Investigating the effect of volatilities in cash flow on investment due to financial constraints

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Abstract: One of the factors that affects investment on the firm's investment decisions is cash flow and how it flows in the firm and in particular its volatilities. The aim of this study was to investigate the relationship between volatilities in cash flow and investment in firms with financial constraints. Assumptions of the study was collected based on information from 144 companies listed on Tehran Stock Exchange during the years 2001 to 2012 and were analyzed using regression analysis. The results show that there are no significant relation between the volatility of cash flow and investment.

Key words: investment, cash flow volatility, financial constraints.

1. Introduction.

In this paper, we address two questions. First, what is the dynamic relationship, if any, between investment and cash flow volatility? Second, is the relationship asymmetric relative to the effect of positive and negative cash flow growth realizations? For each question, we investigate the possible differential impact of financial constraints. Despite existing discussion on the dynamic link between investment and cash flow volatility in real option literature, to our knowledge these questions have not been explicitly addressed in the empirical literature. Previous studies have evaluated the impact of cash flow volatilities on investments as a symmetrical impact. But it seems that perhaps creditors would have a favorable and hopeful look to achieve positive growth in cash flow and an undesirable and despair look at negative growth in cash flow. From this perspective, achieving the positive growth in cash flow reduces the financial constraints, while the realization of negative growth in cash flow increases the financial constraints. So, we can say that in companies experiencing financial constraints where the growth of cash flow is negative (positive), a reverse (direct) relationship is established between the past volatility of cash flow and investment. From the perspective of real options, companies that are not experiencing the financial constraints, will not face a deficit of cash flows in future and therefore, cash flow volatility which doesn't create an incentive for additional investment, is an issue that is expected for companies with financial constraints. In addition, Boyl and Gadri (2003) suggested that high volatility in cash flow makes companies that are not experiencing financial constraints to delay investment in order to strengthen the inverse relationship between volatility in cash flows and the current investment. Based on the arguments above, it seems that there is a close relationship between conditional volatility of cash flows, current investment and future investment. Now, given the particular circumstances of the Iran's capital market and the differences that it has compared to large and old markets of the world, researchers are looking for validity of these arguments among the companies listed on the Iran Stock Exchange, that it is an issue which needs experimental test. Therefore, in this study, the relationship between the mentioned variables will be examined.

This paper proceeds as follows: Section 2 develops our hypotheses. Section 3 reviews the data set, constructs the variables, and examines variable properties. Section 4 tests our hypotheses. Section 5 discusses our results and conducts several robustness checks. Section 6 provides concluding remarks.

2. Development of hypotheses.

Does the relationship between investment and cash flow volatility differ between financially constrained and unconstrained firms? A financially constrained firm has limited access to external capital, and hence their ability to undertake investment is restricted. Moyen (2004) suggests financially constrained firms that face possible future cash shortfalls have increased cash flow

sensitivity, and hence they build cash stocks rather than fund investments. At the extreme, Minton and Schrand (1999) note that firms facing increasing financial constraints may choose to forgo current investment. Under these conditions, financial constraints amplify the negative relationship between cash flow volatility and investment.

Prior literature has treated the effect of volatility on investment as symmetric; however, lenders are likely to favourably view positive realisations of cash flow growth and poorly view negative realisations of cash flow growth. From this perspective, positive cash flow growth realisations relax financial constraints while negative realisations magnify financial constraints.

Hypothesis 1. Within financially constrained firms with negative cash flow growth realisations, there is a negative relationship between prior cash flow volatility and investment.

Hypothesis 2. Within financially constrained firms with positive cash flow growth realisations, there is a positive relationship between prior cash flow volatility and investment.

