Original Research Article

Testing Financial Constraint hypothesis of Investment in NEPSE Listed Companies

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Abstract

This study aims to test financing constraints of Nepalese firms and its impact on investment behavior by controlling the accelerator effect. It divides the firms into Financially Constrained (FC) and Unconstrained (UC) group using discriminant analysis and uses Econometric Model to analyze investment cashflow sensitivities (ICFS) of firms. The data comprised the accounting observations (n=256) obtained from the annual reports of 16 non-financial companies listed in Nepal Stock Exchange Ltd. Results show that financially constrained firm exhibit higher cashflow sensitivity indicating significant influence of financing constraints on Nepalese firm's investment behavior. It documents the evidence of financial market inefficiency, urging for policy prescriptions to address these constraints and spur investment and growth.

Keywords: *Financing Constraints, Investment-Cashflow Sensitivity, Tobin's Q, Tangibility*
JEL classification: E22, E44, G30, G31, G32

Introduction

In frictionless capital market, a firm's financial policy is irrelevant for real investment decisions. Consequently, in Modigliani and Miller (1958) framework, investment decisions motivated by the maximizations of shareholders claims are independent of financial factors such as internal liquidity, leverage and dividend policy. In efficient capital market, a firm's investment problem can be solved without reference to financial factors, i.e., if firms have profitable investment opportunity, capital resources/funds get efficiently allocated to each of these opportunities/projects independent of financing sources viz; internal or external funds (Modigliani and

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Miller,1958; Jorgensen, 1963; Hall and Jorgensen, 1967, Tobin,1969). However, financial markets are not efficient as assumed in neoclassical framework or in MM (1958) prototype. Taxes (Kings,1974), transaction cost (Coase, 1937, Williamson, 1981), bankruptcy costs (Altman,1984), information cost (Myers & Majluf, 1984), quota and credit rationing (Stieglitz, 1981), agency cost (Jenson & Mackling, 1976), irreversibility, uncertainties and business cycle risk premium (Bernanke, 1981); directed lending program (Banerjee & Duflo,2014) etc. in financial markets are the sources of major imperfections that restrict a firm's smooth or equal access to capital market, increases the cost of external capital and makes them reluctant to invest even in positive NPV projects.

The substantial empirical studies including Fazzari, Hubbard & Peterson (1988), Bernanke & Gilchrist (1996), Rajan (1997), Kaplan & Zingales (1997), Cleary (1999), Shen & Wang (2005), Almeida & Campello (2007), Hovakimian & Hovakimian (2009), George & Qian (2011), Garcia & Gomez (2019), Akbas, Jiang & Koch (2020) among others analyzed the role of supply side limits of investible finance on firm's investment decisions and found that most of the firms demonstrate sensitivity towards internal cashflows in their investment decisions. Most of the prior empirical evidences confirmed the positive role of internal cashflows in stimulating investment and also indicated if firm faces internal financing constraints, capital markets are not efficient enough to finance their profitable investment opportunities and lead them to under investment or suboptimal investment problem. Do the Nepalese firms also face this kind of financing constraints? if so, how firms finance their growth and investment activities? and how such an investment problem can be solved with references to financial factors? This study is directed to resolve these issues.

This study aims to analyze the role of internal cashflows on firm's investment decisions controlling the effect of sales growth as a proxy for investment opportunity. Firms were classified into two groups i.e. financially constrained (FC) Vs financially unconstrained (UC) panel to test the hypothesis that degree of investment cashflow sensitivity monotonically increases with severity of financing constraints. Hence, the main hypothesis of this study is to measure the investment cashflows sensitivity and to examine whether the financially constrained firms have higher investment cashflow than less financially constrained firms.

Investment being irreversible in nature suffers with substantial risk and

uncertainty. The resources that are committed in a particular project cannot be reversed costless if the technology, market and product demand changes unfavorably. Every investment decision determines the course of the firm for many years to come. Consequently, inefficient, faulty and suboptimal investment decisions might threaten the survival of the firm and often leads them to bankruptcy. Therefore, a decision about what projects to undertake and which project to reject is perhaps the single most important decision that a firm would undertake (Copeland & Kuldeep, 2009). It is therefore, highly appealing to investigate the investment decisions of firms theoretically and practically to minimize the risk of decision errors of managers and develop better understanding on how to choose the best course of action out of alternative paths. Therefore, this study contributes to the body knowledge in investment literature of Nepalese companies.

This study is limited to the specific method, variable, and data. It has adopted the quantitative approach of research with primary focus on secondary data obtained from the audited annual reports of the non-financial listed companies of Nepal. The secondary data has been limited to historical accounting information extracted from the published financial reports of NEPSE listed non-financial companies of Nepal. This study is limited to the specific dependent and independent variables. The dependent variable in investment equation represents only the investment incurred by firms to acquire the fixed assets during the year. A firm's investment may take various forms like investment in R&D, technology development, investment in inventory, investment in human resource development etc. However, this study only considers the firm level fixed assets investment only. Similarly, internal cashflows variable restrict itself to the operating cashflows earned by the firms during the period. The cashflows from the sale of fixed assets and financial claims have not been considered. To measure the investment opportunities, market to book value ratio of stocks has been considered as appropriate measure of Tobin's Q.

