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FINANCIAL DISTRESS OF COMPANIES AND CASH FLOW-INVESTMENT-SENSITIVITY: EVIDENCE FROM PANEL OF NON-FINANCIAL FIRMS

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Abstract:

This paper investigates the effects of cash flow–investment sensitivity for firms facing varying levels of financial distress. For this purpose, cash flow, dividend policy, firm age, and size are used to create subsamples of firms facing different degrees of financial constraints. Using an unbalanced panel of 336 non-financial firms listed on the Pakistan Stock Exchange over the period 2006–2017, the study provides evidence that prevailing financial constraints affect firms' investment decisions. Financial distress, as identified by cash flow, dividend policy, and firm size, increases with higher cash flow–investment sensitivity, thereby supporting the use of these measures as indicators of financial distress. Furthermore, evidence of a U-shaped investment curve is found when the sample is divided based on cash flow, suggesting a non-linear relationship between cash flow and investment. The results also highlight the link between financial and real economic downturns, suggesting the need for countercyclical economic policies with respect to financial and credit conditions.

Keywords:

Corporate Investment, Financial Constraints, Cash Flow Investment Sensitivity Internal Funds, U-Shape Investment Curve

JEL Classification: C23, E22, G30

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1. Introduction

In perfect capital markets, the cost of funding both from internal and external funds is the same. However, prior studies suggest that firms operating in imperfect market situations bear additional costs of interest, adverse selection problems, and bankruptcy risk when using external funds (Cleary, 2006). Since a majority of the firms cannot bear these additional costs, they are forced to limit their investment to the availability of internal funds (cash flows). Firms that are forced to forgo profitable investment opportunities due to lack of funds are classified as financially constrained firms (FAZZARI and PETERSEN, 1988).

Cash flow investment sensitivity (CIS) is the relation of the firms' investment decisions to its available cash flows. Lewellen and Lewellen (2016) argue that theoretically firms might invest more when cash flow is high because of the low cost of internal funds, overspending of internally available funds and that cash flows are correlated with investment opportunities. Similarly, firms may reduce investment because of lower cash flows, financial constraints and credit conditions. FAZZARI and PETERSEN (1988) were the pioneers to study the effect of financial constraints on corporate investment decisions by exploring the sensitivity of firms' investment with internal funds.. Firms that were hypothesized as financially constrained firms reported higher estimates of cash flow-investment sensitivity (CIS). Later studies reported similar results and used this CIS criterion to identify various factors that constrained these firms (Bond et al., 1999, Carpenter et al., 1998, Gilchrist and Himmelberg, 1995, Kadapakkam et al., 1998).

Kaplan and Zingales (1997) re-categorized the sample of firms used by Fazzari and Petersen (1988) as financially constrained and unconstrained based on both quantitative and qualitative balance sheet measures and found that CIS estimates were higher for the firms that were categorized as less constrained. These findings suspected the use of CIS as a measure of financial distress and similar contradictions were reported by subsequent studies (Cleary, 1999, Kaplan and Zingales, 2000). Moreover, Cleary et al. (2007) provided evidence that the relationship between internal funds and investment is not linear in nature. Instead, this relationship takes a U-shape if cash flow is used as a proxy of internal funds. Another study to support the U-Shape investment curve was done by Guariglia (2008) where they reported a negative relationship between cash flow and investment.

Researchers have used various prior classification criterions as indicators of financial constraints. First, cash flow is used as a proxy for internal financial constraints because a firm with lesser cash flow will have lesser internal funds for spending on forthcoming investment opportunities. Cash flow is used as a proxy for internal funds in most of the previous studies since deviations in cash flow are the main source of variations in internal funds (Devereux and Schiantarelli, 1990, Goergen and Renneboog, 2001,

Kadapakkam et al., 1998). Lewellen and Lewellen (2016) recently provide evidence that the current and lagged cash flows of the firm are associated with additional investment suggesting that financial constraints and free cash flows are significant for investment decisions. Also, cash flow is a better measure of internal constraints because it can take negative values and literature has reported a negative impact of internal funds on investment in the presence of negative value of cash flows (Allayannis and Mozumdar, 2004, Chang et al., 2007, Cleary, 1999, Cleary et al., 2007).

Dividend payout policy is another measure that has been most widely used in previous studies to categorize firms into less and more financially constrained. Fazzari and Petersen (1988), the pioneer study of this area, used the dividend payout ratio as an indicator of financial constraints. According to them, a firm fails to pay its dividends because it remains unable to generate excess funds than those required for its investing needs. Also, more dividend payments by a firm reflect its brighter prospects which will in return ease the acquisition of external finance for such firms (Guariglia, 2008). Bond and Meghir (1994) suggested using dividend policy as an indicator of financial constraints by providing evidence that less dividend-paying firms reported higher CIS estimates. Similarly, Goergen and Renneboog (2001) categorized firms as financially constrained if they reduced their dividend payouts. Lima Crisóstomo et al. (2014) established that the dividend payout ratio was a valid measure of financial distress of a firm.

