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Sensitivity to Changes in Cash Flows and Firm Value and Changes of Investments

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A B S T R A C T

The change in operating cash flow as a source of the companies' cash flow has a significant impact on asset structure and capital, including held cash, capital investment and external financing, so that the increase in cash of the companies, in the short term, increases savings and reduces the external financing and in long-term increases capital investment and external financing. Positive operating cash flow does not guarantee the good performance of the company. If operating cash flow is not sufficient for financial needs and investment, the company will be faced with financial problems. This study examined the relationship between sensitivity to changes in cash flows and firm value and changes of investments in companies. For this purpose, a sample of 100 companies listed in Tehran Stock Exchange is studied for the 5-year period of 2008 to 2012. To verify the hypotheses, a multivariate regression model is used. Hypotheses test results show that there is a significant relationship between sensitivity to changes in cash flows and changes of investments. Also, there is a significant relationship between firm value and investment changes.

Keywords: Changes in Cash Flow, Firm Value, Investment Changes.

INTRODUCTION

Positive operating cash flow does not guarantee the good performance of the company. If operating cash flow is not sufficient for financial needs and investment, the company will be faced with financial problems(Almeida, Campello, & Weisbach, 2004; Richardson, 2006).

The company that is faced with more difficulty in accessing external sources of capital market provides the greater part of it required financial resources from sources inside the company. Such a company is called "financial constraints suffering company". A firm's reliance on domestic resources is determined through "sensitivity of investment- cash flow" of the company (Asker, Farre-Mensa, & Ljungqvist, 2014; Farre-Mensa & Ljungqvist, 2016; Fazzari, Hubbard, Petersen, Blinder, & Poterba, 1988). It is claimed that firms with financial constraints, have more sensitivity of investment cash flow.

One of the modern diagnostic criteria of financial constraints is the amount of cash reserves (cash at hand and its equivalents) in the company. It is expected that "financial constraints suffering companies" to insure themselves against future investment needs, try to reserve cash(Almeida & Campello, 2007; Farre-Mensa & Ljungqvist, 2016). On the other hand,

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companies must make tradeoffs between their present and future investment opportunities. In the situation of cash flows storage, the firm's investment power is reduced at present. In this context, comparing the net present value of current and future investment will be of particular importance. For a company that has no restrictions on financing, keeping "cash reserves" would not have any particular advantage (Kariuki, Namusonge, & Orwa, 2015; Karpuz, Kim, & Ozkan, 2017; Opler, Pinkowitz, Stulz, & Williamson, 1999).

RESEARCH LITERATURE

Moradi and Mahdavi (2016) in a research, titled "Asymmetric cash flow sensitivity of cash holdings in companies accepted in Tehran stock exchange", investigated the relationship between size, added value, dividend percentage, firm's activities history and "cash flow investment sensitivity". His studied 84 companies over a period of five years, 2008 to 2014. He found that there is a positive relationship between the size, added value, the company's dividend ratio and sensitivity of investment cash flow, but there is no relationship between activities history of the company and the investment cash flow sensitivity. In his study, he also evaluated the efficacy of traditional measures of financial constraints.

Farre-Mensa and Ljungqvist (2016) in a study, entitled "Do measures of financial constraints measure financial constraints?", compared the sensitivity of capital investment- cash flow and sensitivity of cash flow of cash as measures of financial constraints. Their study sample involved 78 companies for the period of 1989 through 2011. By testing the significance of equations coefficient of optimized cash reserves, they concluded that the sensitivity of investment cash flow compared to sensitivities of cash flow of cash is a more appropriate criteria for determining the financial constraints. However, they did not use equations of optimized cash reserves to classify the companies.

George, Kabir, and Qian (2011) on a research entitled "Investment–cash flow sensitivity and financing constraints: new evidence from Indian business group firms" examined the sensitivity of capital investment to cash flow as a criterion of measuring financial constraints in affiliated company of India economic group. They classified the companies into two groups of India economic group members companies and independent companies. Results showed that there is a strong sensitivity of investment cash flow in both affiliated companies of India economic group and independent companies. Complementary tests also showed that constantly sensitivity of capital investment cash flow of affiliated companies of India economic group is not significantly smaller than independent companies.