3. Data and Empirical Methods.

Is the identified relationship between volatility and investment asymmetric? To address this question, we focus on the effect of lagged variables using:

$$\begin{aligned}\mathrm{LnCAPXtoAsts}_{i,t} = {} & \alpha_0 + \alpha_1 \mathrm{CFV}_{i,t-1}^{high} + \alpha_2 \mathrm{CONS}_{i,t} + \alpha_3 \mathrm{CFRel}_{i,t-1}^{+} \\ & + \alpha_4 \left(\mathrm{CFV}_{i,t-1}^{high} * \mathrm{CONS}_{i,t}\right) + \alpha_5 \left(\mathrm{CFV}_{i,t-1}^{high} * \mathrm{CFRel}_{i,t-1}^{+}\right) \\ & + \alpha_6 \left(\mathrm{CONS}_{i,t} * \mathrm{CFRel}_{i,t-1}^{+}\right) \\ & + \alpha_7 \left(\mathrm{CFV}_{i,t-1}^{high} * \mathrm{CONS}_{i,t} * \mathrm{CFRel}_{i,t-1}^{+}\right) + \mathrm{CONTROLS}_{i,t} \\ & + \varepsilon_{i,t}\end{aligned}$$

where:

$\mathrm{LnCAPXtoAsts}_{i,t}$: Investment company

$$\mathrm{LnCAPXtoAsts}_{i,t} = \mathrm{Ln}\left[\left(\mathrm{CAPX}_{i,t}/\mathrm{Assets}_{i,t}\right) + 1\right]$$

$\mathrm{CAPX}_{i,t}$: That is, the Amounts capital expenditures buy fixed assets, intangible assets and other long-term assets annually

$\mathrm{Assets}_{i,t}$: Total assets

$\mathrm{CFV}_{i,t-1}^{high}$: SD cash flows over the past three years.

$\mathrm{CONS}_{i,t}$: To calculate the index, introduced by Hdlak and Pierce (2010) is used

$$\begin{aligned}\mathrm{SA\ Index}_{i,t} = {} & -0.737 * \mathrm{Firm\ Size}_{i,t} + 0.043 \\ & * (\mathrm{Firm\ Size}_{i,t})^2 - 0.040 * \mathrm{Firm\ Age}_{i,t}.\end{aligned}$$

$\mathrm{Firm\ Size}_{i,t}$: It is the natural logarithm of total assets.

$\mathrm{Firm\ Age}_{i,t}$. : The number of years the company's activity.

$\mathrm{CFRel}_{i,t-1}^{+}$: The positive growth of the company's cash flow. To calculate the cash flow growth from the following formula is used

$$(\mathrm{OCF}_{i,t-1} - \mathrm{OCF}_{i,t-2})/\mathrm{OCF}_{i,t-2}$$

OCF: Operating cash flow.

$\mathrm{CONTROLS}_{i,t}$: includes $\mathrm{Size}_{i,t}$,

$\mathrm{Sales\ Growth}_{i,t}$,$\mathrm{Assets\ Return}_{i,t}$,$\mathrm{OCF\ to\ Assets}_{i,t}$,$\mathrm{Leverage}_{i,t}$,

$\mathrm{G\&A\ Costs\ to\ Assets}_{i,t}$

The considered sample was studied during the period of 2000 to 2012 and in a 12-years period and included 144 companies on the companies listed in Tehran Stock Exchange.. In this section, mean, median (central criteria), standard deviation, maximum and minimum (scattering parameters) variables used are calculated and presented in Table1.

Before the study of Table1 It worth's to be noted that most of the final key variables used in this study were dummy variables (zero and one) and for this reason, in order to provide clear information in the section of descriptive statistics, the data on the basis of false information provided above are discussed. Meanwhile, although the primary firm-year value was 1872, but it faced a reduction after sorting and removal of outliers.

Table 1: Summary statistics

Variable	Number	Mean	Middle	Std Dev	Min	Max
$LnCAPXtoAsts_{i,t}$	1500	0/047	0/03	0/055	0/483	$4/24*10^{-6}$
$CFV_{1,t-1}^{high}$	1358	/28 88789	/63 19745	/9 323315	422134 9	191/51
$CONS_{i,t}$	1762	-3/49	-3/43	0/371	-2/64	-4/82
$Sales\ Growth_{i,t}$	1519	0/196	0/15	0/458	7/68	-0/85
$Assets\ Return_{i,t}$	1706	0/872	0/759	0/9	12/474	0/02
$OCF\ to\ Assets_{i,t}$	1497	0/05	0/03	0/063	0/622	$4/24*10^{-6}$
$Size_{i,t}$	1762	5/686	5/65	0/566	8/01	4/26
$Leverage_{i,t}$	1756	0/709	0/69	0/283	3/34	0/13
$G\&A\ Costs\ to\ Assets_{i,t}$	944	0/057	0/05	0/0522	0/5	0/01

Summary statistics including the number of observations, mean, Middle, standard deviation, minimum, maximum, are reported for variables. For all variables there are 1872 observations.

