Investment-cash flow sensitivity and financial constraints: evidence from Pakistan

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Abstract

Purpose – The purpose of this paper is to provide new insights about investment-cash flow sensitivities (ICFS) as a representative of financial constraints, by examining panel data consisting of 288 listed firms in Pakistan.

Design/methodology/approach – This study uses a panel data methodology and first difference generalized method of moments to control the problems of heterogeneity and endogeneity. By five different criteria, estimations are made for full and pre-classified sub-samples. Sargan test and Arellano-Bond serial correlation statistic are used for identification and validation of instruments and model.

Findings – According to the results, the ICFS has increased monotonically with the level of financial constraints. Further, the results depict that ICFS for the constrained group is much higher as compared to the unconstrained group. Overall, the result illustrates positively significant ICFS.

Practical implications – This study confirms signs of imperfections in the capital market, which leads to financial markets inaccessibility preceded by high under-investment costs and low social and economic development. Thus, proper policy designing and instigation are necessary for the subsidies, taxation, and foreign direct investment and later for financial market development and promotion of private corporate investment.

Originality/value – Previous studies have mostly focused on developed countries where large listed companies work in well-developed financial markets and do not face severe financial constraints because of the greater market integration (Bekaert *et al.*, 2011, 2013) and superior investor protection laws (Djankov *et al.*, 2008; La porta *et al.*, 1998). However, this study focuses on listed companies from the emerging Pakistani market, which will bring forth the interesting aspects of ICFS and will enhance the existing literature effectively.

Keywords Pakistan, Financial constraints, External finance, Fixed investment, Internal finance, Investment-cash flow sensitivity

Paper type Research paper

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1. Introduction

The financial crises of the twenty-first century have raised alarming concerns about the efficiency and perfectness of financial markets. The factors that define markets can impede corporate investments in lucrative projects (Campello *et al.*, 2010a, b). Due to the drastic consequences of the aforementioned crises, organizations may prefer short-term cash flows instead of profitable long-term ones. Modigliani and Miller (1958) proposed that sources for firms' financing are irrelevant to their decisions about investments. According to them, the costs of obtaining internal and external financing are equal in a perfect financial system and there is no difference between the costs of funds obtained from internal and external financing. However, their theoretical approach has been based on drastic simplifications, partial equilibrium analysis and it is of a static nature. As capital market imperfections enter the model, external finance becomes costlier than internal finance.

The debate on internal financing and investment sensitivities was intensified by the pivotal work of Fazzari *et al.* (1988). Using cash flows as a proxy for internal finance, they asserted that internal finance (if constrained) plays an important role in the marginal capital spending decisions made by firms. They highlighted that investment-cash flow sensitivities (ICFS) increase with the increase of the wedge between external and internal finances. Numerous studies, like those of Carpenter *et al.* (1994), Bond *et al.* (1999) and Nickell and Nicolitsas (1999) have supported similar arguments. Later, Kaplan and Zingales (1997) challenged the soundness of measures for financial constraints used by Fazzari *et al.* (1988) and examined the nexus between cash flows and real investment by using the same data set. They found that for the least constrained firms, ICFS were highest. Lamont *et al.* (2001) developed a financial constraint index based on the work of Kaplan and Zingales (1997) and claimed that the constrained firms were prone to frequent shocks. Whited and Wu (2006) extended this work by establishing a constraint index that employed a structural investment model and stated that the constrained firms in this index depicted features linked with disclosure to external financing constraints. Alti (2003) argued that new companies' decisions about investments are more sensitive as they consciously monitor cash flows due to their uncertainties about quality. He analyzed the investment sensitivity to firms' own cash flows in a frictionless financial environment and highlighted that investment sensitivity is a measure of financing constraints. Several studies, like those of Cleary (1999), Erickson and Whited (2000) and Chang *et al.* (2007) have drawn similar conclusions.

Despite a number of studies, there is a lack of agreement on the aforementioned relationships (positive or negative) between the variables. Cleary *et al.* (2007) emphasized a positive association and argued that the inconsistency in results was due to the lack of a realistic financial constraints proxy. They proposed a *U*-shaped relationship due to revenue earned from investments and cost effects interactions.

Other studies by Guariglia (2008), Hovakimian (2009), Hadlock and Pierce (2010) and Firth *et al.* (2012) also observed a non-monotonic relationship. They also devoted increasing attention to the indecisive role played by the financing and investment behaviors of firms. In addition to this, Hahn and Lee (2009) suggested high cross-sectional predictions for the relationship between the stock returns and the debt capacities of financially constrained firms compared with unconstrained ones, as well as that between ICFS and debt capacity. According to Bassetto and Kalatzis (2011, p. 264), "the literature on […] financial constraint in investment decisions [has] not yet arrived at a definitive conclusion about when a firm is financially constrained."

These arguments have accentuated the necessity for further research to answer why and how such ICFS subsist. Therefore, this study aims to add to the literature by

investigating ICFS empirically using panel data consisting of 288 listed firms from Pakistan. To the best of our knowledge, this is the first study of its kind to have examined the Pakistani market. Earlier studies analyzed large listed companies from developed countries. However, the financial markets are well-developed in those countries and it is less likely that their enterprises suffer severe financial constraints in the way that organizations from emerging markets do. Therefore, it has been interesting to analyze panel data from the Pakistani market which, we believe, will enhance the literature by bringing to broader attention the significant aspects of ICFS in an emerging economy rather than a developed one. Khan (2000) has provided an extensive review of the economic progress and background of Pakistan.

Owing to the most recent financial crises, a significant number of businesses also turned out to be economically restrained. This directed companies' risk-taking behavior towards a different track and coerced them into maintaining more liquid balance sheets (Almeida *et al.*, 2011). Bates *et al.* (2009) argued that when determining capital structure decisions, the importance of cash should be taken into account. Khramov (2012) pointed out that during the financial crises, ICFS doubled due to increased financial constraints. Further, Duchin *et al.* (2010) and Campello *et al.* (2010a, b) suggested that, in general, firms were extra financially constrained during the financial crises. The repercussions of the crises are still being felt in the world's financial systems, so it is fitting to study the nexus between internal finances, financial constraints, and fixed investments.

2. Theoretical review

There is no difference in the values of levered or unlevered firms (Modigliani and Miller, 1958). A firm's value is neutral to its capital structure in a perfect capital market. Hence, the present value of expected future cash flows is considered as the determining factor of a firm's value. Furthermore, the net present value of cash held in a perfect market is trivial due to the zero net present value of such investments. One reason is that there are no financing frictions caused by information asymmetry, agency costs, the tax system, or accessibility to the capital market in perfect capital markets. These markets face severe generalization.

Denis (2011) expressed the view that financing frictions make corporate finance very motivating. External capital is not a perfect substitute for internal capital under imperfect capital market conditions. The decline in a firm's value and growth is the result of lower investment. With the aim of justifying these adverse effects, Denis and Sibilkov (2010) argued further that firms with high costs of external finance (financially constrained firms) depend more on internal capital. Consequently, such obstacles in financing can have an impact on a firm's capacity to take investments with a positive net present value (Almeida *et al.*, 2011; Campello *et al.*, 2010b). The next section explains theories related to firms' investment decisions in detail.

2.1 Agency dilemma

Hillier *et al.* (2010) explained an agency relationship as the relationship between the shareholders and the managements of organizations, where the latter works in the interest of the former to regulate the organization effectively. Classical agency theory provides further guidance in this respect. Nevertheless, Jensen (1986) argued that when the principals (the owners of the firm) are not managers (who manage the firm), agency conflicts occur. Jensen and Meckling (1976) revealed that investments by companies are affected by the efforts and determination of their managers.

