FINANCIAL STRUCTURE, FIRMS' INVESTMENTS AND THE CHANNELS OF MONETARY POLICY IN INDONESIA*

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Abstract

Using Tobin's q and Euler equations estimated by a novel technique of Blundell and Bond's system GMM, this paper investigate the role of financial factors (cash flow and leverage) in investment spending of Indonesian listed companies during 1993-1997. Overall, the results suggest the existence of financial constraints and agency costs for Indonesian firms in raising external funds. However, agency costs vary across firms according to whether the firms are members of large business groups owning foreign exchange banks and their financial conditions (leverage and pay out ratio). These results provide indirect support to the existence of the credit channel of monetary policy which recently becomes a hot debate in the aftermath of the recent Asian financial crisis. A microeconomic aspects of both banks and firms. Specifically, the degree of financial frictions should be monitor using various indicators such as firms' financial leverage, firms' access to bank loans and bank's willingness to lend.

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I. Introduction

Do financial factors such as cash flows and financial leverage influence firms' investment? This question has been a fashionable topic in the last ten years, pioneered by contribution of Fazzari, Hubbard and Peterson (1988) and motivated by a growing literature on asymmetric information in financial markets.[1] Contrary to Modigliani and Miller's claim, most of the recent studies (e.g., Hoshi, Kashyap and Scharfstein, 1991) show that financial factors such as availability of internal finance (net worth) do influence a firm's investment, reflecting the existence of constraints for the firm in raising external finance. The reason is that under asymmetric information in financial markets, the costs of external finance are higher than those of internal finance, leading to the existence of a 'premium on external funds', which is inversely related to a firm's net worth (Bernanke and Gertler, 1989). Any shock in an economy such as an increase in interest rates or a depreciation in assets prices affects the firms' net worth, and hence the premium it has to pay for external funds. This, in turn, influences the ability of firms to raise external funds and thus investment. As a result, monetary policy affects output, not only through the standard money / interest channel, but also trough alteration of the wedge between the internal and external funds. This additional channel is called as the balance sheet channel' (Bernanke and Gertler, 1995).[2] Alternatively, Bernanke, Gertler and Gilchrist. (1996, 1998) labelled such a mechanism as the 'financial accelerator', refering to the role of financial / credit market imperfections in amplifying any initial monetary shock. This balance sheet channel predicts a distributional impact of monetary policy; since it operates largely through smaller firms which are likely to face a proportionately larger premium for external funds.[3] As pointed out by Bernanke et al. (1996), at the beginning of a recession, the financial accelerator generates the flight to quality', a shift in credit shares from firms with higher agency costs to those with lower agency costs. This phenomenon is implicitly highlighted by IMF (1999, pp.83) in its recent assessment of the Asian financial crisis :

…..in this environments [in the aftermath of the crisis], many borrowers that previously had access to credit (especially small and medium size enterprise) found themselves unable to obtain

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1 See the surveys by Schiantarelli (1997) and Hubbard (1998)

2 This channel is one of two versions of the 'credit channel' (Bernanke and Gertler, 1995). The other version is the bank lending channel' referring to the narrower credit channel in which a tight monetary policy reduces supply of bank loans and thus investments by bank dependent borrowers. In the balance sheet channel, a thight monetary policy weakens the credit worthiness of firm (small, independent firms) and hance reduces their ability to raise any outside funds, not necessarily bank loans

3 There is a volume of evidence suggesting that smaller firms more financially constrained, see surveys cited in footnote 1.

financing. The counterpart of this cutoff of access to credit could be an increased share of credit going to capitalize interest on loans to companies perceived as more credit worthy (especially to larger companies…..)

This paper investigates the role of financial factors (cash flows and leverage) on Indonesian firms' investment, hence, indirectly it examines the existence of the balance sheet channel of monetary transmission mechanism. This is in line with the studies by Gertler and Hubbard (1988) and Oliner and Rudebusch (1996), inter alia, a part of research agenda on the asymmetric information based monetary transmission mechanism.

In investigating the role of financial factors on firm's investment, we use Tobin's q and the Euler models of investment augmented by financial factors (cash flows and leverage). It is well known that in the q investment equation, significant coefficient on financial factors like cash flows may arise because the variable contains information on future investment opportunities, not captured by the Tobin's q; which is subject to mismeasurement (Schiantarelli, 1996). Using the Euler equation, in addition to the q equation, we are able to check the consistency of the results. In estimation, we use panel data of non financial Indonesian firms listed on the Jakarta Stock Exchange, from 1993-1997, during which a large surge in foreign capital inflows was evident. Thus, the period provides a setting in which to evaluate the role of foreign sources of funds tapped by the Indonesian large firms, which has partly contributed to the recent financial crisis. Unlike many previous studies which used the first-differences GMM method (Arrelano and Bond, 1991), we use novel econometric method for panel data proposed by Blundell and Bond (1998) to reduce the small sample bias due to the use of a small time series sample.

In addition to the full sample estimation, we use sub-samples of firms classified according to an a priori degree of financial constraints using various criteria, i.e., the institutional characteristics (whether firms are affiliated with bank-business groups), firms size (total sales) and financial conditions (financial leverage and dividend pay-out). Overall, the results suggest the existence of financial constraints and agency costs for Indonesian firms is raising external funds. Agency costs vary across firms according to whether the firms are members of large business groups and whether their future investment opportunities are recognized by markets.

This paper is organized as follows. Section 2 reviews the role of financial structure in investment and its implication for channels of monetary policy. Section 3 provides descriptive statistics of the pattern of firms' financing in Indonesia. Section 4 sets out the methodology

which we employ in this study. Section discusses data and econometric methods. Section 6 reports the empirical results. Finally, Section 7 summarizes the paper, conclusions and its policy implications.

II. Asymmetric Information, Investment and The Channel of Monetary Policy

In a celebrated paper on a theory of the financial market, Modigliani and Miller (1958) argue that a firm's financial structure is irrelevant to investment. The crux of the proposition is that under the assumption of a perfect financial market, firms can raise whatever level of funds they want at a prevailing rate to finance their investment. Accordingly, since external funds are a perfect substitute for internal funds, the firms investment is independent of its financial structure; it is merely dependent on the investment opportunities (expected profitability). However, the condition of perfect capital market is far from reality, i.e., external finance and internal finance are not perfect substitutes. In addition to different tax treatment, agency costs and asymmetric information between firm's managers and investors create a premium on external finance and lead to external finances (debt and equity issues) being more costly than internal finance.

The application of the economics of imperfect information in financial markets explains why external finance can create agency costs or premia. Jensen and Meckling (1976) argue that due to the limited liability feature in debt contract and to ineffective monitoring, agents (firm managers) can create moral hazard problems by making excessively risky investments. There is an incentive to take excessively risky actions because with a high level of debt, the firm retains most of the profits if the project is successful while debt holders incur most of the losses if the project ends in failure. Equity issues can also generate a similar outcome. Under imperfect information, since managers hold a very small portion of the shares, they will have little incentive to work hard to generate the firm's profits. In addition to moral hazard problems, imperfect information.

Form of the external finance, with imperfect information the value of the firm would be lower than it would be under perfect information, creating agency costs or premium for obtaining external finance. The premium compensates investors for costs incurred in evaluating project and monitoring the borrower. Consequently, firms which have a higher level of internal finance are more willing to make investment. A corollary is that the investment decisions made by a firm with higher agency costs and thus paying higher premium such as a small, unlisted firm, should be more sensitive to the availability of internal funds. In sum, the firm's financial factors (the availability of internal funds, accessibility to external funds)

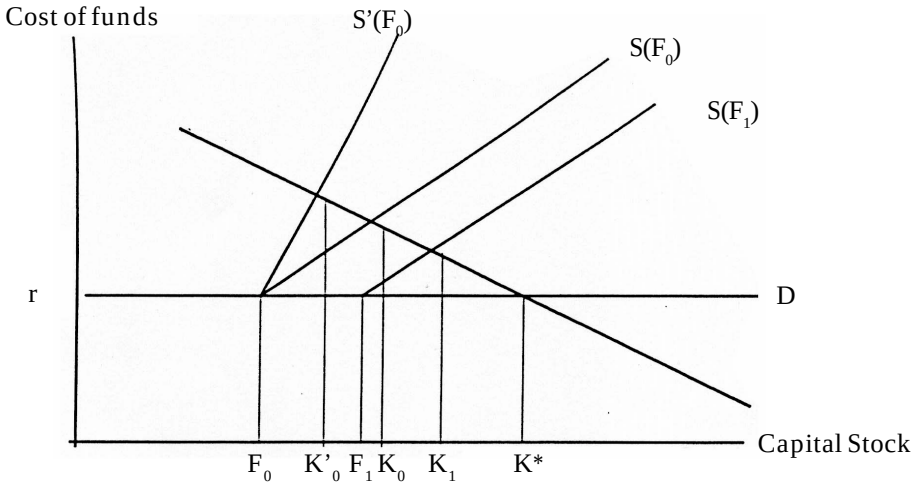

Figure 1
Firm's net worth and investment

do matter in a firms investment decision. This is clearly illustrated in Figure 1.[4]

Figure 1 illustrates firms demand for capital investment and the supply of funds to the firms. Under a perfect capital market where a firm can raise whatever funds needs at a prevailing rate r (the real interest rate), the supply of funds in s horizontal line at r : In this case, the equilibrium capital stock is the intersection between the supply of funds and the demand for capital stock (D) at K*. Demand for capital investment is determined by a firm's investment opportunities (i.e., its expected future profitability). In Figure 1, an increase in investment opportunities shifts the demand curve to the right. At a given cost of capital, r, an increase in investment opportunities will increase the capital investment. However, the S curve is determined only by the real interest rate. An increase in the interest rate, all else being equal, reduces the desired capital investments. In short, under a perfect capital market, the firms investment is determined only by the cost of funds and investment opportunities, while internal funds (F) do not play any role.