Huang (2002) in a study examined the sensitivity of investment cash flow and representing expenses. Their goal was to investigate the effect of representing expenses on the relationship between the overconfidence of the managers and sensitivity of investment cash flow in Chinese companies. They found that managers' overconfidence increases sensitivity of investment cash flow. They also, documented that representing expenses affect the relationship between manager's overconfidence and sensitivity of capital investment cash flow and capital investment distort can be reduced due to the behavior of manager's overconfidence by reducing representing expenses.

METHODOLOGY

The research is a correlational research. Correlational research is applied when the researcher has two or more different kinds of information (in the form of independent variables) related to a group of two or more groups and the research goal is to study the variations rate of two or more factors because of the variations in one or more other factors. Regression analysis is a kind of correlational research that will be used in this research.

On the other hand, as this research seeks to achieve a scientific goal and presents useful information about the extant facts, it is an applied research in terms of the nature.

The study is cross sectional because it examines data related to a period of time (from 2008 until 2012).

To determine the research sample, companies with the following characteristics are considered:

1. Their fiscal year is ended at March of each year.
2. The company has no fiscal year change from 2008 to 2012.
3. Company is not in financial intermediaries (Banks, investments and ...).
4. Their financial reports are available.

In order to answer the research questions and based on the available theoretical background, the following hypotheses were formulated:

First hypothesis: There is a significant relationship between sensitivity to changes in cash flows and changes of investments.

Second hypothesis: There is a significant relationship between firm value and investment changes.

The research model:

The following regression model is used to test the research hypotheses:

$$I/K_{i,t}=\alpha+\beta_1(\Delta CF/K)_{i,t}+\beta_2 Q+\beta_3(SPREAD)+\beta_4(D/K)+\beta_5(S/K)+\beta_6 Size+\varepsilon \quad \Delta$$

Independent variables:

Sensitivity of changes in cash flows

Value of the firm

Dependent variable:

Changes in investment

Control variables: Firm size, financial leverage, information asymmetry, the ratio of sales to assets.

Table 1. Research variables

I	Investment in property, machinery and equipment, capital leases, cash holdings for the construction, re-classified inventory, net of exchange rate changes, discontinued operations, reduction in cash holdings for the construction, and assets of the acquired company
K	Sum of total assets
CF	It is an indicator of cash flows figures
SPREAD	It is an indicator of information asymmetry and is determined by the difference scope of the proposed price of buying and selling shares
D	Firm's total liabilities
SIZE	It is the firm size and is obtained through the logarithm of total sales
S	Firm's total sales
Q	Q Tobin model used in this regression is calculated through dividing the book value of total debt plus the market value of shares by the book value of total assets and it is the statistic that can be viewed as representing the firm's value to investors

RESULT

The information of this section introduces features of the study variables among the sample firms. Descriptive statistics of the variables are shown in Table 2:

Table 2. Descriptive statistics

	Changes in investment	Value of the firm	Sensitivity of cash flows
Mean	0.0268	1.2675	0.13
Std. Deviation	0.02389	0.52898	0.1287
Variance	0.001	0.28	0.017
Skewness	1.2	1.979	0.367
Elongation	1.003	6.132	1.184
Maximum	0	0.04	-0.14
Minimum	0.12	4.09	0.58

The investigation of the dependent variable mean showed that the investment changes of the companies equal to 0.027 and standard deviations is 0.024. The results of the independent variables of firm's value and the sensitivity of cash flows at the end of the financial year are respectively, equal to 1.268 and 0.13 and standard deviations are 0.529 and 0.129.

Results review of the coefficients skewness of the research variables show that all research variables have positive skewness coefficient. This shows that the distribution of data in these variables relative to the normal curve is skew to the right. The elongation coefficient of the research variables indicate that all variables are positive elongation, which are higher than the normal curve.

Test results of model selection type

Common effects test (F Limor): The first step in the estimations of the panel data is to determine the constraints entered into the econometric model. In other words, we must first determine whether the regression equation in the study sample has a heterogeneous intercepts and homogeneous slope or the hypothesis of common intercepts and common slope between sections (pooled data model) is accepted. F test is used for this purpose. Based on the test, first the model is estimated in the form of unconstrained and in general, with common intercepts and common slope, and the regression residuals (R^2_{ur}) is computed. Then the model is estimated in the form of constrained by the assumption of heterogeneous intercepts and homogeneous slope between sections and common slopes, and the values of constrained residuals (R^2_R) are obtained. F test statistic is calculated according to equation 1 and should be compared with the value of table F:

$$F_{n-1,\,nt-n-k)} = \frac{\left[R_R^2 - R_{UR}^2\right] / (n-1)}{\left[1 - R_R^2\right] / (nt - n - k)} \qquad (1)$$

