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## Financial Constraints across Pakistani Listed Firms

**Saira Qasim**

Department of Business, Middlesex University, London, UK, 07713057420

ORCID ID: 0000-0003-0453-4299

### Abstract

*Using Q investment model to scrutinize investment-cash flow sensitivity, a measure of financial constraint, has been a subject of controversy in literature. By using an alternative model called Error Correction model, this study aims to check the sensitivity between firm's internal finance and investment level for the case of lower middle income country. Literature has shown that firms' specific characteristics affect the relation between investment and cash flow of the firms. By considering the unique characteristics of Pakistani corporate sector, this study further target to check whether the investment-cash flow sensitivity differs across size of the firms, group affiliation of the firms and dividend policy of the firms. Our findings indicate that Pakistani listed firms are financially constrained. We find a strong relationship between investment and cash flow for small and non-dividend-paying firms; whereas group-affiliation does not affect investment- cash flow sensitivity of firms.*

**Keywords:** Financial constraints; Investment; Developing country; Firms

**JEL Classifications:** G00; G31

## Introduction

Economic growth of every country mainly relies on the investment level. Continuous and consistent investment growth is a significant determinant of economic development. An extensive literature check the impact of financial frictions on firm investment and firm behaviour (such as Konings et al., 2003; Guariglia et al., 2010; Hennessy & Whited, 2007; Qasim et al., 2020). However, firm's level of financial constraints is pertinent because of the importance of finance for firm growth and investment activities. An empirical study conducted by (Fazzari, Hubbard & Petersen, 1988) (FHP, thereafter) utilized Q investment model, where investment is taken as a function of Tobin's Q and cash flow to estimate firm-level data. This study showed firms tend to be more financially constrained in the case of a bigger effect of cash flow on the investment of firms. The idea behind Q investment model is using equity market participant to capture investment opportunities. However, the relationship between cash flow and investment could be the result of connection between mis-measured or omitted investment opportunities and cash flow (such as Summers, 1981; Erickson & Whited, 2000). The problem may arise if present value of expected future net distribution diverges from the stock market valuation (Cummins et al., 2006). Another challenge to the performance of q theory is given by (Carpenter and Guariglia, 2008) who argued that q model only forecasts outsiders' assessments of investment opportunities. It does not assess insiders' estimation of opportunities. We contribute to the prevailing literature by using a different approach such as error correction model (ECM) to see investment-cash flow sensitivity, whereas the previous studies (such as Riaz et al., 2016; Rashid & Jabeen, 2018) have checked this relationship by using Q investment method.

Our contribution to the literature of effects of financial constraints on the investment with the reference of low and lower-middle income countries is crucial in a number of ways. First, firms' interpretation of cash flow and challenge of financial constraints are considerably less popular in developing countries. Second, under developed financial markets, relatively less regulated equity markets, less developed corporate bond and commercial paper markets trigger the concept of financing constraints much more plausible to developing countries researchers.

We further contribute to the literature by examining the investment-cash flow relationship across small and large firms and among business group firms. The issue of distinct size of the firms is pertinent to investment and financing of firms. Small and medium sized enterprises (SMEs) can suffer more from information asymmetries and market imperfection as compared to large firms. Large firms can have more options to raise funds from external sources (such as credit market) as compared to small firms which rely mainly on internal funds or bank lending. Moreover, this factor is particularly important with the reference of Pakistan as the contribution of SMEs in industrial output and total export of the country is 45 percent and 40 percent respectively (SMEDA, 2009). Besides, Pakistani business groups have their own specific features which make the analysis interesting. First, close banking ties of these business groups. Second, spread of these business groups to an extensive number of industries. The consequences of this range of business groups on investment and firms may be supplementary.

We use a panel of 337 Pakistani manufacturing listed firms over the period 2008-2017 and check for the investment cash flow sensitivity. Our results of empirical specification indicate investment cash flow sensitivity for the sample firms. Alternatively, it means our sample firms are financially constrained. It highlights the presence of information asymmetry in capital markets which may increase the cost of external funds for the firms, in turn firms rely more on internal funds. Our further empirical testing highlights the stronger effect of cash flow on investment for small and non-dividend paying firms. This shows the presence of lending bias in Pakistani capital market on the basis of size and dividend payment. Moreover, our results highlight the need of financial reforms to reduce lending bias among these firms to provide the easy and equal access of funds to small and non-dividend paying firms. We further find that effect of cash flow on investment is not significant for group-affiliated firms. Our results are in contrast to some studies (such as Hoshi et al., 1991; Kato et al., 2002) but consistent with the findings of some other studies which are conducted for developing countries (such as George et al., 2011). Though, (Saeed & Sameer, 2015) highlight that group affiliated firms are more levered, meaning group-affiliated firms borrow more bank loans in Pakistan. It shows the possibility of misuse of loans by the managers of firms.

Our study provides evidence to policy makers to review the process of financial liberalization which took place in the country in 1990s. The results of our empirical study provide evidences to the policy makers to target the particular kinds of firms which are more financially constrained. This further prompts the need to equip financial markets with modern techniques to make them more efficient in the lending process.

Our paper progress as follows: section 2 presents a brief theoretical and empirical review of measures of financial constraints. It further provides background and stylized facts about the Pakistani corporate sector. Section 3 develops the empirical methodology. Section 4 presents the results. The paper will be concluded in section 5.

## Literature Review

The literature of financial constraints on investment associate financial constraints with external financial constraints, as firms find it hard to generate funds for particular investment projects because of expensive external funds (such as Whited, 1992; Bond&Meghir, 1994; Love, 2003). Farre-Mensa and Ljungqvist (2016) further explain the characteristics of financially constrained and unconstrained firms in terms of a firm's capital supply curve. The more the firm is financially constrained, the steeper (more inelastic) the supply curve is.