In addition to cash flow and dividend policy, firm size and age have been used extensively in literature as the measures of financing constraints. Size is a good measure of financial constraints because large firms can easily raise their debt when needed as they are more diversified and faces lesser bankruptcy risks however, smaller firms has to face higher transaction costs and adverse selection problems (Marouene and Abaoub, 2013). Similarly, younger firms also face problems of higher information asymmetries which increase their risk when raising external funds (Beck et al., 2006). Hovakimian and Titman (2003) linked voluntary asset sales by a firm to its investment and reported that smaller firms were more financially constrained. In their study of Australian firms, Chang et al. (2007) showed that smaller firms have much higher CIS estimates then larger firms. Oliner and Rudebusch (1992) provided evidence in their study of financing hierarchy that firm's age was a significant indicator of the degree of financial constraints it faces when investing. Beck et al. (2006) showed that smaller and younger firms face more financing obstacles. Guariglia (2008) categorized a panel of firms using age as classification criteria to establish the validity of age as an indicator of financial constraints.

In the line with the above-mentioned literature regarding CIS and various identifiers of financial constraints, this study investigates whether firms operating in Pakistan are financially constrained or not. Although, previous studies have investigated the effects

of cash flow investment sensitivity on firm investment, such relation has not been significantly studied in the context of emerging economies, specifically Pakistan. Francis et al. (2013) provide evidence that better governance reduces the dependence on internal cash flows and also decrease financial constraints. Therefore, it is of vital significance to study the effects of financial constraints on firm level investment in a weak-form information environment and weaker corporate governance regime. Pakistan provides an interesting setting for such research with an institutional environment characterized by lower regulatory quality, poor enforcement mechanism, inefficient legal and judicial system, poor disclosure and weaker corporate governance. Balfoussia and Gibson (2019) recently studied whether the sensitivity of corporate investment to cash flow is time varying and is associated with firms' financial conditions. The findings are that financial conditions play a significant role in corporate investment decisions over time and financially constrained firms are more likely to condition their investment decisions on credit conditions, thus suggesting the need to study the financial constraints of firms in an environment where the firms are financially constrained and rely on debt financing for corporate investment. As the financial markets are not well developed and companies are reliant on the use of debt for financing investment needs and it is difficult for firms to get financing in capital markets in case of emerging economies, the need for studying the effect of financial constraints and cash flow investment sensitivity are justified and need further investigation. We also examine the suitability of the different firm factors including cash flow, dividend policy, age and size of the firm as indicators of financial constraints. For this purpose, data of non-financial firms listed at Pakistan Stock Exchange is obtained for the period 2006-2017. The empirical results report that firms operating in Pakistan are financially constrained as a positive and significant effect of cash flow on investment for sample firms is observed. This suggests that internal cash flows of the firms have a strong bearing on the investment decisions of firms operating in Pakistan. Further, our results indicate that companies with higher cash flow levels are less financially constrained, validating cash flow level as an indicator of financial constraints on a firm (Haque and Nasir, 2018). These results are in compliance with the previous findings that validate the use of cash flow availability as an identifier of financial constraints (Goergen & Renneboog, 2001; Kadapakkam et al., 1998). Evidence of U-Shaped Investment curve is also witnessed; an insignificant relationship between cash flow and investment is reported for firms with negative cash flows. Our results also suggest that cash flow, dividend payout policy and size are valid indicators of financial constraints.

The rest of the paper is structured as follows. Section 2 presents the empirical model developed for estimation, while section 3 reports the data set and classification criteria. Descriptive analysis, results and discussion is provided in section 4. Section 5 concludes the paper.

2. Empirical Model

Bean (1981) was the first to apply the Error Correction Model (ECM) in the investment literature. ECM uses regression to estimate short-term investment dynamic of a firm by including a long-term investment dynamic which is the difference between firms 'desired capital stock and its actual capital stock. Since a firm invests to eliminate this gap, this desired capital stock (K_{it}) can be estimated as a function of the output of the firm (Y_{it}) and the cost of capital (m_{it}).

$$K_{it} = \gamma_i + Y_{it} - \sigma m_{it} \quad (1)$$

Where *i* is the firm index, *t* is the time index, γ and σ are the model parameters. In the perfect market situation, where no adjustment cost prevails, a firm will adjust its actual capital stock to its desired capital stock immediately but due to imperfect market situations, the capital level takes on an adjustment process to reach its optimal level. This adjustment process is empirically estimated using Auto Regressive Distributed Lag (ARDL) specification on Equation 1. We can write following model using ARDL specification with the assumption of no adjustment costs, firm's desired capital stock is directly proportional to its actual capital stock and that short-term specification are stable enough to be estimated by distributed lags, we can write the model using Auto Regressive Distributed Lag specification as follows.

$$K_{it} = \gamma_1 K_{i,t-1} + \gamma_2 K_{i,t-2} + \alpha_0 Y_{it} + \alpha_1 Y_{i,t-1} + \alpha_2 Y_{i,t-2} \quad (2)$$

Where$\gamma_1, \gamma_2, \alpha_0, \alpha_1, \alpha_2$ are the model parameters. Since long-run elasticity restriction requires (α_0+ α_1+ α_2) = (1 - γ_1- γ_2) we can obtain an error correction form by rearranging equation 2.

$$\Delta K_{it} = (\gamma_1 - 1)\Delta K_{i,t-1} + \alpha_0 \Delta Y_{it} + (\alpha_1 + \alpha_2)\Delta Y_{i,t-1} - (1 - \gamma_1 - \gamma_2)(K_{i,t-2} - Y_{i,t-2}) + d_t + \mu_i + \vartheta_{it} \quad (3)$$

Where d_t is the dummy variable for time μ_i is the unobservable firm-specific effect and ϑ_{it} is the error term. For the estimation of the investment rate (I_{it}) we can use the approximation $\Delta K_{it} \approx I_{it} / K_{i,t-1} - \delta_i$ where δ_i is the depreciation rate of the firm *i*.