N represents the number of sections and firms, t represents the time period and k represents the number of the model explanatory variables. If the calculated value of F in equation (1) is larger than table F with the specified degrees of freedom, H0 hypothesis, based upon homogeneous sections and equal intercepts, is rejected. Therefore, group effects are accepted and different intercepts must be considered in estimation. Consequently, panel method can be used for estimation. But if the hypothesis H0 is accepted, it means identical slopes for different sections and it has the ability to combine data and use the pooled data model that is statistically confirmed. According to F statistic in this test, the panel data model has been adopted for all the studied models, because this probability is zero in the desired model.

H0: Intercept is equal at all levels (pooling data)

H1: Intercept is not equal at all levels (panel data)

Table 3. Test results of common effects

Model	F	df	Sig.	Test result	Selected model
The first hypothesis	3.04136	(98,331)	0.001	H_0 rejection	Panel
The first hypothesis associated with control variables	2.78903	(98,327)	0.001	H_0 rejection	Panel
The second hypothesis	3.41259	(98,331)	0.001	H_0 rejection	Panel
The second hypothesis associated with control variables	3.04953	(98,327)	0.001	H_0 rejection	Panel
Research model general hypothesis	2.82265	(98,326)	0.001	H_0 rejection	Panel

Housman test

After it became clear that there is heterogeneity in the sections and individual differences are considerable, in order to determine which method (random effects or static effects) is more appropriate for estimation (random or stable detection of sectional units' differences), Housman test is used. In the Housman test, the null hypothesis implies that there is no relationship between disturbing component related to the intercept and explanatory variables and they are independent of each other. However, the opposite hypothesis means that there is bias and inconsistency problem between the desired disturbing component and explanatory variables. Thus, if the hypothesis H1 is accepted, it is better use fixed effects method. Under hypothesis H0, the fixed effects and random effects are both adaptable but fixed effects method is inefficient. Housman test hypotheses will be as the following:

$$\begin{cases} H0: \alpha = \alpha_s & \textit{Random effects} \\ H1: \alpha \neq \alpha_s & \textit{Fixed effects} \end{cases}$$

In summary therefore, the null hypothesis of Housman test suggested the use of random method and its 1 hypothesis suggested the use of fixed effects method. According to the results of the table and acceptance of the null hypothesis, the random effects method is used to for estimating the research models.

Table 4. Results of Housman test (random effects)

Model	χ^2	df	Sign	Test result	Selected model
The first hypothesis	2.2305	1	0.1353	H_0 acceptance	Random effects
The first hypothesis associated with control variables	9.3982	5	0.0942	H_0 acceptance	Random effects
The second hypothesis	2.2305	1	0.1353	H_0 acceptance	Random effects
The second hypothesis associated with control variables	4.4879	5	0.4815	H_0 acceptance	Random effects
Research model general hypothesis	10.1573	6	0.1182	H_0 acceptance	Random effects

The first hypothesis

H0: There is no significant relationship between sensitivity of changes in cash flows and investment changes.

H1: There is a significant relationship between sensitivity of changes in cash flows and investment changes.

After determining the appropriate method to estimate the parameters, the results of the estimation of the studied companies' model was investigated. The research first hypothesis results can be seen in Table 5. The examination of the fitted model determination coefficient indicates that the variable of sensitivity to changes in cash flows has explained 1.5 percent of the variation of the companies' investment. This means that 1.5 percent of the companies' investment changes

are justified by the fitted model and other changes are affected by factors outside the model (98.5 percent).

Table 5. Test results of the first research hypothesis

Variable	Regression coefficient	Std. Deviation	T	Sign.
Intercept	0.02465	0.0019	12.6218	0
Sensitivity to changes in cash flows	0.02366	0.0088	2.6864	0.007
Determination coefficient	0.015	F statistics		6.9049 (0.008)
Adjusted determination coefficient	0.013	Durbin- Watson		1.5

The significance results of fitted regression model show that the significance level of the F statistic (6.904) is smaller than 5% and significant (sig <0.05). Hence, with more than 95 percent confidence level, H0 hypothesis is rejected and H1 hypothesis is accepted. That is to say, there is a significant relationship between sensitivity of changes in cash flows and changes in the companies' investment. Regression coefficient results of the variable of sensitivity to changes in cash flows show that (0.024) at significance level of 5%, have a positive and significant impact on the companies' investment changes. Hence, with more than 95 percent confidence level, H0 hypothesis is rejected and H1 hypothesis is accepted. These results mean that the more sensitivity to changes in cash flows increases, the more increase the companies investing changes significantly in 0.024 unit.