Table 2: Testing Hypothesis 1 and 2

Variable	Coefficients	SE	Stat. t	Sig. level
Constant	0/004	0/002	77 1/7	0 0/75
$CFV_{i,t-1}^{high}$	0/0001	/0004 0	/24 0	8 0/09
$CONS_{i,t}$	0/0006	/0007 0	93 0/9	3 0/47
$CFRel_{i,t-1}^{+}$	-0/0002	/0004 0	50 -0/9	6 0/1
$CFV_{i,t-1}^{high} * CONS_{i,t}$	-0/0005	/0001 0	0/4 -	6 0/88
$CFV_{i,t-1}^{high} * CFRel_{i,t-1}^{+}$	8/3*10-5	/0005 0	14 0/3	8 0/85
$CONS_{i,t} * CFRel_{i,t-1}^{+}$	0/001	/0008 0	17 1/3	2 0/41
$CFV_{i,t-1}^{high} * CONS_{i,t} * CFRel_{i,t-1}^{+}$	-0/0009	0/001	/51 -0	6 0/1
$Sales\ Growth_{i,t}$	0/0005	/0002 0	98 1/1	0 0/47
$Assets\ Return_{i,t}$	0/0001	/0002 0	47 0/8	6 0/32
$OCF\ to\ Assets_{i,t}$	0/867	0/002	/78 383	0 0/00
$Size_{i,t}$	-2/93*10-5	/0004 0	06 -0/9	9 0/44
$Leverage_{i,t}$	-0/001	/0005 0	45 -2/6	0 0/14
$G\&A\ Costs\ to\ Assets_{i,t}$	0/001	0/004	30 0/3	7 0/61
coefficient of determination	9 0/94	Statistics F		
coefficient of modified determination	0/994		/51 11652	
Durbin - Watson statistic	5 1/98	Chancestatistics F	0/000	

The results of model test showed that there is no significant relation between the volatility in cash flow and investment. The meaning of volatility of cash flow is the moderating effect of financial constraints and positive growth in cash flow on this relation. Therefore, the first and second research hypothesis are not acceptable. This is while the variables of sales growth and operating-cash-flow-to-assets ratio, have a positive and significant effect on the Company's investments of the current year and the financial leverage had a reverse effect on previous investment of the company.

4. Conclusion.

Identifying the effect of cash flow volatility on investment can give a better and more complete perspective to the managers and capital market participants in decision making and it causes

the optimal allocation of sources and eventually, economic growth. In this research, the relation between volatility of cash flow and investment has been examined in companies listed on Tehran Stock Exchange according to the financial constraints.

As it was evident in the results, the results of statistical tests showed that the firm's investment doesn't have a significant relation with volatility of cash flow and in the other words, cash flow volatility of the firm can't be effective on investment. According to rejection of the impact of volatility cash flow on the firm's investment, estimated moderating effect based on the previous researches were also rejected and in general, the proposed hypotheses in this study were rejected based on the results of experimental tests.

Comparing this result with the suggested arguments in previous studies, in all conditions implies the incompatibility of results. Kif and Tate (2013) considered the impact of cash flow volatility in investment in a research entitled " Is the relation between investment and conditional cash flow volatilities ambiguous, asymmetric or both? Their empirical evidence showed that firms with financial constraints reduce their investment when: (1) they experience an intense and continuous volatility of cash flow ; (2) they experience high volatility and the realization of negative growth in cash flow ; and (3) they have low levels of cash flow and experience the realization of negative growth in cash flow . in firms without financial constraints,the above impacts haven't been seen or they were economically nonsignificant. As can be seen, none of the research results is in accordance with the current study results.

It's necessary to mention that the operating-cash-flow-to-assets-ratio variable has a positive and significant impact on the firms' investments of the current year.

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