PENNIES AND PROSPERITY: UNRAVELING PAKISTAN'S INVESTMENT PUZZLE AMIDST FINANCIAL FLUX

Yusra Shehzadi[1], Muhammad Nabeel Ashraf[2], and Farhan Mahboob[3]

Abstract

Financial constraints and agency cost problems have been identified as the potential cause of increasing investment- cash flow sensitivity (ICFS) of firms limiting the use of an external source of financing for investment opportunities and leading the firms to under-invest. This paper attempts to test this phenomenon in the context of Pakistani markets. Using the workhorse model of Richardson for the construction of free cash flow and abnormal investment, we used pooled OLS, Fixed effect, and GMM estimator on the dataset of 16 cement firms in Pakistan for the time frame of 2010-2022. The results indicate that cash, size, and Tobin's Q are substantial indicators of a firm's investment expenditure. Further, the results show that investment to cash flow sensitivity for over-investing (OI) firms with positive free cash flow (FCF) results from agency cost problems, whereas investment to cash flow sensitivity for under-investing (UI) firms with negative free cash flow (FCF) do not result from financial constraints. The study's finding provides evidence of investment to cash flow sensitivity along with the presence of financial constraints and agency cost problems in Pakistani cement firms.

Keywords: Financial Constraints; Agency Cost; Investment Expenditure; Free Cash Flow.

INTRODUCTION

The upcoming investment activities of a company are significantly influenced by its financial decisions. Firms can finance their investment efforts primarily from two sources. It consists of both internal funding and external financing, such as debt or stock (retained earnings). Companies need money to carry out their expansion plans, and they can either generate it internally or get it through external sources based on their financial strategies (Bhagata et al., 2005). Despite having the option to choose any source of funding, firms' preferences for financing sources are altered by the presence of capital market flaws. The existence of information asymmetry between the market and the enterprise is one potential type among the many different types of market defects. Furthermore, Myers and Majluf (1984) highlighted that businesses looking for high-return investment possibilities tend to employ internal sources of finance for their projects when the market finds it difficult to distinguish between healthy and unhealthy investment options. As a result, the cost of external is financing rises higher than the cost of internal financing, creating what appears to be a pyramid of sources of funding for businesses.

When a company faces financial limits and is unable to choose between an internal and external source of financing, it is forced to rely only on this internal source of funding, which might be risky for such companies (Fazzari et al., 1988). In addition, risk-averse businesses may decide to use an internal source of financing despite having access to external funds and the simplicity with which they can be obtained. Managers of businesses independently create these kinds of financial restrictions. These businesses keep some cash on hand in case they have an immediate need for money or to pay bills.

The difficulties of information asymmetry between financial markets and management, agency conflicts between shareholders and managers, as well as between minority investors and controlling

[1]Lecturer, Department of Business Administration, Iqra University, Karachi, Pakistan. Email: yshehzadi44@gmail.com
[2]Assistant Professor, Department of Management Sciences, National University of Modern Languages (NUML), Karachi Campus, Pakistan. Email: nabeel.ashraf@numl.edu.pk
[3]Senior Assistant Professor, BS, Bahria University Karachi Campus, Karachi, Pakistan. Email: farhanmehboob.bukc@bahria.edu.pk

shareholders, have a significant impact on the investment decisions of firms (Myers and Majluf, 1984; Fazzari et al., 1988). Emerging markets are particularly affected by these issues. Pakistan is a developing nation with capital market inefficiencies, where businesses fight for market share by providing a variety of goods and services. Businesses are said to rely more on internal sources of funding as a result of weaknesses in the capital market (Kashif et al., 2016). Even though numerous measures have been taken to make financing easily accessible in Pakistan, such as the implementation of the National Financial Inclusion Strategy (NFIS) in 2015, businesses continue to favor internal funding sources or steer clear of using external sources of financing due to the high costs and difficult payment terms. Pakistan thus appears to be an intriguing case study for examining whether financial limitations or agency cost issues contribute to the explanation of the investment to cash flow sensitivities.

This study contributes in two ways. First, it adds new insights into the relevant literature by testing the financial constraints hypothesis and agency cost hypotheses on the dataset of the cement sector of Pakistan. The rationale to use the data from the cement sector is that its debt ratio is highly variant and flexible. Also, it faces a high number of issues with agency costs. Second, to our finest knowledge, it uses (Richardson, 2006) model to construct investment and free cash flow for the first time in Pakistan.