Managers are motivated to increase the resources under their control due to a direct nexus between their compensation and their sales growth. Kadapakkam *et al.* (1998) argued that this nexus leads to the creation of doubts in the minds of external investors based on the assumption that managers invest and undertake projects to further their own interests and enjoy the benefits of their success instead of giving primary consideration to the interests of shareholders. Jensen (1986) and Stulz (1990) asserted that this increased risk for external investors results in the placing of extra premiums on the costs of external finance. Stulz (1990) modeled the free cash flow theory presented by Jensen (1986). Free cash flow theory then replaced the managerial agency theory. Free cash flow is defined as, "Cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital" (Jensen, 1986, p. 323). Thus, firms' equity holders would tend to restrict managers' access to free cash flows with the aim of mitigating the managerial agency problem. In response, argued Jensen (1986) and Stulz (1990), a compromise to this restriction would enable managers to fund all their projects with positive net present values by using free cash flows, which would ultimately increase their firms' portfolios.

2.2 Asymmetric information

The cost of capital for internal and external financing would be equivalent in the perfect capital market. Still, a difference in their costs may arise due to the asymmetric nature of the information available. Kadapakkam *et al.* (1998) argued that the asymmetric availability of information relies on the promptness of detailed information about investment decisions being available for insiders (in comparison with outsiders). This depicts the phenomenon that market contributors do not enjoy the privilege of having the same access to information. Further, Myers and Majluf (1984) indicated that the above-mentioned problems result in there being extra premiums on external capital, which stimulates external investors to understate the risks on securities. In competitive markets, credit rationing categorizes the information asymmetry, according to Greenwald *et al.* (1984). Myers (1984), Brennan and Subrahmanyam (1996) and Easley and O'Hara (2004) supported a positive relationship between the cost of external finance and information asymmetry. These conditions make the "availability of capital" the determining factor for firms' investments instead of its capital cost. Ascioglu *et al.* (2008) concluded that higher ICFS depends on high-information asymmetry.

Schiantarelli (1995) discussed whether the impact of information asymmetry is likely to be higher on smaller firms and if they are more likely to witness short track records, lower collateral values, and distinctive risk coupled with greater bankruptcy costs and liabilities. By contrast Kadapakkam *et al.* (1998) emphasized that big firms, due to their higher elasticity in investment timings, face more managerial agency problems. Furthermore, as large companies (listed on the stock exchange) are bound to give more information than small unlisted companies, the former type of business is anticipated to face fewer problems in terms of information asymmetry (Bernanke *et al.*, 1996; Carreira and Silva, 2010). Consequently, both managerial agency and information asymmetry theories have arrived at the same conclusion that external costs involve a premium in contrast to internal costs. This may result in more dependence on internal finance when firms face constraints in acquiring external funding. Based on the theoretical and empirical evidence, the following two hypotheses were tested:

H1. The impact of improved internal cash flows on corporate fixed investments is significant and positive.

H1 tests for ICFS. It examines the effect of internal finance on the fixed investments of corporations without imposing any control in respect of their financial constraints. If *H1* is significant, it means that investment is sensitive to cash flows in the Pakistani market. *H1* does not test and compare the change in ICFS between financial constraints and unconstrained firms. Therefore, the following hypothesis was established to test for variances:

H2. The ICFS in financially constrained firms is higher than that of financially unconstrained firms.

There are a number of empirical studies that focus on the Pakistani market and test for distinct but related hypotheses. Nabi (1989) studied the investment behavior of firms with unequal access to financial markets and showed that favored companies are at an advantage when compared to excluded firms. Khan and Hasan (1998) tested for the McKinnon complementary hypothesis on financial repression and liberalization in Pakistan. They found strong support for the hypothesis. It has proposed a fundamental complementarity between the financial and physical assets within an economy. According to this hypothesis, interest rates below the inflation rate dissuade savings by reducing available financial assets – i.e., constraining investments – and that, in its turn, decreases economic growth. Chaudhry (1995) also provided a review of economic liberalization trends and their repercussions. Francis *et al.* (2013) studied 14 emerging economies, including Pakistan, in their sample and found that better corporate governance mechanisms reduced financial constraints and that those financial constraints distorted the efficient allocation of funds and destroyed firms' values. Nazir and Afza (2009) identified the determining factors for working capital while Shah *et al.* (2004) and Sheikh and Wang (2011) focused on the financing part of the balance sheet and investigated the determinants of the capital structure of Pakistani firms. Aleem (1990) tested and compared the costs and returns of the informal credit market in Pakistan. Khan *et al.* (2012) showed that Pakistani firms used leverage to mitigate the agency costs of free cash flows.

3. Data and methodology

A sample of non-financial firms from Pakistan was analyzed. The non-financial sector is a vital segment of any economy. Also, for economic well-being, a sound, robust and stable industrial base is indispensable. In Pakistan, non-financial businesses are represented by a diversity of enterprises including those in the textile, chemical, motor vehicle, energy, communications, transport services, paper and cement industries as well as other services. Juxtaposed with Cleary *et al.* (2007) and Guariglia (2008), firms included in the sample for this study were engaged in a more comprehensive array of industrial segments.

The secondary research strategy was used. Data were collected from the annual reports of the companies, from the State Bank of Pakistan (SBP) and from the Karachi Stock Exchange (KSE). Balanced panel data from only those firms that had reported data for all the variables over the complete sample period were included in the analysis. The sample period encompassed the ten years from 2002 to 2012. The final selected sample comprised 2,880 firm years. The sample consisted of 288 non-financial firms from a total of 397 non-financial firms recognized by the SBP's database. This mode of sampling might have been thought to lead to survivorship bias, but it is a usual enough practice in the field under consideration, as has been exemplified in the work of Guariglia (2008) and Ding *et al.* (2013). Moreover, the total size of the selected firms

sample represented more than 85 percent of the total market value and the total assets in the market in any year and for each industry. Therefore, it was representative of the market. All corporations included in the sample were listed on the KSE. To control for the potential influence of outliers and to increase the comparability with the extant literature, all regression variables were winsorized in 1 percent tails. This routine was identical with those employed by Denis and Sibilkov (2010), D'Espallier and Guariglia (2015) and Cheng *et al.* (2014).

3.1 Econometric methodology

Panel data regression was used in this study to determine the nature of the relationship. Panel data methodology is beneficial when controlling for unobservable heterogeneity and the potential endogeneity of variables. Such problems can cause biases in estimated results (Carpenter and Guariglia, 2008; Almeida *et al.*, 2010). Erickson and Whited (2000) and D'Espallier and Guariglia (2015) argued that variables in investment equations display endogenous behavior and that ordinary least squares estimation results in biased and inconsistent outcomes. Hence, following Carpenter and Guariglia (2008) and Guariglia (2008), the first difference generalized method of moment (GMM) estimator, proposed by Arellano and Bond (1991), was used in this study. It controls for both individual heterogeneity and endogeneity problems.

For the identification and validation of instruments, a Sargan test for over-identifying restrictions and Arellano and Bond (1991) serial correlation statistics for first- and second-order correlation in difference residuals (AB test) were also estimated. The Sargan test operates as a double-edged sword for testing the validity and moment conditions of instruments. Its null hypothesis is that the over-identifying restrictions are valid and have a χ^2 distribution. The rejection of the null hypothesis validates the instruments used. By contrast, AB tests identify the consistency of the GMM estimator (Baltagi, 2005) and check for serial correlation.

3.2 Variables measurement

The conceptual model had the following variables, which are also summarized in Table I.

3.2.1 Investment. Generally, investment is defined as the total tangible fixed capital (Keynes, 2006). However, in this particular line of study, researchers have focused on changes in tangible fixed capital because they are interested in studying the change in investment capital (D'Espallier and Guariglia, 2015; Firth *et al.*, 2012; Ding *et al.*, 2013). So, in alignment with the literature, investment was defined as the difference between tangible fixed assets at the ends and the beginnings of a year, plus depreciation for the current year.