Under an *imperfect* financial market in which agency costs play a part, the S curve is no longer flat for all levels of capital stock. Up to a level internal funds F_0, the S curve is horizontal at r However, when the level of investment is greater than the available internal funds F_0 and the firm raises external funds the S curve becomes upward sloping. The upward sloping S curve is derived from the prediction that the more external funds the firm raises, the higher is the

4 See Hubbard (1998), Gertler and Hubbard (1988) or Oliner and Rudebusch (1996).

probability of moral hazard that can be arise and hence the higher premium the firm will have to pay. At the level of internal funds F_0 , the equilibrium capital stock is at K_0 which is lower than it would be under a perfect financial market. A more important implication of Figure 1 is that with an increase in a firms internal funds, from F_0 to F_1, the upward sloping part of S curve shifts to the right from S (F_0) to S (F_1). When the investment opportunities are constant (D constant), a rise in internal funds increase the investment from K_0 to K_1. Furthermore, we can notice that for firms facing a higher premium, the slope of the S curve (S_0) is steeper than that of a firms facing a lower premium. Therefore, a change in internal finance for the former, all else being equal, influences its investment more strongly than it would the latter.

Microeconomic analysis of corporate finance under imperfect information has a significant implication for macroeconomic analysis, particularly in understanding the mechanism through which monetary policy influences corporate investment, and hence aggregate economic activity. In a standard money / interest rate channel of monetary policy, assuming a perfect financial market, a decrease in bank reserves due to a monetary contraction raises short-term interest rates and the user cost of capital. Accordingly, this depresses interest sensitive spending. In Figure 1, under perfect information, an increase in the interest rate reduces the optimal capital stock, ceteris paribus.

The imperfect information which characterizes financial markets provides an additional channel of monetary policy to the real sectors. A monetary contraction that raises the interest rate not only raises the cost of capital, but also reduces the present value of collateralisable net worth and hence increases the marginal cost of external finance. As a result of the increasing cost of external finance, investment spending will be depressed. In an imperfect information version of the IS-LSM model, Greenwald and Stiglitz (1990) also shows that reducing the net worth of firms as a result of monetary policy shock provides adverse effects on the firms' investment. Furthermore, it can be predicted that constrained firms (small firms without good reputation, high leverage firms, and firms with a high retention ratio) will be more severely affected by the monetary contraction as they are charged a higher premium for external finance. In consequence, their investment spending will fall more than that of unconstrained firms.

III. Financial Structure of Indonesian Firms

The financing of non-financial firms varies across countries according to the institutional structure of the countries-financial systems. According to the conventional wisdom, Japanese and German financial systems are characterized as 'bank based finance where banks play a major role in the financing of the non-financial sectors. While Anglo-Saxon (UK and US) financial systems are typically associated with equity based finance' (Walter, 1993). However,

Meyer (1990) revealed a surprising finding, contrary to the conventional wisdom. While retentions are a dominant source of financing in industrialized countries[5], their role is greatest in the Anglo-Saxon countries. Bank loans are also dominant sources of finance in all countries, but their share is surprisingly small in Germany. Murinde, Mullineux, and Agung (forthcoming), furthermore, found that the pattern of corporate finance in the European countries is converging toward equity finance.

The financial structure of the corporate sector in developing countries has been a subject of recent studies (Singh and Hamid, 1992, and Glen and Pinto, 1994). These studies surprisingly suggest that firms in developing countries in general rely very heavily on external finance and the role of external finance in the developing countries is more important than it is in industrialized countries[6]. When more external financing became available in developing countries, partly as a result of financial deregulation, including deregulation of capital markets in the early 1990s, firms grew faster (Demirguc-Kunt and Maksimovic, 1994). The 1990s also saw a marked growth in investor interest in emerging market instruments, both in the form of direct access to the foreign capital market[7] and through portfolio investment in the emerging markets. For Indonesia, a qualitative survey of forty large publicly traded Indonesian firms by Ang, Fatemi, Tourani-Rad (1997) suggest that bank loans and internal funds are the most important source of finance. Although internal funds are perceived to be a cheaper source of funds than external funds,

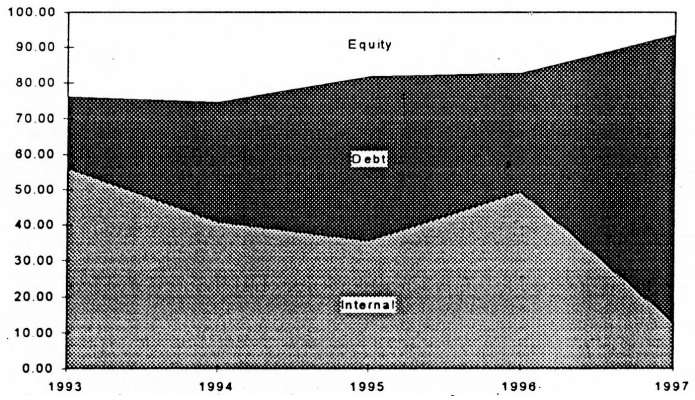

Figure 2.
Sources of finance (as percentage of total funds)

5 The latter are Canada, Finland, France, Germany, Italy, Japan, the UK, and the US.

6 Alba et al. (1998) argue that this surprising finding is attributable to the fact that larger younger firms were chosen in the sample from the developing countries than from the industrialized countries Hence they easier to access and needed relatively more external funds.

7 Through borrowings from international commercial banks or through issuing equities and bonds in international capital markets.

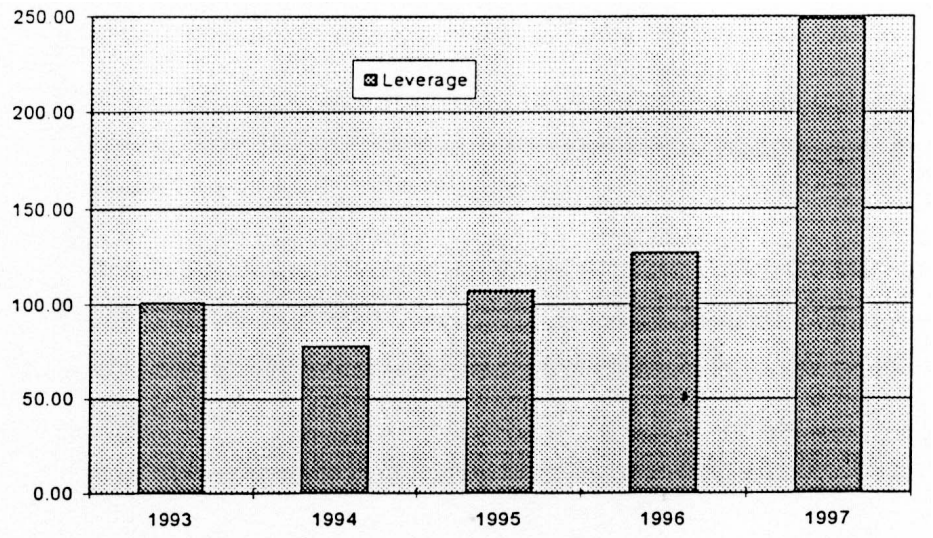

Figure 3.
Leverage (%) of Indonesian firms

study found no significant evidence of an asymmetric information problem between the large firms and outsiders / lenders. Interviews conducted by Glen and Pinto (1994) suggest that the firms' choice of source of funds is much more influenced by the volume, rather than the cost of funds, that they can access in order to extend their market share. The firms acknowledge that they were forced to obtaining a listing on the domestic stock exchange in order to gain access to cheaper foreign sources.

In the following, we employ company accounts' data to shed some light on the financing behavior of Indonesia non financial firms over the period 1993-1997. The result derive from individual firm accounts compiled by FT-Extel Company Research.[8] Firms have three main sources of finance : internal funds (retained earnings), new debt issues (short and long term) and new equity issues.

