conditions matter for cyclical behavior.

Testable Models

By adopting the Fazzari et al. (1988) (FHP henceforth), we try to test whether determinants of investment differ between firms for which, a

⁵ By using the Stiglitz-Weiss's (1981) framework, the non-optimality of credit rationing (there is too little investment at the credit-rationed equilibrium).

⁶ The financial accelerator effect refers to the declines in output arising from external sources act to reduce firms' net worth; these reductions in net worth reduce investment, reinforcing the output decline.

priori, the costs of internal financing and external financing are similar, and firms for which the cost of external financing exceeds the cost of internal financing. In particular, to identify a group of firms that are most likely to face binding constraints, FHP extend a model from the public economics literature, in which dividends are a residual in firm decisions.⁷ The idea is that, supposing a higher cost of adjusting the capital stock relative to adjusting dividend payouts, and that the cost of external finance exceeds that of internal finance, the investment of firms with good investment opportunities that retain all or nearly all of their earnings will be more likely to be sensitive to cash flow than that for high-payout firms with a large (dividend) cushion of funds to finance investment. So the FHP framework can be interpreted as using cash flow to measure the change in net worth. Although firm cash flow is an imperfect proxy for the change in net worth, most studies (e.g. Bernanke and Gertler 1989; Calomiris and Hubbard 1990; and Bernanke and Gilchrist 1997) use it because it is virtually the only such measure available for many firms. Using cash flow, FHP estimates the following model:

$$\frac{I_{it}}{K_{it-1}} = bQ_{it} + c \frac{CF_{it}}{K_{it-1}} + v_i + e_{it} \quad (1)$$

where i and t denote the firm and time period, I is investment, K is capital stock, CF is cash flow, and average Q , constructed from financial market data, is used as a proxy for marginal q ,⁸ substituting expected average returns to capital (ROE) each period for marginal returns. In this specification v_i denotes firm specific effects. Since the estimation for equation (1) uses the panel data and relate to individual firm, so there is subject to be heterogeneity in these firms over time. In order to take such heterogeneity explicitly into account in our estimation procedure, several assumptions about the firm specific effects term have to be made. Therefore, in our estimation, four different effects are assumed, i.e. common, fixed, random and time effects.

In Equation (1), we hypothesize that the decline in the cost of financing causes the decline in the expenses of the firms. Consequently, this affects the cash flow of the firms and persistently the value of collateral (net worth) and the position of firm's balance sheet. Therefore, cash flow could im-

⁷ This idea comes from the tax capitalization model of the dividend decision in the public economics literature. In that model, internal funds are cheaper to the firm than external funds because dividends are more highly taxed than capital gains.

⁸ According to Hayashi (1982), average and marginal q are equal for the model with an assumption to have constant returns in the adjustment costs. The constant returns in the costs of adjustment imply that q determines the growth rate of a firm's capital stock.

prove the firm's current financial position and increase internally the funds available for investment, investments should respond positively to increases in cash flow.

In the absence of capital market frictions, the estimated coefficient c should be zero as long as Q controls adequately for investment opportunities; a significantly positive value of c corresponds to a rejection of the frictionless model and a suggestion of the presence of financing constraints.

We also group firms into three fixed categories: *low, medium, and high dividend payout*. The result is expected to find significantly larger estimated cash flow coefficients, c , for the low-dividend-payout firms than for the high-dividend-payout firms. It is this cross-sectional difference that may lead us to conclude that financing constraints are likely to be important in many firms' investment decisions. This finding has been corroborated in studies of firms for Japan (Hoshi et al. 1991), the United Kingdom (Devereux and Schiantarelli 1990), Italy (Schiantarelli and Sembenelli 1996), Canada (Schaller 1993), and Germany (Elston 1993). Also, using panel data on U.S. manufacturing firms, Hubbard et al. (1995) find similar results to those of FHP using a pre-sample dividend classification.

Empirical Results

Firm level data are collected from the CD Rom database of Kuala Lumpur Stock Exchange (KLSE), a database

containing the annual reports of all Malaysia stock quoted firms. In order to capture different investment behavior among firms, we select the firms that are listed under the sharia board (a combination of first and second boards). The firms are all distributed over all sectors of the economy and the data run from 1995 to 2000. We exclude financial-related firms. To avoid dominating outliers, we delete firm for which any variable is in the upper or lower 0.1 percent of the data set. This leaves us with an unbalanced panel data of 361 firms (1742 observations). We divided the firm into three different categories; low-dividend (firms with dividend average less than 4.80%), middle-dividend (firms with dividend average 4.81%-9.60%), and high-dividend (firms with dividend average more than 9.60%). To see whether firms in the panel are credit constrained, we consider bankruptcies that occur during the sample period. We find that there is no firms go bankrupt during the study period. In addition, the accounting standard for these firms are similar for both firms (i.e, first and second boards, and sharia board) except the Islamic banking system.

