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THE EFFECTS OF FINANCIAL CONSTRAINTS ON FIRMS' INVESTMENT: EVIDENCE FROM A PANEL STUDY OF INDONESIAN FIRMS.

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ABSTRACT

This paper analyses a panel of 289 listed Indonesian firms over the period 1998 -2006 to study the variation of responsiveness of firms Investment to the availability of internal corporate funds , 'cash flow', when the firms are categorized according to different degrees of internal and external financial constraints. Our empirical findings suggest that financially least constrained firms exhibit greater investment cash flow sensitivity compare to financially more constrained firms. We found positive and stronger Leverage effect on Investment for large and high cash flow firms, and this effect is weaker for small and low cash flow firms.

Keywords: Internal financial constraint , External financial constraint , liquidity sensitivity, leverage effect.

1. INTRODUCTION

We focus our study on Indonesian firms' investment behaviour, which is one of the major contributing factors to the Indonesian economy's growth. This motivated us to examine how the Indonesian firms' investment responds to the availability of internal corporate funds, 'cash flow'. We analyse a panel of 289 Indonesian firms that are listed on the Stock market for the period 1998-2006. Firms are categorized on the basis of different degrees of internal financial constraints based on cash flow, and different degrees of external financial constraints based on total real assets as a proxy for firm size.. To classify firms on the basis of different degrees of external financial constraints we consider 'number of employee' and 'sales' as a proxy for firm size. Firms with stronger financial positions are found to be more liquidity sensitive than firms with weaker financial positions. We also examine the leverage effect on firms' investment, when firms face different degrees of internal and external financial constraints, and we found the leverage effect is positive and stronger for financially healthier firms, this effect is positive but weaker for financially constrained firms.

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2. REVIEW OF LITERATURE

Conventional empirical models of business investment are contingent upon the notion that all representative firms have equal access to capital markets, for which firm's financial structure is irrelevant to the investment because, external funds provide a perfect substitute to the internal funds. This is applicable for well known, mature companies. For small, expanding firms, external capital is not a perfect substitute for internal funds, because of asymmetric information that exists between the borrowers and the lenders, as a result it is almost impossible for the providers of the external funds to assess the firms' quality of the investment opportunities.

The 'q' Model approach:

Fazzari ,Hubbard and Peterson (1988) , in their pioneering and seminal paper, reviewed the role of financial factors in investment studies using manufacturing firm data to analyze the differences in investment in firms classified according to their earnings retention practices. According to their estimation result of 'q', 'neoclassical' and 'accelerator' models of investment, firms that exhaust all their internal finance exhibit more sensitivity to fluctuations in cash flow than that of high dividend firms. The financing hierarchy theories discussed in FHP (1988) imply that the supply of Investment finance is not perfectly elastic for firms that face asymmetric information problems and this is independent of how the investment demand has been modelled. Regardless of the true economic process at the foundation, the supply of low cost finance, the level of internal cash flow appears in the reduced form investment equation where internal and external finance are not perfect substitutes. The general form of reduced form equation is $(I/K)_{it} = f(X/K)_{it} + g(CF/K)_{it} + u_{it}$, (1)

I_{it} represents the investment in plant and equipment during period t; X represents the vector of variables as determinants of investments from theoretical perspectives, and u is an error term , all variables are divided by the beginning of period capital stock 'K'. Function g represents the potential sensitivity of investment to fluctuations in available internal finance, after investment opportunities are controlled for through the variables in X. The intuition of the 'q' theory framework is that, absent considerations of taxes or capital market imperfections, a value maximizing firm will invest as long as the shadow value of an

additional unit of capital, marginal q exceeds unity. In equilibrium, the value of an extra unit of capital is just its replacement cost, so that marginal q is unity. 'q' controls for the market's evaluation of the

firms' investment opportunities. They first estimated 'Q investment model' including cash flow for three retention
classes over three time periods 1970 -75 , 1970-79 ,1970-84 . Q is value of 'q' at the beginning of the period which is the sum of the value of equity and debt less the value of inventories, divided by the replacement cost of the capital stock adjusted for corporate and personal taxes.

Estimation results suggest largest CF/K coefficient for class 1 firm (low dividend paying), and as the sample period is extended this coefficient declines monotonically, where as for class 2 and class 3 (relatively higher dividend paying firms) this coefficient seems to be stable over time. Differences in the estimated coefficients across classes are always statistically significant at very high confidence levels. Using lagged Q as an instrument for Q; they obtain similar coefficients for Q and cash flow terms. For robustness check , models of the additional cash flow lags demonstrate that collinearity among the cash flow variables reduce the current cash flow coefficient in all classes , but the pattern across classes remains clear and differences of the coefficients between class 1 and 3 are almost identical to that of the previous finding. The current cash flow coefficient is much larger relative to lagged coefficients for class 1 than for class 3. Model including lagged Q shows greater sensitivity of Investment to fluctuation in internal funds for class 1 compare to class 2 and 3. It is possible that the current cash flow contains news about the investment opportunities not captured in the beginning of period 'Q', so when the basic 'Q' model is reestimated by treating CF/K as endogenous and using instrumental variable techniques and then adding 'Q' , dated at the end of the current period ,thus incorporating all news arriving in the current period ,with both alterations , the differences in the estimated cash flow coefficients across classes remained. Internal funds help explain investment in all classes, even for firms that have much more cash flow than investment. It is typical to find significant effects of both sales and profits or cash flow in an investment equation , whether the cash flow is a signal of profitability of investment not captured in the accelerator formulation or weather it represents an additional supply of low cost investment finance for firms that must pay a premium for external funds, 'Q' is included in the estimated equation where 'Q' is based on asset prices determined in the forward looking markets .Including 'Q' reduces the cash flow

effect somewhat in class 2 and 3 but cash flow still has a strong effect in all the dividend payout classes.