Figures 2 and 3, and Table 1 illustrate the composition of firms' funds as percentage of total funds and firms debt equity ratio. The latter is calculated as an average of the debt to equity ratio of the sample firms reported in the individual firm's balance sheet. The figure confirms that internal funds are an important source of finance. However, when we compare the internal vs external funds (debt and equity), the *total* external funds have constantly dominated the internal funds since 1994, possible due to an increase of long-term debts since

8 See section 1. For detailed sources of data.

Tabel 1.
Sources of funds of Indonesian firm's

Sources of funds	1993	1994	1995	1996	1997	1993-1997
1. Internal funds	56.01	40.85	35.48	49.33	12.96	**38.93**
2. External funds	43.99	59.15	64.52	50.67	87.04	**61.07**
a. Debt	19.85	33.48	46.13	33.28	80.36	**42.62**
- LT Debts	4.89	23.56	30.10	30.52	44.26	**26.67**
- ST Debts	14.95	9.92	16.03	2.77	36.10	**15.95**
b. Equity	24.14	25.67	18.40	17.39	6.68	**18.45**
Total (1+2)	100	100	100	100	100	**100**

that year as result of increase in foreign borrowing. New debt issues constantly surpass new equity issues during the period, especially since 1994. This is also reflected in the constant increase in the firms' leverage since 1994. It can be observed that the proportion of debts to total funds increased very substantially in 1997 as a result of the financial crisis. Due to the large scale depreciation and the dramatic rise in interest rates in the crisis, loans in foreign currency became very high in local terms, and at the same time, the interest costs increased and profits declined. Accordingly, in 1997 the proportion of debts increased and the internal funds (retained earnings) declined. The financial leverage was about 250% on average in 1997, almost twice as large as the previous year.

Next, we turn to a more detailed description of firms financing. In particular, we examine how financing varies across different types of companies according to whether firms are members of a large business group owning foreign exchange banks and according to firms' size (total sales). There do not appear to be significant differences in the proportion of internal and external funds between affiliated and non-affiliated firms. i.e. around 40 % of firms' investment is self-financed and around 60% comes from outside. But, debt figures suggest that the firms associated with banks and business groups have more access to long-term debts, which includes long-term loans. This is not surprising considering their close relationship with their own banks and also state banks. As suggested by Barclay and Smith (1995), the maturity structure of debts reflects the degree of firms' riskiness : less risky firms with a lower degree of asymmetric information tend to use longer-term debt. To the extent that a close relationship between firms and business groups and banks reduces the degree of

asymmetric information between borrowers and lenders, this group of firms is able to longer term debts. It can also be noted that the debt-equity ratio of the affiliated firms is larger that of independent firms. This is consistent with our presumption that the strong relationship with a banks-business group reduces the cost of debt finance. Hoshi et al. (1991) also found a similar pattern, i.e., firms which are members of Keiretsu have a higher debt-equity ratio.

Examining the source of finance for large and small firms reveals the following facts. The percentage of external finance for small firms is higher than for larger firms. Perhaps small firms are more likely in the early periods of their life-cycle to need more external sources to finance the growth of investment. However, it appears that the debt equity ratio of large firms is greater than that of small firms. This confirms many empirical studies (see for example, Scott and Martin, 1976) that as larger firms have better creditworthiness and thus pay lower interest rates on debt issues, then the larger a firm is, the more debt capital it uses.

Finally, we differentiate the sample of firms across different industry sectors. There is no established consensus as to whether financial structure is related to industry sector. However, intuitively, it might be supposed that firms in the same industry experience similar business risks as they face similar supply and demand uncertainty. Hence, it is reasonable to suppose that they would choose c certain amount of debt (Ferri and Jones, 1979). Table 3 provides a summary of sources of finance for eight industry sectors. There appear to be interesting differences in financing behavior between industries. Textile / clothing, chemical, and food / pharmaceutical industries appear to have the highest external funds and financial leverage. The chemical and machine / engineering industries seem to have the highest long-term debt finance. On the other hand, the mining industry appears to be the most self-financed and to have the least leverage.

Table 2.
Sources of finance, full Sample split by bank-group affiliation and size, 1993-1997, (%)

Sources of funds	Full sample	Bank-group Affiliation		Size	
		Affiliated	Non-affiliated	Large	Small
1. Internal funds	38.93	40.68	38.10	40.64	30.07
2. External funds	61.07	59.32	61.90	59.36	69.93
a. Debt	42.62	42.45	41.87	41.81	46.25
- LT Debts	26.67	29.72	22.79	26.18	28.48
- ST Debts	15.95	12.73	19.08	15.63	17.77
b. Equity	18.45	16.87	20.02	17.56	23.67
Total (1+2)	100.00	100.00	100.00	100.00	100.00
Debt-equity ratio	132.24	163.33	124.86	156.23	113.49

Table 3.
Source of funds for different industry sectors, (%)

Sources of funds	IND1 Chemical industry	IND2 Machine, engineering, Steel)	IND3 Electronic and electrical	IND4 Textile/ Clothing, Shoes	IND5 Food and pharmaceutical)	IND6 Agriculture and Forestry	IND7 Mining	IND8 Others (property, and other services)
Internal funds	35.48	43.46	44.46	26.98	37.59	43.32	72.61	49.09
External funds	64.52	56.54	55.54	73.02	62.41	56.68	27.39	50.91
a. Debt	44.44	46.63	42.57	53.05	46.67	34.86	11.86	30.07
- LT Debts	32.62	29.36	17.78	28.18	26.98	15.24	-3.90	13.29
- ST Debts	11.83	17.27	24.79	24.87	19.69	19.63	15.76	16.78
b. Equity	20.08	9.91	12.98	19.97	15.74	21.82	15.53	20.84
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
D/E ratio	164.95	133.88	145.55	168.99	105.87	238.04	28.45	109.39

IV. Methodology

4.1. Tests for Financial Constrains and Investment

Testing the effects of cash flows on a firms investment pose some challenges in empirical investigations. The paramount challenge is to control for investment opportunities in order to determine that the shifts in investment take place as a result of a change in a firm's net worth (supply of capital funds), not because of the shifts in demand for capital stock induced by the investment opportunities. Two approaches have been adopted to tackle this problems : first, the investment model including Tobin's q (Tobin, 1969) and second, the Euler equation approach. In this study we use both approaches to check the consistency of our results. The two neo-classical approaches of investment for a firm are actually derived from the same firms value maximization (see Appendix 1). In the appendix, the two equations a derived from the firm's value maximisation problem in which the cash flow identity incorporates the agency costs of external finance (see also Chirinko, 1993 or Galeotti et al., 1994).

In the Tobin's q investment model, under certain conditions[9], the investment opportunities can be captured by the average q (as the proxy of unmeasurable marginal q), that is, the ratio of the market value of a firm to the replacement cost of its capital (Hayashi, 1982). According to the theory, q should be the only determinant of investment and no other variable should matter. If there is no friction in the financial market and firms can raise

9 Perfect competition, constant return to scale in production and adjustment cost functions, and capital as the only input that is costly to adjust.

whatever funds they need, then a change in the firm's net worth does not change the investment decision, as long as Tobins q is constant. However, if the financial market is not perfect, and thus internal and external funds are not perfect substitutes, the standard Tobin's q theory no longer holds. As discussed in the previous section, with imperfect information where the external funds are more expensive than internal funds, firms which have lower cash flows will probably be more constrained in their investment decision. Conversely, firms which have large cash flows can finance their investment internally and are likely to be less constrained in their investment decisions (Schiantarelli and Sembenelli, 1995, and Bond and Meghir, 1994). The main reason is that the leverage is related to agency costs, and thus to the premium on external finance, leading to a negative effect on their investment. A vast literature shows that high leverage aggravates agency problems (Jansen and Meckling, 1976 and Myers, 1977). Myers (1977), for example, shows that due to debt overhang, positive NPV projects will not be carried out as the equity needed to finance these projects will not be provided by shareholders.

The dynamic version of Tobin's q, as derived in Appendix 1, augmented by sales variable is given by :

$$\left(\frac{I}{K}\right)_{i,t} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2 Q_{i,t-1} + \beta_3\left(\frac{Y}{K}\right)_{i,t-1} + \beta_4\left(\frac{X}{K}\right)_{i,t-1} + \beta_5\left(\frac{B}{K}\right)_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where i = 1, ..., n indexes companies, t = 1, ..., T indexes time. $\left[\frac{I}{K}\right]$ denotes the investment rate, $e_{i,t}$ is a disturbance term. Q is the average *q* as a proxy for marginal *q* (Hayashi, 1982). *X* is cash flow, *Y* is sales, *B* is total borrowing. As aforementioned, we expect β_1, β_2, β_3, to be positive, β_1 to be positive under an imperfect financial market and β_5 to be negative due to agency costs / bankruptcy costs.