The first hypothesis associated with control variables

Table 6. Test results of the first research hypothesis associated with the control variables

Variable	Regression coefficient	Std. Deviation	T	Sig.
Intercept	0.005339	0.0121	0.4394	0.6606
Sensitivity to changes in cash flows	0.02154	0.0089	2.4116	0.0163
Information asymmetry	-0.02797	0.078	-0.3586	0.72
Firm's total liabilities	-0.007317	0.0049	-1.4649	0.1437
Firm's total sales	-0.001713	0.0017	-1.0058	0.3151
Firm size	0.002015	0.00078	2.2959	0.0222
Determination coefficient	0.035	F statistics		3.095 (0.009)
Adjusted determination coefficient	0.024	Durbin- Watson		1.5

The results of the research first hypothesis associated with the control variables showed that using fitted model, 3.5 percent of the companies' investment changes was explained. The significance review of regression model shows that at significance level 5% the fitted model is significant. Hence, with more than 95 percent confidence level, H0 hypothesis is rejected and H1 hypothesis is accepted. As can be seen in the coefficient table, among the studied variables of regression coefficient, the variables of sensitivity to changes in cash flows (0.022), and firm size (0.002) at 5% error level have a positive and significant impact on the companies' investment changes. These results mean that the more sensitivity to changes in cash flows and firm size increases, the more increase the companies investing changes significantly. In general, the results show that the companies' investment changes will increase in lieu of per unit change in variables of sensitivity to changes in cash flows and firm size, respectively 0.022 and 0.002 unit. Also investigating the variables coefficients of information asymmetry (-0.028), total liabilities of the company (-0.007) and total sales (-0.002) showed that at 5% error level, they have no significant effect on the companies' investment changes and the remarkable thing is their coefficients direction, so that they lead to dependent variable reduction. That is to say, the more these listed variables increase, the more will decrease the companies' investment changes.

The second hypothesis

H0: There is no significant relationship between firm size and investment changes.

H1: There is a significant relationship between firm size and investment changes.

Table 7. Test results of the second hypothesis

Variable	Regression coefficient	Std. Deviation	T	Sig.
Intercept	0.02752	0.00174	15.758	0.0001
Firm value	0.000057	0.0004	1.3222	0.186
Determination coefficient	0.003	F statistics		1.715 (0.191)
Adjusted determination coefficient	0.002	Durbin- Watson		1.51

As can be seen, the results of the research second hypothesis are presented in Table 7. The determination coefficient of fitted model indicates that the companies' investment changes are explained only 0.003 by the research second model. This means that the firm value could explain 0.3 % of the variability of the dependent variable of the companies' investment changes and other changes are affected by factors outside the model (99.7 percent).

The significance results of fitted regression model show that the F statistic (1.715) in the significance level of 5% is greater than 1% and it is not significant (sig >0.05). Hence, with more than 95 percent confidence level, H0 hypothesis is accepted and H1 hypothesis is rejected. That is to say, there is no significant relationship between firm value and changes in the companies' investment. Regression coefficient results of the variable of firm value show that (0.000057) at significance level of 5%, have no significant impact on the companies' investment changes. Hence, with more than 95 percent confidence level, H0 hypothesis is accepted and H1 hypothesis is rejected.

Table 8. Test results of the second hypothesis associated with control variables

Variable	Regression coefficient	Std. Deviation	T	Sig.
Intercept	-0.0048	0.0135	-0.3553	0.7225
Firm value	0.0001	0.00004	2.38867	0.0173
Information asymmetry	-0.04156	0.07825	-0.53117	0.595
Firm's total liabilities	-0.0072	0.00505	-1.42868	0.153
Firm's total sales	-0.0018	0.00174	-1.06055	0.289
Firm size	0.0029	0.00098	3.036672	0.002
Determination coefficient	0.034	F statistics		(0.012) 2.979
Adjusted determination coefficient	0.022	Durbin- Watson		1.51

The results of the research second hypothesis associated with the control variables showed by entering the control variables to the model, the main model determination coefficient increases from 0.003 to 0.034 (3.1%). That is to say, the companies' investment changes are explained by the firm value and control variables 3.4.The significance review of fitted regression model shows that at error level of 5%, the F statistic is smaller than 5% (0.012) and significant.