Gilchrist and Himmelberg (1995),following Abel and Blanchard (1986), estimated a set of vector auto regression (VAR) forecasting equations using a subset of information that is available to both firm and Econometrician and used the estimates of this VAR to construct expected value of marginal 'Q' conditional on observed fundamentals, and refer to this variable as 'Fundamental Q', They explicitly included the cash flow as one of the observable fundamentals , thus cash flow contains any information about the marginal value of Capital. This information should be fully captured by Fundamental 'Q', because this investment specification clearly isolates the role of cash flow as a forecasting variable. They find that investment still responds to cash flow even after controlling for it's role as a forecasting variable for future investment opportunities. In addition this effect is stronger for firms that have been identified a priori as financially constrained.

Their data set consists of firms from COMPUSTAT data base over the period 1979-1989. Following FHP (1988), they use low dividend payouts to identify financially constrained firms. In addition size is also used as a measure of capital market access because small firms are vulnerable to information asymmetries and collateral constraints. They use bond ratings and access to commercial paper market as sample splitting criteria. They estimate both standard neoclassical model of investment under perfect capital markets and model augmented with cash flow. The neoclassical model is rejected for the constrained firms but fits well for firms classified as 'Unconstrained' once the 'fundamental Q' is used instead of Tobin's 'Q'. After adding cash flow (estimation period is 85-89) in investment equation with fundamental 'Q' there is very little residual correlation between investment and cash flow for unconstrained firms ,but there is high degree of residual correlation for constrained firms, which provides strong support for financial market imperfections interpretation of the role of cash flow in investment regressions. In a series of robustness checks, they extend this analysis in number of directions, all of which strengthen this conclusion.

Kaplan and Zingales (1997), examined 49 low dividend firms of FHP (1988) . A firm is considered more financially constrained as the wedge between its internal and external cost of funds increases. KZ (1997) argued that it is not necessarily true that the magnitude of the sensitivity of investment to cash flow increases in the degree of financing constraints. Cash

flow is measured as the sum of earnings before extraordinary items and depreciation and average Tobin's 'Q'. They use the qualitative information in the annual reports, together with quantitative information in the companies' financial statements and notes, to classify each firm into one of five groups. 'Not financially constrained' characterized by more liquidity than it would need for investment in the foreseeable future and where the lenders did not restrict them from making large dividend payments. The next group is 'likely not financially constrained' that differs from NFC by absence of an explicit statement of excess liquidity, the Possibly financially constrained group does not report any clear signs of financing constraint but they do not look particularly liquid either and so there is a contradiction, likely to be financially constrained are prevented from paying dividends and have little cash available. Financially constrained firms are in violation of debt covenants and are renegotiating debt payments. Regression results of investment on cash flow and 'Q' for total sample from 1970 to 1984 indicates firms classified as NFC and LNFC exhibit greatest cash flow sensitivity exceeding for the entire sample. The coefficient for NFC is economically and statistically greater than coefficients for other firms.

They estimate a regression in which they group the PFC with NFC, this lowers the cash flow sensitivity, but does not alter basic result that the unconstrained firms exhibit greater investment cash flow sensitivity. This result remains unchanged for different sub -periods. In a series of robustness checks the results are qualitatively and statistically identical under all alternatives. This indicates investment cash flow sensitivity criterion as a measure of financing constraints is not well grounded in theory and is not supported by empirical evidence in the case they investigate.

Empirical findings of leverage effect within the 'q' model:

Lang et al.(1996) examined the COMPUSTAT data for the period 1970-1989 and found negative relation between leverage and future growth at the firm level, this relationship holds for firms with low Tobin's 'q' ratio, but not for high 'q' firms .Therefore leverage does not reduce growth for firms known to have good investment opportunities but is negatively related to growth for firms whose growth opportunities are either not recognized by Capital markets or are not sufficiently valuable to overcome the effects of their debt overhang. Similar finding is obtained by Aviazian et al. (2003) , from a study of Canadian

publicly traded Firms. The result provides support to Agency theories of corporate leverage , that leverage has a disciplining role for firms with low growth opportunities.

The Error –Correction Approach:

Bond, Elston, Mairesse and Mulkay (2003), estimate reduced form 'Error correction model' where the long-run formulation for the level of the capital stock is specified as consistent with a simple model of the firm's demand for capital, but in which the short-run investment dynamics are found from an empirical specification search rather than being imposed as a priori. In the absence of adjustment costs , the desired capital stock can be written as a log linear function of output and the cost of capital.

The desired capital stock can be written as:

$$k_{it} = a_i + y_{it} - \sigma j_{it}, \qquad (2)$$

k_{it} is the log of desired capital stock, y_{it} is the log of output and j_{it} is the log of real user cost of capital ,they also consider the autoregressive –distributed lag specification with upto second order dynamics as the following:

$$k_{it} = \alpha_1 k_{i,t-1} + \alpha_2 k_{i,t-2} + \beta_0 y_{it} + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} + d_t + \eta_i + v_{it}, \qquad (3)$$

where d_t is a time dummy , η_i is unobserved firm specific effect, and v_{it} is an error term. Imposing the long-run unit elasticity restriction $(\beta_0+\beta_1+\beta_2)/1-\alpha_1-\alpha_2 =1$, the above ADL model can be reparameterized as the following error correction form:

$$\Delta k_{it} = (\alpha_1-1)\,\Delta k_{it-1} + \beta_0 \Delta y_{it} + (\beta_0+\beta_1)\,\Delta y_{i,t-1} - (1-\alpha_1-\alpha_2)\,(k_{i,t-2}-y_{i,t-2}) + d_t + \eta_i + v_{it}. \qquad (4)$$

The error correction behaviour requires that the error correction coefficient of $(k_{i,t-2}-y_{i,t-2})$ be negative, so that a capital stock above it's desired level is associated with lower future investment and vice-versa. Approximating the investment rate as $\Delta k_{it} \approx I_{it}/k_{i,t-1}$, and including additional current and lagged cash flow terms, the error correction model has the following form.