The literature of financial constraints dates back to Modigliani and Miller's (1958) theorem on the irrelevance of capital structure which considers firm's internal and external sources of funds are perfectly substituted; therefore, a firm's investment decision is not stimulated by the method of financing. However, capital markets are imperfect in the real world, presence of information asymmetries leading to adverse selection or moral hazard require lenders (investors) be compensated for information cost. In this situation, shadow cost to the manager of uncollateralized external financing surpass that of internal financing; causing financial constraints (Hubard, 1998).

Empirically, financial constraint has been gauged by the investment-cash flow sensitivity<sup>1</sup>. In their influential paper (Fazzari et al., 1988) test the relationship between investment and cash flow (internal finance) by using q model of investment for the case of US manufacturing firms. They find that firms' cash flow plays a significant role in firms' investment decision. Under the Q investment model, Q controls for the market evaluation of the firm's investment opportunities, whereas another variable depicts the condition of internal funds – usually cash flow. Under this model, none of the variables, including cash flow, should be significant. If cash flow appears significant, this means failure of the frictionless q model, which will support the existence of financial constraints. Hoshi et al., (1991) used the same methodology to scrutinize the presence of financial constraints between 24 manufacturing companies that were affiliated with KEIRETSU (industrial group) and 121 independent firms that were not members of KEIRETSU in Japan. Oliner and Rudebusch (1992) also used Q investment model to check investment- cash flow sensitivity between 99 NYSE-listed firms and 21 over-the-counter firms. These studies further supported the findings of (Fazzari et al., 1988).

However, a big concern regarding the use of Q investment to calculate investment –cash flow sensitivity has been raised in the following years. Though, Hayashi (1982) showed that marginal q and average q are equal in a value maximizing model of investment behaviour in the case of strictly convex adjustment costs and linear homogeneity of the net revenue function. In turn, average q has been used in the literature for the value of q. However, some studies (such as Erickson & Whited 2000; Bond & Cummins, 2001; Cummins et al., 2006) highlight the chances of a measurement error problem in the standard implementation of the investment model if share prices may not depict the true value of the firm. Besides, the relation between investment and conventional measures of average q could not have strong empirical support either<sup>2</sup>. In this situation, the equality of average q and marginal q become suspicious and validity of the value of q emerges. Guariglia (2008) also argues that q model only forecasts outsiders' assessments of investment opportunities and does not assess insiders' estimation of opportunities. Though, some recent studies have been trying to tackle the measurement error in q (such as Agca & Mozumdar, 2017).

In order to overcome the shortcomings of q model to test the hypothesis of financial constraint, literature has used another approach called Error Correction model (such as Bond et al., 2003; Guariglia 2008). Bean (1981) initially applied this model in the investment literature. The model specifies a long- run level of capital stock and allows a flexible specification of the adjustment dynamics to be estimated from the data. Some studies have used ECM to check the changes in financial conditions on the level of investment. Bond et al., (2003) used ECM to check the effects of financial constraint on investment under different financial systems including Belgium, France, Germany and UK. Chen (2008) used ECM to see the role of cash flow to

<sup>1</sup> For instance, see Fazzari et al., 1988; Kaplan, 1997 Guariglia (2008). Cash flow is normally measured by the level of internal funds in the empirical literature.

<sup>2</sup> Such as see Abel and Blanchard (1986), Hayashi & Inoue (1991)

determine firms' levels of investment in the transition economy of China. There is still a gap in literature to use ECM in the context of investment-cash flow sensitivity for developing countries.

### Corporate Sector in Pakistan

Size and group affiliations are two prominent features of Pakistani corporate sector in the context of lending bias. It is worth mentioning here that government of Pakistan (GOP) took a number of steps, such as the establishment of Small and Medium Enterprise Development Authority (SMEDA) in 1998, the formation of SMEs and micro finance banks and creation of specialized departments for the SME sector in most commercial banks to overcome the problems related to their financial needs. Regardless of all these steps, SMEs have been suffering from a number of hindrances that are affecting their performance level. These obstacles include a low level of financial literacy, lending strategies by the banks, and absence of reliable business information structure (Khwaja & Mian, 2005; Dar et al., 2017). Another significant feature of Pakistani industrial sector is group-affiliation of firms. These groups do not only own manufacturing industries but also private banks, insurance companies, leasing companies, modarabas (financial contracts), and power plants. In addition to listed companies, the number of unlisted public firms and private limited companies is also innumerable. These groups also have companies that are incorporated abroad. They have ties to each other via formal and informal relations (Rehman, 2006). These features of Pakistani corporate sector make it interesting to analyse the effects of cash flow on investment under this particular setting.

## Research and Methodology

### Error correction model (ECM)

By following (Bond et al., 2003; Bond and Lombardi 2006; Guariglia 2008), the version of ECM that we derive will take the following form:

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + Z_1 \left( \frac{I_{i,t-1}}{K_{i,t-2}} \right) + Z_2 \Delta S_{it} + Z_3 \Delta S_{i,t-1} + Z_4 (K_{i,t-2} - S_{i,t-2}) + Z_5 \left( \frac{CF_{it}}{K_{i,t-1}} \right) + v_i + v_t + v_r + e_{it} \quad (1)$$

Where  $I_{it}$  denotes investment for firm  $i$  in period  $t$ ,  $K_{it}$  is the value of capital stock.  $\alpha$  is a constant term.  $S_{it}$  logarithm of real sales showing output,  $CF_{it}$  is cash flow,  $v_t$  shows time-specific effect,  $v_i$  gives firm-specific effect,  $v_r$  controls for region effects, and  $e_{it}$  gives idiosyncratic shock. To investigate the role of financial factors in investment, we include current cash flow term in the estimation equation. A significant coefficient of cash flow refers to the presence of financial constraints on investment. We would expect a positive and significant coefficient on cash flow, if firms' internal funds affected firms' investment.