To verify whether the availability of cash flow limits the investing decision of a firm i.e. firm is financially constrained, we include a current term of cash flow and a one year lagged term of cash flow scaled by $K_{i,t-1}$ and $K_{i,t-2}$ in our model, thus our final model has the following form.

$$I_t/K_{i,t-1} = \rho\ I_{i,t-1}/K_{i,t-2} + \alpha_0 \Delta Y_{it} + \alpha_1 \Delta Y_{i,t-1} + \theta\left(K_{i,t-2} - Y_{i,t-2}\right) + \beta_0\, CF_{it}/K_{i,t-1} + \beta_1\, CF_{i,t-1}/K_{i,t-2} + d_t + \mu_i + \vartheta_{it} \quad (4)$$

Whereρ, α_0, α_1, θ, β_0, β_1 are the parameters of the model. This model requires the coefficient of error correction term θ to be negative, only then the implication that actual

capital stock causes positive investments in the next period is satisfied. Following form of equation 4 will be estimated in this study.

$$I_{it}/K_{i(t-1)} = \alpha_0 + \alpha_1 I_{i(t-1)}/K_{i(t-2)} + \alpha_2 \Delta s_{it} + \alpha_3 \Delta s_{i(t-1)} + \alpha_4 (K_{i(t-2)} - s_{i(t-2)}) + \alpha_5 CF_{it}/K_{i(t-1)} + \upsilon_i + \upsilon_t + e_{it} \quad (5)$$

Where α_0, α_1, α_2, α_3, α_4, $\alpha_5$are the model parameters. I_{it} is the investment of a firm and is measured as the change in total fixed assets in a current year. K_{it} is the book value of firm's capital; s_{it} is the logarithm of sales and CF_{it} is the firm's net cash flow. Subscript *i* is used as a firm index and subscript *t* is used as a time index, where *t* = 2006-2017. The error term of the above model is made up of three components. u_i is a firm-specific component; u_t is the time specific component and e_{it} is the idiosyncratic component.

3. The Data Set

Dataset is constructed using financial information gathered from the annual reports of non-financial firms listed at the Pakistan Stock Exchange for the period 2006-2017. These selected firms are engaged in wide range of industrial sectors that are Automobiles, Beverages, Construction, Utilities, Telecommunication, Health Care, Household Goods, Personal Goods (Textile), Media and Information Technology etc. To make sure that results of this study are compatible with the previous studies (Chang et al., 2007, Ding et al., 2013, Guariglia, 2008), we have used the following selection criteria for the final sample. Only firms that fulfill the following criteria are included.

- Complete data for the variables of sales, cash flow, and total assets are available.
- Data of at least 3 consecutive years is available.
- Firms that have not changed the date of their accounting cycle during the period 2006-2017 to ensure that every entry in the data refers to a complete year accounting period.
- Observations that lie above 1st percentile and below the 99th percentile for the variables of total assets, sales, and cash flow are excluded to control the influence of outliers.

Out of total 390 non-financial firms, 336 firms fulfilled the above criteria and were included in the final sample. Finally, an unbalanced panel of 3249 firm-years over the period 2006-2017 is constructed. The number of years for each firm in the panel varies between 3 and 12.

3.1 Classification Criteria for Financial Constraints

To check the impact of different levels of cash flow on the degree of financial constraints, we first divide our sample into three sub-samples based on cash flow to the

beginning of the period capital stock ratio. Therefore, the following three subsamples are created,

1. NEGATIVE CASHFLOW: All those firms that have a negative mean cash flow to capital ratio are included in this category.
2. LOW CASHFLOW: All those firms that have a positive mean cash flow to capital ratio but less than the 75^{th} percentile of this ratio for their particular industrial sector is included in this category.
3. HIGH CASHFLOW: All those firms that have the mean cash flow to a capital ratio more than the 75^{th} percentile of this ratio for their particular industrial sector are included in this category.

All three of these samples are separately analyzed to check the impact of internal constraints on CIS in each of these groups individually. According to U-Shape Investment theory, an insignificant or negative estimate of CIS estimate for NEGATIVE CASHFLOW is expected. Cash flow can be used to identify financial constraints if CIS estimate for LOW CASHFLOW is higher than CIS estimate for HIGH CASHFLOW.

To check the impact of financial constraints, we also categorize our sample according to dividend policy; the following two subsamples are created,

1. NON-DIVIDEND PAYERS: All those firms that had dividend payout ratio less than or equal to zero are included in this category.
2. DIVIDEND PAYERS: All those firms that had dividend payout ratio greater than zero are included in this category.