$$I_{it}/k_{i,t-1} = \rho\, I_{i,t-1}/k_{i,t-2} + \gamma_0 \Delta y_{it} + \gamma_1 \Delta y_{it-1} + \varphi(k_{i,t-2}, y_{i,t-2}) + \pi_0 C_{it}/k_{i,t-1} + \pi_1 C_{it-1}/k_{i,t-2} + d_t + \eta_i + v_{it}. \qquad (5)$$

They use panel data on company accounts covering the period 1978-89.The GMM estimation for the error correction model outlined above shows that the error correction coefficient is negative and sales growth has positive short-run effect on investment rates in all four countries. Neither current or lagged cash flow has significant effect on Investment for Belgium .Current cash flow has a significant coefficient in Germany, but the long-run effect on an increase in cash flow on the firm's capital stock is much smaller than the United Kingdom. The sensitivity of investment spending to the fluctuations in cash flow appears to

be much greater in the UK, than it is in Belgium, France or in Germany. The availability of internal finance appears to have been a more important constraint on company investment in their sample of UK firms. This suggests that market oriented financial system in the UK performs less well in channelling investment funds to firms with profitable investment opportunities than do the continental European financial system.

Guariglia (2008) tested the U hypothesis as stated by Cleary (2007), from a large panel of UK unlisted firms for 1993 to 2003 using the error correction specification. According to Cleary (2007), the sensitivity of investment is determined by the interactions of a cost and a revenue effect. The cost effect arises because , assuming the internal funds are high but insufficient to finance all of the firm's investment requirements, higher levels of investment is typically associated with higher borrowing, higher repayment costs, and consequently a higher risk of default. So a drop in cash flow leads to drop in investment as it allows the firm to avoid higher borrowing , higher repayment costs. Revenue effect suggests negative relationship between cash flow and Investment. Higher levels of Investment generates higher revenue which lowers the firm's risk of default .The exact relationship between the sensitivity of investment to cash flow depends on which of the two effects prevails. If firms are classified on the basis of their internal funds , then the relationship between Investment and Cash flow should be negative. If firms are classified according to size, bond ratings (the degree of external financing constraints) the relationship could be negative or positive depends on which effect prevails.
The following error correction specification was used as the baseline specification.

$$I_{it}/K_{i,\,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-2} - s_{i,t-2}) + a_5\, CF_{it}/K_{i,t-1} + v_i + v_t + v_{jt} + e_{it}. \qquad (6)$$

Where I is the firm's investment , K the replacement value of the capital stock ,k is it's logarithm , 's' is the logarithm of real sales, and CF firm's cash flow. The model predicts the coefficient of the error correction term $(k_{i,t-2} - s_{i,t-2})$ be negative v_i and v_t are firm and time- specific component respectively. v_{jt} is time specific component which varies across industries and e_{it} is an idiosyncratic component. Later cash flow was interacted with dummy variables indicating the external and internal financial constraints faced by the firm.

Estimation result suggests that cash flow coefficient is precisely determined both in manufacturing sector and in broader sample, but in broader sample the cash flow has weaker effect on firm's investment. Estimation results of investment equations with interactions based on cash flow to capital ratio show that cash flow coefficient is negative for firm years with negative cash flow, that is the revenue effect prevails over the cost effect. Cash flow plays a significant and positive effect on the investment of firm years with high cash flow for which the cost effect is likely to prevail over the revenue effect. When the coverage ratio is used to differentiate the effects of cash flow on firm's investment , she obtained similar results for manufacturing sector , when the broader sample is considered cash flow attracts a positive and significant both for firm years with middle sized and high coverage ratio. These results are in line with findings in Cleary (2007), and with those in KZ(1997), according to which the sensitivity of investment to cash flow is highest for the least financially constrained firms. When the coverage ratio is used to differentiate the effects of cash flow on firm's investment obtained similar results are obtained for the manufacturing sector, when the broader sample is considered cash flow attracts positive and significant both for firm years with middle sized and high coverage ratio. The coverage ratio is defined as the ratio between firms' total profits before tax and interest and their total interest payments

According to Guariglia (2008) , the different conclusions reached by FHP (1988) and KZ(1997), about whether higher sensitivities of investment to cash flow are probably due to the different criteria used in their studies to partition the sample. Finally combining the internal and external financial constraints the sensitivities are highest for those externally financially constraint firms that have relatively high level of internal funds.

3.OVERVIEW OF FINANCIAL STRUCTURE OF INDONESIAN ECONOMY

The role of Bank Finance:

Indonesian finance has historically been dominated by 'Banks'. The flow of funds accounts indicate (Table:1) 30-45% of private capital formation is financed by bank credit and most of the rest is financed within domestic private non banking sector. Finance provided directly by the government and foreigners declined between 1991and 1994.

Table: 1 Indonesia: Role of Banks in private finance

	1991	1992	1993	1994
(In trillions of Rupiah)				
Domestic private Non bank sector				
Gross capital formation	51.2	53.2	67.5	86.2
Credit from Domestic Banks	19.3	15.7	31.0	37.5
Credit from Bank Indonesia and Central Government	7.9	4.9	2.7	1.3
Credit from foreign sources	8.7	8.5	1.2	2.8

Source: Bank Indonesia, Indonesia's flow of funds account matrix, 1991-1994.

The comparison of Bank Finance with other forms of Finance:

Available data (Table:2) indicate that Bond market provides a very small part of

Table:2 Indonesia. Role of Bank and Securities Finance , 1994-1995

	(In trillions of Rupiah)		(In percent of total business Finance)	
	1994 -	1995	1994 -	1995
Bank Credit (Commercial)	142.2	176.4	65.7	62.4
Total Securities Market Capitalization	74.2	106.1	34.3	37.6
Stock Market	67.7	98.8	31.3	35.0
Bond Market	6.5	7.2	3.0	2.5

Source: Bank Indonesia , *Report for the financial year 1994-1995*.