### Role of size, group membership, and dividend ratio

To test the impact of firm size on investment-cash flow sensitivity, we divide the sample on the basis of total assets. We sort the data by size. The firms with total assets above the sample median are in the group of large firms. The firms with total assets less than the sample median comprise the group of small firms. We generate a dummy variable, size dummy $_{it}$ , which is equal to 1 if firm  $i$  has total assets larger than median in year  $t$ , and 0 otherwise. We estimate our investment equation where cash flow variables are interacted to size dummy. We will use error correction model for estimation. The equation (2) will become:

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + Z_1 \left( \frac{I_{i,t-1}}{K_{i,t-2}} \right) + Z_2 \Delta S_{it} + Z_3 \Delta S_{i,t-1} + Z_4 (K_{i,t-2} - S_{i,t-2}) + Z_5 \frac{CF_{it}}{K_{i,t-1}} + Z_6 \text{Size dummy}_{it} + Z_7 \left( \frac{CF_{it}}{K_{i,t-1}} \right) * \text{Size dummy}_{it} + v_j + v_r + e_{it} \quad (2)$$

To test the impact of group membership, we will introduce the dummy of group affiliation in to the main empirical specification. The group affiliation dummy is equal to 1 if firms belong to the top 30 industrial groups in Pakistan.

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + Z_1 \left( \frac{I_{i,t-1}}{K_{i,t-2}} \right) + Z_2 \Delta S_{it} + Z_3 \Delta S_{i,t-1} + Z_4 (K_{i,t-2} - S_{i,t-2}) + Z_5 \frac{CF_{it}}{K_{i,t-1}} + Z_5 \text{Group dummy}_i + Z_6 \left( \frac{CF_{it}}{K_{i,t-1}} \right) * \text{Group dummy}_i + v_j + v_r + e_{it} \quad (3)$$

To test the impact of dividend ratio, we will generate the dummy variable. If the firms pay a dividend to their shareholders, it will be equal to 1; otherwise, it is 0.

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + Z_1 \left( \frac{I_{i,t-1}}{K_{i,t-2}} \right) + Z_2 \Delta S_{it} + Z_3 \Delta S_{i,t-1} + Z_4 (K_{i,t-2} - S_{i,t-2}) + Z_5 \frac{CF_{it}}{K_{i,t-1}} + Z_5 \text{dividend dummy}_{it} + Z_6 \left( \frac{CF_{it}}{K_{i,t-1}} \right) * \text{dividend dummy}_{it} + v_j + v_r + e_{it} \quad (4)$$

## Estimators

It is expected that some estimators may lead to bias because some regressors may be endogenously determined in our specifications<sup>3</sup>. In the presence of endogeneity, ordinary least square (OLS) estimator tend to upward bias the estimation of lagged dependent variable. Fixed effect estimator may lead to a downward bias of lagged dependent variable. The useful estimator, which can control for unobserved heterogeneity and endogeneity problems at the same time, is generalized method of moments<sup>4</sup> (GMM). We will estimate the empirical specification with system GMM given by (Arellano & Bover, 1995; Blundell & Bond, 1998). By accumulating an additional assumption of uncorrelation between the first differences of instrument variables and fixed effects, Arellano and Bover (1995) and Blundell and Bond (1998) improve the efficiency of original difference GMM (Roodman, 2009). We further choose two-step estimation as finite-sample correction to the reported standard errors is performed in it (Windmeijer, 2005). In order to evaluate the model and instruments, we will rely on the AR (2) test for second-order serial correlation of the residuals, and the Sargan test for over-identifying restrictions in the differenced equations.

## Results and Discussion

### Sample selection and summary statistics

Financial data at firm-level is taken from the ORBIS database, this includes Profit and Loss and balance sheet data. We use US two-digit standard industry classification (SIC) and select Pakistani listed non-financial firms. By following (Aharony et al., 2010 & Saeed et al., 2014), we re-distribute two-digit SIC into eight-industry categories. Appendix A.1 gives the detailed industry classification.

ORBIS database comprises 349 non-financial listed firms which accounts for 87 per cent of all non-financial listed firms in Pakistan. We only concentrate on positive values of capital, total assets and sales. To clean our data we also remove those firms which have missing values for the essential variables. Our data further includes those firms which have observations for a minimum of two consecutive years. To further eradicate the potential influence of outliers, we exclude observations in the 1% tails for each of the regression variables. After meeting these conditions, the final sample consists of an unbalanced panel of 2190 firm year observations of 337 firms for the period 2008-2017. As the firms in the sample consist of different number of time-series observations, therefore, it is an unbalanced panel data.

GDP Price Deflator and Wholesale Price Index have been used to get real values of the variables for this study. Data on the GDP Price deflator and Wholesale Price Index have been extracted from the World Bank database. We use Wholesale Price Index to deflate Capital stock and investment. We use GDP Price Deflator to deflate other variables. By following (Masulis et al., 2011; Ashraf & Ghani, 2005) we collect data on group affiliated firms by (Rehman, 2006). Rehman (2006) gives list of top 38 business groups (based on their size) and names of their affiliated firms. However, 8 out of 38 groups consist of non-listed and financial firms only. We find 101 firms are affiliated to groups, whilst 236 firms are stand-alone by matching the affiliated firms to those 30 business groups in our total sample of 337 firms.

<sup>3</sup> Cash flow and sales are taken as endogeneous variables in the investment equations, as it is understandable that higher investment leads to higher sales and cash flow.

<sup>4</sup> GMM hereafter.