3.2.2 Internal finance. Jordan *et al.* (2011) defined internal finance as a part of corporate income that is held back in the organization just as retained earnings or depreciation are. Nevertheless, Ağca and Mozumdar (2008), Guariglia (2008) and Ding *et al.* (2013) offered a more comprehensive and inclusive definition of internal finance. Therefore, following this stream of literature, internal finance was measured by operating cash flows calculated as net income, before extraordinary items, plus depreciation.

3.2.3 Financial constraints. To increase the validity and robustness of the study, the degree of financial constraint was measured using two different types of five distinct measures. These were made up of two one-variable (single) proxies, namely, size and the age of the firms; and three indices, namely, an SA-index, a KZ-index, and a *Z*-score. A number of researchers have used single proxy variables for measuring financial

Variable name	Measure	Expected sign	Literature
Investment	Difference between the end and the beginning of a year tangible fixed assets plus depreciation of current year	–	D'Espallier and Guariglia (2015), Firth *et al.* (2012) and Ding *et al.* (2013)
Internal finance (operating Cash flows)	Net income before extraordinary items plus depreciation	Positive	Ağca and Mozumdar (2008), Guariglia (2008) and Ding *et al.* (2013)
Investment opportunities (Tobin's *Q*)	Book value of assets minus book value of equity plus market value of equity divided by book value of assets	Positive	Attig *et al.* (2012) and Francis *et al.* (2013)
Output	Sales during the period	Positive	Ndikumana (1999) and Aivazian *et al.* (2005b)
Leverage	Ratio of total debt to total assets at time "t"	Negative	Lang *et al.* (1996), Aivazian *et al.* (2005a, b) and Pindado *et al.* (2011)
Working capital investment	Change in working capital stock from period "t" to "t−1"	Negative	Fazzari and Petersen (1993), Almeida *et al.* (2004), Ding *et al.* (2013) and Baños-Caballero *et al.* (2014)
Change in long-term debt	Difference between long-term debt of period "t" and "t−1"	Positive	Fazzari and Petersen (1993) and Brown and Petersen (2009)

Table I.
Variable definitions

constraints (Rauh, 2006; Denis and Sibilkov, 2010; Baños-Caballero *et al.*, 2014). The single variable proxy can be a good measure if it is highly correlated with financial constraints. Cleary *et al.* (2007) have argued that it is hard to find a good variable because of weak correlation problems. Subsequently, three indices were also used in this study.

Hadlock and Pierce (2010) have argued that exogenous firm features should be used when measuring financial constraints. They created an SA-index based on the sizes and ages of firms. Higher index scores correspond to unconstrained firms, while low scores correspond to constrained ones. The size of a firm can be measured as the natural logarithm of total assets or sales while their age is defined as their listed age by Hadlock and Pierce (2010). Both sales and assets are used as proxies for size and SA-indices are calculated as:

$$SA_1 = -0.737(\text{Sales}) + 0.043(\text{Sales})^2 - 0.040(\text{Listed Age}) \quad (1)$$

$$SA_2 = -0.737(\text{Total Assets}) + 0.043(\text{Total Assets})^2 - 0.040(\text{Listed Age}) \quad (2)$$

The second measure, the KZ-index, consists of five variables. Kaplan and Zingales (1997) performed a logit regression on pre-classified firms. Following earlier studies, the same regression coefficients were used for the calculation (Lamont *et al.*, 2001; Cheng *et al.*, 2014). Contrary to the SA-index, financially constrained firms have higher KZ-index values and vice versa. The KZ-index was calculated using the following equation:

$$KZ = -1.002\left(\frac{\text{Cash flows}}{\text{Fixed capital stock}}\right) + 0.283(\text{Tobin's } Q) + 3.139\left(\frac{\text{Total Debt}}{\text{Total Capital}}\right)$$
$$-39.368\left(\frac{\text{Dividends}}{\text{Fixed Capital Stock}}\right) - 1.315\left(\frac{\text{Cash Stock}}{\text{Fixed Capital Stock}}\right) \quad (3)$$

where Tobin's *Q* is given as the "book value of assets minus the book value of equity plus the market value of equity divided by the book value of assets." These indices are used by Lamont *et al.* (2001), Malmendier and Tate (2005), Bakke and Whited (2010), Hong *et al.* (2012) and Cheng *et al.* (2014).

The last measure of financial constraint is the *Z*-score proposed by Altman (1968). This measure of capital constraint is also used in a large body of the literature (Cleary, 1999; Aggarwal and Zong, 2006; Baños-Caballero *et al.*, 2014). Firms with high *Z*-scores are classified as unconstrained, while the companies with low scores are categorized as constrained. The formula used for calculating the *Z*-score is:

$$Z = 1.2\left(\frac{\text{Working Capital}}{\text{Total Assets}}\right) + 1.4\left(\frac{\text{Retained Earnings}}{\text{Total Assets}}\right) + 3.3\left(\frac{\text{Earnings before interest and taxes}}{\text{Total assets}}\right) + 0.6\left(\frac{\text{Market Capitalization}}{\text{Book Value of Total Liabilities}}\right) + 0.99\left(\frac{\text{Sales}}{\text{Total Assets}}\right) \quad (4)$$

These indices are used to categorize firms into financially constrained and unconstrained groups on the basis of their median values. Businesses with above-median scores are characterized as unconstrained and those with below-median values are constrained in the cases of the SA-index and the *Z*-score, while scores above-median values are classified as constrained and below-median values are said to be unconstrained under the KZ-index.

3.2.4 Control variables. The following control variables have been included in the model for robustness and to control biases due to firms' distinctive factors.

3.2.4.1 Investment opportunities. The most important control variable used in the literature is that for investment opportunities. Average *Q* is used to proxy for the unobservable Tobin's *Q*. It is calculated as the book value of assets minus the book value of equity plus the market value of equity divided by the book value of assets (Attig *et al.*, 2012; Francis *et al.*, 2013). A positive sign is expected for the coefficient for growth opportunities (Fazzari *et al.*, 1988).

3.2.4.2 Output. Net sales are used as an authentic proxy for productivity or output (Blundell *et al.*, 1992; Aivazian *et al.*, 2005b). Sales are also a proxy for changes in product demand. Therefore, sales are included as a control variable and a positive relationship is expected (Ndikumana, 1999).

3.2.4.3 Leverage. Leverage is measured as the ratio of total debt to total assets at time "t". A negative relationship of leverage is expected with investment and can be explained as a means that increases the inducement for investment in low-profile ventures (Lang *et al.*, 1996; Aivazian *et al.*, 2005a, b; Pindado *et al.*, 2011).

3.2.4.4 Working capital investment. This is measured as the change in working capital stock from period "t" to "t−1", while working capital stock is equal to current assets less current liabilities at time "t" (Fazzari and Petersen, 1993; Almeida *et al.*, 2004; Ding *et al.*, 2013; Baños-Caballero *et al.*, 2014).

3.2.4.5 Change in long-term debt. This is measured as the difference between the long-term debt from period "t" and that from period "t−1" (Fazzari and Petersen, 1993). Considering the work of Fazzari and Petersen (1993) and Brown and Petersen (2009), a positive value is expected.