Commercial Finance ,while the stock market provides just over one third and banks provide just under two thirds of the total. However this overstates the role of stock market , because capitalization includes shares which have never been sold on stock market. A reported 70% of total shares are held by company founders , including those held by government after partial

privatizations. A rough adjustment of these unissued shares shows that stock market provides about one seventh of total business finance and banks a little under six sevenths.

The Role of financial intermediaries including insurance and nonblank finance companies in Indonesian markets is small compared with that of Banks

Table: 3: Size of selected financial intermediaries, 1992-1994.

	1992	1993	1994
	(In percent of Bank credit and assets of other companies)		
Commercial Banks (Total Credit)	87.7	86.7	86.9
Of which			
State Banks	46.8	48.2	41.6
Private National Banks	32.0	29.6	36.5
Insurance companies (Assets)	6.0	6.3	6.4
Finance Companies (Assets)	6.3	7.1	6.7

Source: Bank Indonesia, Report for the financial year, 1993/1994 and 1994/1995.

4.MAIN FEATURES OF THE DATA AND SUMMARY STSTISTICS

The Data set:

The data set is obtained from 'Oriana' from Bureau Van Dijk Electronic publishing .The data set is constructed from Profit and Loss account and Balance sheet. The firms in the data set cover different Industries in Indonesia, including Agriculture, Forestry and Fishing, Mining, Construction, Manufacturing, Transportation, Utility services, Wholesale trade, Retail trade, Finance, Insurance and Real state and Service sector.

Our data set provides information for the period 1998 -2006 , on total of 289 Indonesian firms that are listed on the stock market, and our panel has unbalanced structure, with the number of years of observations on each firm varying between 1 and 9. By allowing for both entry and exit , the use of an unbalanced panel partially mitigates potential selection and survivor bias. We have total of 1514 annual observations on 289 firms. We transformed regression variables and variables for summary statistics from nominal to real by using implicit G.D.P. deflator. To control for the potential influence of the outliers we truncated

the sample by removing observations beyond 1st and 99th percentiles for each of the regression variables and for variables that are reported as summary statistics.

Cash flow is obtained as sum of net income and depreciation. Investment is measured as the purchase of fixed tangible assets by firms.

Sample separation criteria:

The level of cashflow is used as a proxy for degree of internal financial constraint for firms and 'firm size' for degree of external financial constraint for firms. Cash flow is widely used in literature as a measure of corporate internal funds available for firms (KZ 1997).The total real assets is used to measure the firm size (FHP1988, Kadapakkam et al 1998).Size is used as a measure of capital market access because small firms are vulnerable to information asymmetries and collateral constraints.

Given the small sample size and also as many firms do not have data prior to 2001, we classify the firms by 'Industry' only .

To test whether cash flow has differential impact on the investment of firms with different degrees of internal financial constraints , based on cash flow . We construct therefore, the following dummy variable.

$NEWLCF_i$ which is equal to '1' if firm i has a cash flow less than or equal to the 50th percentile of the distribution of cash flow of all firms operating in the same industry and equal to '0' otherwise. The subscript i indexes firms. Thus $NEWLCF_i$ is a dummy variable equal to 1 for 'low cash flow firms', and equal to 0 otherwise.

To examine whether the cash flow has differential impact on Investment of firms that have different degrees of external financial constraints, sample is divided on the basis of total real assets. We create the following financial status dummy variable :

$NEWSMALL_i$ equal to '1' if firm *i* has a total real assets less than or equal to the 50th percentile of the distribution of real assets of all firms operating in the same industry, and equal to '0' otherwise. Thus $NEWSMALL_i$ is a dummy variable equal to 1 for 'small firms', and equal to 0 otherwise.

We use these dummies in investment regressions as interactions on the cash flow term.

We examine the 'leverage effect' on Investment of firms that face different degrees of external and Internal financial constraints, by introducing the 'debt to asset ratio' in the baseline specification instead of 'cash flow' . The 'debt to asset' ratio is constructed as the ratio of sum of long-term and short-term debt to lagged total real assets. This debt to asset ratio is interacted with financial status dummies based on cash flow and total real assets to examine the differential impact of leverage on firms' investment that face different degrees of internal and external financial constraints.

Summary Statistics:

Table 4 represents the means, medians and standard deviations of some of the variables in regression and in addition we present the summary statistics on 'Current ratio' and 'Coverage ratio' , here the 'coverage ratio' is defined as the ratio of total Interest payments to sum of total interest payments and cash flow. Column 1 refers to the full sample , columns (2) to (3) to the sub-samples based on 'cash flow' , and columns (4) to (5) to the sub samples based on 'firm size.'

Table:4

		All Firm-Years	**Firms such that $NEWLCF_i$ =0**	**Firms such that $NEWLCF_i$=1**	**Firms such that $NEWSMALL_i$ =0**	**Firms such that $NEWSMALL_i$=1**
		(1)	**(2)**	**(3)**	**(4)**	**(5)**
Real Assets	Mean	1615.6	2225..5	579.4	2564.6	242.0

	Median	514.7	1215.8	187.9	1484.2	174.5
		(2984.2)	(2881.0)	(1369.1)	(2958.1)	(291.8)
I_{it} / $K_{i(t-1)}$	Mean	.06	.11	.001	.08	.02
	Median	.02	.05	-.03	.03	-.005
		(.24)	(.25)	(.21)	(.26)	(.21)
$CF_{it}/K_{i(t-1)}$	Mean	.21	.34	.06	.23	.18
	Median	.15	.23	.07	.16	.13
		(.38)	(.32)	(.37)	(.30)	(.42)
Sales Growth	Mean	.001	.04	-.04	.02	-.02
(ΔS_{it})	Median	.008	.05	-.03	.04	-.02
		(.30)	(.22)	(.35)	(.26)	(.34)
Current Ratio	Mean	2.02	1.99	2.08	1.78	2.3
	Median	1.5	1.53	1.36	1.36	1.54
		(2.20)	(1.8)	(2.5)	(1.7)	(2.58)
Coverage Ratio	Mean	.20	.23	.21	.21	.22
	Median	.20	.19	.25	.22	.20
		(.76)	(.18)	(1.03)	(.71)	(.77)

Notes: 'Current ratio' is defined as the ratio of firms current assets to current liabilities. Here the coverage ratio is defined as the ratio between total Interest payments to the sum of interest payments and cash flow. Standard deviations are presented in parenthesis. I_{it} / $K_{i(t-1)}$ and CF_{it} /$K_{i(t-1)}$ are Investment over lagged tangible fixed assets and cash flow over tangible fixed assets respectively.