## Summary statistics

Summary statistics for the key regression variables for the total sample of the firms is provided in table 1. The second row in table 1 reports the investment to tangible fixed assets ratio which is used to see the intensity of investment for the firm. Based on this ratio, the investing intensity of overall listed firms in Pakistan is 6 per cent. The cash flow to capital ratio shows how much capital expenditure requirements are fulfilled by internal cash flow. Our statistics show it is 17 per cent for the whole sample of listed firms. Sales to capital ratio gauges operational efficiency of the firm which is 2.93 for the case of our sample firms.

Table 2 gives summary statistics for the key regression variables for the firms sorted by size, group affiliation, and dividend. The large and small firms are investing 10 and 2 per cent of their tangible assets each year respectively. The difference is also highly significant at 1% level. The group-affiliated and stand-alone firms are investing 5 and 6 per cent of their total tangible fixed assets respectively. However, the difference is statistically not significant. The firms that pay dividends are investing 8 per cent as compared to the 3 per cent of investment of those firms that do not pay dividends. The difference is also statistically highly significant. The differences in cash flow and sales ratios are statistically insignificant between large and small firms. Cash flow ratio is higher for non-affiliated and dividend paying firms as compared to affiliated and non-dividend paying firms. This difference is highly significant. Non-affiliated and dividend paying firms have higher sales to capital ratio as compared to affiliated and non-dividend paying firms. This difference is statistically significant too. Overall, summary statistics show that mostly differences are statistically significant across the firms on the basis of group-affiliation and dividend-payment.

**Table 1: Descriptive statistics**

	Mean	Median	Standard Deviation	Min	Max	Obs
$I_{it}/K_{i,t-1}$	.062	.005	.270	-.973	1.97	2190
$CF_{it}/K_{i,t-1}$	.170	.116	.2846	-.973	1.98	2190
$Sales_{it}/K_{i,t-1}$	2.934	1.87	4.276	.0015	49.217	2190

Notes: I represents real investment. Investment is measured as the change in real tangible fixed assets plus depreciation. K represents real fixed assets. Capital is measured by real tangible fixed assets. CF represents cash flow. Cash flow is defined as net income for the year plus depreciation. Sales represent net sales.

**Table 2: Descriptive statistics for key regression variables across different firms' status**

	$Sizedum_{it}=0$	$Sizedum_{it}=1$	Mean diff (t-stat)	Group aff <sub>it</sub> =0	Group aff <sub>it</sub> =1	Mean diff (t-stat)	$Divdum_{it}=0$	$Divdum_{it}=1$	Mean diff (t-stat)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I_{it}/K_{i,t-1}$	.027 (.215)	.106 (.319)	-.08***	.066 (.268)	.054 (.274)	.012	.030 (.277)	.084 (.263)	-.056***
$CF_{it}/K_{i,t-1}$	.168 (.272)	.1800 (.299)	-.009	.1186 (.302)	.149 (.238)	.04***	.050 (.187)	.261 (.309)	-.210***
$Sales_{it}/K_{i,t-1}$	3.12 (4.53)	2.90 (3.94)	.213	3.24 (4.81)	2.49 (2.62)	0.76***	1.90 (2.98)	3.78 (4.85)	-1.88***
No of obs	1200	990		1530	660		890	1300	

Notes: The table reports sample mean, and corresponding standard deviations are reported in parentheses.  $Sizedum_{it}=0$  represents small firms.  $Sizedum_{it}=1$  represents large firms.  $Group\ aff_{it}=0$  represents stand-alone firms.  $Group\ aff_{it}=1$  represents group-affiliated firms.  $Divdum_{it}=0$  represents firms that do not pay dividends.  $Divdum_{it}=1$  represents firms that pay dividends. I represents real investment. Investment is measured as the change in real tangible fixed assets plus depreciation. K represents real fixed assets. Capital is measured by real tangible fixed assets. Q represents Tobin's q, is a ratio of market value of the firm over total assets. CF represents cash flow. Cash flow is defined as net income for the year plus depreciation. Sales represent net sales.

We use ECM to check investment cash flow sensitivity. Equation (1) is estimated for the whole sample of the firms and reported in table 3. The error correction term is estimated by 2-step System GMM. Current sales growth affects investment positively. Lagged sales growth affects the investment too. The coefficient of cash flow is positive and significant which shows a positive relationship between firms' investment and cash flow. The estimated coefficient of cash flow shows that, on average, investment of Pakistani non-financial firms increased 0.27 units for each additional unit of cash flow. Table 3 also reports Sargan test and AR(2) test

for GMM. The regression estimates pass both tests which shows second-order serial correlation does not exist in residual. This further proves the validity of instruments. Our results support the findings of vast literature such as (Fazzari et al.,1988) for US firms, (Carpenter & Guariglia 2008) for UK firms and (Riaz et al.,2016) for Pakistani firms.

**Table 3:** Baseline specification of ECM estimation

Dependent variable	
$I_{it}/K_{i,t-1}$	System GMM
$I_{i,t-1}/K_{i,t-2}$	.0100 (0.034)
$\Delta S_{it}$	.0067** (.0034)
$\Delta S_{i,t-1}$	.0095** (.005)
$K_{i,t-2} - S_{i,t-2}$	-.0059 (.0061)
$CF_{it}/K_{i,t-1}$	.269*** (.0852)
Sargan(p)	0.303
AR(2) (P)	0.340
Region dummies	NO
Year dummies	YES
Industry dummies	NO
Observations	1,515
R-squared	

Notes: Standard errors are reported in parentheses. The Sargan test is used to check over-identifying restriction. It is tested under the null of instrument validity. AR(2) is used to test for Second-order serial correlation in the first-difference residuals. It is tested under the null of no second-order serial correlation. In order to accept the instruments, the p-value of Sargan test and AR(2) should be greater than 0.05. The System GMM uses lagged values of cash flow, sales and  $I_{i,t-1}/K_{i,t-2}$  dated t-3 as instruments. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. I represents real investment. Investment is measured as the change in real tangible fixed assets plus depreciation. K represents real fixed assets. Capital is measured by real tangible fixed assets. CF represents cash flow. Cash flow is defined as net income for the year plus depreciation. Sales represent net sales.