4. Empirical research model

An empirical research model based on Q theory from the work of Fazzari *et al.* (1988) was adopted, where Tobin's Q and cash flow were the two core explanatory variables. In this study, their model was extended by including extra control variables, as explained above. The baseline model used for testing the hypothesis is given below:

$$\frac{I_{it}}{K_{i,t-1}} = \alpha + \beta\frac{\mathrm{CF}_{it}}{K_{i,t-1}} + \gamma Q_{it} + \delta\frac{S_{it}}{K_{i,t-1}} + \vartheta\frac{\mathrm{DLTD}_{it}}{K_{i,t-1}} + \rho\mathrm{LEV}_{it} + \varphi\frac{\mathrm{WKI}_{it}}{K_{i,t-1}} + \varepsilon_{it} \quad (5)$$

where "I" represents an investment, "K" represents fixed capital stock, "CF" represents cash flows (internal finance), "Q" represents Tobin's Q, "S" represents sales, "DLTD" represents a change in long-term debt, "LEV" represents leverage, and "WKI" represents working capital investment. Fixed capital stock was calculated as the book value of tangible fixed assets at time "t". The subscripts "i" and "t" denote "ith" organization and "t-th" period.

In this empirical model, ICFS is reflected by the coefficient β. A positively significant cash flow coefficient will accept *H1*. For testing *H2*, firms were classified by their financial constraint status, based on five distinct criteria. The comparison of the coefficient sizes of the sub-samples, based on their constraint statuses, would confirm *H2*. If financially constrained firms were to carry significant positive cash flow coefficients when compared with unconstrained firms, then *H2* would be accepted.

5. Results

5.1 Descriptive statistics

There are several important aspects prominent in the descriptive statistics for Table II. The median value of investments (I/*K*) was 0.11 which was comparable with the results from preceding studies. Fazzari and Petersen (1993) reported a median variable of 16.1 percent. Degryse and De Jong (2006) also studied firms in the Netherlands and they reported a median variable of 16.1 percent. Cleary *et al.* (2007) found 21 percent for all their balanced observations and Chen and Chen (2012) reported a median investment variable of between 15 and 23 percent. The mean value of the variable was 0.29 alongside the median. Cleary (2006) reported a mean variable of 44 percent for the subsample of France. Bassetto and Kalatzis (2011) reported a variable of 44.2 percent for their sample of Brazilian firms, and D'Espallier and Guariglia (2015) showed a mean variable of 18.07 percent for a sample of Belgian small and medium-sized enterprises (SMEs). The investment ratio had a standard deviation of 0.56. The operating cash flows ratio, the main explanatory variable, had an average of 0.34, a median of 0.15, and

Variables	Minimum	Q1	Median	Q2	Maximum	Mean	SD
I/*K*	−0.35	0.03	0.11	0.31	3.69	0.29	0.56
CF/*K*	−0.72	0.05	0.15	0.37	4.68	0.34	0.72
Q	0.32	0.76	0.92	1.20	5.39	1.11	0.73
LEV	0.10	0.48	0.64	0.76	2.38	0.65	0.33
DLTD/*K*	−0.54	−0.05	0	0.10	1.34	0.07	0.27
S/*K*	0.12	1.42	2.56	4.93	76.26	5.55	10.45
WKI/*K*	−2.09	−0.11	0.02	0.17	3.13	0.08	0.58
Ln(Sales)	0.74	6.62	7.57	8.57	13.84	7.60	1.68
Ln(Assets)	1.63	6.57	7.49	8.61	12.76	7.62	1.54

Table II. Descriptive statistics

a standard deviation of 0.72. This highlighted the substantial difference in investment and operating cash flows among the sample companies.

The average proportion of debt to total assets was 0.65, where the average change in long-term debt was 0.07, which indicated an increasing trend in company debt. The average of Tobin's *Q* was 1.11; the sales ratio was 5.55, and the working capital investment ratio was 0.077. The sales ratio showed a significant range, the greatest value being about seven standard deviations away from the mean. The difference between the descriptive statistics of size measured by the book value of total assets and the total sales was negligible, especially when the use of these variables was considered. The natural logarithm was used and, hence, the differences between the two variables were found to be decreasing.

5.2 Correlation analysis

The correlation between variables along with their significance levels is reported in Table III. The highest significant correlation was noted between investment and cash flows or the change in long-term debt, i.e., between internal and external financing sources. The correlation coefficient was 0.29 for cash flows and 0.30 for the change in long-term debt. The significant positive association between internal and external finance and investments was also evident from the literature, as exemplified by Guariglia (2008) and Firth *et al.* (2012). This positive association also provided affirmation for *H1*. Furthermore, as expected, the correlation for investment to leverage and working capital investment was negative while that between growth opportunities and output was positive.

5.3 Regression results

First, the overall sample was regressed to test for ICFS, then sub-samples, divided by predetermined criteria for financial constraints, were studied. The median values of five different pre-specified criteria were used to slice the full sample into two mutually exclusive groups (Baños-Caballero *et al.*, 2014). The following are the results based on those criteria:

5.3.1 Full sample. The sample regression results are shown in Table IV under the column headed "Full sample." The estimated results showed that, on average, Pakistani non-financial firms increased 0.392 units of their investment for each extra unit of cash flow. A positive significant relationship was evidenced at the 1 percent level of significance. Therefore, these results supported *H1*. The results were in harmony with those of Fazzari *et al.* (1988) for US firms, Kaplan and Zingales (1997) for US firms,

Table III.
Correlation analysis (sample: 2004-2012)

	I/*K*	CFN/*K*	DLTD/*K*	LEV	*Q*	*S*/*K*	WKI/*K*
I/*K*	1.0						
CF/*K*	0.29*	1.0					
DLTD/*K*	0.30*	0.01	1.0				
LEV	−0.01	−0.17*	0.06*	1.0			
Q	0.01	0.24*	0.01	0.18*	1.0		
S/*K*	0.21*	0.54*	0.01	−0.08*	0.26*	1.0	
WKI/*K*	−0.06*	0.53*	0.17*	−0.11*	0.08*	0.31*	1.0

Notes: Included observations: 2,592. *,**,***Significant at 1, 5 and 10 percent levels, respectively

Variable	Full sample	Firm size		Firm age	
		Large	Small	Old	Young
Panel: A					
CF/*K*	0.392*	0.283*	0.761*	0.423*	0.531*
Q	1.811**	0.124	0.670***	1.394	−0.463
DLTD/*K*	0.849*	0.507*	0.822*	0.854*	0.510*
LEV	−6.189*	−0.874**	−1.674*	−6.886	−0.295
S/*K*	0.036*	0.062*	0.009	0.033*	0.005
WKI/*K*	−0.615**	−0.127**	−0.854*	−0.613*	−0.526*
Panel: B					
Sargan test					
J-statistic	1.2326	4.3248	6.5257	6.1561	0.8445
Prob(*J*-statistic)	0.8727	0.3638	0.1632	0.1043	0.8388
Arellano-Bond serial correlation test					
m1	0.0016	0.0000	0.0001	0.0642	0.0000
m2	0.1405	0.1002	0.1376	0.2927	0.3495
Panel: C					
Adjusted periods	6	6	6	6	6
Firms	288	184	152	183	156
Firm years	1,728	952	776	898	761

Notes: *,**,***Significant at 1, 5 and 10 percent levels, respectively

Table IV. Results based on full sample, firm size and firm age

Lensink *et al.* (2003) for Indian firms, Carpenter and Guariglia (2008) for UK firms, John Wei and Zhang (2008) for eight East Asian markets, Wan and Zhu (2011) for Chinese firms, and Etemadi and Baghiyan (2013) for Iranian firms.

The evidence garnered from instruments based on the *J*-statistic and an AB test for serial correlation affirmed the model's validity and confirmed that there was no problem of autocorrelation with the model. Panel C of Table IV represents the total sample size included in the regression analysis of 288 firms, with six adjusted periods and a total of 1,728 firm years.

5.3.2 Size and age. The first two criteria used for the classification of firms were the median values of size and age. If either the age or the size were of less than median value, the firm was designated as being small and young, otherwise they were understood to be large and old. Younger and small firms were considered to be constrained because of the problems born of information asymmetry and vice versa.