LITERATURE REVIEW

In general, the availability of internal cash flows has a substantial influence on a firm's financing decisions and investments (Fazzari et al., 1988). This implies that an increase in internal cash flow is directly proportional to growth in spending for investment and vice versa (Falato et al., 2022). The reason is that internal cash flows are less expensive as compared to external financing. Lower cost of financing helps the firm to maintain high safety margins on its investment and suffer from less financial risk. Explaining further, the authors claim that when firms suffer from financial constraints, the sensitivity of their investment decisions to changes in cash flow tends to raise more. Consequently, firms have to bear the cost when they cannot invest in less risky projects with high returns just because of the unreadiness of internal funds after meeting firms' operational and financial obligations (Tapang et al., 2022).

Even though the issue of financial constraints and investment has been discussed in empirical literature using the dataset of various emerging and developed countries for the different time frames, the findings lack mutual consensus. Some scholars report that investment-cash flow sensitivities (ICFS) tend to increase/decrease when firms' financial position tightens (Abel and Eberly, 2011; Almeida and Campello, 2001; Brown and Petersen, 2009), whereas some scholars found no significant effect of financial constraints on ICFS (Chen and Chen, 2012; Erickson and Whited, 2000). Besides, it is observed that there exists a noticeable difference in the measurement criteria of investment and cash flow. For example, Riaz et al. (2016) investigated the same issue by using the Q theory model on the dataset of 288 Pakistani listed firms. By using the GMM technique for estimation, it was found that sensitivities of investment-cash flow increase with the rise in the level of financial constraints of the firm. Besides, financially constrained firms are more affected by this sensitivity as compared to their counterparts. Using the same Q model and Euler Equation model (Altaf and Shah, 2018) conducted a study on the same issue addressing both fixed and working capital investment. By applying GMM estimator to the dataset of 254 Indian manufacturing firms from 2006 through 2015, it concluded that working capital investment is more prone to cash flow shocks. Moreover, it also found that both fixed and working capital investment in financially constrained firms is more prone to cash flow shocks compared to their counterparts.

Intending to find out the manifestation of financial constraints among Malaysian firms, (Ismail et al., 2010) applied a GMM estimator to the dataset of Malaysian firms between 1988 and 2005. The

outcomes indicate that Malaysian firms are expected to face problems in getting access to an external source of financing due to the presence of agency problems between the financer and firms. Taking agency conflicts into consideration, (Albuquerue and Wang, 2008) found that weaker investor protection offers over-investment incentives to countries. Franchising may help the firms to keep relying on their internal source of financing. For checking the influence of franchising on investment-cash flow sensitivity (ICFS), (Seo et al., 2018) carried out a study on the dataset of US restaurants. The results indicated that franchising has a significant moderating influence on the ICFS of financially constrained firms. To see the differences in the effect of financial constraints on ICFS across various sectors, (Ahmad and Hashmi, 2019) conducted a study on firms' data in different industries. Using the GMM estimator, the study found that financial constraints affect the ICFS of all sectors' firms except the chemical sector because of the non-availability of investment opportunities in this sector. Further, it highlighted the significant difference in the investment behavior between financially constrained and non-financially constrained firms. Besides, the findings indicate that financially constrained firms prefer internal finance over external finance.

Table 1
Literature Summary

Authors	Country	Affect Firms' ICFS Due to Financial Constraints	Affect Firms' ICFS Due to Agency Cost Problems
(Ahmad and Hashmi, 2019)	Pakistan	Supported	Not included
(Ismail et al., 2010)	Malaysia	Not included	Supported
(Riaz et al., 2016)	Pakistan	Supported	Not included
(Pawlina and Renneboog, 2005)	UK	Not included	Supported
(Mulier et al., 2016)	Europe	Supported	Not included
(Guariglia and Yang, 2016)	China	Supported	Supported
(Fazzari et al., 1988)	US	Supported	Not included
(Kaplan and Zingales, 1997)	US	Not supported	Not included
(Kuang, 2011)	China	Supported	Not included
(Almeida and Campello, 2001)	US	Supported	Not included

Tobin's Q and Euler equation are two main models of investment theory. The former model considers the change in investment demand or in simple words it accounts for growth opportunities for firms which need investment. This model is considered as a lone measure of investment in perfect capital markets, whereas for imperfect market other variables in q models show significant coefficients, which can be understood as an assumption which states that the two sources of funding(internal and external) are not perfect substitutes. It is important to note that this model can only be used by listed firms since it requires firms' stock market information. The later model overcomes this shortcoming since it can work for non-listed firms too.