### Robustness Check

We also use Q model to check investment cash flow sensitivity for the robustness check. Table 4 gives the estimates of empirical specification for a full sample which is given below

$$\frac{I_{it}}{K_{i,t-1}} = a_0 + b \frac{I_{i,t-1}}{K_{i,t-2}} + cQ_{t-1} + \frac{dCF_{it}}{K_{i,t-1}} + v_i + v_t + v_r + e_{it}$$

where I/K is investment to fixed assets ratio. This ratio is used to see the intensity of investment for the firms. We define investment as change in real tangible fixed assets plus depreciation. In order to control possible heteroscedasticity due to size scale effect and for comparison purposes, we will scale the key variables with lagged fixed assets. K is capital, which is measured by fixed assets. Q is Tobin's q. CF is cash flow, as given by the ORBIS database. ORBIS defines it as profit for period plus depreciation. A significant and positive coefficient of cash flow after controlling the investment opportunities via Tobin's q, will highlight the existence of financial constraints.  $v_t$  shows time-specific effect,  $v_i$  gives firm-specific effect,  $v_r$  controls for region effects, and  $e_{it}$  gives idiosyncratic shock.

Empirical specification is estimated by 2-step System GMM estimator. The focus of the estimation is the coefficient of cash flow, which is statistically significant. This evidence shows that listed firms in Pakistan are financially constrained as investment is positively and significantly influenced by cash flow of the firms.

**Table 4:** Baseline specification of q model estimation

Dependent variable	System-GMM
$I_{it}/K_{i,t-1}$	
$I_{it-1}/K_{i,t-2}$	.0233*** (.0029)
$Q_{t-1}$	.0358*** (.0035)
$CF_{it}/K_{it-1}$	.2130*** (.0131)
Sargan (p)	0.066
AR (2) (p)	0.155
Region dummies	NO
Year dummies	YES
Industry dummies	NO
Observations	1,899
R-squared	

Notes: Standard errors are reported in parentheses. The Sargan test is used to check over-identifying restriction. It is tested under the null of instrument validity. AR(2) is used to test for Second-order serial correlation in the first-difference residuals. It is tested under the null of no second-order serial correlation. In order to accept the instruments, the p-value of Sargan test and AR(2) should be greater than 0.05. The System GMM estimator uses lagged values of all right side variables dated t-3 as instruments. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. I represents real investment. Investment is measured as the change in real tangible fixed assets plus depreciation. K represents real fixed assets. Capital is measured by real tangible fixed assets. Q represents Tobin's q, is a ratio of market value of the firm over total assets. CF represents cash flow. Cash flow is defined as net income for the year plus depreciation.

#### Investment-cashflow sensitivity across different types of firms

We now estimate empirical specification given in equation (2) by System GMM. Column 1 of table 5 gives the results of the firms with size dummy. Our results in table 5 predict that small firms suffer from tighter financial constraints as compared to large firms. The coefficient of the interaction term of cash flow and dummy of firm size is negative and significant (-0.116). Our results pass j and m2 tests. Our results support the findings of previous studies such as (Carpenter & Guariglia, 2008 ; Guariglia, 2008) which also highlight that cash flow of small firms are more sensitive to investment as compared to large firms. These findings show the presence of cost effect for small firms. It further highlights that small firms are more sensitive to asymmetric information as compared to large firms.

Equation (3) which includes the dummy of affiliation with industrial groups is estimated by System GMM. The results are reported in column 2 of table 5. The coefficient of interaction term (CF\*Group-aff) is insignificant. On the basis of insignificant coefficient of interaction term, we can predict group affiliation of firms do not affect financial status of listed firms in Pakistan. Our results are in contrast of other studies in literature. Such as our results do not support Hoshi et al., 1991 who find lower investment –cash flow sensitivity among group-affiliated firms. Our results are in contrast of some other studies which are conducted for developing countries such as (George et al., 2011). George et al., find that both affiliated and group-affiliated firms have positive investment-cash flow sensitivities. Since our results show that group affiliation does not affect investment-cash flow sensitivities for Pakistani listed non-financial firms exhibiting investment-cash flow sensitivity is not a characteristic of Pakistani business group.

Column 3 of table 5 gives the result of equation (5), when firms are sorted on the basis of dividend payments estimated by System GMM. The coefficient of the interaction term of cash flow and dummy of dividend is significant and negative (-0.220). It implies a firm's dividend policy affects investment-cash flow sensitivity for Pakistani listed non-financial firms. In other words, dividend ratio is associated with Pakistani firms' financial status. The results are in line with the findings of previous studies (such as Fazzari et al., 1988; Hubbard, et al., 1995), which find low investment-cash flow sensitivity among dividend-paying firms.