Regression results are presented in Panel A of Table IV. The results show that all the four sub-samples bear positively significant ICFS. The large firms confirmed a positive coefficient of 0.283, while the estimated coefficient of small firms was 0.761 at the 1 percent level of significance. With reference to the Wald test for coefficient restrictions, the difference in coefficients was statistically significant at 5 percent (t-value = 2.20). These results were in accordance with Fazzari *et al.* (1988) and contrary to Kaplan and Zingales (1997). On the other hand, younger firms bore a positive coefficient of 0.531, which was greater than 0.423, i.e., the old firms' coefficient. However, the difference in the coefficients was not statistically significant at a 5 percent level (t-value = −1.56).

Azam and Shah (2011) also studied the relationship between size, age and investment at 52 listed companies in Pakistan. They showed a positive coefficient for size and a negative coefficient for age. The results of this study also complemented

their findings. All the coefficients were significant and carried expected signs, except for Tobin's *Q* and sales. Fazzari *et al.* (1988) also showed negative signs for *Q* and argued that it could be due to measurement error or because *Q* may not represent market fundamentals. Islam (2006) studied Bangladesh and found an insignificant coefficient value for Tobin's *Q* and sales and argued that because financial markets in Bangladesh are less developed, they may induce uneven market competition. The coefficient of large firms (0.507) for DLTD/*K* was much less in absolute terms than the coefficient for small firms (0.822) while the LEV of small firms was greater than that of large firms (Ndikumana, 1999; De Almeida and Eid, 2014). This could be because small firms are additionally debt-oriented and use debt to a greater extent compared to equity for fixed investment (Kurshev and Strebulaev, 2007). Large unconstrained firms' investments are less sensitive to WKI/*K* if compared to those of constrained small firms (Fazzari and Petersen, 1993) because large firms have easy access to financial markets and experience less information asymmetry when compared to small constrained firms (Leary and Roberts, 2005).

A Sargan test and an Arellano-Bond serial correlation test authenticated the validity and reliability of the model and instruments, and there was no problem of autocorrelation with the model. Panel C of Table IV shows six adjusted periods included in each regression sample.

5.3.3 SA-index. The third criterion used was an SA-index developed by Hadlock and Pierce (2010). The results, based on this standard, are shown in Table V. If the SA-index is below the median value, then the firm is categorized as constrained and vice versa. SA-index 1 used total assets, while SA-index 2 used sales as a proxy for size.

Under SA-index 1 the constrained firms had an ICFS of 1.124, which was about 2.5 times greater than 0.447, the coefficient estimated for unconstrained firms.

	SA-Index 1		SA-Index 2	
Variable	Constrained	Unconstrained	Constrained	Unconstrained
Panel: A				
CF/*K*	1.124*	0.447*	0.796**	0.377*
Q	1.780**	0.079	1.532***	1.031**
DLTD/*K*	0.781*	0.365**	0.414**	0.475*
LEV	−2.993*	−0.818**	−1.824**	−1.731*
S/K	0.003	0.062	0.021	0.029*
WKI/*K*	−0.890*	−0.363*	−0.654*	−0.347*
Panel: B				
Sargan test				
J-statistic	2.6451	1.2179	5.6236	3.1141
Prob(*J*-statistic)	0.4496	0.5439	0.1314	0.2108
Arellano-Bond serial correlation test				
m1	0.0013	0.0000	0.0001	0.0001
m2	0.1091	0.1494	0.1397	0.1356
Panel: C				
Adjusted periods	6	6	6	6
Firms	207	172	208	165
Firm years	962	766	964	764

Table V.
Results based on SA-indices 1 and 2

Notes: *,**,***Significant at 1, 5 and 10 percent levels, respectively

Both coefficients were found to be significant at a level of 1 percent. SA-index 2 also showed similar results. Constrained firms had a positively significant coefficient of 0.796, which was a greater coefficient than that seen for unconstrained firms (0.377). The difference in coefficients was statistically significant at 1 percent for both SA-index 1 and SA-index 2 with *t*-values of −6.30 and −6.06, respectively. These findings were comparable to those of Fazzari *et al.* (1988, 2000) and ran counter to those of Kaplan and Zingales (1997, 2000).

All variables carried expected signs but, analogous to the size and age benchmarks, Tobin's *Q* and sales were insignificant (Fazzari *et al.*, 1988; Islam, 2006). Under both indices, constrained firms showed large coefficients for *Q* (Carpenter and Guariglia, 2008), which can be explained by agency theory. Unconstrained firms have extra resources to invest, so managers may invest in less-profitable and negative-present-value projects while the investments of small companies are coerced by low funds availability to depend on investment opportunities. DLTD/*K* showed significant values at 0.365, 0.475 and 0.781, 0.414 and LEV as −0.818, −1.731, and −2.993, −1.824 for unconstrained and constrained firms. These results were in line with those of Lang *et al.* (1996) and Ascioglu *et al.* (2008). Again investments in unconstrained firms were less sensitive (smaller coefficient size) to WKI/*K* as compared to the small constrained firms (Fazzari and Petersen, 1993; Leary and Roberts, 2005).

The Sargan test statistic was insignificant for all four samples which confirmed the model. The Arellano-Bond serial correlation test also showed the accuracy of all the results, i.e., significant negative m1 serial correlation and insignificant m2 serial correlation.

5.3.4 KZ-index and Z-score. The fourth and fifth criteria were the KZ-index and the Altman *Z*-score, respectively. The results, based on these criteria are given in Table VI.

	KZ-index		*Z*-score	
Variable	Constrained	Unconstrained	Constrained	Unconstrained
Panel: A				
CF/*K*	0.461*	0.404*	0.361*	0.252*
Q	1.266**	0.580***	0.507***	0.984*
DLTD/*K*	0.830*	0.332***	0.701*	0.623*
LEV	−2.441*	−2.539**	−4.881*	−1.565*
S/K	0.032*	0.036*	0.050*	0.038*
WKI/*K*	−0.815*	−0.188*	−0.582*	−0.325*
Panel: B				
Sargan test				
J-statistic	4.3381	1.0231	2.4250	0.9988
Prob(*J*-statistic)	0.2272	0.7957	0.6581	0.8015
Arellano-Bond serial correlation test				
m1	0.0000	0.0000	0.0098	0.0000
m2	0.4024	0.2238	0.8071	0.2085
Panel: C				
Adjusted periods	6	6	6	6
Firms	217	211	220	227
Firm years	881	847	863	863

Notes: *,**,***Significant at 1, 5 and 10 percent levels, respectively

Table VI.
Results based on KZ-index and *Z*-score

If the index score of a firm was above the median value, it was classified as constrained under the KZ-index and unconstrained under the *Z*-score, respectively and vice versa.

All the predicting variables were significant and carried expected signs. Grouped under the KZ-index and the *Z*-score, the constrained firms showed cash flow sensitivities of 0.461 and 0.361 which were greater in magnitude than those of unconstrained firms (with 0.404 and 0.252 respectively). The results concurred with those of Fazzari *et al.* (1988, 2000), but conflicted with Kaplan and Zingales (1997, 2000). The difference in the ICFS across the constrained and unconstrained firms was found to be significant for the *Z*-score at a 10 percent level, while it was insignificant for the KZ-index with *t*-values of −1.84 and 1.07, respectively.

Again, under these criteria, the constrained firms showed greater coefficients for the *Q*, which could be explained by capital market imperfections (Agca and Mozumdar, 2008; Ascioglu *et al.*, 2008). Changes in long-term debt for constrained firms had a positively significant greater coefficient in harmony with the findings of De Almeida and Eid (2014). Leverage carried a negative sign as expected (Pindado *et al.*, 2011). Moreover, constrained firms' investments were more sensitive to investments in working capital (Ding *et al.*, 2013). Leary and Roberts (2005) argued that it could be due to large firms having easy access to financial markets, and information asymmetry for these was less severe. The insignificant *J*-test, negatively significant m1 and insignificant m2 values also confirmed the model, instruments and the results.