Dividend Policy can be used to identify financial constraints if CIS estimate for NON-DIVIDEND PAYERS is higher than CIS estimate for DIVIDEND PAYERS.

To check the impact of age on CIS estimates, firms are categorized according to age into three sub-samples as following,

1. YOUNG: Those firms that have age less than the 25^{th} percentile of the age of their particular sector are included in this category.
2. $MEDIUM_A$: Those firms that have age more than 25^{th} percentile but less than 75^{th} percentile of the age of their particular sector are included in this category.
3. OLD: Those firms that have age more than 75^{th} percentile of the age of their particular sector are included in this category.

Age can be used to identify financial constraints if CIS estimate for OLD is lower than CIS estimate for other two categories.

To categorize our sample according to size, we divide these firms according to total assets. As a result following three sub-samples are created,

1. SMALL: Those firms that have total assets less than the 25^{th} percentile of the total assets of their particular sector are included in this category.

2. MEDIUM$_S$: Those firms that have total assets greater than the 25th percentile but less than the 75th percentile of total assets of their particular sector are included in this category.
3. LARGE: Those firms that have mean total assets greater than the 75th percentile total assets of their particular sector are included in this category.

Size can be used to identify financial constraints if CIS estimate for LARGE is lower than CIS estimate for other two categories.

4. Results and Analysis

4.1 Descriptive Analysis

This section provides the descriptive statistics including the mean and standard deviation of the variables used in the study.

Table 1: Descriptive Analysis

Variables	All Firms	Cash flow			Dividend Policy		Age			Size		
		NEGATIVE CASH FLOW	LOW CASHFLOW	HIGH CASHFLOW	NON-DIVIDEND PAYERS	DIVIDEND PAYERS	YOUNG	MEDIUM$_A$	OLD	SMALL	MEDIUM$_S$	LARGE
	(1)	(2)			(3)		(4)			(5)		
Investment	572 (3,389)	161 (2,236)	542 (3,391)	1,073 (4,443)	309 (2,594)	846 (4,039)	592 (3,160)	541 (3,181)	476 (2,575)	41 (509)	420 (2,720)	1,428 (5,589)
Shareholder Equity	2,319 (9,098)	747 (2,797)	3,111 (11,000)	2,199 (8,600)	1,032 (5,166)	3,662 (11,700)	2,762 (12,800)	1,701 (5,772)	2,342 (4,510)	118 (428)	1,873 (9,041)	5,597 (12,900)
Sales	7,111 (30,600)	3,723 (25,800)	7,578 (24,200)	10,400 (47,200)	3,002 (11,500)	11,300 (41,500)	6,005 (17,100)	5,448 (15,300)	7,360 (19,600)	1,326 (7,987)	5,542 (19,000)	16,900 (56,300)
Cash flow	385 (2,305)	(238) (1,553)	502 (2,472)	726 (2,586)	79 (1,659)	703 (2,790)	486 (3,007)	262 (1,602)	272 (1,201)	12 (245)	339 (2,413)	856 (3,187)
Total Assets	5,577 (17,300)	3,305 (11,400)	6,219 (18,200)	6,877 (20,400)	3,549 (12,500)	7,693 (20,900)	5,598 (15,700)	4,594 (14,000)	5,411 (11,500)	542 (2,120)	4,739 (17,300)	12,700 (23,000)
Age	36 (17)	34 (16)	37 (18)	35 (15)	33 (16)	39 (18)	17 (9)	37 (11)	58 (13)	31 (17)	37 (16)	36 (18)
Net Profit	534 (4,029)	430 (2,654)	667 (5,198)	482 (2,404)	512 (4,676)	557 (3,214)	710 (3,483)	643 (5,367)	322 (1,784)	390 (1,322)	561 (5,279)	705 (2,750)
Dividend paid	251 (1,792)	53 (438)	334 (2,115)	255 (1,774)	- -	528 (2,573)	486 (3,428)	174 (983)	143 (459)	5 (14)	146 (1,136)	733 (3,329)

Notes: Table reports Sample Mean and Standard Deviation of different balance sheet variables used in the model and to categorize firms. All values are mean and standard deviation of annual data for the period 2006 to 2017 for companies listed at Pakistan Stock Exchange. Standard deviations are mentioned in parentheses. All values are in Millions of rupees except Age. The values of Age are in years rounded to nearest integer. Investment of a year is total assets of the firm at the end of the year minus total assets of the firm at the end of the previous year. Shareholder's equity is the total shareholder's equity of a firm at the end of the year. Sales are the total Annual sales of a firm reported during the year. Total Assets are the total Assets of a firm reported at the end of the year. Age is the number of years from the year of Incorporation of a firm till 2017. Net Profit is the Net Earnings after Interest and Tax reported in the year. Dividend Paid is the total amount of dividend that firm pays in the year.