Research Hypotheses

According to (Modigliani and Miller, 1958), firms' investment decisions are not affected by the choice of capital financing in a perfect capital market. Empirical literature shows the positive relationship between investment and cash flow (ICF) (Fazzari et al., 1988), but the justification for such an association is controversial in the literature. First, the affirmative association between ICF may stem from agency problems ascending from the conflicts between an outside borrower and corporate insider (Myers and Majluf, 1984; Fazzari et al., 1988). This explanation is supported by the financial constraints hypothesis which highlights the premium cost which is to be paid by firms obtaining an external source of financing (loans, equity, or debt) in an imperfect capital market (Xiang et al., 2022). High cost and difficulty in reaching out to external financing urge the firms to switch to internal financing (such as retained earnings). In such a situation, financially constrained firms have to do without investing in good margins projects owing to the excessively high premium cost of external financing (Jansen et al., 2023). Hence, firms facing financial constraints can only invest more, when they have more cash flows, hence decrease in cash flows may lead firms to under-investment. In this regard, high ICFs can be assumed as evidence of financial constraints (Chiu et al., 2022).

Second, considerable evidence exists in the literature that suggests an affirmative relationship between ICF resulting from the agency problems between shareholders and managers; and between minority investors and controlling shareholders (Jensen, 1986; Pawlina and Renneboog, 2005; Stulz, 1990). This explanation is in support of the agency cost hypothesis which claims significant differences between the objectives of shareholders and managers. Managers focus more on increasing firms' value instead of shareholders' wealth maximization because an increase in their salary and compensation is directly proportional to an increase in firms' profitability, thus firms' expansion will increase the resources and power of managers (Deng and Zhao, 2022). Besides, the interests of controlling shareholders also do not match with those of minority investors due to poor protection rights of minority investors and a weak legal system. Resultantly, to avoid paying dividends to investors, controlling shareholders often spend firms' cash flows on unprofitable projects resulting in over-investment. In essence, firms facing agency problems invest more, when they have excess cash flow (Setiany, 2021). Thus, the positive association between ICF can be understood as evidence of the existence of agency costs. Firms' optimal investment decisions can be affected by both financial constraints and agency problems. Both financial constraints and agency problems may upsurge ICFS, which may lead to investment inefficiency (Guizani and Ajmi, 2021).

To distinguish between these two reasons, we will test the subsequent hypotheses.

H1: Financial constraints (FC) Hypothesis: Under-investing (UI) enterprises with negative FCF have high positive investment-free cash flow sensitivity, which is mostly due to financing restrictions.

H2**:** Agency Charges (AC) Hypothesis: Overinvesting (OI) businesses with positive FCF have high positive investment-free cash flow sensitivity, which is mostly due to agency costs.

The Dataset

The data used in this study is extracted from annual reports of cement firms and financial statements analysis reports (for non-financial firms) published by the State Bank of Pakistan. We excluded defaulter firms and firms with less than three years of observation. The reason for taking the cement sector particularly is its frequent investment into new plants and machinery for increasing cement production. Besides, it majorly contributes to the economic development of the country every year by attracting a large portion of Foreign Direct Investment (FDI) and increasing cement demand locally and for exports.

The failure of the cement sector may cause an adverse impact on the country's economy. The information for firms' age is taken from Companies' financial data on Pakistan Stock Exchange. The age of the firm is recorded from the firm's date of listing to the date of finalizing the dataset. Data from 16 Cement companies between 2010 and 2019 are included in the dataset, which makes 160 observations in total. For every firm, 10 years of observations are recorded which makes our dataset balanced.