We can further predict that under asymmetric information, the sensitivity of investment to cash flows should be different across firms. The investment of firms for which information problems are likely more severe, such a small firms (Gilchrist and Himmelberg, 1995), independent firms (Hoshi et al., 1991, Elston, 1995), and young firms (Schaller, 1993) should be more sensitive to cash flows than other firms are. Furthermore, we can also expect that firms subject to problem emanating from asymmetric information experience a higher negative impact of financial leverage on investment.

There are some problems with the testing of financial constraints in the context of Tobin's *q* models. If the assumption of perfect competition in the firms product market does not hold, the average *q* is no longer a valid proxy for marginal *q*. For example, if the firm is a

monopoly, the average *q* is higher than marginal *q* (Hayashi, 1982). An inefficient capital market, where stock market prices are so volatile that they do not reflect the fundamental value of firms, invalidates the average *q* as a measure of investment opportunities. Under such circumstances, the initial problem of identification of the investment opportunities (demand effects) and the financial constraint (supply effects) emerges.

An alternative approach is the Euler equation model of investment (Bond and Meghir, 1994). This framework does not rely on a firm's stock market data (market value) to measure investment opportunities, hence the problem of measuring the "true value" of the *q* ration could be eliminated. Instead, the approach is based on the idea that investment rates for the next period should be positively related to the investment rate in the current period. In the standard Euler equation, the expectation of the next investment rate, therefore, summaries the same information as in the q ration. However, if capital market imperfection exists, the standard Euler equation is mis-specified and other variables such as cash flows would be a significant determinant of investment.

The Euler equation, as derived in Appendix 1 (equation A.16) and augmented by sales variable, is given by :

$$\left(\frac{I}{K}\right)_{i,t} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2\left(\frac{I}{K}\right)^2_{i,t-1} + \beta_3\left(\frac{Y}{K}\right)_{i,t-1} + \beta_4\left(\frac{\Pi}{K}\right)_{i,t-1} + \beta_5\left(\frac{B}{K}\right)^2_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

where II is gross profit. In the standard Euler equation, under the null hypothesis of no financial constraint, β_1 is positive and greater than one, β_2 is negative and greater than one, β_3 is positive β_4 is negative, β_5 is zero under Modigliani-Miller debt irrelevance and negative otherwise (Bond and Meghir, 1994). Under alternative hyphothesis, the equation (2) will be mis-specified, i.e., the investment will be positively related to the gross profit, β_4 is positive.

4.2. Identifying Constrained and Unconstrained Firms

One of the most significant implications of models of investment under asymmetric information is that the sensitivities of investment to cash flows are different across firms, depending on the information / agency costs encountered by the firms. To test this prediction, we use a different sample separator. International evidence suggests that institutional features such as affiliation to business groups or banks is essential in identifying whether firms are likely to be financially constrained (Chirinko, 1996). Hoshi et al. (1991), for example, classify whether a firm is affiliated with an industrial group (keiresu) which has close ties with large banks or is an independent firm without affiliation. We follow this suggestion by dividing the sample into firms affiliated to large business groups (conglomerates) which own forex banks

(banks group affiliation) and non bank-group affiliation (independent) firms. The idea is that business groups whose activities are well diversified and whose funds from different subsidiaries are pooled and reallocated across firms could play a role in mitigating the information problems faced by their members in accessing external funds. This is particularly true for conglomerates in Indonesia where most of them own banks and have a special informal relationship with state (large) banks (see Ang et al., 1997 and Chapter 4)[10]. Therefore, we can expect that firms affiliated to these groups are less sensitive to cash flows due both to the mitigation of the information problem and the internal capital market (Schian-tarelly, 1996).

Another classification is based on the size of firms. This criterion is frequently used to identify firms that face information problems (for example, Harris et al., 1994, Jarmillo et al., 1994). We can expect that small firms are more financially constrained than large firms for several reasons: their collaterisable assets relative to their total assets are low, they lack a 'track-record' for external investors, their activities are less diversified (subject to idiosyncratic risk). However, if our sample consist of firms listed on the stock market (i.e., relatively large companies), the sample partition based on size would not reflect the agency cost they incur. Share ownership of 'small' firms listed in the stock exchange tends to be less concentrated, hence the agency problem between managers and outside investors is less severe (see for example, Devereux and Schiantarelly, 1990). In this study, we use the total use total sales (turnover) as the size indicator to split the sample into small and large firms.

Dividend pay-out it also used as a criterion to split a sample firms in order to analyze the effects of cash flows on investment. The seminal work by Fazzari, Hubbard and Petersen (1988), for example, shows that firms with a low dividend pay-out ratio were more sensitive to cash flows. The reason is that low dividend firms may indicate that they have exhausted their retention to finance their investment and consequently these 'lemons' will incur a higher premium for external funds. But, whatever the reason, a low dividend payment is generally a signal of liquidity constraints (Oliner and Rudebusch, 1989). Another criterion we use in testing for financial constraint is the debt equity ratio (leverage). Firms with high leverage may be expected to meet higher agency costs. The agency costs can arise from 'moral hazard' generated by the firms' managers by making an excessively risky investment. The reason for this risky behavior is that with high leverage, the firms may retain most of the profit from any

10 As in Korea, the economy in Indonesia is characterized by the dominant role played by large business groups (conglomerates). From 304 firms listed in the Jakarta Stock Exchange, more than 40% are owned by business groups (Indonesian Business Data Centre, 1996).

success but lenders incur most of the losses from failure due to the limited liability nature of debt contracts.

V. Data and Econometrics Methods

5.1. Data

The company data were obtained from the Extel's Company Research database. The samples are unbalanced panel data extracted from 219 non financial companies listed on the Jakarta Stock Exchange during 1993-1997. Compared with other sources such as Datastream, the Extel's Company Research database covers more items chosen from balance sheets, cash flows and profit and loss accounts. Furthermore, it covers balance sheet items before the firms went public.

Since we were estimating dynamic models, we selected only the companies with at least three years' observations. Furthermore, we excluded outliers, observations where investment, capital stock or sales increased by a factor of ten or more from on year to the next. Finally, 140 companies were selected for the Euler equation estimation. Since the estimation of Tobin's *q* models requires share market value, we constructed a second data set. The share market value is calculated as a multiplication of the share price and the number of shares at the reporting date, which were obtained from the Datastream's company account. The sample for the second set is 132 companies with at least three years' market value data. The details of the definition of data are presented in Appendix 2.

To select firms that are members of a large business-group, we used the following procedures. First, we selected the 25 largest group of firms (based on their revenues), listed in Indonesian Business Online in 1995. Second, from these 25 groups, we selected groups which own foreign-exchange licensed banks, resulting in 16 business groups. In our sample, there are 34 companies with a complete set of data which are members of the 16 largest conglomerates. The other sub samples are classified by dividing the sample into two groups of firms, based on the median of the sample.

A summary of statistics for the sample and sub sample are shown in Appendices 3 (data set for Tobin's *q*) and 4 (data set for the Euler equation). The first rows of Appendices 3 and 4 report mean, median and standard deviations of selected variables for the full sample. The heterogeneity of the sample is clearly observed. For example, average sales of firms affiliated with a bank-group is four times larger than that of non affiliated firms, while the average sales

of large firms is about eight times larger than that of small. It as also interesting to note that firms with low leverage and high dividend pay-out are generally smaller (in terms of total sales) than the high-leverage and the low dividend payout firms. The former group of firms (low leverage and high-dividend payment) represents 'high quality' firms which are characterized by high profit and low leverage (althoug not necessarily large firms). Another interesting feature of our data is that less financially constrained firms are characterised by a high Tobin's *q* and the Tobin's *q* of the affiliated firms are the highest among the groups.[11]

5.2. Econometric Methods

We use a dynamic panel data specification to estimate Tobin's *q* models of (1) and the Euler equation of (2), where the residual ε_{it} can be decomposed into the following components:

$$\varepsilon_{it} = \alpha_i + \gamma_t + v_{it}$$

These subscript i refers to the firm and t refers to the time period, α_i is firm –specific effect, γ_t is time specific effect and v_{it} is idiosyncratic shock.

There are several econometric issues which should be addressed in estimating (1) and (2). First, the possible correlation between the regressors and the firms specific effects, i.e., $E(x_{it} \alpha_i) = 0$. Second, the possible edgoneneity of regressors with respect to v_{it}, i.e. $E(x_{it} \alpha_i) = 0$, for s<t,0 otherwise. For example, the current value of cash flows and Tobins *q* are likely to be correlated with the current shock to investment. Third, the possible heteroskedasticity of the disturbance v_{it} since the panel data covers many heterogeneous firms and several time periods. The problems would result in an upward based estimate of it the OLS estimator is used. Furthermore, as shown by Blundell et al (1992), the estimate of will be downward biased if the within-groups estimator is used. Arrelano and Bonds (1991) provide General Method of Moments (GMM) estimators for dynamic panel data which have the above mentioned properties. Basically, in this estimation method, the individual effects are eliminated by taking the firs-difference of equations (1) and (2) and lagged *levels* of variables are used as instruments. The use of lagged variables[12] as instruments is only valid if v_{it} serially uncorrelated, other wise the estimator will be inconsistent. Given that v_{it} is serially uncorrelated, in the first difference models, the error term becomes a first-order moving average, MA (1). Hence, second order serial correlation should not exist in Δv_{it} Arrelano and Bond (1991) provide tests of second-order serial correlation together with Sargan tests of over identifying restriction, to examine

11 Pomerleano (1998) notices that the high Tobin's q of these large companies is possibly associated with the 'exuberant' valuations of portfolio inflows in the illiquid market, marked by highly sensitive valuations on marginal flows.