Table 1 presents the mean and standard deviation of different financial statement measures used in empirical model estimation and to create sub-samples. These statistical estimates are shown for a complete sample of firms in column 1 and for individual categories in subsequent columns. This study hypothesizes HIGH CASHFLOW, DIVIDEND PAYERS, OLD and LARGE categories firms as financially non-constrained firms. The average investment is highest for all these categories among their respective categorizations except OLD, which reported the least amount of mean investment among the age categorization as shown in column 4. The mean amount of total assets for DIVIDEND PAYERS category (Rs. 7,693 Million) was much higher than that for NON-DIVIDEND PAYERS category (Rs. 3,549 Million). From cash flow categorization, the NEGATIVE CASHFLOW category reported mean investment of 161 despite the negative mean value for their cash flows (-238), signaling the dominance of revenue effect over cost effect, an indication of U-Shaped investment curve. OLD category made the highest amount of mean sales (7,360) in the age categorization (YOUNG: 6,005, $MEDIUM_A$: 5,448). One surprising figure was reported in terms of total assets where YOUNG category reported the highest mean amount of total assets (5,598) in age categorization ($MEDIUM_A$: 4,594, OLD: 5,411). On a similar note, YOUNG category, that contained the largest firms, earned the highest amounts of profits as mean annual net profit of YOUNG category is 710 in comparison to just 322 for OLD category. Also, YOUNG category paid more dividends (486) as compared to $MEDIUM_A$ category (174) and OLD category (143). From size categorization, LARGE category is dominating with highest mean values in all variables (Investment: 1,428, Shareholder's Equity: 5,597, Sales 16,900, Cash flow: 856, Total Assets: 12,700, Net Profit: 705, Dividend Paid: 733) except age, where $MEDIUM_S$ category firms are the oldest ones with the mean age of 37 years and SMALL category firms are the youngest ones with the mean age of 31 years.

Figure 1: U Shaped Investment Curve

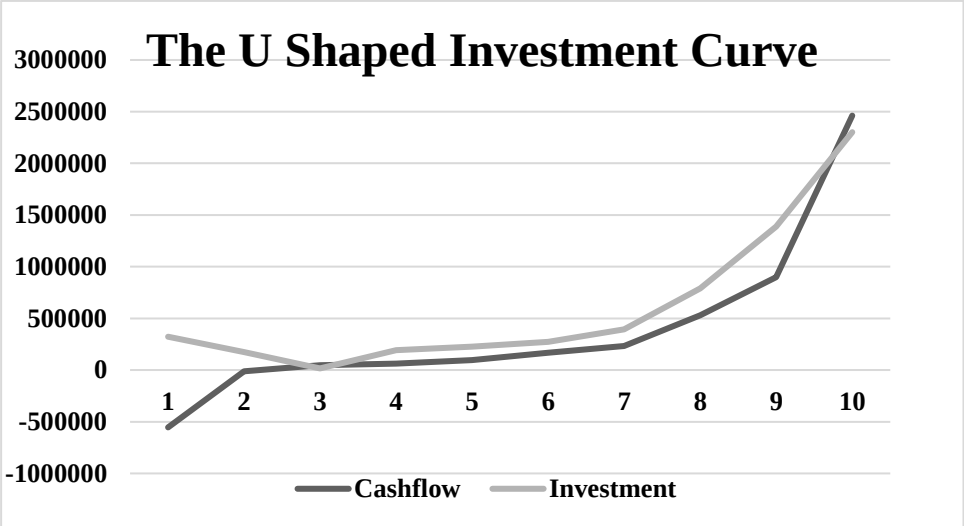

Figure 1 shows the U shaped relationship between cash flow and investment. It can be seen that initial investment is declining with the decline in cash flow but up to a certain level, beyond this threshold, further decline is cash flow is causing the investment to rise thus forming a U-Shape in the Investment trend.

4.2 Regression Results

An empirical specification of equation 5 was estimated using both fixed Effect and random Effect panel regression techniques and the results were compared using the Hausman test. The results of the Hausman test (Chi-Square: 115.78 p-value: 0.00) provide evidence that estimates of both these models are significantly different, thus fixed effect panel regression technique should be used.

Table 2: U Shape of Investment Curve

Percentile	Cash flow	Investment
0% – 10%	-554	321
11% – 20%	-12	175
21% – 30%	47	16
31% – 40%	64	193
41% – 50%	97	225
51% – 60%	169	274
61% – 70%	233	395
71% – 80%	530	789
81% – 90%	898	1,389
91% –100%	2,462	2,302

Note: Table reports mean cash flow and mean Investment for deciles of the complete sample of firms for the distribution of annual cash flow. All the amounts are in Millions of Rupees.