Literature Review

During past century, several theories were developed to explain the firms' investment decisions under market imperfection. Broadly these theories discuss the “macro” and “micro" concerns. The “macro” concern links the investment to business cycle fluctuations, which are largely explained by market-based indicators of expected

future profitability or the user cost of capital (Bernanke & Gilchrist, 1995). In contrast, "micro" concern links to the 'informational asymmetry' idea of insurance market (Hubbard, 1998). In this view, two significant frictions wedge the gap between the cost of internal and external finance. First, unequal information between borrowers and lenders create adverse selection problem, where external investors cannot distinguish between bad and good borrowers and to compensate with such "lemons", investors may ask "loan premium", that increases the cost of external funds for borrowers. Next concern is related to incentive design problems which urges to misuse of funds by firm insiders or managers for the purpose other than the value maximizing goals of shareholders. To cope with such incentive problems and control managerial actions, the external investors demand a higher rate of return in their investment, resulting external funds being more costly than internal fund (Townsend, 1979).

The study by FHP (1988) was ground breaking in investment cashflow research, as it was the first of its kind to examine the influence of financing frictions, such as informational asymmetry and moral hazards problems, in causing adverse effects on investment decisions and resulting higher investment cashflow sensitivity. They argue that the sensitivity of investment to internal funds should increase with the wedge between the costs of internal and external funds *(monotonicity hypothesis*). Their study revealed that financing frictions give rise to "financing hierarchies" among firms, leading to varying investment decisions based on whether internal or external finance is used. These results found true even to large firms, particularly during tough periods. Hence, their results provided an empirical support to the existence of financing constraints among the large sections of the US firms and such constraints have implications in firm's investment decisions.

Firm's sorting approach used by FHP (1988) is questioned by Kaplan and Zingales (1997) and argue that the monotonicity hypothesis is not a necessary property of optimally constrained investment. Using the same sample data of FHP (1988), they report new evidence that contradicts with Fazzari et.al. findings. Cleary (1999) found least ICFS among unhealthy and financially constrained firms and concluded that such behavior of unhealthy firms could be attributed to their tendency of building financial slack for long-term value. Similarly, Sen & Wang (2005) attributed to a firm's strong bank relationship as a moderating factor that could change the firm's investment behavior associated with internal cashflows. Erickson and Whited (2000), Gomes

(2001), and Alti (2003) further displayed that the results reported by Fazzari et.al. are consistent with models in which financing is frictionless.

Almeida & Campello (2007) empirically disclosed the intervening effect of tangibility (collateral) to alleviate information problem in financial markets and induce investment decisions even in the crisis of internal cashflows. Chen & Chen (2012) questioned the investment cashflow sensitivity as a measure of financing constraints and ruled out the claim of decline of investment cashflow sensitivity due to deepening of financial markets. Analyzing the data of underdeveloped capital market, Tran and Le (2017) found that financial frictions of the market affect investment behavior only for the firms with negative cash flows, which implies that better financial conditions alleviate the financing constraints and also the sensitivity of investment to negative cash flow. This study also suggests that this effect is greater for larger firms and firms without state ownership.

Gautam & Vaidya (2018) investigated the investment- cashflow sensitivity of Indian manufacturing companies stressing more on ex-post firm splitting criteria. In their view, liquidity constraints have considerable evidence to explain the behavior of corporate investment in India. They displayed that the investment cashflow sensitivity (ICFS) is not consistent measure related to firm creditworthiness. A monotonic pattern can only be observed in ICFS if the sample splitting criteria impose more restrictions that are likely to exclude more firms classified as non-sensitive. They also indicated that the investments of non-sensitive ICFS companies are mostly funded by external capital. Non-sensitive firms invest heavily regardless of the availability of cash flow. Moreover, investments of positive ICFS companies are more cash flow sensitive as compared to other two groups. Their findings seem to have some support for both Fazzari et.al. (1988) and Kaplan and Zingales (1997) perspectives.

Gupta & Muhakad (2019) examined the impact of financial development on corporate investment in terms of their influence on financing constraints and investment-cashflow sensitivity across the size, degree of financial severity and group affiliation of the firm. In their study, it was found that the Indian firms are revealed investment cashflow sensitivity supporting the financial constraint hypothesis. However, such sensitivity was reduced along with the increment of financial development specifically for small sized and standalone firms.