Different measures of financial constraints, namely, single variable measures such as age and size (results in Table IV) and indices (results in Tables V and VI) were used to assure robustness. All the financial constraint measures showed the same results and hardly diverged from the main construction of the theory. The study implied a broad range of earlier as well as newly developed measurements of financial constraints. Further, when calculating the SA-index, both total assets and sales were used separately as a proxy for firm size, but the results did not get mixed up. Since no significant differences in the results across the different measures of the financial constraints were observed, the data analysis was perceived to be robust.

6. Conclusion

In this paper, a panel of listed Pakistani firms from a broad spectrum of industrial segments was used to investigate the effects of financial constraints on ICFS confronted by corporations. Such comprehensive data provided a distinct opportunity to formulate a measure of financial constraints, exhibiting a fair level of unique observations. Study implied the use of the *Q*-model of investment of Fazzari *et al.* (1988) for estimations. Regression technique was used for estimation. Based on pre-specified criteria, companies were divided into constrained and unconstrained groups to study ICFS across the firms. Five distinct measures were used for the financial constraints that added to the robustness of the test.

The results showed a positively significant internal finance and investment relationship that confirmed *H1* (see Table IV). The ICFS also increased monotonically with the level of financial constraints. By splitting the full sample (based on the financial constraints), the study indicated that financially constrained firms have much higher sensitivities than unconstrained firms. The results were statistically significant in terms of size, SA-index 1, SA-index 2, and *Z*-score. This confirmed *H2*. However, some contradiction was observed with respect to age and the KZ-index. There was also a positive relationship between investment and Tobin's *Q*. The results were robust and

applicable to a wider range of industries in Pakistan. These findings were in line with those of Fazzari *et al.* (1988), Agca and Mozumdar (2008), Ding *et al.* (2013), Baños-Caballero *et al.* (2014) and Cheng *et al.* (2014). However, they contradicted those of Kaplan and Zingales (1997), Cleary *et al.* (2007), Hovakimian (2009) and Chen and Chen (2012). The study has contributed to the extant literature by emphasizing the generalizability of the results of Fazzari *et al.* (1988) in an emerging market and provides validation of their findings.

The results of the study have vital implications for policy design and implementation at the macroeconomic as well as the microeconomic level. Firms located in emerging markets, such as Pakistan's, face a greater disparity between their internal and external financing. Moreover, the Pakistani economy has fewer large, oligopolistic businesses and a greater number of small firms. Thus, in less developed nations like Pakistan, a lack of easy access to financial markets can lead to higher under-investment costs, affecting both economic growth and social development. Thus, this study has emphasized the importance of policy considerations about bank lending (Behra *et al.*, 2013), the stock market (Lamont *et al.*, 2001), risk management policies (Lin and Paravisini, 2013) and dividend policy (Pathan *et al.*, 2015). This study has also opened new avenues for research and development in terms of macroeconomic policies (Li, 2011; Korajczyk and Levy, 2003). Therefore, the government needs to implement subsidy and taxation policies diligently in the non-financial sector and in financial markets as they develop. The formation and implementation of appropriate policies, resulting in the reduction of financial constraints, may lead to long-term growth in the economy (Campello *et al.*, 2010a).

Future research could explore the various aspects and characteristics of ICFS. One such way could be to inspect the growth of ICFS within firms. The existing literature incorporates explorations based on comparisons across firms, pre-classified based on financial constraints. Such constraints may include strenuous access to financial markets, information asymmetry, etc. Moreover, it would be interesting to explore how corporate events like acquisitions by a multinational corporation or international cross-listings, etc., which cut financial constraints, may affect ICFS. Lastly, future research could study different countries as characterized by their different level of economic development. However, they could also be extended to include Pakistan's SMEs as part of their sample.

References

Ağca, S. and Mozumdar, A. (2008), "The impact of capital market imperfections on investment-cash flow sensitivity", *Journal of Banking & Finance*, Vol. 32 No. 2, pp. 207-216.

Aggarwal, R. and Zong, S. (2006), "The cash flow-investment relationship: international evidence of limited access to external finance", *Journal of Multinational Financial Management*, Vol. 16 No. 1, pp. 89-104.

Aivazian, V.A., Ge, Y. and Qiu, J. (2005a), "Debt maturity structure and firm investment", *Financial Management*, Vol. 34, pp. 107-119.

Aivazian, V.A., Ge, Y. and Qiu, J. (2005b), "The impact of leverage on firm investment: Canadian evidence", *Journal of Corporate Finance*, Vol. 11 Nos 1-2, pp. 277-291.

Aleem, I. (1990), "Imperfect information, screening, and the costs of informal lending: a study of a rural credit market in Pakistan", *The World Bank Economic Review*, Vol. 4 No. 3, pp. 329-349.

Almeida, H., Campello, M. and Galvao, A.F. Jr (2010), "Measurement errors in investment equations", *Review of Financial Studies*, Vol. 23 No. 9, pp. 3279-3328.

Almeida, H., Campello, M. and Weisbach, M. (2004), "The cash flow sensitivity of cash", *Journal of Finance*, Vol. 59 No. 4, pp. 1777-1804.

Almeida, H., Campello, M. and Weisbach, M. (2011), "Corporate financial and investment policies when future financing is not frictionless", *Journal of Corporate Finance*, Vol. 17 No. 3, pp. 675-693.

Alti, A. (2003), "How sensitive is investment to cash flow when financing is frictionless?", *Journal of Finance*, Vol. 58 No. 2, pp. 707-722.

Altman, E. (1968), "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy", *Journal of Finance*, Vol. 23 No. 4, pp. 589-609.

Arellano, M. and Bond, S.R. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies*, Vol. 58 No. 2, pp. 277-297.

Ascioglu, A., Hegde, S.P. and McDermott, J.B. (2008), "Information asymmetry and investment-cash flow sensitivity", *Journal of Banking & Finance*, Vol. 32 No. 6, pp. 1036-1048.

Attig, N., Cleary, S., El Ghoul, S. and Guedhami, O. (2012), "Institutional investment horizon and investment-cash flow sensitivity", *Journal of Banking and Finance*, Vol. 36 No. 4, pp. 1164-1180.

Azam, M. and Shah, S.A. (2011), "Internal financial constraints, external financial constraints and investment choice: evidence from Pakistani firms", *Australian Journal of Business and Management Research*, Vol. 1 No. 8, pp. 18-22.

Bakke, T.E. and Whited, T.M. (2010), "Which firms follow the market? An analysis of corporate investment decisions", *Review of Financial Studies*, Vol. 23 No. 5, pp. 1941-1980.

Baltagi, B.H. (2005), *Econometric Analysis of Panel Data*, 3rd ed., John Wiley & Sons, West Sussex.

Baños-Caballero, S., García-Teruel, P.J. and Martínez-Solano, P. (2014), "Working capital management, corporate performance, and financial constraints", *Journal of Business Research*, Vol. 67 No. 3, pp. 332-338.

Bassetto, C. and Kalatzis, A. (2011), "Financial distress, financial constraint and investment decision: evidence from Brazil", *Economic Modelling*, Vol. 28 Nos 1-2, pp. 264-271.

Bates, T., Kahle, K. and Stulz, R. (2009), "Why do US firms hold so much more cash than they used to?", *Journal of Finance*, Vol. 64 No. 5, pp. 1985-2021.