When firms are classified on the basis of cash flow, Real assets, ($I_{it}/K_{i(t-1)}$), Sales Growth (ΔS_{it}) and ($CF_{it}/K_{i(t-1)}$) tend to rise monotonically as we move from low cash flow to high cash flow firms and from 'small' to 'large' firms on basis of real assets. In case of current ratio , we see the median value is higher for high cash flow firms than that of low cash flow firms but the mean value is roughly same for the two groups, and both the sample mean and median value of this ratio is slightly higher for 'small' firms than that of 'large' firms. The sample mean coverage ratio does not differ substantially between 'high cash flow' and 'low cash flow' firms , and this ratio is larger for 'small' firms than that of 'large' firms. In case of median coverage ratio it is higher for large firms than that of small firms and lower for high cash flow firms than that of low cash flow firms.

5.BASELINE SPECIFICATION AND ESTIMATION METHODOLOGY

Baseline specification:

We initially estimated the following 'Error- Correction Specification' (Guariglia 2008 for a similar type specification):

$$I_{it}/K_{i,\,t-1}= a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,(t-1)}-s_{i,(t-1)}) + a_5\, CF_{it}/K_{i,t-1} + v_i + v_t + e_{it} \qquad (1a)$$

Where, I is the firm's investment, normalised by lagged value of tangible fixed assets $K_{i,\,t-1}$, ΔS_{it} is sales growth, $\Delta S_{i,t-1}$ is the lagged sales growth, and $(k_{i,(t-1)}-s_{i,(t-1)})$ is the error correction term ,where 'k' is the logarithm of real tangible fixed assets and 's' is the logarithm of real sales. The subscript i indexes firm , t time, where t=1998-2006, and CF is the firm's cash flow. Because of the presence of the error correction term, the firms will not immediately adjust its capital stock (k) to the target level (s) ,to be consistent with error correction behavior , coefficient with term $(k_{i,(t-1)}-s_{i,(t-1)})$ should be negative. If capital is higher (lower) than its desired level future investment should be lower (higher). Our error term has three components, v_i is a firm- specific component , v_t is time specific component to capture possible business cycle effects, and e_{it} an idiosyncratic component .

We estimate the error correction model because, this specification is new in literature and to some extent the error correction approach is able to bypass the problem of 'q' approach , where q variable cannot control for investment opportunity appropriately.

Then to focus on the differential impact of cash flow on the Investment of different categories of firms we use the following baseline specification where we interact the cash flow variable with dummy variables indicating the degree of internal and external financial constraints faced by firm.

$$I_{it}/K_{i,\,t-1}= a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[CF_{it}/K_{i(t-1)} * CATEGORY1_i] +$$

$$a_{52}[CF_{it}/K_{i(t-1)} * CATEGORY2_i] + v_i + v_t + e_{it} \qquad (2a)$$

When the firms are classified on the basis of different degrees of internal financial constraints based on cash flow, we estimate the equation of the following type:

$$I_{it}/K_{i,\,t-1}= a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[CF_{it}/K_{i(t-1)}] * NEWLCF_i +$$

$$a_{52}[CF_{it}/K_{i(t-1)}] * (1-NEWLCF_i) + v_i + v_t + e_{it} \qquad (2b)$$

When the firms are classified on the basis of different degrees of external financial constraints based on total real asset as a proxy for firm size, we estimate the equation of the following type:

$$I_{it}/K_{i,\,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[CF_{it}/K_{i(t-1)}]^{*}\, NEWSMALL_i + a_{52}[CF_{it}/K_{i(t-1)}]^{*}(1-NEWSMALL_i) + v_i + v_t + e_{it} \qquad (2c)$$

Then to investigate the different 'leverage effects' on firms Investment that face different degrees of 'external financial constraints' we replace the $CF_{it}/K_{i,t-1}$ variable in above specification by 'debt to asset ratio' measured by the ratio of sum of long term and short-term debt to lagged total real assets, we define this term as 'debt' where

$$\text{'debt'} = \frac{ltd_{it} + std_{it}}{Totalrealassets_{i,t-1}}$$

So we estimate the following specifications to examine the leverage effect on firms Investment that face different degrees of internal and external financial constraints.

$$I_{it}/K_{i,\,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[(ltd_{it}+std_{it})/\text{total real assets}_{i,t-1}{}^{*}SMALL_i] + a_{52}[(ltd_{it}+std_{it})/\text{total real assets}_{i,t-1}{}^{*}(1-SMALL_i)] + v_i + v_t + e_{it} \qquad (2d)$$

And

$$I_{it}/K_{i,\,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2\,\Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[(ltd_{it}+std_{it})/\text{total real assets}_{i,t-1}{}^{*}LOWCF_i] + a_{52}[(ltd_{it}+std_{it})/\text{total real assets}_{i,t-1}{}^{*}(1-LOWCF_i)] + v_i + v_t + e_{it} \qquad (2e)$$

Where 'ltd' and 'std' refer to 'real long-term debt' and 'real short term debt' respectively. The sum of these two variables are normalized by lagged total real assets.