In contrast, there are very few studies that specifically explore the investment

cashflow sensitivity in the context of emerging markets, particularly in Nepal. Pradhan & Kurmi, (2004) found that investment of Nepalese firms is seriously affected by cashflow constraints due to severe imperfection in capital market. In their observation, Koirala & Bajracharya (2004) characterized Nepalese capital market suffering the problems noted with corporate governance, transparency and disclosures seriously dented, run with relatively weak contract enforcement and regulatory mechanisms, dominated with banking sectors companies and less diversified to real sectors. In such a market, firms seeking to finance new project face serious constraints from the investor's side. For example, a growth firm might be unable to finance its investment fully with its existing cashflows, leading to internal financing constraints. A study by Subedi (2023) indicated the detrimental effect of financing constraints on firm's investment decisions, particularly when their internal cashflows are depleted. This conferred a crucial implication, which is the existence of financial market frictions resulting adverse effect on firm's investment activities.

Research Methodology

This study is based on quantitative information obtained from financial statements of Nepalese non-financial firms. Hence, it follows the quantitative approach using descriptive and causal comparative research design. Secondary data were used for empirical testing for the firm's investment cashflows sensitivity. Majority of Nepalese listed companies comprise from banking, finance and insurance sectors. However, these companies were excluded from study because the nature of their investments is different from nonfinancial firms. Hence, this is primarily based on sample study of Nepalese listed companies from non-financial sector of economy that comprised manufacturing, hotel, hydropower, telecom and trading sector firms (N=62). Initially, all non-financial firms were considered for sampling, but those with missing observations on study variables for at least five consecutive years during the study period (1999/2000 to 2019/20) were excluded. Under this selection criteria, the final sample, thus constituted an unbalanced panel of 262 firm-year observations representing 16 non-financial firms (n=16). Therefore, the sample size can be regarded as 24.61% of total population from non-financial sector listed companies. The sector of business, number of firms and number of observations that constitutes this study is presented in table 1 as follows:

Table 1

Sampling frame and sample observations for study

Sn	Sector	Sampling frame (No. of listed firms)	Sample taken (No. of Firms)	No. Observation
1	Manufacturing & Processing	19	6	104
2	Hotel Sector	4	3	58
3	Hydro Power	35	5	65
4	Trading sector	4	1	20
5	Utility Sector	1	1	15
	Total	63	16	262

An investment function of a profit-maximizing firm with no credit constraint can be derived from an optimal input choice decision under neo-classical framework (Sargent, 1975). However, the assumptions of no credit constraints are restrictive and partial. In the presence of asymmetric information and agency conflicts, the firms with good prospects of future profitability also fall short of the amount required for acquiring the optimal capital stock. The methodological shortcomings neoclassical models have been inspired a plethora of studies focusing to measure the effects of financial constraints on investment. The financial constraint may be due to government-imposed restrictions (like directed credit that discriminates against certain sectors), or problems of moral hazard and adverse selection in the credit markets arising from asymmetric information (Stiglitz and Weiss, 1981). With abundant sources of firm-level panel data, it is now possible to analyze the frequency and severity of information and incentive problems and conclude how these imperfections affect investment decisions.

There are two alternative approaches of framing the investment function for empirical estimation. In its first prototype, "an explicit investment function is derived, under some restrictions on functional forms, from the closed form solution of a firm's optimization problem" (Chatelain, 2000). Second empirical specification of the investment function can be obtained through the parameterization of the Lagrange multiplier under the binding credit constraint. Consistent to its theoretical grounds, for the specification of the investment, two types of firms, i.e., credit constrained Vs. unconstrained should be obtained with ex-ante classifications and one of the approaches can be used to test the credit constraints.

Tobin (1968) and Hayashi (1982) provide the theoretical framework behind several recent empirical studies of firm's investment behavior. In their framework,

internal funds had no role in firms' investment decisions; only expected future profitability captured in Tobin's Q have full exogenous effect on investment. However, such models require strong assumptions and the empirical results from these models are not encouraging enough. These models assume fully informed, competitive and perfect capital markets. But such assumptions are restrictive. The fact that financial constraints may, therefore be a real problem motivates the inclusion of internal cashflows in the investment functions. The tests for the presence of financing constraints is conducted by adding proxies for the availability of internal funds in Q models derived under the assumption of perfect capital markets.

Fazzari et.al. (1988) pioneered to specify and test an investment model that augmented the Tobin's Q equation with internal cashflows. If the firms are in severe financing constraints, they proposed, the internal cashflow should explain the firm's investment problem. Hence, the reduced form investment equation under financing constraints takes the following form as reported in equation 1.

$$(I/K)_{it} = f(X/K)_{it} + g(CF/K)_{it} + \mu_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where I_{it} represents net investment in fixed assets for firm i during period t; and taken as outcome variable. It is obtained by differencing the end of period net fixed assets with beginning of period net fixed assets plus depreciation of the period. X is the vector of investment opportunity set variables, including lagged values, that have explained as determinants of investment, and CF/K is the internal cashflows of the firm during the period defined as net income plus depreciation and amortization and μ is an error term.