12 i.e. t-2 and further lags for endogenous variables and t-1 and further lags for predetermined variables.

the validity of instruments.

This so called first differenced GMM, GMM (DIF), estimator has been widely used in most recent empirical literature concerning the role of financial factors in investment, including prominent studies such as Blundell et al (1992), Devereux and Schiantarelli (1990) and Bond and Meghir (1994). However, in a recent empirical work, Hall, Mairesse, and Mulkay (1998) found that the GMM method of estimation results in much imprecision in the estimated parameters. Using simulation studies, Alonso-Borrego and Arrelano (1996) also fund that the first differences GMM estimator produces a large sample bias and poor precision, particularly in the setting of dynamic panel data models with a small number of time series observations and large autogressive parameter. The problem stems from the "weak instruments" of the levels of variables in the first-difference equations. Some progress has been made by Blundell and Bond (1998) to improve the GMM estimator by introducing additional restrictions on the initial conditions process which allows the use of lagged first differences of variables in the levels equations, in addition to lagged levels instruments in the first differenced equations as in the first differenced GMM. They show that the 'system GMM', GMM (SYS), provides more precise parameter estimates and reduces small sample biases. Since our sample is also characterized by small number of time series observations, we follow this approach and use the DPD98 program (Arrelano and Bond, 1998) which was run in the Gauss 386i. Because of heteroskedastic nature of the data, a two-step estimation procedure provided by the DPD98 program was used to obtain a more efficient estimation.

VI. Empirical Results

6.1. Tobin's q-model of Investment

Table 4 reports Tobin's *q* model of investment of a full sample of data, estimated by the GMM (SYS) and GMM (DIF). The two estimation procedures generate different results. We gain higher precision in the parameters estimated and obtained the a priori sign of the coefficients when using GMM (SYS). Using GMM (SYS), we find, however, coefficient of Tobin's *q* is significant at only around 10%; but the coefficient on sales is highly significant. By contrast, using GMM (DIF), the coefficient on Tobin's *q* is not significant and the coefficient of sales is negative and significant. The Sargan tests of the two estimators do not reject validity of the instruments used and m_2 statistic do not reject the hypothesis of no second-order serial correlation in the differenced residuals. The m_1 statistic do show significant negative first-order serial correlation in the differenced residuals, Δv_{it} which is to be expected if the levels residuals v_{it} are serially uncorrelated.

Given the superiority of the GMM (SYS), we focus on the results estimated by this

estimator. The most interesting finding is that coefficient of cash flows is large, positive and highly significant. If Tobin's *q* as well as sales could perfectly control the expected profitability, then the significance of cash flows in the investment equation supports the financial constraint hypothesis. In particular, the results indicate imperfect substitutability between external and internal finance, i.e. cash flows provide a cheaper form of finance. Another interesting result is that the coefficient of leverage (debt to capital ration) has the expected sign (negative) and is highly significant when we estimate it by using GMM (SYS). This supports the hypothesis that the agency costs are higher when the amount of debt is relatively large. Accordingly, the fact that high leveraged firms have to pay the greater premium on external finance leads to a negative impact on investment. This result parallel to those of Lang, Ofek, and Stulz (1996) and Schiantarelli and Sembenelli (1995).

We now turn to the sub-sample results (Table 5). As the GMM (SYS) outperforms the GMM (DIF) estimator, we only use the GMM (SYS) for sub-sample estimations. Tobin's *q* coefficient for firms affiliated to bank and business groups are positive and significant, as our prior hypothesis. By contrast, the corresponding coefficient for non affiliated firms is not significant. The coefficients of sales are positive and highly significant for both classes of firms, but the accelerator effect for affiliated firms is larger than that of nonaffiliated firms. The most interesting result is that the coefficients of cash flows are positive and highly significant for the two groups of firms, meaning that the financial factor is important for both groups. However, surprisingly, the coefficient of cash flows for affiliated group firms larger than the corresponding coefficient for non affiliated firms. This finding is robust across different sub-sampling criteria (Table 6-8). That is, the investment-cash flows sensitivities for those firms classified as less financially constrained are greater than those classified as financially constrained firms. The t-statistics for the difference between cash flow coefficients in different classes of firms are significant in all sample splits. Although the monotonicity of the relationship between the investment-cash flows sensitivity and the degree of financial constraint is still a subject of debate (see Kaplan and Zingales, 1997 and Fazzari, Hubbard and Petersen, 1996), we need to justify these counter-intuitive results. Devereux and Schiantarelli (1990) found similar results for UK firms and argue that this can happen if the larger firms tend to have lower relative cash flows. However, this is not supported by our sample data (see Appendix 2 and 3). An alternative possible explanation is that since the sample covers only the listed firms, there probably is 'a selection bias in favour of picking only the best of small firms' (Devereux and Schiantarelli, 1990, pp.83).

Objections of mis-measurement have been raised in respect of Tobin's *q* by many critics. In particular, it does not entirely capture investment opportunities, therefore cash flow terms

may contain information about future investment opportunities. For example, firms with low cash flows could have low investment merely because they have few investment opportunities. Another reason is that strict assumption of using average as the proxy of marginal *q*, such as perfect competition in the output market, may be violated. Moreover, an inefficient stock market in developing countries, such as Indonesia, leads to share values being an imperfect proxy for fundamentals and Tobin's *q* can be mismeasured in consequence. Finally, as pointed out by Hayashi and Inoue (1991), Tobin's *q* model is more appropriate for an individual unit than for a holding company. In fact, our sample contains some holding companies.[13] We address the problem of the mismeasurement of Tobin's *q* by estimating the Euler equation (sub-section 4.2).

The estimates of leverage (debt-capital ratio) coefficients provide interesting results (Table 5). The results consistently show that the coefficient on debt ratio for firms classified as financially unconstrained are positive and significant, while those for the constrained firms are negative and significant. These significant differences between the debt coefficients for the two groups of firms (as show by the t-statistics for coefficient differences) support the hypothesis that the agency costs or premium of debt funds for the constrained firms are higher than for the unconstrained firms. One possible explanation of the positive and significant coefficient non leverage for the affiliated firms is their interlocking relationship with domestic banks and their access to foreign sources of funds as suggested by large capital inflows in the periods of sample (see Pomerleano, 1998, Claessen, 1998). The findings are consistent with Harris et. Al. (1994) who exploit the standard accelerator model of investment using a 1981-1988 sample.

Table 4.
Tobin's *q* model of investments, full sample 132 firms

	GMM(SYS)	GMM(DIF)
$\left(\frac{I}{K}\right)_{i,t-1}$	0.2826	0.2347
	(10.985)	(4.495)
$Q_{i,t-1}$	0.0072	0.0092
	(1.612)	(1.010)
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0220	-0.0561
	(8.478)	(-8.265)
$\left(\frac{X}{K}\right)_{i,t-1}$	0.2913	0.4168
	(9.522)	(3.981)
$\left(\frac{B}{K}\right)_{i,t-1}$	-0.0156	0.0629
	(-4.310)	(2.837)
m_1 (df = 98)	-3.214	-4.108
m_2 (df = 55)	1.113	1.178
Wald test (df =5)	1052.73	166.605
Sargan test	47.785 (df = 40)	22.039 (df = 25)

13 For exmple, Bimantara, Kalbe Farma, Bakrie Brothers.

They find positive debt-capital ratio coefficients for large firms both members of conglomerates and independent. They argue that these findings may suggest that for larger firms, a high degree of leverage may act as signal of creditworthiness. At the same time, positive and significant coefficients of leverage and high dividend pay-out firms may be attributable to the high quality firms. In fact., q the less financially constrained firms is higher than for the constrained firms (see descriptive data in Appendix 2). This is consistent with the view investment by firms white a high *q*, i.e. whose valuable investment opportunities are recognized by the capital market, are less effected by leverage (see Lang et al., 1996).