METHODOLOGY

A framework of (Richardson, 2006) was used to operationalize (over and under) investment and free cash flow (FCF). After measuring both terms, it is tested whether the connection between the (over and under) investment and free cash flow is affected by financial constraints or agency costs. The outline for the operationalization of (over and under) investment and free cash flow is presented in Fig.1. *I_total* is the change between capital expenditure and sale of property, plant, and equipment. *I_total* is divided into subcategories. *I_main* aims to measure the required investment expenditure for maintaining its existing assets, thus its measurement is done by taking the sum of depreciation and amortization, and *I_New,* which is derived to measure new investment expenditure is calculated by taking the change between *I_total* and *I-main.* New investment expenditure *(I_new)* is further fragmented into two parts. 1. Investment expenditure expected for upcoming positive NPV projects (I_e_new) 2. Abnormal investment (over and under) or unexpected investment (I_u_new).

A Dynamic Model for Expected Investment Expenditure Estimation

The purpose of using the dynamic panel model is particularly to control the effects of unobserved regressors not counted in the model and to allow the mechanisms of partial adjustment. All variables (independent) are lagged in this model to reduce the simultaneity issues. To estimate the investment expenditure expected for upcoming positive NPV projects (I_e_new), the investment expectation model of (Richardson, 2006) is used and formulated in Eq.1.

$$I\_new = \alpha_0 + a_1 I\_new_{i,t-1} + a_2 Cash_{i,t-1} + a_3 Q_{i,t-1} + a_4 Size_{i,t-1} + a_5 Age_{i,t-1} + a_6 ROA_{i,t-1} + a_7 Leverage_{i,t-1} + \sum Year + u_i + e_{i,t} \quad (1)$$

This model can be taken as the optimal level of firms' investment outlay. Particularly representing $I\_new_{i,t-1}$ with new investment expenditure; *Cash* with the ratio of cash to total assets; *Q* with the proportion of the market value of assets to book value of assets; *Size* with the natural logarithm of total assets; *Age* with the number of years since the firm's listing year, *ROA* with a ratio of net income to total assets; *leverage* with the ratio of total debt to total equity; whereas the symbol i represent firms and t represent time (2010-2022). $\sum Year$ represents the time dummies taking into account the impact of interest rate fluctuations and changes in the business cycle.

Eq.1 shows two components of error terms: u_i represents a firm-specific component for accepting any time-invariant characteristics of measurement error affecting any variable in our model and the time-invariant component that may affect firms' investment; whereas e_i refers to unsystematic risk.

The fitted values of Eq.1 are to be taken as expected investment expenditure (I^e-*new*). For operationalizing unexpected investment expenditure *(I^u-new),* we make the change between real investment (*I_total*) and optimal investment (I^e-*new*). I^u-*new* can assume either positive or negative value based on over-investment and under-investment respectively. We then calculate cash flow for assets in place *(CF_{AIP})* by taking the change between cash flow from operating activities *(CFO)* and required

investment expenditure for assets' maintenance *(I_main*). For the measurement of free cash flow, we make the change between cash flow for assets in place *(CF_{AIP})* and expected investment expenditure *(I^{e}-new)*.

Investment to Free Cash Flow Nexus

After the firms are segregated into groups based on I^{u} *_new*. One group includes firms with positive I^{u} *_new* are classified as an over- investment; whereas the other group includes the firms with negative I^{u} *_new* are termed as under-investment. Following (Richardson, 2006) we expect that abnormal investment expenditure *(I^{u} _new)* is a function of free cash flow *(FCF)*. In this context, we examine whether the response of I^{u} *_new* to *FCF* varies for firms having +ve or -ve *FCF* using the following equation.

$$I^{u}\_new = \alpha_0 + \alpha_1 Dum_{FCF>0} + \alpha_2 FCF_{i,t} * Dum_{FCF<0} + \alpha_3 FCF_{i,t} * Dum_{FCF>0} + \sum Year + + u_i + e_{i,t} \quad (2)$$

Where $Dum_{FCF>0}$ refers to the FCF dummy that is equal to 1 for firms with positive FCF, and 0 otherwise. With $FCF_{i,t} * Dum_{FCF<0} (Dum_{FCF>0})$ means we interact the dummy of FCF with the value of FCF. Hence, we assume α_2 and α_3 as a proxy for investment inefficiency. Concerning the financial constraint hypothesis, we suppose α_2 to have an affirmative and significant value for UI firms that are prone to face financial constraints, whereas for α_3 , we expect to have an affirmative and significant value for OI firms due to the agency cost problem. The reason for including $Dum_{FCF>0}$ in the model is to incorporate the effect that it may have on the firm's investment. Lastly, we include year dummy and error components to control endogeneity issues.