Estimation Methodology

we estimate equation (1a) , (2b), and (2c) and using OLS, the Within groups estimator and finally 'The First Difference Generalized Method of Moments' (GMM) estimator developed by Arellano and Bond (1991).And we present only the Arellano and Bond (1991) GMM estimates of equation (2d) and (2e). This technique takes unobserved firm heterogeneity into account by estimating the equation in first differences, and controls for possible endogeniety problems by using the model variables lagged two or more periods as instruments. Whenever GMM is used equations are estimated in first differences and values of regressors lagged twice or more are used as instruments so at least three cross sectional observations are needed for each firm to allow the first differencing process and construction of

instruments, so we exclude those firms that have number of observations for less than three consecutive periods. We control for v_t by including time dummies in all our specifications. We do not include the lagged dependent variable in the OLS and Fixed effects specifications, as this causes bias.

In order to evaluate whether the model is correctly specified we use the following criteria the Sargan test (*J* test) and also test for second - order serial correlation of the residuals in the differenced equation (*m2* test). If the model is correctly specified the variables in the instrument set should be uncorrelated with the error term in equations (1a) , (2b) and (2c) ,(2d) and (2e).The *j* statistic tests overidentifying restrictions. Under the null of instrument validity Sargan test is asymptotically distributed as a 'chi-square' .The *m2* test is asymptotically distributed as 'z' statistic under the null of no second order serial correlation of the differenced residuals, and provides a further check on the legitimacy of variables dated *t-2* as instruments in the differenced equation.

Empirical results:
Investment equations without interactions:
Table: 5 The effects of cash flow on Investment : An error – correction approach

Dependent Variable : $\boldsymbol{I_{it} / K_{i,t-1}}$ Full sample

	First Difference GMM	**Within Groups Estimator**	**OLS (pooled)**
	(1)	(2)	(3)
$I_{i(,t-1)} / K_{i,(t-2)}$	-.05	--	--
	(.12)		
ΔS_{it}	.26*	.13**	.08**
	(.15)	(.05)	(.03)
$\Delta S_{i,(t-1)}$	-.05	-.08**	.05
	(.07)	(.04)	(.04)
$(k_{i,(t-1)}-s_{i,(t-1)})$	-.43**	-.26***	-.005
	(.18)	(.04)	(.008)
$CF_{it} / K_{i,(t-1)}$	.58**	.23**	.21***
	(.25)	(.06)	(.04)

m2	.55	--	--
j Test(*p* value)	.16	--	--
Number of observation	343	590	590

Notes: For GMM estimation , the numbers in parenthesis are asymptotic standard errors. In GMM estimation the instruments are $I_{i(,t-2)} / K_{i,(t-3)}$, $\Delta S_{i,(t-2)}$, $CF_{i,(t-2)} / K_{i,(t-3)}$, $(k_{i,\ (t-3)}-s_{i,(t-3)})$, $(k_{i,\ (t-2)}-s_{i,(t-2)})$,and further lags. Time dummies are included in the instrument set. For Within groups estimation and OLS the, numbers in parenthesis are standard errors, and robust standard errors respectively and time dummies are also included in these estimations.* indicates significance at 10% level.** indicates significance at 5% level .*** indicates significance at 1% level.

Table 5 represents the estimates of equation (1a) on full sample. Column(1) , (2) and (3) represent GMM, Within Groups and OLS estimate respectively. As expected the error correction coefficient always attracts negative sign, and precisely determined in GMM and Within groups estimates. The positive and precisely determined coefficients associated with cash flow in all estimation techniques suggest that the Internal corporate funds play a major role in determining the Indonesian firms' Investment. An increase in cash flow leads to an increase in Investment, because this internal finance might be the low cost source of finance than 'external finance' where the firms have to incur the borrowing cost associated with external finance. The sales growth term is positive and statistically significant, but the lagged sales growth term is not statistically significant, except in Within Groups estimation where it attracts negative sign and precisely determined. The Sargan test indicates we do not have problem with the choice of instruments and specification of the model and the *m2* test indicates there is no evidence of second order auto correlation of differenced residuals.

Next we will evaluate how exactly the Investment cash flow sensitivities varies across sub – groups of firms.

Investment equations with interactions based on the degree of internal financial constraints faced by firms.

Table 6: The effects of cash flow on Investment : distinguishing firms on the basis of the degree of internal financial constraints based on cash flow .

Dependent variable: $I_{it} / K_{i,t-1}$

	First Difference GMM (1)	Within Groups estimator (2)	OLS (pooled) (3)
$I_{i(,t-1)} / K_{i,(t-2)}$	.05	--	--
	(.10)		
ΔS_{it}	.19	.14 **	.08**
	(.15)	(.05)	(.03)
$\Delta S_{i,(t-1)}$	-.02	-.08**	.04
	(.07)	(.04)	(.04)
$(k_{i,(t-1)}-s_{i,(t-1)})$	-.26**	-.28***	-.006
	(.13)	(.05)	(.008)
$(CF_{it} / K_{i,(t-1)})*NEWLCF_i$	.26	.02	.05
	(.27)	(.08)	(.03)
$(CF_{it} / K_{i,(t-1)})*(1-NEWLCF_i)$	.34*	.32***	.31***
	(.20)	(.06)	(.05)
m2	.60		
Sargan *j* test	.02		
Number of observations	338	583	583

Notes : $NEWLCF_i$ is a dummy variable equal to '1' if firm *i* has cash flow less than or equal to the 50th percentile of the distribution of cash flow of all firms operating in the same industry and equal to '0' otherwise. In GMM estimation the instruments are $(k_{i,(t-3)}-s_{i,(t-3)})$, $I_{i,(t-2)} / K_{i(,t-3)}$, $\Delta S_{i,(t-2)}$, $(CF_{i,(t-2)} / K_{i,(t-3)})*(1-NEWLCF_i)$, $(CF_{i,(t-2)} / K_{i,(t-3)})*NEWLCF_i$ and further lags. The numbers in the parenthesis in GMM estimation are asymptotic standard errors , the numbers in parenthesis in Within groups and OLS are standard errors and robust standard errors respectively. * indicates significance at 10% level.**indicates significance at 5% level .*** indicates significance at 1% level.