Behr, P., Norden, L. and Noth, F. (2013), "Financial constraints of private firms and bank lending behavior", *Journal of Banking & Finance*, Vol. 37 No. 9, pp. 3472-3485.

Bernanke, B., Gertler, M. and Gilchrist, S. (1996), "The financial accelerator and the flight to quality", *The Review of Economics and Statistics*, Vol. 78 No. 1, pp. 1-15.

Blundell, R., Bond, S., Devereux, M. and Schiantarelli, F. (1992), "Investment and Tobin's Q evidence from company panel data", *Journal of Econometrics*, Vol. 51 Nos 1-2, pp. 233-257.

Bond, S., Harhoff, D. and Van Reenen, J. (1999), "Investment, R&D and financial constraints in Britain and Germany", *Institute for Fiscal Studies Discussion Paper*, Vol. 99 No. 5, pp. 1-54, doi: 10.1920/wp.ifs.1999.9905.

Brennan, M. and Subrahmanyam, A. (1996), "Market microstructure and asset pricing: on the compensation for illiquidity in stock returns", *Journal of Financial Economics*, Vol. 41 No. 3, pp. 441-464.

Brown, J.R. and Petersen, B.C. (2009), "Why has the investment-cash flow sensitivity declined so sharply? Rising R&D and equity market developments", *Journal of Banking & Finance*, Vol. 33 No. 5, pp. 971-984.

Campello, M., Graham, J. and Harvey, C. (2010a), "The real effects of financial constraints: evidence from a financial crisis", *Journal of Financial Economics*, Vol. 97 No. 3, pp. 470-487.

Campello, M., Giambona, E., Graham, J. and Harvey, C. (2010b), "Liquidity management and corporate investment during a financial crisis", working paper, The University of Illinois, Duke University, and University of Amsterdam, Urbana-Champaign, IL, Durham, NC, and Amsterdam.

Carpenter, R. and Guariglia, A. (2008), "Cash flow, investment and investment opportunities: new tests using UK panel data", *Journal of Banking and Finance*, Vol. 32 No. 9, pp. 1894-1906.

Carpenter, R., Fazzari, S. and Petersen, B. (1994), "Inventory (dis)investment, internal finance fluctuations, and the business cycle", *Brookings Papers on Economic Activity*, Vol. 1994 No. 2, pp. 75-122.

Carreira, C. and Silva, F. (2010), "No deep pockets: some stylized empirical results on firms' financial constraints", *Journal of Economics Surveys*, Vol. 24 No. 4, pp. 731-753.

Chang, X., Tan, T., Wong, G. and Zhang, H. (2007), "The effects of financial constraints on corporate policies in Australia", *Accounting and Finance*, Vol. 47 No. 1, pp. 85-108.

Chaudhry, M.G. (1995), "Economic liberalization of Pakistan's economy: trends and repercussions", *Contemporary South Asia*, Vol. 4 No. 2, pp. 187-192.

Chen, H. and Chen, S. (2012), "Investment-cash flow sensitivity cannot be a good measure of financial constraints: evidence from the time series", *Journal of Financial Economics*, Vol. 103 No. 2, pp. 393-410.

Cheng, B., Ioannou, I. and Serafeim, G. (2014), "Corporate social responsibility and access to finance", *Strategic Management Journal*, Vol. 35 No. 1, pp. 1-23.

Cleary, S. (1999), "The relationship between firm investment and financial status", *Journal of Finance*, Vol. 54 No. 2, pp. 673-692.

Cleary, S. (2006), "International corporate investment and the relationships between financial constraint measures", *Journal of Banking & Finance*, Vol. 30 No. 5, pp. 1559-1580.

Cleary, S., Povel, P. and Raith, M. (2007), "The U-shaped investment curve: theory and evidence", *Journal of Financial and Quantitative Analysis*, Vol. 42 No. 1, pp. 1-40.

D'Espallier, B. and Guariglia, A. (2015), "Does the investment opportunities bias affect the investment-cash flow sensitivities of unlisted SMEs?", *The European Journal of Finance*, Vol. 21 No. 1, pp. 1-25.

De Almeida, J.R. and Eid, W. Jr (2014), "Access to finance, working capital management and company value: evidences from Brazilian companies listed on BM & FBOVESPA", *Journal of Business Research*, Vol. 67 No. 5, pp. 924-934.

Degryse, H. and De Jong, A. (2006), "Investment and internal finance: asymmetric information or managerial discretion?", *International Journal of Industrial Organization*, Vol. 24 No. 1, pp. 125-147.

Denis, D. (2011), "Financial flexibility and corporate liquidity", *Journal of Corporate Finance*, Vol. 17 No. 3, pp. 667-674.

Denis, D. and Sibilkov, V. (2010), "Financial constraints, investment, and the value of cash holdings", *Review of Financial Studies*, Vol. 23 No. 1, pp. 247-269.

Ding, S., Guariglia, A. and Knight, J. (2013), "Investment and financing constraints in China: does working capital management make a difference?", *Journal of Banking & Finance*, Vol. 37 No. 5, pp. 1490-1507.

Duchin, R., Ozbas, O. and Sensoy, B. (2010), "Costly external finance, corporate investment, and the subprime mortgage credit crisis", *Journal of Financial Economics*, Vol. 97 No. 3, pp. 418-435.

Easley, D. and O'Hara, M. (2004), "Information and the cost of capital", *Journal of Finance*, Vol. 59 No. 4, pp. 1553-1583.

Erickson, T. and Whited, T. (2000), "Measurement error and the relationship between investment and q", *Journal of Political Economy*, Vol. 19 No. 4, pp. 1027-1057.

Etemadi, H. and Baghiyan, F. (2013), "Investment and financing constraints in Iran: International Journal of Economics", *Finance and Management Sciences*, Vol. 1 No. 5, pp. 252-257.

Fazzari, S. and Petersen, B. (1993), "Working capital and fixed investment: new evidence on financing constraints", *RAND Journal of Economics*, Vol. 24 No. 3, pp. 328-342.

Fazzari, S., Hubbard, R. and Petersen, B. (1988), "Financing constraints and corporate investment", *Brooking Papers on Economic Activity*, Vol. 1988 No. 1, pp. 141-195.

Fazzari, S., Hubbard, R. and Petersen, B. (2000), "Investment-cash flow sensitivities are useful: a comment on Kaplan and Zingales", *Quarterly Journal of Economics*, Vol. 115 No. 2, pp. 695-705.

Firth, M., Malatesta, P., Xin, Q. and Xu, L. (2012), "Corporate investment, government control, and financing channels: evidence from China's listed companies", *Journal of Corporate Finance*, Vol. 18 No. 3, pp. 433-450.

Francis, B., Hasan, I., Song, L. and Waisman, M. (2013), "Corporate governance and investment-cash flow sensitivity: evidence from emerging markets", *Emerging Markets Review*, Vol. 15, pp. 57-71.

Greenwald, B., Stiglitz, J.E. and Weiss, A. (1984), "Informational imperfections in the capital market and macroeconomic fluctuations", *American Economic Review*, Vol. 74 No. 2, pp. 194-199.

Guariglia, A. (2008), "Internal financial constraints, external financial constraints, and investment choice: evidence from a panel of UK firms", *Journal of Banking & Finance*, Vol. 32 No. 9, pp. 1795-1809.

Hadlock, C. and Pierce, J. (2010), "New evidence on measuring financial constraints: moving beyond the KZ index", *Review of Financial Studies*, Vol. 35 No. 5, pp. 1909-1940.

Hahn, J. and Lee, H. (2009), "Financial constraints, debt capacity, and the cross-section of stock returns", *The Journal of Finance*, Vol. LXIV No. 2, pp. 891-921.

Hillier, D., Ross, S., Westerfield, R., Jaffe, J. and Jordan, B. (2010), *Corporate Finance*, McGraw-Hill, Berkshire.