Investment opportunity (X) in equation (1) is an important control variable. Theoretically, the marginal Q is the good approximation of present and expected future profitability. However, practically, marginal Q is unobservable, so many empirical studies use the average Q defined as market to book value ratio of common stock. When the stock market is well developed, average Q well captures the assets-based investment fundamentals of investment opportunities. In our case, the companies that have been selected for the study do not have their market trading regularly, and in Nepalese capital market, only a limited number of non-financial companies are listed, so this study. It has used alternative measure for investment opportunity.

Sales scaled by beginning of period net fixed assets (S/K) has been used alternatively as a proxy for the investment opportunities in this study. This proxy has been used in other similar studies on developed and developing economies for example; Lensink & Sterken (1998), Chen & Chen (2012), Agca & Mozumdar (2017) Garcia & Gomez (2019) and more often, it outperforms Tobin's Q. The coefficient 'g' depends on the firm's internal cashflows (CF/K); it represents the potential sensitivity of investment to firm's internal cashflows- after controlling the investment accelerator.

In sum, theoretical statement of investment model is obtained in fixed assets (I/K) which may have regarded as subject to constraints of sales scaled by net fixed assets (S/K) or (alternatively M/B ratio) and cashflows (CF/K) as an additional proxy for financing constraints. Hence, in this study the baseline regression equation for investment has been estimated as reported in equation (2);

$$\mathbf{I/K}_{it} = \propto + \beta_1 \mathbf{(S/K)}_{it} + \beta_2 \mathbf{(CF/K)}_{it} + \mu_{it} \text{ ----------} \quad \mathbf{(2)}$$

In the given specification, $\beta_1 > 0$ and $\beta_2 > 0$, if the investment accelerator and financing constraints matter for investment.

Estimation of investment equation for FC and UC firms

It is hypothesized that there is financing constraint among the firms which affects the relationship between the sensitivity of investments and the internal funds. As stated earlier, firms that belongs to sever information problem faces higher level of financing constraints than those which have less information asymmetry due to larger size, better networths, matured status, better bank relationship or any other attributes. In such a condition where asymmetric information is substantially reduced, cashflow sensitivity to investment should be negligible or zero. Accordingly, our hypothesis is that investment is insensitive to liquidity when firms belong to less information asymmetric regime but more sensitive when information asymmetry is more severe. These two specifications are proposed to examine this hypothesis as follows;

If level of financing constraint is < threshold value (Zfc)

$$\mathbf{(I_{it}/K_{it-1}) = \beta_0^{(1)} + \beta_1^{(1)} (it\text{-}1) + \beta_2^{(1)} (CF_{it}/K_{it-1}) + \alpha_i^{(1)} + \epsilon_{it}^{(1)}} \quad \mathbf{\ldots\ldots\ldots\ldots\ldots\ldots(3)}$$

If level of financing constraint is > threshold value (Zfc)

$$(I_{it}/K_{it-1}) = \beta_0^{(2)} + \beta_1^{(2)} (X_{it-1}) + \beta_2^{(2)} (CF_{it}/K_{it-1}) + \alpha i^{(2)} + \epsilon_{it}^{(2)} \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Additional control variables like tangibility and square of cashflows are also included in estimated regression equations to capture the properties of cashflow models as suggested by Almeida and Campello (2007), Cleary (2006) among others. The testing strategy proceeds as follows. First, the level of firms financing constraints is estimated using discriminant score and threshold value (Zfc) is obtained. Then this threshold (Zfc) is used to divide the sample into two sub-samples. For example, when discriminant score (Zfc) is less than median value, firms are assumed in financially constrained and, hence, keep higher liquidity on hand; this suggests that $\beta 2^{(2)}$ should be positive and significant. Conversely, while discriminant score (Zfs) is greater than median value, firms are in a frictionless financing regime and need not to maintain liquidity when investing, which is indicative of insignificant $\beta 2^{(1)}$. The non-linear effect of internal funds on asymmetric information is thus estimated as;

$$H_0 = \beta_2^{(2)} > 0, = \beta_2^{(1)} = 0$$

Alternatively the hypothesis takes the following form:

$$H_1 = \beta_2^{(2)} > \beta_2^{(1)}$$

Firm Classification Strategy

Many criteria have been used to split the firms into different financing constraint level in the studies of many industrialized countries. The dividend payout ratio, (Fazzari, Hubbard and Peterson, 1988), firm size (Gertler and Gilchrist, 1994), bond rating (Gilchrist & Himmelberg, 1998), association with business groups and banks, (Hoshi Kashyap and Scharfstein1991), Discriminant score (Cleary, 1997) etc. are the major basis taken for sample splitting criterion. Fazzari, Hubbard, and Petersen (1988) used dividend payout ratio first, to classify the firms and it been used in a number of subsequent studies. The rationale behind such splitting criteria, that when firms pay dividends, it endogenously reveals that they give a low shadow value to internal funds. The size split has also been used widely to differentiate between *constrained* and *unconstrained* firms (Gertler and Gilchrist, 1994; Carpenter, Fazzari, and Petersen 1996).