The Error correction coefficient attracts negative sign and precisely determined in GMM and Fixed effects estimation . The coefficient associated with '$(CF_{it} / K_{i,(t-1)})*(1-NEWLCF_i)$' term is positive and precisely determined in all estimation techniques, but the cash flow does not have precisely determined effect on investment for those firms that have relatively low level of internal funds. The sales growth is positive and statistically significant in Within groups and OLS estimation technique. But the lagged sales growth term attracts negative sign and precisely determined only in Fixed effects estimation .In the GMM estimation the Sargan test indicates we have problem with the choice of the instruments but *m2* test indicates that there is no evidence of second order auto correlation of first differenced residuals.

The firms with relatively high level of Internal funds choose internal finance to fund their real activities although their collateral aspect is better because such firms might try to avoid incurring high borrowing cost associated with external funds, therefore, these firms try to avoid the risk of default in future. But the Investment of firms with low level of cash flow is not affected by the internal corporate funds, in the Indonesian context the probable explanation is , although the Indonesian Economy is basically 'bank based' but the other Non- bank financial intermediaries and venture capital industries are now expanding which are channeling funds to firms that have internal financial constraints for which such firms' investment may not respond with the availability of internal funds.

Investment equations with interactions based on the degree of external financial constraints faced by firms.

Table:7 The effects of cash flow on Investment : distinguishing firms on the basis of the different degrees of external financial constraints based on total real assets.

Dependent variable: $I_{it} / K_{i,t-1}$

	First Difference GMM (1)	Within Groups estimator (2)	OLS (pooled) (3)
$I_{i(,t-1)} / K_{i,(t-2)}$	-.04	--	--
	(.11)		
ΔS_{it}	.39**	.14 **	.08**
	(.15)	(.05)	(.03)
$\Delta S_{i,(t-1)}$	-.02	-.09**	.04
	(.07)	(.04)	(.04)
$(k_{i,(t-1)}-s_{i,(t-1)})$	-.41**	-.26***	-.004
	(.19)	(.05)	(.008)
$(CF_{it} / K_{i,(t-1)})*NEWSMALL_i$	.34	.09	.12
	(.30)	(.07)	(.04)
$(CF_{it} / K_{i,(t-1)})*(1-NEWSMALL_i)$	.64**	.38***	.33***
	(.28)	(.07)	(.06)
m2	.84		
j Test (p value)	.66		
Number of observations	343	590	590

Notes :. $NEWSMALL_i$ is a dummy variable equal to 1 if firm *i* has real assets less than or equal to the 50th percentile of the distribution of total real assets of all firms operating in the same industry and equal to 0 otherwise. In GMM estimation the instruments are $(k_{i,(t-3)}-s_{i,(t-3)})$, $I_{i,(t-2)} / K_{i(,t-3)}$, $\Delta S_{i,(t-2)}$, $(CF_{i,(t-2)} / K_{i,(t-3)})*(1-NEWSMALL_i)$, $(CF_{i,(t-2)} / K_{i,(t-3)})*NEWSMALL_i$ and further lags. The numbers in the parenthesis in GMM estimation are asymptotic standard errors , the numbers in parenthesis in Within groups and OLS are standard errors and robust standard errors respectively. * indicates significance at 10%.** indicates significance at 5% .*** indicates significance at 1%.

As expected the error correction coefficient attracts negative sign and precisely determined in GMM and Fixed effects estimation . The coefficient associated with $(CF_{it} / K_{i,(t-1)})*(1-NEWSMALL_i)$ is positive and precisely determined in all estimation techniques. For small firms the cash flow coefficient is not precisely determined .The sales growth is now positive and precisely determined in all estimation techniques. But the lagged sales growth term attracts negative sign and precisely determined only in Within groups estimation . There is no sign of mis-specification of our model and the choice of instruments according to Sargan *J* test and *m2* test.

According to our empirical results , firms' Investments with relatively larger real assets respond with the availability of Internal funds, whereas the firms' Investments with lower real assets do not . The likely explanation is managers of such large and high cash flow firms give priority to 'borrowing cost' associated with external finance , though these firms have relatively easier access to external finance.

On the other hand the small firms that are likely to suffer from asymmetric information problem are supposed to show greater sensitivity of investment to the fluctuation of cash flow in principle, but the small firms investment does not respond with the availability of internal funds, because these growing small firms investment might be financed by other alternative financial services which are now active and expanding in Indonesia, where the asymmetric information problem is not an impediment and where the rules and regulations are less stringent compare to traditional bank based finance.

Our empirical finding is closer with Kaplan and Zingales (1997). The cash flow sensitivity is greatest for firms with stronger financial position and the cash flow sensitivity is lowest for firms that have weaker financial positions. In our empirical finding , when the firms are categorized on the basis of internal and external financial constraints, financially unconstrained firms are more liquidity sensitive than financially constrained firms.

6. LEVERAGE EFFECT ON FIRMS' INVESTMENT:

Leverage effect on Firms' Investment that face different degrees of internal financial constraints:

We estimate equation (2d) . Here we measure 'firm size' based on total real assets . We define '$SMALL_i$ is a dummy variable equals to '1' if firm *i* has real asset less than or equal to the 50th percentile of the distribution of total real asset of all firms operating in the same industry and equal to'0' otherwise. We define the ratio of the sum of real long-term and short-term debt to total lagged real assets as 'debt', So we estimate equation of the following type:

$$I_{it}/K_{i,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2 \Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[(ltd_{it}+std_{it})/total\ real\ assets_{i,t-1} * SMALL_i] + a_{52}[[(ltd_{it}+std_{it})/total\ real\ assets_{i,t-1} * (1-SMALL_i)] + v_i + v_t + e_{it} \quad (2d)$$

As we have defined $\frac{ltd_{it} + std_{it}}{Totalrealassets_{it-1}} = Debt$, where the numerator is the sum of real long-term and short-term debt.