Notes :

1. Value in parentheses are t-statistics derived from asymptotic standard errors which asymptotically robust to heteroskedasticity.
2. m_1 and m_2 are tests for first and second order serial correlation in the first differences residuals, asymptotically distributed as normal distribution under the null of no serial correlation.
3. Wald test is a test of joint significance of the coefficients, asymptotically distributed as χ^2 under the null of no-significance.
4. Sargan is a test the overidentifying restrictions, asymptotically distributed as χ^2 under the null of instrument validity.
5. The instruments used in each equation are

   GMM(DIF) - $(I/K)_{i,t-2}$, .. $(I/K)_{i,t-4}$; $q_{i,t-2,}$ .. $q_{i,t-4}$;$(Y/K)_{i,t-2}$, .. $(Y/K)_{i,t-4}$;$(X/K)_{i,t-2}$, .. $(X/K)_{i,t-4}$;$(B/K)_{i,t-2}$, ..$(B/K)_{i,t-4.}$ GMM(SYS) - first difference equations - as GMM(DIF); level equations - $\Delta(I/K)_{i,t1}$, $\Delta q_{i,t-1}$, $\Delta(Y/K)_{i,t-1}$, $\Delta(X/K)_{i,t-1}$; $\Delta(B/K)_{i,t-1}$.

6.2. The Euler equation

Table 6 reports the Euler equation results for full a sample of data, estimated by the GMM (SYS) and GMM (DIF). Again, the GMM (SYS) estimates parameters more precisely. First, comparison between coefficients on the lagged investment term from the two estimators indicates that the coefficients are correctly signed and significant, but the coefficient estimated by GMM (SYS) is about twice as large as than by GMM (DIF) and is also more precise. This is also the case for coefficients of the lagged squared investment term. Although it is correctly signed, the coefficients is not significant when it is estimated by GMM (DIF). The coefficients of gross profit estimated by the two procedures are positive and significant. This is contrary to

Table 5.
Tobin's *q* model of investments across heterogeneous firms

	Affiliation with groups		Firm's size		Leverage		Pay-out	
	Affiliated	Not-affiliated	large	small	low	high	high	Low
$\left(\frac{I}{K}\right)_{i,t-1}$	-0.0271 (-1.326)	0.2948 (10.524)	0.2462 (17.164)	0.2617 (9.165)	0.1938 (6.049)	0.3611 (23.771)	0.2652 (10.934)	0.2945 (11.927)
$Q_{i,t-1}$	0.0034 (1.926)	0.0033 (0.622)	-0.0014 (-0.454)	-0.0094 (-1.620)	-0.0014 (-0.355)	0.0491 (8.685)	0.0072 (1.594)	0.0187 (6.734)
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0328 (6.796)	0.0132 (6.593)	-0.0079 (-3.114)	0.0320 (15.307)	0.0079 (1.369)	0.0005 (0.323)	-0.0043 (-1.469)	0.0487 (12.027)
$\left(\frac{X}{K}\right)_{i,t-1}$	0.4674 (9.703)	0.2510 (10.353)	0.6081 (11.908)	0.3107 (20.403)	0.3065 (9.203)	0.1445 (8.035)	0.3079 (6.958)	0.1335 (3.886)
$\left(\frac{B}{K}\right)_{i,t-1}$	0.0835 (5.644)	-0.0057 (-1.638)	0.0045 (0.882)	-0.0158 (-8.348)	0.058 (4.347)	-0.0003 (-0.123)	0.047 (7.262)	-0.0197 (-11.351)
t-stat (X/K)[a] diff	4.013		5.581		4.280		3.113	
t-stat (B/K)[a] diff	5.869		3.730		4.298		9.954	
m1	-2.093	-2.616	-1.701	-3.284	-2.960	-2.837	-2.768	-2.943
M2	1.738	-0.036	0.156	-1.492	0.418	1.400	1.364	0.069
Wald test	60108.105	1581.033	2344.750	1413.081	798.565	9561.718	3280.646	2226.93
Sargan test, df=40	28.860	39.099	43.488	39.099	48.84	43.635	39.771	43.732

Notes: See note of Table 1, a t-statistik for the null hypothesis that the coefficients on cash flows (and debt) of the two groups are the same

the prediction of the theoretical model under the null of no financial constraints. The theory predicts that under a perfect capital market where firms can raise funds as much as they wish for investment at a given real opportunity cost, this term, which reflects the marginal revenue product of capital should be negative. Thus, the positive sign of gross profits term could reflect the marginal revenue product of capital should be negative. Thus, the positive sign of gross profits term could reflect the existence of financial constrains in the capital market. This is consistent with the previous finding using Tobin's *q* model.

Next, we divide the sample into two groups of firms, as before. There results are presented in Table 7. Broadly speaking, the coefficients on lagged investment terms and squared investment terms are significant and correctly signed in all sub-samples. However, the magnitude of the coefficients is significantly different from what was expected according to the theoretical model under the assumption of perfect capital market. The coefficients on gross profit ratio are also positive and highly significant in all sub-samples, contrary to what was predicted by the basic Euler equation. In the basic Euler equation (under a perfect capital market), this coefficients should be zero. These all suggest that the basic theoretical fails to

14 Non bank group affiliated firms are an exception ; here the coefficient is positive but not significant at 5%

Table 6.
Euler model of investment, full sample 140 firms.

	GMM(SYS)	GMM(DIF)
$\left(\frac{I}{K}\right)_{i,t-1}$	0.6962	0.3540
	(10.278)	(2.683)
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.5208	-0.1876
	(-5.812)	(-1.355)
$\left(\frac{Y}{K}\right)_{i,t-1}$	-0.0044	-0.0201
	(-4.856)	(-7.980)
$\left(\frac{\pi}{K}\right)_{i,t-1}$	0.0847	0.1144
	(11.914)	(6.914)
$\left(\frac{B}{K}\right)^2_{i,t-1}$	0.0002	-0.0002
	(1.359)	(-1.110)
m_1 (df = 127)	-4.898	-4.598
m_2 (df = 70)	0.892	1.177
Wald test (df =5)	1594.34	452.85
Sargan test	57.569(df = 40)	31.54(df = 25)

characterize the investment data, a fact which is consistent the presence of financially constrained firms. Comparison between the coefficient of profit for unconstrained and constrained firms indicates no significant differences of the investment-profit sensitivities between unconstrained and constrained firms, except that high leverage firms are more investment profit sensitive than are low leverage firms. Finally, signs of the coefficients on the debt term are consistent with those estimated in Tobin's *q* model, i.e., positive and highly significant for less constrained firms, and negative for constrained firms.[14] Moreover, the t-statistics for differences of debt coefficients between the two groups of firms are significant in all cases.

Notes :

1. Value in parentheses are t-statistics derived from asymptotic standard errors which asymptotically robust to heteroskedasticity.
2. m_1 and m_2 are tests for first and second order serial correlation in the first differenced residuals, asymptotically distributed as normal distribution under the null of no serial correlation.
3. Wald test is a test of joint significance of the coefficients, asymptotically distributed as X^2 under the null of no-significance.
4. Sargan is a test the overidentying restrictions, asymptotically distributed as X^2 under the null of instrument validity.
5. The instruments used in each equation are
   GMM(DIF) - $(I/K)_{i,t-2}$,..$(I/K)_{i,t-4}$;$(I/K)^2_{i,t-2}$,..$(I/K)^2_{i,t-4}$;$(Y/K)_{i,t-2}$,..$(Y/K)_{i,t-4}$;$(P/K)_{i,t-2}$,..$(P/K)_{i,t-4}$;$(B/K)^2_{i,t-2}$,..$(B/K)^2_{i,t}$,GMM(SYS) - *differented equations - as* GMM(DIF); level equations - $\Delta(I/K)_{i,t-1}$,

Table 7.
Euler equation of investment across heterogenous firms

	Affiliation with groups		Firm's size		Leverage		Pay-out	
	Affiliated	Not-affiliated	large	Small	low	high	high	Low
$\left(\frac{I}{K}\right)_{i,t-1}$	0.3043 (15.778)	0.9318 (17.445)	0.7785 (26.95)	0.6001 (6.889)	4.840 (6.542)	0.6431 (15.281)	0.3140 (11.466)	1.0387 (16.529)
$\left(\frac{I}{K}\right)^2_{i,t-1}$	-0.3205 (-14.973)	-0.7978 (-10.342)	-0.5370 (-13.39)	-0.463 (-4.728)	-0.2494 (-3.035)	-0.392 (-6.758)	-0.1156 (-2.766)	-0.8778 (-12.903)
$\left(\frac{Y}{K}\right)_{i,t-1}$	0.0444 (12.073)	-0.0044 (-6.977)	-0.0034 (-2.344)	0.0078 (1.412)	0.0085 (2.904)	-0.0054 (-4.522)	0.0011 (0.898)	0.0031 (1.061)
$\left(\frac{\pi}{K}\right)_{i,t-1}$	0.0683 (3.674)	0.0536 (10.989)	0.0704 (5.414)	0.0621 (10.733)	0.0772 (19.918)	0.0994 (10.304)	0.0566 (5.307)	0.0611 (18.882)
$\left(\frac{B}{K}\right)^2_{i,t-1}$	0.006 (9.785)	0.0001 (1.870)	0.0048 (70.789)	-0.0004 (-7.464)	0.0115 (8.691)	-0.00001 (-1.164)	0.004 (79.300)	-0.0004 (-14.214)
t-stat (X/K) diff	0.764		0.583		-2.135		-0405	
t-stat (B/K) diff	9.586		60.166		8.698		76.177	
m1	-2.394		-2.602	-3.896	-3.696	-3.718	-3.300	-3.599
m2	1.685		0.431	1.374	0.778	0.865	0.602	0.667
Wald test	95078.22		30333.91	3690.4	1590.10	12107.25	26103.37	7640.53
Sargan test, df=40	27.78		43.07	50.58	44.67	44.812	50.083	38.90