Dynamic Panel Model

To estimate 1, we use the system Generalized Methods of Moments (GMM) approach developed by (Arellano and Bover, 1995; Blundell and Bond, 1998). GMM estimation technique enables us to control for endogeneity issues present in regressors, bias in omitted variables, as well as time-invariant and firm-specific heterogeneity. GMM approach is primarily designed for dynamic panel model with many individuals and small-time period (large N small T). The GMM system is classified into two equations (level equation and first-difference equation). The level equation helps to improve the precision and efficiency of estimators, whereas the first difference equation aims to reduce unobserved heterogeneity issues. Therefore, we use the lag of the dependent variable as an explanatory variable to control for endogeneity issues of regressors (Bond et al., 2001).

For ensuring the validity of instrument and model specification, literature has used two diagnostic tests in GMM estimation. The first test is the *Hansen (J) test* used for over-identification of restrictions. Following *Chi-square* distribution, this test shows the number of over-identifying restrictions (number of instruments less number of parameters) with the value of the degree of freedom. Non-rejection of the null hypothesis of this test implies that instruments are correctly incorporated in the regression or are not correlated with the error term. The second diagnostic test, *m(n)*, tests for the validity of model specification, instruments' legitimacy, and n^{th}-order serial correlation of the differenced residuals. Following the standard normal distribution, this test's null hypothesis is *"no n^{th}-order serial correlation of the differenced residuals"*. In case the null hypothesis is not retained, then we lag the instruments for at least n+1times.

To ensure robustness, we also estimate the equation using the Fixed effect *(FE)* and pooled OLS estimators. It is worth mentioning that in a dynamic panel model, the pooled OLS estimator does not

properly consider the potential endogeneity of regressors and firms' unobserved heterogeneity. Besides, the fixed effects (FE) estimator might face endogeneity issues in the dynamic panel model setting. In such a setting, the coefficient of the lagged dependent variable acquired from the fixed effect *(FE)* estimator will be biased downwards, whereas the one acquired from pooled OLS estimator will be biased upwards. Using different approaches for our dynamic model enables us to check our estimates' validity: *"the accurately projected coefficient on the lagged regressand should lie between the estimates obtained from the fixed effects (Fe) estimators and pooled OLS"* (Bond et al., 2001).

Static Panel Model

To control time-invariant firm-specific heterogeneity, we use a fixed effect (FE) estimator for the static panel regression model in Eq. 2.

Initial Summary Statistics

The following section shows the summary of the data gathered for the study. It includes the statistics of variables and the four groups made based on FCF and the nature of the investment.

Table 2

Descriptive Statistics

	I_NEW	TOBIN_Q	CASH	SIZE	AGE	ROA	LEVERAGE
Mean	1.74E+08	1.867628	0.029727	16.62837	26.57037	8.326222	1.454963
Median	600855.0	1.634526	0.010143	16.70878	26.00000	9.040000	1.580000
Maximum	1.30E+10	7.184280	0.315121	19.24055	58.00000	37.68000	8.240000
Minimum	-6566935.	1.085130	0.000170	14.17850	12.00000	-18.20000	-9.930000
Std. Dev.	1.15E+09	0.853950	0.051237	1.104213	9.753331	10.06576	1.581756
Skewness	10.50535	2.757957	3.201937	0.132015	1.335793	-0.396221	-2.662387
Kurtosis	117.2649	14.54040	14.35287	2.216059	6.365031	3.688722	24.62728
Jarque-Bera	75925.72	920.2849	955.6721	3.849050	103.8420	6.200447	2790.519
Probability	0.000000	0.000000	0.000000	0.145945	0.000000	0.045039	0.000000
Sum	2.35E+10	252.1297	4.013086	2244.831	3587.000	1124.040	196.4200
Sum Sq. Dev.	1.76E+20	97.71691	0.351776	163.3844	12747.08	13576.81	335.2616
Observations	135	135	135	135	135	135	135