**Table 5:** Sorting of firms according to size, dividend, and group affiliation

Dep variable =	SYSTEM GMM	SYSTEM GMM	SYSTEM GMM
$I_{it,t-1} / K_{i,t-1}$	-0.00115 (0.0292)	0.170* (0.101)	-0.513*** (0.0860)
$\Delta S_{it}$	-0.0179* (0.0262)	0.0361* (0.0241)	-0.132*** (0.104)
$\Delta S_{i,t-1}$	0.0173* (0.313)	0.0180 (0.0145)	0.0687 (0.0921)
$K_{i,t-2} - S_{i,t-2}$	-0.00820 (0.0112)	-0.00264 (0.0141)	-0.105* (0.0604)
$CF_{it} / K_{i,t-1}$	0.252* (0.13)	0.467** (0.161)	2.259** (0.907)
Size dummy <sub>it</sub>	0.0909** (0.0409)		
$CF_{it} / K_{i,t-1} * \text{Size dummy}_{it}$	-0.116* (0.198)		
Group dummy <sub>it</sub>		0.107 (0.0919)	
$CF_{it} / K_{i,t-1} * \text{Group dummy}_{it}$		-0.451 (0.369)	
Dividend dummy <sub>it</sub>			-0.190 (0.187)
$CF_{it} / K_{i,t-1} * \text{Dividend dummy}_{it}$			-0.220* (0.924)
Sargan(p)	0.603	0.998	0.136
AR(2) (P)	0.478	0.441	0.159
Region dummies	NO		NO
Year dummies	YES		YES
Industry dummies	NO		NO
Observations	1,515		1,515

Notes: Standard errors are reported in parentheses. The Sargan test is used to check over-identifying restriction. It is tested under the null of instrument validity. AR(2) is used to test for Second-order serial correlation in the first-difference residuals. It is tested under the null of no second-order serial correlation. In order to accept the instruments, the p-value of Sargan test and AR(2) should be greater than 0.05. The System GMM estimator use lagged values of all right side variables dated t-2 as instruments. I represents real investment. Investment is measured as the change in real tangible fixed assets plus depreciation. K represents real fixed assets. Capital is measured by real tangible fixed assets. . CF represents cash flow. Cash flow is defined as net income for the year plus depreciation. Sales represent net sales.\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## Conclusion

This paper inspects investment-cash flow sensitivity for Pakistani listed firms over the period 2008–2017 by using Error Correction Model (ECM). The process of financial liberalization which took place in the country in 1990s makes it interesting to investigate this issue. The process was initiated to reduce the financial limitations to corporate sector. The empirical results of this study confirm Pakistani firms are financially constrained. It is substantially important for Pakistan to develop its financial markets to facilitate the financial demand of the firms. Failure to do so may further slowdown the process of economic growth that the economy has been encountering for almost the last two decades. Financially constrained listed firms further highlight the underdeveloped stock markets in Pakistan. These stock markets are not fully equipped to fulfil the financial demands of listed firms.

Moreover, our findings suggest a different investment cash flow relationship across firms' size and dividend policy. Our results lend support to the presence of lending bias among large and dividend paying firms. As large and dividend-paying firms show less investment –cash flow sensitivity as compared to small and non-dividend paying firms. We do not find the evidence to claim that group affiliation of firms affect firms' investment-cash flow sensitivity. These results could be the result of strict borrowing conditions and transparency requirements of external funds among small and non-dividend paying firms.

## Appendix

### A1: Industry classification

Industry	Two-digit SIC code	Number of firms	Percentage of entire sample
Food & Tobacco	1,2, 9, 20,21,54	38	11
Basic industries including petroleum	10, 12, 13, 14, 24, 26, 28, 29, 33	54	17
Construction	15, 16, 17, 32, 52	35	10
Textile & Trade	22, 23, 31, 51, 53, 56, 59	135	40
Consumer durable	25, 30, 36, 37, 39, 50, 55, 57, 34, 35, 38	33	10
Transportation	40, 41, 42, 44, 45, 47	11	3
Services	72,73,75,76,80,82,87,89	4	1
Others	No specific SIC code	27	8
Total Sample		337	100

### A2: Definition of variables

$I_{it}$ : Investment is measured as the change in real tangible fixed assets plus depreciation.

$CF_{it}$ : Cash flow is defined by ORBIS as net income for the year plus depreciation.

$K_{it}$ : Capital is measured by real tangible fixed assets.

$Q$ :  $Q$  is defined by ORBIS as ratio of market value of the firm over total assets.

$S_{it}$ : Sales is the real net sales defined by ORBIS.

Total assets: Book value of total assets.

Dividend: Dividend is proxied by cash dividend paid by the firm.

**Availability of data and materials:** The datasets generated and analysed during the current study are available in the ORBIS repository <https://www.bvdinfo.com/engb/our-products/data/international/orbis>

## References

- Agca, S., & Mozumdar, A. (2017). Investment-Cash flow sensitivity: fact or fiction? *Journal of financial and quantitative analysis*, 52(3), 1111-1141. <https://doi.org/10.1017/S0022109017000230>
- Aharony, J., Wang, J., & Yuan, H. (2010). Tunnelling as an incentive for earnings management during the IPO process in China. *Journal of Accounting and Public Policy*, 29(1), 1-26. <https://doi.org/10.1016/j.jaccpubpol.2009.10.003>.
- Almeida, H., & Campello, M. (2001). Financial constraints and investment-cash flow sensitivities: New research directions. Unpublished working paper, New York University. <http://dx.doi.org/10.2139/ssrn.298027>.
- Allayannis, G., & Mozumdar, A. (2004). The impact of negative cash flow and influential observation on investment-cashflow sensitivity estimates. *Journal of banking & finance*, 28(5), 901-930. [https://doi.org/10.1016/S0378-4266\(03\)00114-6](https://doi.org/10.1016/S0378-4266(03)00114-6).
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, 58(2), 277-297. <https://doi.org/10.2307/2297968>.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics*, 68(1), 29-51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)
- Ashraf, J., Ghani, W. (2005). Accounting development in Pakistan. *The international journal of accounting*, 40(2), 175-201. <https://doi.org/10.1016/j.intacc.2005.01.010>.