Table 2

Firm Classification Strategy

Authors	Classification Variables
Fazzari et al. (1988)	- Dividend Payout ratio
Devereux and Schiantarelli (1990)	- Age - Size - Age+ size
Hoshi et al (1991)	- Group membership
Bond and Meghir (1994)	- Dividend over capital stock + share issues
Chrinko and Schaller (1995)	- Age - Concentration of ownership - Group membership
Gilchrist and Himmelberg (1995)	- Dividend payout ratio - Size - Existence of bond rating
Kaplan and Zingales (1997)	- Qualitative data from financial statements
Cleary (1999)	- Financing constraints index (Altman Z) - Multivariate analysis
Greenway et al (2005)	- Liquidity - Credit rating
Whited (2006)	- Dividend policy - Group membership
Hovakimian & Hovakimian (2009)	- Firm level estimate of investment cashflow sensitivity

This study first takes dividend payout as a subjective measure to classify the firms into financially constrained and unconstrained regime. However, to overcome the problem of subjective approach, multivariate discriminant analysis approach developed by Altman to estimate financial bankruptcy and subsequently used by Cleary (1999) to classify firm's financial condition has been used in this study. It employs five independent variables taken as proxy for firm liquidity (CR or CF/K), leverage (DR), profitability (ROA), assets efficiency (ATR) and growth (SG). The hypothesis is that these variables are able to predict financing constraints of firms in subsequent period. Coefficient values are estimated that best distinguish each independent variable between the two groups according to the following equation (5);

$$Z_{fs} = B_1 Current\ Ratio + B_2 ROA + B_3 Sales\ Growth + B_4 Debt\ Ratio + B_5\ Assets\ Turnover. + B_6\ Cashflows/K \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Based on literature review and methodology discussed, the description of various explanatory variables, their roles and significance for modeling has been mentioned in this table 3 as follows:

Table 3

Major variables affecting investment decisions

Major variables	Definitions/ proxies	Expected sign	Prior studies
CF/K	Cashflows scaled by beginning of period capital	+	Fazzari et. al (1988), Kaplan & Zingales (1997), Cleary (2006), Gomes (2001)
$(CF/K)^2$	Square of cashflows scaled by beginning of period capital	+	Cleary (2006), Almeida & Campello (2007), Chen & Chen (2012)
Sales/K	Sales divided by fixed assets	+	Erickson and Whited (2000), Gomes (2001), Alti (2003), Gautam & Vaidya (2018)
Tangibility	Fixed assets divided by total assets	+	Almeida & Campello (2007), Gautam & Vaidya (2018)

Results and Discussion

Firm Classification Results

Discriminant equation (5) requires an overt variable to categorize firms into two mutually exclusive groups. status of dividend payout is the best subjective measure of classification of into financially constrained and unconstrained group. The firms that pay (or did not pay) dividend in period 't' is assumed to be 'Unconstrained' (or financially constrained) firm for objective sorting purpose under discriminant analysis. The independent variables shown in equation (5) were assumed to capture financial characteristics like liquidity, profitability, leverage, assets turnover and growth of the firm. Unstandardized Discriminant Function Coefficients for the given observations showed the following results for group classification.

$$Z_{fs} = -0.578+ 0.021CR + 0.546\ ROA + 2.996\ CF/K +0.0.161GROWTH + 0.107 + 0.211ATR – 1.421\ Debt\ Ratio \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The discriminant function classified 76 firm-year observations as predicted group one (likely to no dividend payout group) and 169 firms-year observations were classified as predicted group two (likely to dividend payout group) firms. While in the original grouped cases, the 100 firm-years observations were classified into first group (increase or no change in dividend payout) and 162 firm-years observations were classified into second group (decrease or no dividend payout) of firms. The relative importance of identified variables in terms of their power to discriminate the firms with financial constraints against the firms without financing constraints can be captured in the following structure matrix as follows in table 4.

Table 4

Discriminant coefficients and test statistics

Parameters	Function 1	Test statistics	
Sales Growth	0.161	Wilk's Lambda	0.785
Return on Assets	0.546	Chi square	58.223
Total Debt/Total Assets	-1.42	P-value	0.000
CF/Kt-1	2.996	Eigenvalue	0.275
Assets Turnover	0.211	Canonical correlation	0.464
CA/CL	0.021	Classification accuracy	73.9%

It is very essential to determine "cut off point" to classify a firm as either financially constrained or unconstrained group. It is the most difficult to assign a firm into one of the two groups: financially constrained or unconstrained group. The groups' centroids: are -0.697 for constrained firms and 0.391 for unconstrained firms; that can be used to assign group membership. A company with z-score close to -0.69 is constrained company and if it is close to 0.391 is unconstrained company. However, it cannot give exact "cut off point" to sort the firm-year observation. So, the group centroid was weighted averaged to obtain cut-off value since the sample size is not equal. The cut-off point as per weighted average of centroid is still -0.69. According to this procedure, if the average of the centroids is -0.69, it can be said that a company is constrained, if its Z-score is less than or equal to -0.69, and it is a financially unconstrained, if Z-score is more than zero (-.069).