Table 2 can be an indicator of the few ratios of the cement industry in Pakistan. Looking at Q, which shows that the maximum value of Tobin's Q in the industry is 7.18 whereas the minimum value is 1.09? These values show that all the firms in the industry are overvalued. The cash position shows the mean of 2.9% which implies that many firms lack balance in their cash accounts. This states that on average firms keep a very minimum amount of cash in hand. The size of every firm on average is 16.62. The average age of all firms is 26 years. The average ROA of all firms is 8.32%, whereas the standard deviation of firms is 10.06576, which means that on average ROA of a firm is far from its mean score by 10 times. On average the leverage of firms is 1.45% which shows that the firm's liabilities are greater than its assets which put the firm at high financial risk. Leverage mean score is also higher than its standard deviation score which means that leverage data is spread out from its means score.

Table 3
Mean and Medians of Groups

	G1	G2	G3	G4	Total	Differences G1 vs G3
FCF	(258,311,260.20)	6,255,688.49	5,150,352.13	(638,514,163.18)	(105,736,971.32)	0.00
	(58,400,509.32)	2,254,323.20	3,216,180.70	(184,668,186.50)	1,619,619.01	0.02
Iu_new	(125,389,088.67)	(3,431,524.43)	4,184,365.94	1,126,674,912.64	66,119,075.57	0.00
	(19,770,321.98)	(1,254,211.03)	1,654,791.33	173,929,329.44	1,245,018.65	0.00
Ie-New	260,092,713.17	3,621,957.66	(1,746,186.97)	640,118,752.91	109,257,273.94	0.00
	61,946,387.95	2,183,219.91	(1,430,947.54)	189,504,303.50	(347,873.43)	0.00
I-total	170,474,099.67	3,680,340.38	2,576,312.57	1,662,669,662.73	175,260,111.28	1.00
	6,809,936.00	1,608,350.00	756,060.00	192,889,134.00	1,414,552.00	0.00
I_main.i,t)	672,613.00	2,213,568.77	877,792.01	979,930.55	969,149.43	1.00
	254,057.50	1,315,997.00	428,202.00	240,607.00	396,560.00	0.00
I-New	169,801,486.67	1,466,771.62	1,698,520.56	1,661,689,732.18	174,290,961.85	0.91
	5,028,491.50	909,221.00	145,369.00	187,505,914.00	600,855.00	0.01
(Tobin's Q)	1.81	1.86	1.89	1.91	1.87	0.66
	1.36	1.45	1.65	1.66	1.63	0.09
Cash	0.02	0.07	0.03	0.02	0.03	0.96
	0.01	0.02	0.01	0.01	0.01	0.09
Size	16.25	17.37	16.66	16.58	16.63	0.38
	16.09	17.14	16.89	16.42	16.71	0.94
Age	26.13	34.38	25.59	25.73	26.57	0.97
	26.00	28.00	26.00	26.00	26.00	0.01
ROA	5.46	9.30	9.66	5.22	8.33	0.98
	1.77	10.26	10.74	7.68	9.04	0.01
Leverage	1.77	1.75	1.45	0.26	1.45	0.13
	1.52	1.53	1.62	1.51	1.58	0.80

Table 3 shows the descriptive statistics of Groups of firms generated on the basis of FCF and I^u_new. Group one consists of UI firms with -ve FCF; Group two consists of UI firms with +ve FCF, Group three consists of OI firms with +ve FCF; group four consists of OI firms with -ve FCF. The first row of each variable shows the average, whereas the second row shows the median. The column labeled as "total" includes the average and median of all the firms of all four groups. The last column labeled "Differences"

includes the comparison of means and median between Group 1 and Group 3. The reason for taking Group 1 and group 3 for comparison is that the former group includes the firms facing financial constraints and the latter group includes the firms facing agency costs problems.

RESULTS

Table 4 shows the results after running the Pooled OLS estimator on Eq. 1.