Table 3: Regression Analysis

Variables	All Firms	Cash flow			Dividend Policy		Age			Size		
		NEGATIVE CASH FLOW	LOW CASHFLOW	HIGH CASH FLOW	NON-DIVIDEND PAYERS	DIVIDEND PAYERS	YOUNG	MEDIUM$_A$	OLD	SMALL	MEDIUM$_S$	LARGE
	(1)	(2)			(3)		(4)			(5)		
$I_{i(t-1)}/K_{i(}$	0.0001 (0.09)	-0.0269 (-0.73)	-0.0101 (-0.44)	-0.0059 (-1.02)	-0.0044 (-1.03)	-0.1323*** (-5.02)	-0.0230 (-0.94)	-0.0028 (-0.61)	0.0141*** (3.25)	0.0083 (0.27)	-0.0046 (-1.10)	0.0020 (1.42)
Δs_{it}	-0.0016 (-0.42)	0.0055 (0.75)	0.0486*** (3.62)	0.0743** (2.85)	-0.0003 (-0.08)	0.0601*** (2.65)	0.1928*** (6.78)	-0.0036 (-0.54)	-0.1222* (-0.69)	0.0152 (0.93)	0.0034 (0.46)	-0.0114** (-2.43)
$\Delta s_{i(t-1)}$	-.0030 (-0.59)	-0.0028 (-0.23)	-0.0025 (-1.53)	0.0038 (0.34)	-0.003 (-1.10)	0.0183 (0.39)	-0.1691*** (-6.89)	0.0047 (0.59)	0.0661* (1.94)	0.0667*** (3.94)	-0.0081 (-1.03)	0.0685** (2.52)
$(K_{i(t-2)} - s_{i(t-2)})$	-0.0006* (-1.32)	-0.0001 (-0.55)	-0.0001 (-0.24)	-0.0001 (-1.24)	-0.0001 (-0.76)	-0.0002*** (-3.65)	0.0003 (0.61)	-0.0007 (1.43)	-0.0008* (-1.87)	-0.0002 (-0.58)	-0.0006 (-1.36)	0.0001 (0.21)
$CF_{it}/K_{i(t-}$	0.0094*** (4.34)	-0.0072 (-0.51)	1.2117*** (2.98)	0.0039 (0.13)	0.0086*** (2.75)	-0.0291 (-0.72)	-0.0307 (-0.75)	0.0082*** (3.08)	0.0496*** (3.65)	0.0965 (0.84)	0.0075** (2.53)	0.0205 (1.18)
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)
No of Observations	3249	621	1803	825	1648	1601	950	1362	937	598	1758	893

Notes: Table reports the empirical estimates of the Fixed Effect Panel Regression of equation 5. *I*is investment of a firm. *K*is the book value of the firm's capital, *s*is the logarithm of real sales and *CF i*s the firm's cash flow. Subscript *i*is used as a firm index and subscript *t* is used as a time index, where *t* = 2000-2011. All the regression coefficients are estimated using fixed effect panel data regression. *** are estimates significant at 1% level of significance. ** are estimates significant at 5% level of significance. * are estimates significant at 10% level of significance. The figures reported in parentheses are the t statistics.

Column 1 of Table 3 reports the estimation results of an empirical specification of the model from equation 5 for all companies that were included in our sample. The overall model is significant. The coefficient of error correction term is negative that is in compliance with the error correction behavior of the model (Colombo et al., 2013). The coefficient of cash flow is positive and significant as according to prior literature which proves that cash flow has a strong effect on the investment decisions of these companies. This provides the necessary evidence to determine that firms operating in Pakistan are financially constrained. Similarly, past studies have employed CIS as

identification criteria of financial distress over firms (Abubakr and Esposito, 2012, Bhaumik et al., 2012, Lima Crisóstomo et al., 2014).

Column 2 of Table 3 provides estimated results of equation 5 for cash flow categories. The coefficient of cash flow variable for the LOW CASHFLOW category is high and significant and for the HIGH CASHFLOW category it is low and insignificant, indicating that companies with higher cash flow levels are less financially constrained, validating Cash flow level as an indicator of financial constraints on a firm. These results are in compliance with the previous findings that validate the use of cash flow availability as an identifier of financial constraints (Goergen & Renneboog, 2001; Kadapakkam et al., 1998). Furthermore, the NEGATIVE CASHFLOW category reported an insignificant effect of cash flow on investment suggesting that these companies were also not financially constrained. These findings suggest that below a certain level of internal funds, cash flow has no effect on investment of a firm, as stated by U-Shape theory of investment (Cleary et al., 2007; Guariglia, 2008).

In Column 3 of Table 3, the coefficient of cash flow for NON-DIVIDEND PAYERS category is significant while for DIVIDEND PAYERS category it is insignificant giving proof that dividend-paying firms have investments less sensitive to their cash flows as compared to firms that do not pay dividends. These results are in line with a large portion of literature that claims that dividend policy of a firm is a valid indicator of financial constraints on investment (Chang et al., 2007, Cleary, 1999, FAZZARI and PETERSEN, 1988, Hovakimian, 2009, Marouene and Abaoub, 2013).

Column 4 of Table 3, show estimates of equation 5 for age categorization. The coefficient of cash flow for YOUNG was insignificant while for $MEDIUM_A$ and OLD, these coefficients are both positive and significant. But this coefficient was greater for OLD then that for $MEDIUM_A$ providing evidence that older firms have investments dependent on their internal funds. According to these results, age does not provide a clear indication of financial distress. These findings are in the line with the previous study by Cleary (2006) that found that CIS estimates increase with the rise in firms' age. A possible reason for these findings of our study can be that most amounts of investment were done in the youngest firms throughout the time period as found in the descriptive analysis. Furthermore, youngest firms earned the highest value of profits and paid most dividends and as witnessed earlier, dividend-paying firms are least constrained, youngest firms also showed unconstrained behavior.