Equation (2d) becomes following:

$$I_{it}/K_{i,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2 \Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[(Debt) * SMALL_i] + a_{52}[[(Debt) * (1-SMALL_i)] + v_i + v_t + e_{it} \quad (2f)$$

And equation (2e) becomes the following:

$$I_{it}/K_{i,t-1} = a_0 + a_1 I_{i,t-1}/K_{i,t-2} + a_2 \Delta S_{it} + a_3 \Delta S_{i,t-1} + a_4(k_{i,t-1}-s_{i,t-1}) + a_{51}[(Debt) * LOWCF_i] + a_{52}[[(Debt) * (1-LOWCF_i)] + v_i + v_t + e_{it} \quad (2g)$$

Here $LOWCF_i$ is a dummy variable equal to '1' if firm *i* has cash flow less than or equal to the 50th percentile of the distribution of cash flow for all firms operating in the same industry and equal to '0' otherwise.

We present only the GMM estimates of the above equations.

Table: 8 Effects of debt on Investment : Distinguishing firms on the basis of the degree of external and financial constraints based on total real asset and internal financial constraint based on cash flow.

Dependent variable: $\boldsymbol{I_{it} / K_{i,t-1}}$

	First Difference GMM (1)	First Difference GMM (2)

$I_{i(,t-1)} / K_{i,(t-2)}$	-.02	-.02
	(.12)	(.11)
ΔS_{it}	.58 **	.55**
	(.23)	(.21)
$\Delta S_{i,(t-1)}$	-.06	-.06
	(.07)	(.07)
$(k_{i,\ (t-1)}\text{-}s_{i,(t-1)})$	-.69 ***	-.69***
	(.15)	(.13)
$Debt*SMALL_i$	.54	
	(.47)	
$Debt*(1\text{-}SMALL_i)$	.55**	
	(.27)	
$Debt*LOWCF_i$		.52*
		(.27)
$Debt*(1\text{-}LOWCF_i)$		.57 **
		(.27)
m2	.43	.38
Sargan Test (*p* value)	.76	.64
Number of observations	326	322

Notes: $SMALL_i$ is a dummy variable equal to '1' if firm *i* has real asset less than or equal to the 50th percentile of the distribution of real asset of all firms operating in the same industry and equal to '0' otherwise. In GMM estimation the instruments are $(k_{i,\ (t-3)}\text{-}s_{i,(t-3)})$, $I_{i,(t-2)} / K_{i(,t-3)}$, $\Delta S_{i,(t-2)}$, $\frac{ltd_{i,(t-2)} + std_{i,(t-2)}}{Totalrealassets_{i,(t-3)}} * (1\text{-}SMALL_i)$, $\frac{ltd_{i,(t-2)} + std_{i,(t-2)}}{Totalrealassets_{i,(t-3)}} * SMALL_i$ and further lags. Time dummies are included in instrument set .

$LOWCF_i$ is a dummy variable equal to 1 if firm *i* has cash flow less than or equal to the 50th percentile of the distribution of cash flow of all firms operating in the same industry and equal to 0 otherwise. In GMM estimation the instruments are $(k_{i,\ (t-3)}\text{-}s_{i,(t-3)})$, $I_{i,(t-2)} / K_{i(,t-3)}$, $\Delta S_{i,(t-2)}$, $\frac{ltd_{i,(t-2)} + std_{i,(t-2)}}{Totalrealassets_{i,(t-3)}} * (1\text{-}LOWCF_i)$, $\frac{ltd_{i,(t-2)} + std_{i,(t-2)}}{Totalrealassets_{i,(t-3)}} * LOWCF_i$ and further lags.

*indicates significance at 10% , ** indicates significance at 5% and *** indicates significance at 1%.

When the firms are categorized on the basis of internal and external financial constraints we observe that the leverage effect on Investment for large firms and the high cash flow firms is always positive and precisely determined this finding is consistent with Lang et al. (1996), but the leverage effect on Investment for Small firms is not precisely determined and for low cash flow firms it attracts positive sign but the magnitude is lower than that of high cash flow firms and the debt coefficient for low cash flow firms is significant at 10%.

The large and high cash flow firms are able to borrow more since such firms have more liquid assets, thus are more sensitive to profitability shocks because of the well- known leverage effect (Almeida 1999, Kaplan and Zingales 2000) . Less financially constrained firms then exhibit higher investment cash flow sensitivities than firms that have less liquid assets, and are more financially constrained (Kaplan and Zingales 2000).

7.CONCLUSIONS

In this paper we have analyzed a panel of listed Indonesian firms , operating in a broad range of industrial sectors , to examine the liquidity sensitivity of Investment across firms that face different degrees of Internal and external financial constraints. We have used the 'Error – Correction specification which allows to by-pass to a certain extent the criticism according to which cash flow might affect Investment opportunity not properly captured by Tobin's 'Q'.

Our estimation results suggest that financially healthier firms in terms of higher real assets and higher level of cash flow exhibit greater liquidity sensitivity compare to firms that have relatively low level of real assets and low level of cash flow. Thus in our finding, firms with stronger financial positions exhibit greater liquidity sensitivity of Investment than that of firms with weaker financial positions. In general our finding is closer to Kaplan and Zingales (1997), and later empirical findings such as Kadapakkam et al. (1998),Cleary (1999), Cleary (2006) .Thus the liquidity sensitivity does not tend to increase monotonically with the degree of internal and external financial constraints faced by firm.

We also examined the leverage effect of firms' Investment when the firms are classified according to basis of different degrees of internal and external financial constraints based on cash flow and real assets respectively. We have found positive and precisely determined leverage effect of Investment for high cash flow and large firms but this leverage effect is relatively weak for low cash flow and small firms.

Our results might shed light for further development of Financial market in Indonesia where financial system is predominantly bank based .As we have found that Internally and externally constrained firms need reliable source of 'external finance' . Policies to promote non bank financial intermediaries as an alternative source of financial services are particularly important in this regard.

Finally, since our sample size is relatively small and biased towards listed firms only, an important future research agenda could be the comparison of liquidity sensitivity of unlisted and listed firms of Indonesia , which could be examined to understand the effects of financial constraints on firms' investment in greater depth.

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