The table 5 presents the classification result. Largely, the independent variables successfully predict the firms in Group 1 if they will cut or pay no dividend in period $_t$

from period $_{t-1}$ and predict the firms in Group II which increases the payout ratio or paid their dividend in period $_{t}$ from period $_{t-1}$. In total, the firms are being properly classified at 73.9 % of the original group cases of all time.

The following are classification result of sample of firms-year observations of Nepalese non-financial sectors of enterprises. Firms are classified into groups according to a beginning of period financial constraints index (Z_{fs}), The index is determined using multiple discriminant analysis considering an entire profile of characteristics shared by a particular firm and transforming them into a univariate statistic.

Table 5

Classification Results of firms [a,c]

		Dividend Status	Predicted Group Membership		Total
			Dividend paying firm	Dividend not-paying firms	
Original	Count	Not Paid	50	38	88
		Paid	26	131	157
	%	Not Paid	56.8	43.2	100.0
		Paid	16.6	83.4	100.0
Cross-validated	Count	Not Paid	47	41	88
		Paid	27	130	157
	%	Not Paid	53.4	46.6	100.0
		Paid	17.2	82.8	100.0

a. 73.9% of original grouped cases correctly classified.
b. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
c. 72.2% of cross-validated grouped cases correctly classified.

Table 6 reports summary statistics of mean, median, P_{25}, P_{75} and standard deviations of various financial variables for the sample period which confirm that firms likely to reducing dividends or no dividends (FC Panel) exhibit lower Current Ratios, lower Assets Turnover Ratio, higher Debt Ratios, lower Return on Assets, lower Cashflows, and sluggish Sales Growth than the firms (UC Panel) that are likely to increase or no change in dividend in period 't'. The characteristics of firms in terms of their financial variables are significantly different between FC panel and UC group. The FC panel firms exhibit lower return on assets (ROA) and higher debt assets ratio

as compared to UC group. These firms' investment to capital stock ratio is average of 7.79% as compared to 17.79% of UC panel. The cashflows to capital (CF/K) ratio for FC group is very poor i.e. 7.24% in comparison of 43.5% of UC panel. Sales growth taken as a measure of firm investment opportunities is noticed higher in UC panel as compared to FC panel. The sales growth ratio is only 9.68% in FC panel as compared to average growth of 11.41% in NFC panel of enterprises. The higher variability of sales growth is noticed in FC group.

The followings are the reports of financial variables statistics for the sub-sample of firms categorized inti financially constrained Vs Unconstrained group on the basis of threshold value of discriminant score. The table presents P25, Mean, median, P75 and Standard Deviation of financial variables. All financial variables are for the beginning of period of the fiscal year except for cash flow and investment, which represents firm cashflows and investment in fixed assets during period t. K is the firm's beginning of period net fixed assets value. The discriminant score (Z_{fc}) is calculated using the parameter coefficients obtained in discriminant equation 7.

Table 6

Summary statistics of classified sample by Fisher's linear discriminant functions

Zfs	Variable	Mean	SD	p25	p50	p75	N
FC group	Invest/K	.0779	.1229	.0075	.0341	.0921	76
	Sales/K	1.681	2.076	.214	.5987	2.374	76
	Cashflows (CF/K)	.0724	.0779	.0096	.0591	.1352	76
	Leverage (TD/TA	.7475	.1993	.6199	.7594	.923	76
	Liquidity (CR)	1.098	.9752	.5316	.9279	1.067	76
	Sales Growth	.0968	.2354	-.0512	.1052	.239	76
	Tangibility (TANG)	.7759	.168	.6802	.8171	.9183	76
	Discriminant score (Zfc)	-1.231	.363	-1.464	-1.239	-.9313	76
UC Group	Invest/K	.1779	.1576	.0412	.1358	.2983	168
	Sales/K	2.702	2.621	.4641	1.755	4.255	169
	Cashflows (CF/K)	.435	.259	.2218	.378	.6171	169
	Leverage (TD/TA	.3994	.2173	.2381	.3822	.5329	169
	Liquidity (CR)	3.369	8.703	1.18	1.503	2.095	169
	Sales Growth	.1141	.1767	.0135	.1052	.2251	169
	Tangibility (TANG)	.6515	.1835	.4857	.6776	.8256	169
	Discriminant score (Zfc)	.5535	.8895	-.1182	.2988	1.203	169

In table 6, it is noticed that the FC groups of firms invest only 7.7% of capital stock in average value and its median value is only 3.2%. The standard deviation in investment is highest among the Unconstrained groups (15.57%). Unconstrained (UC) groups of firms have annual average investment rate is 17.79%. However, the median value of investment ratio in these group is found 13.58% and fluctuation of investment is 15.76%.