Table 4
POOLED OLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I_NEW1	0.171121	0.081280	2.105332	0.0372
CASH1	3.28E+08	1.91E+09	0.171392	0.8642
TOBIN_Q	2.84E+08	1.09E+08	2.611915	0.0101
SIZE1	-55036701	22433673	-2.453308	0.0155
AGE1	26042778	9738765.	2.674135	0.0085
ROA1	-18674829	9997578.	-1.867935	0.0641
LEVERAGE1	-5148291.	60377985	-0.085268	0.9322
R-squared	0.164282	Mean dependent var		1.76E+08
Adjusted R-squared	0.124799	S.D. dependent var		1.15E+09
S.E. of regression	1.08E+09	Akaike info criterion		44.48475
Sum squared resid	1.47E+20	Schwarz criterion		44.63613
Log-likelihood	-2973.478	Hannan-Quinn criteria.		44.54626
Durbin-Watson stat	1.949699			

Using the pooled regression on e-views, the above table is drawn to predict investment expenditure. Tobin's Q, size, age, and ROA have been found to be statistically significant with a p-value of less than 0.05. This means that out of our model, these four variables help predict a firm's investment expenditure. The model is significant overall with DW stat close to the value of 2. The adjusted R2 value of 12.47% indicates that our model can explain the 12.47% variation in investment expenditure of firms.

Table 5
System GMM Estimator

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I_NEW1	0.171121	0.081280	2.105332	0.0372
CASH1	3.28E+08	1.91E+09	0.171392	0.8642
TOBIN_Q	2.84E+08	1.09E+08	2.611915	0.0101
SIZE1	-55036701	22433673	-2.453308	0.0155
AGE1	26042778	9738765.	2.674135	0.0085
ROA1	-18674829	9997578.	-1.867935	0.0641
LEVERAGE1	-5148291.	60377985	-0.085268	0.9322
R-squared	0.164282	Mean dependent var		1.76E+08
Adjusted R-squared	0.124799	S.D. dependent var		1.15E+09
S.E. of regression	1.08E+09	Sum squared resid		1.47E+20
Durbin-Watson stat	1.949699	J-statistic		127.0000
Instrument rank	9	Prob(J-statistic)		0.000000

For robustness, we have run system GMM in which two-stage least squares were selected for estimation of weighting matrix, this confirms the results obtained from the pooled OLS estimator, this also shows that Tobin's q, size, age, and ROA are significant with a p-value of less than 0.05 respectively. However, size is found to be insignificant to all other variables.

Testing Eq.2

Based on table 3, the value of abnormal investment (I^u_new) and expected investment expenditure (I_e_new) is calculated. Then, firms are divided into four groups on the basis of FCF (+ or -) and I^u_new (value with a positive sign refers to over-investment and value with a negative sign refers to under-investment). The pattern of dividing is shown in Fig.1.

Table 6
Pooled OLS of Eq.2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM1	3364449.	1.29E+08	0.026146	0.9792
FCFDUM1	0.159196	17.94293	0.008872	0.9929
FCFDUM2	-1.119186	0.175500	-6.377140	0.0000
R-squared	0.231493	Mean dependent var		66119076
Adjusted R-squared	0.219849	S.D. dependent var		9.12E+08
S.E. of regression	8.06E+08	Akaike info criterion		43.87487
Sum squared resid	8.57E+19	Schwarz criterion		43.93943
Log likelihood	-2958.554	Hannan-Quinn criter.		43.90110
Durbin-Watson stat	1.983005			

Using OLS on Eq. 2, we have gained the above results, which show that fcfdum1 is insignificant, which suggests that sensitivity of investment to cash flow(ICFS) does not result from financial constraints for UI firms with negative FCF. However, fcfdum2 is significant which shows that ICFS result from agency cost problems for OI firms with +ve FCF. This means that H1 is rejected whereas H2 is retained. For further robustness, we also run the Eq. 2 using GMM. The results are shown below.

Table 7
System GMM of Eq.2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUM1	3640731.	1.41E+08	0.025897	0.9794
FCFDUM1	0.080086	19.48140	0.004111	0.9967
FCFDUM2	-0.787875	0.189363	-4.160653	0.0001
R-squared	0.112024	Mean dependent var		66611505
Adjusted R-squared	0.098467	S.D. dependent var		9.16E+08
S.E. of regression	8.70E+08	Sum squared resid		9.91E+19
Durbin-Watson stat	2.307784	J-statistic		131.0000
Instrument rank	5	Prob(J-statistic)		0.000000

To further confirm the results, one step GMM is used. The above table also confirms the results obtained from the OLS estimator. This also shows that ICFS result from agency cost problems for OI firms with +ve FCF.