As can be seen the regression coefficient of the control and main variables of the model are presented in table (8). The study of regression coefficients shows that the variables of firm value (0.0001) and firm size (0.003) at 5% error level have a positive and significant impact on the companies' investment changes. These results mean that the more firm value and firm size increases, the more increase the companies investing changes significantly. In general, the results show that the companies' investment changes will increase in lieu of per unit change in variables of firm value and firm size, respectively 0.0001 and 0.003 unit.

The variable coefficient the firm value in fitted model is notable, because this variable had no significant effect on the dependent variable in main model. While entering the control variables, the effect size of it increased, and had significant effect.

The study of other coefficients of model variables shows that they have a negative impact on the companies' investment changes. But it must be pointed out that the significance level of listed variables is greater than 5% and they are not significant.

Research general hypothesis:

There is a significant relationship between sensitivity to changes in cash flows and firm value, and investment changes in listed companies in Tehran Stock Exchange associated with the control variables.

Table 9. Results of the research general hypothesis

Variable	Regression coefficient	Std. Deviation	T	Sig.
Intercept	-0.006835	0.013012	-0.525302	0.5996
Firm value	0.000106	0.00004	2.478123	0.0136
Sensitivity to changes in cash flows	0.021849	0.008884	2.459258	0.0143
Information asymmetry	-0.036320	0.077677	-0.467583	0.6403
Firm's total liabilities	-0.006536	0.004972	-1.314536	0.1894
Firm's total sales	-0.002312	0.001707	-1.354612	0.1763
Firm size	0.002898	0.00094	3.081985	0.0022
Determination coefficient	0.049	F statistics	3.629 (0.002)	
Adjusted determination coefficient	0.035	Durbin- Watson	1.5	

The determination coefficient of research general hypothesis indicates that all variables entered the main model could explain only 4.9% of the companies' investment changes. The significance results of fitted regression model show that at significance level of 5%, there is a significant relationship between the research variables and the dependent variable that is the companies' investment changes. Hence, with more than 95 percent confidence level, H0 hypothesis is rejected and H1 hypothesis is accepted.

Regression coefficient results of the variable of the model show that the variables of firm value (0.0001), sensitivity of cash flows (0.022) and firm size (0.003) at significance level higher than 5%, have a positive and significant impact on the companies' investment changes. Also, as other variables significance level is greater than 5% therefore they have no significant effect on the dependent variable.

CONCLUSION

This study examined the relationship between sensitivity to changes in cash flows and firm value and changes of investments in listed companies in Tehran Stock Exchange.

In relation to the first hypothesis, results show that the more sensitivity to changes in cash flows and firm size increases, the more increase the companies investing changes significantly. In general, the results show that the companies' investment changes will increase in lieu of per unit change in variables of sensitivity to changes in cash flows and firm size, respectively 0.022 and 0.002 unit. Also investigating the variables coefficients of information asymmetry (-0.028), total liabilities of the company (-0.007) and total sales (-0.002) showed that at 5% error level, they have no significant effect on the companies' investment changes and the remarkable thing is their coefficients direction, so that they lead to dependent variable reduction. That is to say, the more these listed variables increase, the more will decrease the companies' investment changes.

The results associated with the second hypothesis suggest that the more firm value and firm size increases, the more increase the companies investing changes significantly. In general, the results show that the companies' investment changes will increase in lieu of per unit change in variables of firm value and firm size, respectively 0.0001 and 0.003 unit. The variable coefficient the firm value in fitted model is notable, because this variable had no significant effect on the dependent variable in main model. While entering the control variables, the effect size of it increased, and had significant effect. The study of other coefficients of model variables shows that they have a negative impact on the companies' investment changes. But it must be pointed out that the significance level of listed variables is greater than 5% and they are not significant.

The result of hypothesis testing about the relationship between sensitivity to changes in cash flows and the companies' investment changes is consistent with the research results of Arslan, Florackis, and Ozkan (2006), Hovakimian and Hovakimian (2009), George et al. (2011) and Farre-Mensa and Ljungqvist (2016) that "there is a relationship between sensitivity to changes in cash flows and changes in investment."

The result of hypothesis testing about the relationship between firm value and the companies' investment changes is consistent with the research results of Al-Hadi, Hasan, and Habib (2016), based upon "the correlation of cash flow and firm value is significantly stronger than the correlation of earnings and the firm value".

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