Finally, column 5 of Table 3 provides estimates of equation 5 for size categorization. For $MEDIUM_S$ category, the coefficient of cash flow is positive and significant but insignificant for the LARGE category. This trend is in line with the previous literature that larger firms are relatively less financially constrained and suggest that size can be used as an indicator of financial constraints (Guariglia, 2008; Hovakimian, 2009). However, the SMALL category also has an insignificant coefficient for cash flow indicating that

smaller firms in this sample are financially unconstrained. A plausible reason of the absence of financial constraints over smallest firms is evident in column 5 of table 1, where smaller firms have least mean value of age which means that most firms that belong to the SMALL category, also belong to YOUNG category, and YOUNG category is least financially constrained. Similar to our findings, Audretsch and Elston (2002) had also reported the smallest companies as non-financially constrained.

5. Conclusion

This study uses an unbalanced panel of 336 non-financial Pakistani firms, listed at Pakistan stock exchange over the period 2006-2017. We have used Cash flow-Investment-Sensitivity (CIS) as a measure of financial distress of a company. For this purpose, an empirical specification of the Error Correction Model is estimated by applying the fixed effect panel regression technique. Our results confirm that firms operating in Pakistan's market are significantly financially constrained. The presence of financial restrictions over the investment of these firms is revealed by the positive and significant effect of cash flow over the investment of these firms. Furthermore, firms that are prior classified as financially constrained based on cash flow level, dividend policy and size reported higher CIS estimates suggesting that financially constrained firms reduce corporate investment in relation to their financial conditions. Further, use of above proxies is also substantiated as the indicators of financial distress. These findings are in line with the literature which has established these variables as valid indicators of financial distress over firms' investment. The results of the study also shed light on the relation between financial and real cycle downturns suggesting the need for economic policies including monetary, macro prudential and fiscal policies to be counter cyclical with respect to financial and credit conditions.

Descriptive analysis of the study indicates a U-shaped investment curve in the investing patterns of the sample firms. The U shaped investment curve suggests that investments increase monotonically with internal cash flows as pointed out by Cleary (2007). Investment increases when internal funds are large and decreases when internal funds are lower. This suggests that financial constraints and internal fund have bearing on the investment decisions of firms in Pakistan. This paper has contributed to literature by extending this study over Pakistan's market. The study has found the presence of financial constraints on investment decisions of Pakistani firms due to the presence of hurdles faced by firms in substituting their internal funds with external funds. Future researchers may include corporate governance and ownership structure variables in their study, as it is quite plausible to hypothesize that governance quality of the firm can affect the firm investment to cash flow sensitivity. The inclusion of these variables may shed further light regarding the conflicting behavior of different firms.

References

ABUBAKR, S. & ESPOSITO, F. 2012. Bank concentration and financial constraints on firm investment in UK. *Studies in Economics and Finance,* 29**,** 11-25. https://doi.org/10.1108/10867371211203828

ALLAYANNIS, G. & MOZUMDAR, A. 2004. The impact of negative cash flow and influential observations on investment–cash flow sensitivity estimates. *Journal of Banking & Finance,* 28**,** 901-930. https://doi.org/10.1016/S0378-4266(03)00114-6

AUDRETSCH, D. B. & ELSTON, J. A. 2002. Does firm size matter? Evidence on the impact of liquidity constraints on firm investment behavior in Germany. *International Journal of Industrial Organization,* 20**,** 1-17. https://doi.org/10.1016/S0167-7187(00)00072-2

BALFOUSSIA, H. & GIBSON, H. D. 2019. Firm investment and financial conditions in the euro area: evidence from firm-level data. *Applied Economics Letters,* 26**,** 104-110. https://doi.org/10.1080/13504851.2018.1441496

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

BECK, T., DEMIRGÜÇ-KUNT, A., LAEVEN, L. & MAKSIMOVIC, V. 2006. The determinants of financing obstacles. *Journal of International Money and Finance,* 25, 932-952. https://doi.org/10.1016/j.jimonfin.2006.07.005

BHAUMIK, S. K., DAS, P. K. & KUMBHAKAR, S. C. 2012. A stochastic frontier approach to modelling financial constraints in firms: An application to India. *Journal of Banking & Finance,* 36**,** 1311-1319. https://doi.org/10.1016/j.jbankfin.2011.11.026

BOND, S., HARHOFF, D. & VAN REENEN, J. 1999. Investment, R & D and financial constraints in Britain and Germany. Institute for Fiscal Studies London. https://doi.org/10.1920/wp.ifs.1999.9905

BOND, S. & MEGHIR, C. 1994. Dynamic investment models and the firm's financial policy. *The Review of Economic Studies,* 61**,** 197-222. https://doi.org/10.2307/2297978

CARPENTER, R. E., FAZZARI, S. M. & PETERSEN, B. C. 1998. Financing constraints and inventory investment: A comparative study with high-frequency panel data. *Review of Economics and Statistics,* 80**,** 513-519. https://doi.org/10.1162/003465398557799