$\Delta(I/K)^2_{i,t-1}, \Delta(Y/K)_{i,t-1}; \Delta(B/K)^2 i_{,t-1}$

VII. Conclusion and Policy Implication

We have investigated the role of financial factor in firms' investment using panel data of Indonesia companies publicly traded in the Jakarta Stock Exchange within the sample period 1993-1997. The main objective is to investigate whether the Indonesian firms' investment is constrained by the availability of finance and whether some types of firms are more affected by financial constraint. The investigation was carried out using the Tobin's q and the Euler models of investment augmented by financial variables (cash flows / profit and leverage) and estimated by a new econometric technique the 'system-GMM' developed by Blundell and Bond (1998). The full sample results generated by the two models robustly indicates that the cash flow terms were positive and highly significant, while the leverage term is negative and significant in the Tobin's q and insignificant in the Euler model. This evidence on the effect of cash flows and leverage is consistent with the possibility of financial constraints and the existence of agency costs of debt finance.

In spite of convincing evidence for the existence of financial constraint in full sample data, testing for financial constraints needs to examine the differentials behavior of financially

constrained and unconstrained firms. We classify firms into these groups based on their institutional characteristics (firms affiliation with bank-business groups), size of firms (sales turnover) and financial conditions (financial leverage and dividend pay out). Evidence from the role of the cash flow investment equation indicates the existence of financial constrains for firms that are a priori classified as both financially constrained and unconstrained. The most striking result is that firms' investment, taking unconstrained and constrained firms responds differently to degrees of financial leverage. The investment spending by financially constrained firms responds negatively to the degree of financial leverage. This is not suppressing as the increasing leverage reduces funds for investment and simultaneously reduces the ability of firms to raise funds from outside sources. In contrast, for financially unconstrained firms, such as firms affiliated with large banks and business groups, leverage does not affect investment spending. Although, there is no clear government policy to support the large business groups as Chaebol firms in Korea, these business groups, in fact, enjoy a favored relationship with state banks. Other financially less constrained firms, such as lower leverage and higher pay-out firms, which are also characterized by high Tobin's q, responds positively to leverage. The findings have in common with those of Lang et al. (1995) that 'leverage matters more than operating cash flow in explaining investment differentials.

The evidence provides some support to the financial constraint hypothesis and indirectly proves the broad credit channel of monetary policy. The implications on monetary policy formulation are as follows. The response of the real sector to a monetary policy shock depends upon the financial structure of firms, the segmentation of the financial market between large and small firms, and the degree of financial / credit friction in the capital / credit market. Hence, the authorities should monitor a broad range of indicators regarding the microeconomic aspects of firms and banks. In addition to banks' balance sheets, survey on corporates' balances sheets should be conducted by the monetary authorities. Data such as ability of firms to access to banks' credit, debt to equity ratio and banks willingness to lend at least provide indicators on financial friction in the credit market.[15]

As far as the financial crisis in Southeast Asia is concerned, although still a subject of debate (see IMF, 1999), some provided evidence that the credit channel operates in countries in the region in the aftermath of the crisis (Ding at al., 1998, Kim, 1999, and Ito and Da Silva, 1999). Accordingly, monetary authorities should be aware of the possible amplification and distributional effect of their policy. Otherwise, there is a risk that the monetary policy could be 'overkilling' (Domac and Ferri, 1998) the economy, largely due to its severe impact to small

15 Federal Reserve, for example, constructs an index of banks' willingness to lend

and medium enterprises.

The credit channel controversies surrounding the financial crisis in Indonesia bequeath a future research agenda. The Asian financial crisis, characterized by disruption due to credit flows a s result of the collapse of banks / financial intermediation, resembles the Great Depression in 1930s, and is thus perhaps an interesting setting for research on the 'malfunction of financial institutions' in the propagation of the financial crisis, as conducted by Bernanke (1983) when pioneering the notion of the credit channel.

Appendix 1.
Derivation of The Tobin's q model and the Euler equation

Firms maximize the expected present discounted value of existing shareholders by maximizing dividend flows :

$$\text{Max } V_t = E_t \sum_{j=0} \beta^t_{t+j} D_{t+j} \qquad \text{(A.1)}$$

sources of funds the sum of cash flows and funds raised from external sources, net of costs of external borrowings and agency costs. The Where E, denotes expectation operator given information set at period t, β_{1+j} the nominal discounted factors between period t to $_{t+j}$, D_1 dividend (i.e., distributed profit). The value maximization is subject to the capital accumulation.

$$K_t = (1 - \delta) K_{t-i} + I_1 \qquad \text{(A.2)}$$

And the cash flows identity, i.e., the sources and uses of funds must be balanced. The sources of funds include the sum of cash flows and funds raised from external sources, net of costs of external borrowings and agency costs.The uses of funds comprises distributed profit (dividend) and new capital expenditures. Assuming zero-tax and unity of prices of capital and output for simplicity, the cash flow balance follows this identity.

$$F(K_t,L_t) - J(K_t,I_t) - \omega_t L_{t-} i_t B_{t-1} + \Delta B_t - A[B_t,K_t,X_t] = D_t + I_t \qquad \text{(A.3)}$$

Where, $X_t = F(K_t,L_t) - J(K_t,I_t) - \omega_t,L_t$, is cash flow. K_t is capital stock, I_t gross investment, L_t labour inputs, ω price of labour, B_t is stock of debt, i_t is capital stock, is the rate on debts. $F_t(.)$ is gross production function, $J_t(.)$ is installment / adjustment cost function, $F_i(.)$ $J_t(.)$ Is net output production. $A_t(.)$ is the agency costs, positively related to B_t and negatively related to capital stock and cash flows X_t.

The first order conditions are :

$$L_t[1-A_X(t)][F_L(t) - w_t] = 0 \quad \text{(A.4)}$$

$$B_t[1-A_B(t)] - E_t[(1+ i_{t+1})\beta_{t+1}] = 0 \quad \text{(A.5)}$$

$$I_t[1-A_x(t)]\, J_I(t)-1+\lambda_t = 0 \quad \text{(A.6)}$$

$$K_t[1-A_X(t)][F_K(t) - J_K(t)] -A_k(t) -\lambda_t + E_t[(1-\delta)\lambda_{t+1}\beta_{t+1}] =0 \quad \text{(A.7)}$$

where A_X, A_β, A_K denotes the partial derivative of the agency costs with respect to X,B and K. Elimination of λ_t by subtituting equation (A.6) into (A.7) results in what so called Euler equation for capital :

$$[1-A_X(t)][F_K(t) - J_K(t)] - A_K(t) - E_t[1-(1-\delta)\beta_{t+1}] =$$

$$I_t[1-A_X(t)]J_I(t)-1-A_X(t+1)J_I(t+1)\, E_t[(1-\delta)\beta_{t+1}] \quad \text{(A.8)}$$

According to (A.8), the optimal condition requires that the marginal cost of investment today must be equal to the marginal return of the new unit of capital net of its user costs and plus saving in marginal adjustment costs due to the absence of tomorrow's investment.

q model of investment can be derived from adding of A.4-A.7, cash flow balance and homogeneity properties of F(.), G(.) and A(.):

$$(1-\delta)\lambda_t K_{t-1} - E_t[(1-\delta)\lambda_{t+1}\beta_{t+1}K_t] = D_t + (1+i_t)B_{t-1} \quad \text{(A.9)}$$

Solving A.9 recursively forward and using A.2 and A.6 generates the following equation:

$$[1-A_X(t)]J_t(t) = \frac{\beta_t^{-1}V_t + (1+i_t)B_{t-1}}{(1-\delta)K_{t-1}} - 1 \quad \text{(A.10)}$$

The right hand sight of A.10 is deviation of market value of firms' equity and debt to unity (the average q) which is exactly equal to the marginal adjustment costs. Linearization of A.10 around sample means produces the linear model of investment as follow :

$$\frac{I_t}{K_t} = \beta_0 + \beta_1 Q_t + \beta_2\left(\frac{X_t}{K_t}\right) + \beta_3\left(\frac{B_t}{K_t}\right) + \varepsilon_t \quad \text{(A11)}$$

Where :

$$\beta_0 = b; \beta_1 = \frac{1}{a(1-A_X^*)}; \beta_2 = \frac{(I^*/K^*)A_{X.X/K}^*}{1-A_X^*}; \beta_3 = \frac{(I^*/K^*)A_{X.B/K}^*}{1-A_X^*}$$

where superscript * denotes evaluation at sample means β_1, β_2 are positive and β_j negative.