The analysis in this section reports the descriptive analysis and the regression results by using the panel data estimation. Table 1 shows the descriptive analysis results for the low dividend firms, middle dividend firms and high dividend firms. Generally, the investment values show that the investment for the high dividend firms is larger rather than the low and middle

Table 1. Descriptive Analysis

	Investment	Capital Stock	Marginal Q	Cash Flow
Low				
Mean	209564.90	170952.70	1.87988	-4558.88
Median	99468.00	62965.00	1.04138	3505.00
Maximum	2703086.00	4574529.00	21.91999	722648.00
Minimum	204.00	28.00	0.00165	-808054.00
Std. Dev.	307772.70	416644.30	2.40795	80933.39
Middle				
Mean	229273.80	415292.30	1.43613	26186.74
Median	125896.00	83864.00	0.91463	994.00
Maximum	4539010.00	42988300.00	17.98224	1636600.00
Minimum	8818.00	1408.00	0.00297	-361881.00
Std. Dev.	452910.40	3126057.00	1.71536	122070.40
High				
Mean	471011.40	713256.90	1.38159	66364.81
Median	174804.00	124101.00	0.75211	11324.50
Maximum	21136700.00	45709600.00	16.48663	2528800.00
Minimum	3287.00	776.00	0.00396	-261000.00
Std. Dev.	1162296.00	2800678.00	1.75970	204009.80

Table 2. Regression Results

Variables	Model 1 (low-dividend)	Model 2 (middle-dividend)	Model 3 (high-dividend)
Q_{it}	-1.0042 (206.3476)*	-0.0550 (50.3038)*	0.1243 (178.1367)*
CF/K_{it-1}	0.6363 (18.2421)*	1.8313 (13.6606)*	1.3432 (86.6343)*
No. of observations	549	218	438
Adjusted R ²	0.9020	0.9528	0.9921
F	9.00E+32	4.30E+32	5.90E+32
r	0.0000	0.0000	0.0000
DW	0.8658	0.4708	1.5915

Note: * indicates statistical significance at 1 percent level.
The values in (parentheses) refer to *t*-statistic.

dividend firms. The same trend is reported for capital stock and cash flow based on the mean and the median values, respectively. While for Q , low dividend firms report a higher mean, median, and standard deviation values compared to the middle and the high dividend firms. Based on the mean values, the results imply that the high dividend firms tend to have higher investment, capital stock, cash flow and low Q .

This section analyzes the estimation results. We run four different models (common effects, fixed effects, random effects and time effects) for each firm's category. But after the screening process that considered the best adjusted R^2 value, the t value compared to the F -value for the GLS model and the significant coefficient, we conclude that the GLS method with fixed effect model are the best for each estimation for different firms. Table 1 reported the estimation results.

As reported in Table 2, the result shows that the estimates for the cash flow coefficients are of the right sign and significant. But the increases of investment are larger for the middle-dividend firms rather than the high-dividend and low-dividend firms. This implies that the cash flow of the middle-dividend firms is more sensitive to the investment rather than the high and low-dividend firms. According to FHP, firms that retain all or nearly all of their earnings in investment are more likely to be sensitive to cash flow than the high-payout firms with a large

(dividend) cushion of funds to finance investment.

While for Q , the coefficient is statistically significant and of the right sign for the high-dividend firms. According to Tobin's q theory, the firms increase its capital stock if q is high. An increase in capital stock increases the investment. But the coefficients are of the unexpected sign for the low and middle-dividend firms. The result shows that an increase in the firm's capital stock decreases the firm's investments. According to Romer (1996), a firm increases its capital stock if the market value of capital exceeds the costs to acquire the capital. Maybe in this situation, even though the firm's capital stocks are high, but the costs to acquire the capital are greater. Therefore, an increase in firm's capital stock decreases the firm's investments.

Conclusions

The purpose of this paper is two-fold: to show how credit market imperfections have been incorporated to dynamic general equilibrium models of the economy, using recent advances in the economics of information and incentives; and to provide an empirical evidence for investment equation. The following conclusions can be extracted from the study realized in this paper: *first*, theoretically, agency costs arising from asymmetric information raise the cost of external finance, and therefore discourage investment. This result suggests that the efficiency of the

financial system in processing information and monitoring borrowers is a potentially important determinant of investment. This observation has implications for both short-run fluctuations and long-run growth.

Second, the empirical studies of firm investment provide strong support for the basic predictions of links between changes in net worth and investment arising from informational problems in financial markets. For many firms in the economy, the evidence is consistent with: a gap between the cost of external and internal financing; and a positive relationship between the borrower's spending and net worth. Therefore, we should examine not only with respect to investment in plant and equipment spending, but also in inventory investment, research and development, employment,

business formation and survival, pricing, and corporate risk management.

Third, credit market imperfections create two new channels through which monetary policy can affect the investment decisions of the agents in the economy: the *balance sheet* and the *bank lending* channels.

Fourth, while there is relatively an agreement on the role of financial frictions in the investment decisions of some firms, there is less agreement on the magnitude of that role. Several possible extensions of this line of research: analyze the link between internal resources and the shadow cost of external financing in models of decisions in individual firms and industries; and estimate the quantitative importance of the financial accelerator for aggregate investment fluctuations.

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