Univariate significance level displayed in table 7 indicates that Debt Assets (Leverage) ratio, Cashflows/K, Return on Assets, assets turnover ratio is significant at 1 % level of significance, current ratio is significant at 10% level where as Sales Growth is not significant. The equality of group means is tested by Wilk's Lambda and F- Statistics as shown in table 7. Similarly, the average sales growth, assets turnover, cash flow ratio and ROA are smaller for financially constrained groups in comparison of 'Unconstrained Group' but leverage ratio is greater in financially constrained group. Correspondingly the standard ratio performs higher variability in all cases for 'Financially constrained' group.

Table 7 reports predicted group wise statistics (mean value) and the classification function coefficients and its significance level by various measures of statistical test for individual level of independent variables used for deriving discriminant equation. The firms with financing constraints is classified as predicted group 1 and financially unconstrained is grouped in predicted group 2.

Table 7

Test of equality of group means

Variables	Predicted Group 1	Predicted Group 2	Wilks' Lambda	Sig.
Cashflows/K	0.16480	0.276858	0.816	.000
Sales Growth	0.14510	0.708056	0.999	.575
Profitability	0.07998	0.147053	0.881	.000
Utilization Efficiency	0.58390	0.803958	0.950	.000
Liquidity	1.48299	8.942962	0.985	.050
Total Debt Ratio	0.58716	0.237192	0.949	.000

Table 8 reports that the company that belongs to financially constrained regime in almost of the time have substantially lower annual average investment rate

than the companies that belong to Unconstrained regime. According to discriminant classification, SMHPL has been to financially constrained groups over the total sample period and its annual investment rate is 3.29% only.

Table 8

Average annual investment rate of companies by their status of financing constraints

Name of sample company	Annual average investment	Status of financial constraints (% of sample period)	
		FC	UC
Arun Valley Hydro Power Company (AVHPCL)	13.62%	-	100
Bottlers Nepal Limited (BNL)	20.82%	28.6	71.4
Bottlers Nepal (Terai) Limited (BNTL)	26.07%	18.2	81.8
Butwal Power Company (BPCL)	13.78%	5.2	94.7
Chilime Hydro Power Company (CHPCL)	18.99%	6.6	93.3
Himalayan Distillery Limited (HDL)	11.85%	11.2	88.8
National Hydro Power Company (NHDL)	6.83%	63.4	36.6
Nepal Lube Oil Limted (NLOL)	12.52%	33.4	66.6
Nepal Telecom (NTCL)	26.97%	-	100
Oriental Hotel Limited (OHL)	7.35%	79	21.0
Shivam Cement Limited (SCL)	27.89%	-	100
Saoltee Hotel Limited (SHL)	13.92%	26.4	73.6
Sanima Mai Hydro Power Limited (SMHL)	3.29%	100	-
Salt Trading Corporation (STCL)	7.08%	84.3	15.7
Taragaun Regency Hotel Limited (TRHL)	1.04%	62.5	37.5
Unilever Nepal Limited (UNL)	16.35%	-	100

Similarly, the companies like TRHL, NHPL, STCL, OHL, and NHPL are classified into financially constrained regime over the 60% of time out of their total sample period and simultaneously their investment rate is observed less than 8% over the whole sample period. On the other hand, AVHPL, SCL, NTCL, and UNL are the companies classified as financially not constrained during the whole sample period and if their investment rate is observed, it has been found more than 13.62% in an annual average. Companies like SCL, BNTL, NTCL and BNL have shown an attractive annual average investment rate of more that 20% of their capital stock in each of

the sample period. Hence, it also reveals that the firms' classification strategy based on discriminant score index (Zfc) do the good job particularly showing the observed differences in investment rate and practices of the firms.

Table 8 reports the status of average investment by Nepalese non-financial enterprises over the study period and their financing constraints level. Investment is the mean investment percentage of capital stock. FC denotes the financially constrained status on the basis of discriminant score. NFC stands for not-financially constrained firms as per the discriminant score calculated using equation 7.

Regression Results

In this section, regression equations for various sub-samples are estimated using split-sample criterion based upon discriminant score. Following the approach of various past studies and particularly the study of Cleary (1999), firms-year observations were grouped into financially constrained and Unconstrained regime based on discriminant score obtained from discriminant analysis using eq. (6) which split the firms as per objective classification scheme based upon their dividend payout behavior.

Table 9 presents the estimation results of OLS and REM model. These models are estimated using eq. (2), (3) and (4) respectively. The first row shows the coefficients of investment opportunity as measured in sales accelerator value. The third row reports the coefficient of assets tangibility. The basic idea lies behand that when financially constrained firms lack internal cashflows, then their investment should be affected by tangibility since the firms with higher collateral capacity have easy access to external debt market. The priori hypothesis of this partial equation model is that the investment of financially constrained firms should have higher positive coefficient of tangibility similar to cashflows since it also acts as the instruments for reducing financing constraints since it alleviates the information asymmetry of the firms. However, the regression results are not supportive to the expected hypothesis. The tangibility coefficient is not significant in all models however they are positive as per our prior expectation. In all of the models, results are not significant.