Equation A.11 can be added by output-capital ratio, , $\frac{Y_1}{K_t}$ to control demand

effect that are not adequately captured by the q, resulting the model as presented in equation (1) in the text.

In the Euler equation A.8, marginal profits from capital are unobserved. Using A.4 and linear homogeneity assumption for F(.) And G(.), we can write :

$$F_K(.) - G_K(.) = \frac{\Pi_t}{K_t} + G_t(.)\frac{I_t}{K_t} \qquad \text{(A.12)}$$

where Π is the firm sales minus variable costs. The adjustment cost function is assumed to follow a quadratic form :

$$G(Kt, It) = \frac{a}{2}\left[\left(\frac{I_t}{K_t}\right) - b\right]^2 K_t \qquad \text{(A.13)}$$

Assuming that AX(.) = 0 i.e., agency costs is dependent on cash flows and the agency costs function follows the form :

$$A(B, Kt, Lt) = \frac{c}{2}\left(\frac{B_t^2}{K_t}\right) \qquad \text{(A.14)}$$

Subtituting A.11 - A.13 into A.8 we obtain the Euler equation :

$$\frac{I_t}{K_t} = \alpha_0 + \alpha_1\rho_t + \alpha_2\rho_t\frac{I_{t+1}}{K_{t+i}} + \alpha_3\left(\frac{I_t}{K_t}\right)^2 + \alpha_4\frac{\Pi_t}{K_t} + \alpha_5\left(\frac{B_t}{K_t}\right)^2 + u_t \qquad \text{(A.15)}$$

where $\rho_t = (1-\delta)\beta_{i+1*}$ The parameters of A.15 are :

The rate of discount term is replaced by firm specific effects. In the empirical model we also introduce output-capital ratio which may be significant if the product market is imperfect. Equation A.15 can be rearranged to obtain the following model, as equation (2) in the text.

$$\alpha_0 \frac{ab-1}{a(1+b)}; \alpha_1 = \frac{1-ab}{a(1+b)}; \alpha_2 = \alpha_3 = \frac{1}{1+b}; \alpha_4 = \frac{1}{a(1+b)}; \alpha_5 = \frac{c}{2a(1+b)} \qquad \text{(A.16)}$$

where β_1 positive, β_2, β_3 and β_4 negative.

Appendix 2. Definition of variables used

Investment (I_t) is calculated as the tangible fixed assets (property, plants and land) acquired less tangibles fixed assets sold.

Replacement value of capital stock (K_t) is calculated by the formula :

$$K_t = K_{t-1} + I_t - DEP_t$$

where DEP_t is the depreciation and we choose 1992 as the initial year in calculating the recursive formula.

Gross cash flow (X_t) is profit after tax plus depreciation.

Sales are gross sales or turnover.

Debts (D_t) is calculated as the sum of both short and long-term securities and loans including overdrafts.

Cash and liquids (F_t) are cash and its equivalent, including cash on hand, cash at bank and short term deposits.

Tobin's q is proxied by average *q(Q)* calculated by the formula :

$$Q_t = (V_t + B_t - F_t) / (K_t + N_t)$$

where :

V = market value of share

B = market value of debt

F = market value of financial assets

N = market value of inventories

K = market value of the capital stock

Appendix 3. Sample data for Tobin's *q* estimation

Separation Criteria			Sales	Investment	Capital Stock	I/K	Y/K	X/K	Q	D/K
Whole sample	132 firms	Mean	451876	106818	340779	0.32	3.25	0.29	2.14	1.55
		Median	162962	22441	81819	0.30	2.08	0.25	1.63	1.04
		StDev	1198609	267764	836633	0.20	4.14	0.43	1.74	2.62
Group	Affiliation (34 firms)	Mean	965330	235721	777966	0.34	2.58	0.25	2.42	1.45
		Median	323461	58282	219595	0.33	1.82	0.21	1.81	1.04
		StDev	2171188	448205	1452417	0.23	2.63	0.31	1.97	1.31
	Non-affiliation (98 firms)	Mean	264121	59682	180912	0.31	3.49	0.30	2.04	1.58
		Median	140133	16771	59992	0.29	2.14	0.26	1.57	1.03
		StDev	339113	128533	304642	0.19	4.55	0.46	1.64	2.96
Size	Large (65 firms)	Mean	806617	186298	597515	0.32	3.60	0.30	2.35	1.62
		Median	410412	58651	214792	0.32	2.13	0.28	1.92	1.31
		StDev	1621026	360187	1126977	0.19	4.93	0.38	1.84	1.42
	Small (67 firms)	Mean	108579	29901	92324	0.31	2.90	0.27	1.94	1.48
		Median	75712	8465	33344	0.28	2.06	0.23	1.42	0.83
		StDev	220983	61027	157607	0.21	3.17	0.46	1.63	3.40
Leverage	Low (64 firms)	Mean	249028	43427	140685	0.31	3.27	0.38	2.35	1.03
		Median	124529	14190	47478	0.28	2.26	0.34	1.62	0.60
		StDev	370844	110959	246211	0.20	2.98	0.45	2.08	1.23
	High (68 firms)	Mean	649617	168613	535834	0.32	3.23	0.20	1.94	2.04
		Median	281610	49206	165272	0.31	1.65	0.18	1.63	1.35
		StDev	1621314	349396	1117277	0.20	5.03	0.38	1.31	3.41
Payout Ratio	High (66 firms)	Mean	292463	64664	198510	0.32	3.73	0.31	2.17	1.46
		Median	139622	16505	57710	0.29	2.36	0.27	1.60	0.99
		StDev	389153	166771	399473	0.22	5.05	0.44	1.92	1.82
	Low (66 firms)	Mean	625231	152659	495489	0.31	2.72	0.26	2.11	1.64
		Median	225112	32667	148085	0.31	1.59	0.23	1.64	1.11
		StDev	1668020	340087	1115491	0.18	2.75	0.41	1.53	3.28

Appendix 4. Sample data for Euler estimation

Separation Criteria			Sales	Investment	Capital Stock	I/K	Y/K	X/K	P/K	D/K
Whole sample	140 firms	Mean	497,835	117,333	378,091	0.33	3.21	0.29	0.83	1.51
		Median	161,227	24,103	86,442	0.31	2.03	0.24	0.51	0.92
		StDev	1,276,112	313,615	1,027,235	0.21	4.13	0.39	0.89	2.51
Group	Affiliation (34 firms)	Mean	1,101,839	234,525	775,968	0.34	2.61	0.25	0.71	1.44
		Median	339,667	60,898	230,540	0.33	1.82	0.23	0.44	1.03
		StDev	2,279,542	437,880	1,413,152	0.23	2.61	0.31	0.69	1.28
	Non-affiliation (106 firms)	Mean	293,443	77,677	243,452	0.33	3.42	0.30	0.87	1.53
		Median	133,460	17,864	60,472	0.30	2.06	0.25	0.53	0.99
		StDev	514,009	246,715	817,503	0.20	4.51	0.42	0.95	2.81
Size	Large (69 firms)	Mean	889,624	203,321	665,131	0.33	3.65	0.32	0.81	1.57
		Median	404,721	60,113	213,645	0.32	2.17	0.28	0.55	1.22
		StDev	1,706,431	422,691	1,388,729	0.20	4.94	0.35	0.78	1.43
	Small (71 firms)	Mean	107,313	31,624	91,980	0.33	2.78	0.26	0.85	1.45
		Median	73,474	8,775	34,417	0.29	1.94	0.22	0.45	0.83
		StDev	219,027	62,106	153,624	0.22	3.07	0.44	0.99	3.26
Leverage	Low (69 firms)	Mean	386,719	78,069	261,844	0.32	3.25	0.38	0.96	0.99
		Median	124,529	16,415	51,873	0.30	2.20	0.33	0.65	0.60
		StDev	922,927	289,367	980,194	0.21	3.22	0.41	0.98	1.05
	High (71 firms)	Mean	605,058	155,223	490,265	0.33	3.18	0.20	0.71	2.01
		Median	238,454	43,243	140,207	0.31	1.69	0.19	0.42	1.32
		StDev	1,536,084	331,426	1,060,185	0.21	4.85	0.36	0.78	3.30
Payout Ratio	High (66 firms)	Mean	304,650	65,224	196,593	0.33	3.79	0.31	0.91	1.47
		Median	141,964	17,864	58,077	0.30	2.38	0.27	0.54	0.99
		StDev	405,428	164,791	393,883	0.22	5.07	0.41	0.96	1.84
	Low (74 firms)	Mean	674,821	165,073	544,371	0.33	2.69	0.26	0.76	1.54
		Median	178,280	34,090	140,021	0.31	1.58	0.23	0.47	1.01
		StDev	1,705,509	398,859	1,350,871	0.20	2.93	0.38	0.81	3.01

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