CHANG, X., TAN, T. J., WONG, G. & ZHANG, H. 2007. Effects of financial constraints on corporate policies in Australia. *Accounting & Finance,* 47**,** 85-108. https://doi.org/10.1111/j.1467-629X.2007.00200.x

CLEARY, S. 1999. The relationship between firm investment and financial status. *The Journal of Finance,* 54**,** 673-692. https://doi.org/10.1111/0022-1082.00121

CLEARY, S. 2006. International corporate investment and the relationships between financial constraint measures. *Journal of Banking & Finance,* 30**,** 1559-1580. https://doi.org/10.1016/j.jbankfin.2005.03.023

CLEARY, S., POVEL, P. & RAITH, M. 2007. The U-shaped investment curve: Theory and evidence. *Journal of Financial and Quantitative Analysis,* 42**,** 1-39. https://doi.org/10.1017/S0022109000002179

COLOMBO, M. G., CROCE, A. & GUERINI, M. 2013. The effect of public subsidies on firms' investment–cash flow sensitivity: Transient or persistent? *Research Policy,* 42, 1605-1623. https://doi.org/10.1016/j.respol.2013.07.003

DEVEREUX, M. & SCHIANTARELLI, F. 1990. Investment, financial factors, and cash flow: Evidence from UK panel data. *Asymmetric information, corporate finance, and investment.* University of Chicago Press. https://doi.org/10.3386/w3116

DING, S., GUARIGLIA, A. & KNIGHT, J. 2013. Investment and financing constraints in China: does working capital management make a difference? *Journal of Banking & Finance,* 37**,** 1490-1507. https://doi.org/10.1016/j.jbankfin.2012.03.025

FAZZARI, S. M. & PETERSEN, B. C. 1988. Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity,* 1988**,** 141-206. https://doi.org/10.2307/2534426

FRANCIS, B., HASAN, I., SONG, L. & WAISMAN, M. 2013. Corporate governance and investment-cash flow sensitivity: Evidence from emerging markets. *Emerging Markets Review,* 15**,** 57-71. https://doi.org/10.1016/j.ememar.2012.08.002

GILCHRIST, S. & HIMMELBERG, C. P. 1995. Evidence on the role of cash flow for investment. *Journal of Monetary Economics,* 36**,** 541-572. https://doi.org/10.1016/0304-3932(95)01223-0

GOERGEN, M. & RENNEBOOG, L. 2001. Investment policy, internal financing and ownership concentration in the UK. *Journal of Corporate Finance,* 7**,** 257-284. https://doi.org/10.1016/S0929-1199(01)00022-0

GUARIGLIA, A. 2008. Internal financial constraints, external financial constraints, and investment choice: Evidence from a panel of UK firms. *Journal of Banking & Finance,* 32**,** 1795-1809. https://doi.org/10.1016/j.jbankfin.2007.12.008

HAQUE, A. & NASIR, A. The application of Value at Risk and Expected Shortfall as Controlling Mechanism of Systematic Risk of Pakistani Stock Market. Proceedings of Economics and Finance Conferences, 2018. International Institute of Social and Economic Sciences. https://doi.org/10.20472/EFC.2018.009.004

HOVAKIMIAN, G. 2009. Determinants of investment cash flow sensitivity. *Financial Management,* 38**,** 161-183. https://doi.org/10.1111/j.1755-053X.2009.01032.x

HOVAKIMIAN, G. & TITMAN, S. 2003. Corporate investment with financial constraints: Sensitivity of investment to funds from voluntary asset sales. National Bureau of Economic Research. https://doi.org/10.3386/w9432

KADAPAKKAM, P.-R., KUMAR, P. & RIDDICK, L. A. 1998. The impact of cash flows and firm size on investment: The international evidence. *Journal of Banking & Finance,* 22**,** 293-320. https://doi.org/10.1016/S0378-4266(97)00059-9

KAPLAN, S. N. & ZINGALES, L. 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics,* 112, 169-215. https://doi.org/10.1162/003355397555163

KAPLAN, S. N. & ZINGALES, L. 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. *The Quarterly Journal of Economics,* 115**,** 707-712. https://doi.org/10.1162/003355300554782

LEWELLEN, J. & LEWELLEN, K. 2016. Investment and cash flow: New evidence. *Journal of Financial and Quantitative Analysis,* 51**,** 1135-1164. https://doi.org/10.1017/S002210901600065X

LIMA CRISÓSTOMO, V., JAVIER LÓPEZ ITURRIAGA, F. & VALLELADO GONZÁLEZ, E. 2014. Financial constraints for investment in Brazil. *International Journal of Managerial Finance,* 10**,** 73-92. https://doi.org/10.1108/IJMF-11-2012-0121

MAROUENE, F. & ABAOUB, E. 2013. Investment-Cash Flow Sensitivity under Financial Constraints Case of Tunisia. *International Journal of Business and Management,* 8**,** 14. https://doi.org/10.5539/ijbm.v8n9p14

OLINER, S. D. & RUDEBUSCH, G. D. 1992. Sources of the financing hierarchy for business investment. *The Review of Economics and Statistics***,** 643-654. https://doi.org/10.2307/2109378