Reported coefficients are the regression estimates for split-sample of Nepalese enterprises(n=256). Capital expenditure (normalized by net fixed assets) is the dependent variable. The independent variables are Cash flow (CF/K), and Sales/K in cashflow model and additional inclusion of tangibility and square of cashflows/K

in tangibility models respectively. OLS and Random Effect Model estimation results are presented in all of the financial constrained (Zfc -0.069) and Unconstrained group (Zfs>0.-069) split under weighted average values of group centroids of FC and UC panel predicted by discriminant analysis.

Table 9

Regression Result for FC and UC group

	Pooled OLS		**Random Effect**	
	(1)	(2)	(3)	(4)
	FC	**UC**	**FC**	**UC**
Sales/K	0.0090	-0.0110	0.0108	-0.0084
	(0.0142)	(0.0065)	(0.0130)	(0.0078)
CF/K	1.0205**	0.4043**	0.8495**	0.3326*
	(0.3598)	(0.2345)	(0.4385)	(0.2400)
Tangibility	0.1284	0.02772	0.1780	0.03965
	(0.1394)	(0.0833)	(0.1637)	(0.0884)
Square of CF/K	-3.1888	-0.1342	-2.7731	-0.05467
	(1.6758)	(0.2261)	(2.1603)	(0.2241)
Constant	-0.07504	0.04784	-0.09780	0.04406
	(0.1294)	(0.0981)	(0.1465)	(0.0956)
N	76	168	76	168
R^2	0.0965	0.1139	0.0909	0.1133

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.000$

In second row of the table 9, the results of cashflows coefficients are presented. Similar to prior expectation, in all of the models, the coefficients are significant and positive. More interestingly, the cashflows coefficients of Financially Constrained (FC) group are stronger and significant in all models (OLS & REM) as compared to Not-Financially Constrained (UC) group of firms. The cashflow coefficients of FC groups ranges from 0.3326 to 1.0205 in different models but in case of UC groups, some of the coefficients are not significant and those that are significant ranges from 0.3326 to 0.4043. It means the variation in cashflow coefficients of FC and UC groups is noticed at least by 0.51. However, the estimation of OLS may be biased since it ignores the idiosyncratic risk. When operating cashflows is employed as the measurement of

liquidity, the focused coefficients in the two regimes, FC and UC are 0.4043 and 0.3326 respectively, with the both being statistically significant and positive, that fully supports the hypothesis.

The conventional liquidity measure of 'cash flow provides' support for the notion of non-linear effect of asymmetric information on investment decision. This result evidences financing constraints hypothesis in Nepalese financial market. It implies that the firms with higher level of financing constraints may have to cut their profitable investment opportunities due to paucity of external finance. The coefficients of square of cashflows are negative and insignificant in all models of FC panel and UC panel. It indicates that with increase in cashflows, its sensitivity to investment decreases in UC group. In FC firms the cashflow sensitivity to investment remains negative indicating that cashflows decreases quadratic level. It further supports the severe cashflows sensitivity of investment in financially constrained firms.

The results evidently support the financing constraint hypothesis. In both, FC and UC models, cashflows (CF/K) coefficients were not only statistically significant predictor of investment but also predicted the level of financing constraints of the firms, since the results displayed that cashflow coefficients of FC firms were larger than UC firms. This result supports the evidences by FHP (1988), Bond & Meghir (1994), Hoshi, Kashyap & Scharfstein (1991), Gilchrist & Himmelberg (1995) and contradicts with Kaplan & Zingales (1997), Cleary (2006) Agarwal, Taffler, Bellotti & Nash (2016) among others. Financially unconstrained (UC) firms show little concern for internal cashflows in their investment decisions, meanwhile investment responses of financially constrained (FC) firms increase monotonically to their internal cashflows.

Conclusion and Implication

The investment behaviors of firms vary significantly, and these variations can be partly be explained examining financial variables, especially internal cashflows. Neglecting the financial aspects by focusing solely on investment opportunities (Tobin's Q), can greatly obscure a firm's investment behavior. moreover, the internal cashflows determine investment behavior of all Nepalese firms but it is more prevalent financially constrained firms. FC firms is more sensitive to fluctuation in internal cashflows than those of unconstrained firms (UC). The differences found in coefficients of cashflow variables across the FC Vs. NFC groups of firms confirmed the different degree of

investment cashflow sensitivity among the Nepalese firms. When the firm's financial health worsened the level of investment cashflow sensitivity intensified and vice-versa. It showed the level of financing constraints have negative effect on firm's investment. Such a behavior of investment could be attributed to information and agency problems as postulated in imperfect capital markets theories. Consequently, investment cashflow sensitivity could be a measure of financing constraints in Nepalese firms. The practical implication of this study conveys; the firm specific financial factors like strong internal cashflows, and sufficient networth of the firms could alleviate different forms of market imperfections and encourage investment and growth of the firms.

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