- Bean, C. R. (1981). An econometric model of manufacturing investment in the UK. *The economic journal*, 91, 106-121. <https://doi.org/10.2307/2231700>.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8).
- Blundell, R., Bond, S., Devereux, M., & Schiantarelli, F. (1992). Investment and Tobin's Q: evidence from company panel data. *Journal of econometrics*, 51(1-2), 233-257. [https://doi.org/10.1016/0304-4076\(92\)90037-R](https://doi.org/10.1016/0304-4076(92)90037-R).
- Bond, S., & Cummins, J. (2001). Noisy share prices and the Q model of investment. IFS working paper. 10.1920/wp.ifs.2001.0122.
- Bond, S., & Meghir, C. (1994). Dynamic investment models and the firm's financial policy. *The Review of economic studies*, 61(2), 197-222. <https://doi.org/10.2307/2297978>.
- Bond, S., Elston, J. A., Mairesse, J., & Mulkay, B. (2003). Financial factors and investment in Belgium, France, Germany, and the United Kingdom: a comparison using company panel data. *The Review of economics and statistics*, 85(1), 153-165. <https://www.jstor.org/stable/3211629>.
- Bond, S. R., & Lombardi, D. (2006). To buy or not to buy? Uncertainty, irreversibility, and heterogeneous investment dynamic in Italian company data. IMF staff papers, 53 (3) 2. <https://www.imf.org/en/Publications/WP/Issues/2016/12/30/To-Buy-or-Not-to-Buy-Uncertainty-Irreversibility-and-Heterogeneous-Investment-Dynamics-in-17196>
- Carpenter, R. E., & Guariglia, A. (2008). Cash flow, investment and investment opportunities: new tests using UK panel data. *Journal of banking & finance*, 32(9), 1894-1906. <https://doi.org/10.1016/j.jbankfin.2007.12.014>.
- Chen, M. (2008). Financial constraints to the investment of Chinese listed firms across firm characteristics. University of Nottingham working paper.
- Chirinko, R. S., & Schaller, H. (1995). Why does liquidity matter in investment equations? *Journal of money, credit and banking*, 27(2), 527-548. <https://doi.org/10.2307/2077882>.
- Chow, C. K., & W, Fung. M K Y (1998) Ownership structure, lending bias, and liquidity constraints: evidence from Shanghai's manufacturing sector. *Journal of comparative economics*, 26(2) 301-316. <https://doi.org/10.1006/jcec.1998.1527>.
- Cleary, S. (1999). The relationship between firm investment and financial status. *The journal of finance*, 54(2), 673-692. <https://doi.org/10.1111/0022-1082.00121>.
- Cleary, S., Povel, P., & Raith, M. (2007). The u-shaped investment curve: theory and evidence. *Journal of financial and quantitative analysis*, 42(1) 1-39. <https://www.jstor.org/stable/27647284>.
- Cummins, J. Hassett, K., & Oliner, S. D. (2006). Investment behavior, observable expectations, and internal funds. *The American economic review*, 96 (3) 796-810. DOI: 10.1257/aer.96.3.796
- Dar, M. S., Ahmed, S., & Raziq, A. (2017). Small and medium-size enterprises in Pakistan: definition and critical issue. *Pakistan business review*, 19 (1). <http://dx.doi.org/10.22555/pbr.v19i1.1245>.
- Erickson, T., & Whited, T. M. (2000). Measurement error and the relationship between investment and q. *Journal of political economy*, 108(5) 1027-1057. <https://doi.org/10.1086/317670>.
- Farre-Mensa, J., & Ljungqvist, A. (2016). Do measures of financial constraints measure financial constraints? *The Review of Financial Studies*, 29 (2) 271-308. <https://doi.org/10.1093/rfs/hhv052>.
- Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing constraints and corporate investment. *Brooking papers on economic activity*, 1988(1), 141-206. <https://doi.org/10.2307/2534426>.
- Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (2000). Investment –Cash Flow Sensitivities are Useful: A Comment on Kaplan and Zingales. *The Quarterly Journal of Economics*, 115(2), 695-705. <https://www.jstor.org/stable/2587007>.
- George, R., Kabir, R., & Qian, J. (2011). Investment- Cash flow sensitivity and financing constraints: new evidence from Indian business group firms. 21(2), 69-88. <https://doi.org/10.1016/j.mulfin.2010.12.003>.
- Guariglia, A. (2008). Internal financial constraints, external financial constraints, and investment choice: evidence from a panel of UK firms. *Journal of banking & finance*, 32 (9), 1795-1809. <https://doi.org/10.1016/j.jbankfin.2007.12.008>.
- Guariglia, A., Liu, X., & Song, L. (2010). Internal finance and growth: Microeconomic evidence on Chinese firms. *Journal of Development Economics*, 96(1), 79-94. <https://doi.org/10.1016/j.jdeveco.2010.07.003>
- Guariglia, A., & Knight, J. (2013). Investment and financing constraints in China: Does working capital management make a difference? *Journal of Banking and Finance*, 37(5), 1490-1507. <https://doi.org/10.1016/j.jbankfin.2012.03.025>.