Hong, H.G., Kubik, J.D. and Scheinkman, J.A. (2012), "Financial constraints on corporate goodness", NBER Working Paper No. 18476.

Hovakimian, G. (2009), "Determinants of investment cash flow sensitivity", *Financial Management*, Vol. 38 No. 1, pp. 161-183.

Islam, M.R. (2006), "Corporate investment and cash flow sensitivity in Bangladesh: evidence from firm-level panel data", *North-South Business Review*, Vol. 1 No. 1, pp. 17-33.

Jensen, M. (1986), "Agency costs of free cash flow, corporate finance, and takeovers", *The American Economic Review*, Vol. 76 No. 2, pp. 323-329.

Jensen, M. and Meckling, W. (1976), "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 305-360.

John Wei, K.C. and Zhang, Y. (2008), "Ownership structure, cash flow, and corporate investment: evidence from East Asian economies before the financial crisis", *Journal of Corporate Finance*, Vol. 14 No. 2, pp. 118-132.

Jordan, B., Westerfield, R. and Ross, S. (2011), *Corporate Finance Essentials*, McGraw-Hill/Irwin, New York, NY.

Kadapakkam, P., Kumar, P. and Riddick, L. (1998), "The impact of cash flows and firm size on investment: the international evidence", *Journal of Banking & Finance*, Vol. 22 No. 3, pp. 293-320.

Kaplan, S. and Zingales, L. (1997), "Do investment-cash flow sensitivities provide useful measures of financing constraints?", *Quarterly Journal of Economics*, Vol. 112 No. 1, pp. 707-712.

Kaplan, S. and Zingales, L. (2000), "Investment-cash flow sensitivities are not valid measures of financing constraints", *Quarterly Journal of Economics*, Vol. 115 No. 2, pp. 707-712.

Keynes, J.M. (2006), *General Theory of Employment, Interest and Money*, Atlantic Publishers & Dist, New Delhi.

Khan, A.H. and Hasan, L. (1998), "Financial liberalization, savings, and economic development in Pakistan", *Economic Development and Cultural Change*, Vol. 46 No. 3, pp. 581-597.

Khan, A., Kaleem, A. and Nazir, M.S. (2012), "Impact of financial leverage on agency cost of free cash flow: evidence from the manufacturing sector of Pakistan", *Journal of Basic and Applied Scientific Research*, Vol. 2 No. 7, pp. 6694-6700.

Khan, T.A. (2000), "Economy, society and the state in Pakistan", *Contemporary South Asia*, Vol. 9 No. 2, pp. 181-195.

Khramov, V. (2012), "Asymmetric effects of the financial crisis: collateral-based investment-cash flow sensitivity analysis", IMF working paper.

Korajczyk, R.A. and Levy, A. (2003), "Capital structure choice: macroeconomic conditions and financial constraints", *Journal of Financial Economics*, Vol. 68 No. 1, pp. 75-109.

Kurshev, A. and Strebulaev, I.A. (2007), "Firm size and capital structure", AFA 2008 meetings paper, New Orleans, LA.

Lamont, O., Polk, C. and Saa-Requejo, J. (2001), "Financial constraints and stock returns", *The Review of Financial Studies*, Vol. 14 No. 2, pp. 529-554.

Lang, L., Ofek, E. and Stulz, R. (1996), "Leverage, investment and firm growth", *Journal of Financial Economics*, Vol. 40 No. 1, pp. 3-29.

Leary, M.T. and Roberts, M.R. (2005), "Do firms rebalance their capital structures?", *Journal of Finance*, Vol. 60 No. 6, pp. 2575-2619.

Lensink, R., Molen, R.D.V. and Gangopadhyay, S. (2003), "Business groups, financing constraints and investment: the case of India", *Journal of Development Studies*, Vol. 40 No. 2, pp. 93-119.

Li, D. (2011), "Financial constraints, R&D investment, and stock returns", *Review of Financial Studies*, Vol. 24 No. 9, pp. 2974-3007.

Lin, H. and Paravisini, D. (2013), "The effect of financing constraints on risk", *Review of Finance*, Vol. 17 No. 1, pp. 229-259.

Malmendier, U. and Tate, G. (2005), "CEO overconfidence and corporate investment", *The Journal of Finance*, Vol. 60 No. 6, pp. 2661-2700.

Modigliani, F. and Miller, M. (1958), "The cost of capital, corporation finance, and the theory of investment", *American Economic Review*, Vol. 48 No. 3, pp. 261-297.

Myers, S. (1984), "Capital structure puzzle", *Journal of Finance*, Vol. 39 No. 3, pp. 575-592.

Myers, S.C. and Majluf, N.S. (1984), "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, Vol. 13 No. 2, pp. 187-221.

Nabi, I. (1989), "Investment in segmented capital markets", *The Quarterly Journal of Economics*, Vol. 104 No. 3, pp. 453-462.

Nazir, M.S. and Afza, T. (2009), "Working capital requirements and the determining factors in Pakistan", *IUP Journal of Applied Finance*, Vol. 15 No. 4, p. 28.

Ndikumana, L. (1999), "Debt service, financing constraints, and fixed investment: evidence from panel data", *Journal of Post Keynesian Economics*, Vol. 21 No. 3, pp. 455-478.

Nickell, S. and Nicolitsas, D. (1999), "How does financial pressure affect firms?", *European Economic Review*, Vol. 43 No. 8, pp. 1435-1456.

Pathan, S., Faff, R., Méndez, C.F. and Masters, N. (2015), "Financial constraints and dividend policy", *Australian Journal of Management*, Vol. 41 No. 3, pp. 1-25.

Pindado, J., Requejo, I. and de la Torre, C. (2011), "Family control and investment-cash flow sensitivity: empirical evidence from the Eurozone", *Journal of Corporate Finance*, Vol. 17 No. 5, pp. 1389-1409.

Rauh, J. (2006), "Investment and financing constraints: evidence from the funding of corporate pension plans", *Journal of Finance*, Vol. 61 No. 1, pp. 33-71.

Schiantarelli, F. (1995), "Financial constraints and investment: methodological issues and international evidence", *Oxford Review of Economic Policy*, Vol. 12 No. 2, pp. 70-89.

Shah, A., Hijazi, T. and Javed, A.Y. (2004), "The determinants of capital structure of stock exchange-listed non-financial firms in Pakistan (with comments)", *The Pakistan Development Review*, Vol. 43 No. 4, pp. 605-618.

Sheikh, N.A. and Wang, Z. (2011), "Determinants of capital structure: an empirical study of firms in manufacturing industry of Pakistan", *Managerial Finance*, Vol. 37 No. 2, pp. 117-133.

Stulz, R. (1990), "Managerial discretion and optimal financing policies", *Journal of Financial Economics*, Vol. 26 No. 1, pp. 3-27.

Wan, H. and Zhu, K. (2011), "Is investment-cash flow sensitivity a good measure of financial constraints?", *China Journal of Accounting Research*, Vol. 4 No. 4, pp. 253-270.

Whited, T. and Wu, G. (2006), "Financial constraints risk", *Review of Financial Studies*, Vol. 19 No. 2, pp. 531-559.

Further reading

Bekaert, G., Harvey, C.R., Lundblad, C.T. and Siegel, S. (2011), "What segments equity markets?", *Review of Financial Studies*, Vol. 24 No. 12, pp. 3841-3890.

Bekaert, G., Harvey, C.R., Lundblad, C.T. and Siegel, S. (2013), "The European Union, the Euro, and equity market integration", *Journal of Financial Economics*, Vol. 109 No. 3, pp. 583-603.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R.W. (1998), "Law and finance", *The Journal of Political Economy*, Vol. 106 No. 6, pp. 1113-1155.

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