DISCUSSION

We have found that between G2 and G3, FCF means is greater in G2 because firms in this group under-invest, whereas firms in G3 over-invest. On the contrary, FCF between groups with negative cash flows shows that firms who underinvest have greater FCF as compared to over-investment firms. However, we have found a significant difference between G1 and G3 similar to those (Guariglia and Yang, 2016). Looking at an *abnormal investment* between G1 and G3, firms in G3 have greater unexpected investment expenditure as compared to G1 because firms in G3 have excess cash flow similar to (Guariglia and Yang, 2016). Firms in G1 have greater *expected investment expenditure* as compared to G3. Due to collinearity between the calculations of I-total, we do not find any difference between the total investment of G1 and G3. However, we also do not find substantial differences in the mean of Tobin's q, cash, size, age, ROA, and leverage. The potential reason for no difference is that our study sample includes the firms of one sector only, whereas, (Guariglia and Yang, 2016) have included firms from various sectors, hence our results are contradicting it.

Looking at the results of Eq. 1, we have only found Tobin's q and cash significant with both Pooled OLS and GMM estimator, whereas the size is significant in Pooled OLS only. This implies that changes in Tobin's Q and cash also change the investment expenditure of firms, whereas the other variables do not cause any change in the investment expenditure of firms as per our results. However, (Guariglia and Yang, 2016) reported that all the variables in the model influence the investment expenditure of firms. In essence, we have found that only Tobin's Q, firms' size, and cash are significant predictors of firms' investment expenditure.

To test the hypotheses, we used three models on Eq. 2 and found that fcfdum2 is significant in all the models. The results indicate that *investment to free cash flow sensitivity* for OI firms with positive cash flow results from agency cost problems similar to (Guariglia and Yang, 2016), whereas *investment to free cash flow sensitivity* for UI firms with negative free cash flow does not result from financial constraints as per our results which are non-parallel to (Guariglia and Yang, 2016). The potential reason for this contradiction is that unlike the firms in our study sample, Chinese firms suffer from inefficient credit markets in terms of resource allocation.

CONCLUSION

This study looks into how financial conditions affect how much money businesses invest. On the dataset of 16 cement firms in Pakistan for the period of 2010–2019, we employed pooled OLS, Fixed effect, and GMM estimator in accordance with Richardson's workhorse model to construct free cash flow and anomalous investment. The findings show that major markers of a firm's investment expenditure are cash, size, and Tobin's Q. Additionally; the findings demonstrate that agency cost issues are the cause of investment to cash flow sensitivity for OI firms with free cash flow; however this is not the case for UI enterprises with negative cash flow due to financial restrictions. The results of the study show that Pakistani cement manufacturers are sensitive to cash flow when making investments, and they also show that there are financial limitations and issues with agency costs. According to the study, banks in particular should offer appealing financing options with simple terms and low interest rates so that even small businesses have the choice to use an outside source of funding for investments in expansion and growth initiatives. Additionally, risk-averse businesses should look into outside funding options to urge banks to maintain developing fresh financing options for businesses.

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APPENDIX

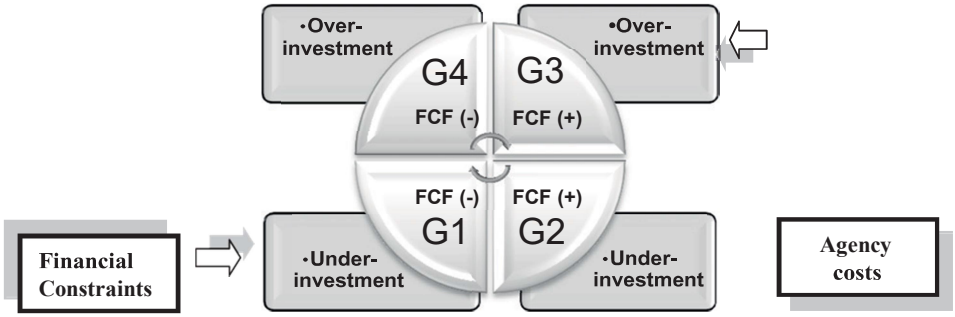

Figure 1: Four Groups of Firms Based on Their Abnormal Investment and Free Cash Flow (FCF)