- Hayashi, F. (1982). Tobin's marginal q and average q: a neoclassical interpretation. *Econometrica*. 50 (1)213-224. <https://doi.org/10.2307/1912538>.
- Hennessy, A. C., & Whited, M. T. (2007). How costly is external financing, evidence from a structural estimation. *The Journal of finance*. 62 (4), 1705-1745. <https://www.jstor.org/stable/4622315>.
- Hoshi, T., Kashyap, A., & Scharfstein, D. (1991). Corporate structure, liquidity, and investment: evidence from Japanese industrial groups. *The Quarterly Journal of Economics*. 106 (1), 33-60. <https://www.jstor.org/stable/2937905>.
- Hubbard, R. G., Kashyap, A. K., & Whited, T. M. (1995) Internal finance and firm investment. *Journal of Money, Credit and Banking*. 27 (3), 683-701. <https://www.jstor.org/stable/2077743>.
- Jaramillo, F., Schiantarelli, F., & Weiss, A. (1996). Capital market imperfections before and after financial liberalization: an Euler equation approach to panel data for Ecuadorian firms. *Journal of development economics*. 51 (2) 367-386. [https://doi.org/10.1016/S0304-3878\(96\)00420-8](https://doi.org/10.1016/S0304-3878(96)00420-8).
- Jensen, M.C., & Meckling, W.H. (1976). Theory of the firm: managerial behaviour, agency costs and ownership structure. *Journal of financial economics*. 3(4), 305-360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X).
- Kaplan, S. N., & Zingales, L. (1997). Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? *The Quarterly Journal of Economics*. 112 (1)169-215. <https://www.jstor.org/stable/2951280>.
- Kato, H. K., Loewenstein, U., & Tsay, W. (2002). Dividend policy, cash flow, and investment in Japan. *Pacific-Basin Finance Journal*. 10 (4) 443-473. [https://doi.org/10.1016/S0927-538X\(02\)00068-9](https://doi.org/10.1016/S0927-538X(02)00068-9).
- Khalique, M., Isa, A. H. M., & Shaari, A. N. (2011). Challenges for Pakistani SMEs in a knowledge-based economy. *Indus journal of management and social science*. 5 (2) 74-80. <https://ssrn.com/abstract=1895458>.
- Khwaja, A. I., & Mian, A. (2005). Do lenders favour politically connected firms? Rent provision in an emerging financial market. *The quarterly journal of economics*. 120 (4), 1371-1411. <https://www.jstor.org/stable/25098774>.
- Konings, J., Rizov, M., & Vandenbussche, H. (2003). Investment and financial constraints in transition economies: micro evidence from Poland, the Czech Republic, Bulgaria and Romania, *Economics letters* 78 (2), 253-258. [https://doi.org/10.1016/S0165-1765\(02\)00210-0](https://doi.org/10.1016/S0165-1765(02)00210-0).
- Kuh, E. (1963). *Capital Stock Growth: A Micro-econometric Approach*. Amsterdam: North-Holland.
- Love, I. (2003). Financial development and financing constraints: international evidence from the structural investment model. *The Review of Financial Studies*. 16 (3) 765-791. <https://doi.org/10.1093/rfs/hhg013>.
- Masulis, R. W., Pham, P. K., & Zein, J. (2011). Family business groups around the world: financing advantages, control motivations, and organizational choices. *The Review of Financial Studies*. 24, 3556-3600. <https://doi.org/10.1093/rfs/hhr052>.
- Mannetje, A., & Kromhout, H. (2003). The use of occupation and industry classifications in general population studies, *International Journal of Epidemiology*. 32 (3) 419-428. <https://doi.org/10.1093/ije/dyg080>.
- Modigliani, M., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American economic review*. 48 (3) 655-669. <https://www.jstor.org/stable/1809766>.
- Moyen, N. (2004). Investment-cash flow sensitivities: constrained versus unconstrained firms. *The journal of finance*. 59(5), 2061-2092. <https://www.jstor.org/stable/3694817>.
- Myers, S.C. (1984). Capital structure puzzle. *The journal of finance*. 39 (3) 575-597. <https://doi.org/10.1111/j.1540-6261.1984.tb03646.x>
- Myers, S.C., & Majluf, S.N. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics*. 13 (2), 187-221. [https://doi.org/10.1016/0304-405X\(84\)90023-0](https://doi.org/10.1016/0304-405X(84)90023-0).
- Oliner, S. D., & Rudebusch, G. D. (1992). Sources of the financing hierarchy for business investment. *The Review of Economics and Statistics*. 74 (4)643-654. <https://doi.org/10.2307/2109378>.
- Qasim, S., Rizov, M., & Zhang, X. (2020). Financial constraints and the export decision of Pakistani firms, *International Journal of Finance & Economics*. 1-17. <https://doi.org/10.1002/ijfe.2030>.
- Rashid, A., & Jabeen, N. (2018). Financial frictions and the cash flow – external financing sensitivity: evidence from a panel of Pakistani firms. *Financial Innovation*. 4(15). <https://doi.org/10.1186/s40854-018-0100-6>
- Rehman, U.R. (2006). *Who owns Pakistan*, (5th ed). Islamabad: Mr Books (PVT.). Ltd.
- Riaz, Y., Shahab, Y., Bibi, R., & Zeb, S. (2016) Investment-cash flow sensitivity: Evidence from Pakistan. *South Asian journal of global business research*. 5 (3) 403-423. DOI: 10.1108/SAJGBR-08-2015-0054.

- Roodman, D. (2009). How to do xtabond2: an introduction to 'differences' and 'system' GMM in stata. *The Stata Journal*.9 (1)86-136. <https://doi.org/10.1177/1536867X0900900106>.
- Saeed, A., Belghitar, Y., & Clark, E. (2014). Political connections and leverage: firm-level evidence from Pakistan. *Managerial and decision economics*. 36(6), 364-383. <https://doi.org/10.1002/mde.2674>.
- Saeed, A., & Sameer, M. (2015). Financial constraints, bank concentration and SMEs: evidence from Pakistan. *Studies in economics and finance*. 32 (4), 503-524. DOI:10.1108/SEF-02-2014-0046.
- Small and Medium Enterprise Development Authority (SMEDA). (2009). Annual report-2009.
- Summers, L.H. (1981). Taxation and corporate investment: a q-theory approach. *Brooking papers on economic activity, economic studies program*. The Brooking Institution. 12(1), 67-140.
- Tirole, J. (2006). *The theory of corporate finance*. Princeton: Princeton University Press.
- Whited, T. M. (1992). Debt, liquidity constraints, and corporate investment: evidence from panel data. *The journal of finance*. 47(4), 1425-1460. <https://doi.org/10.2307/2328946>.
- Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*. 126 (1), 25-51. <https://doi.org/10.1016/j.jeconom.2004.02.005>