

The Impact of Insufficient and Excess Cash on Future Performance

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ABSTRACT

Transaction costs in financial markets is an important item of the cost, therefore, these costs would convince corporate executives to attempt to maintain cash assets. On the other hand, the presence of information asymmetry between managers and investors (actual and potential) in the capital market has also caused some limitations; hence, establishing some precautionary motives for the company's liquidity demand can be a criterion for the action. Thus in this research, we study the implications of insufficient and excess cash for the future performance of chemical and pharmaceutical companies in Tehran Stock Exchange. We start by estimating the optimal cash of chemical and pharmaceutical companies, then we investigate the effects of deviation from the estimated optimal cash on the future performance of these companies. For the purpose of this study, a sample of 30 listed chemical and pharmaceutical companies on the Tehran Stock Exchange was studied in the period between 2010 and 2016. A total of 210 cases was observed, among which 100 cases were related to the companies with excess cash and 110 cases to the companies with insufficient cash. The statistical method used in this research is the multiple regressions. Four hypotheses suggested in order to reach the objectives of the study, all of which were confirmed. The result of the hypothesis testing shows that a higher cash balance than the estimated ideal level in chemical and pharmaceutical companies would yield a positive return on operational assets and abnormal return in the future. Meanwhile, a lower cash balance than the estimated ideal level in chemical and pharmaceutical companies would lead to a negative return on operational assets and abnormal return in the future.

Keywords: Insufficient Cash, Excess Cash, Performance

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1. Introduction

Over time, cash turnover has been one of the determining factors of the company's required networking capital. The production of goods requires the use of cash. In other words, in order to produce the goods, corporate executives are required to purchase the raw materials and transform them into the final products. By selling the manufactured goods, accounts receivable or notes receivable will increase and by collecting them, the cash flow period ends. It can be said that cash is one of the main components of production or any type of business.

Keynes sees three motives as the reason for cash holding: the need for transactions, precautionary measures, and to deal with the high-risk situations (Keynes, 1936). In other words, the amount of cash the company executives hold in their companies is affected by many factors such as transaction costs, opportunity costs, and information asymmetry. By considering the importance of the amount of cash stored in the chemical and pharmaceutical companies, this study analyzes whether the deviation from the optimal estimate of cash in chemical and pharmaceutical companies affects the company's future performance or not.

The main objective of this study is to investigate the impact of inadequate or excess cash on the future performance of chemical and pharmaceutical companies in Tehran Stock Exchange. In this regard, the optimal cash of the chemical and pharmaceutical companies are estimated using Oler and Picconi's model, then its effect is assessed on the future performance of these companies (which is measured through the future return on net operational assets and abnormal return in this study).

2. Theoretical principles and literature review

Cash always accounts for a significant percentage of the company's assets (kimet. al, 1998). Therefore, there is a certain range for the cash balance of the companies in a way that it is neither much higher than the actual need (where the company would suffer from losses due to the capital inactivity) nor less than the required minimum (where the company would face a cash shortage) (Oler and Picconi, 2012). In order to look at the company's cash flow perspective, first of all, we have to consider the profit of the company. As a general rule of thumb, profitability and liquidity both can participate in securing the cash dividends of the investors and can be considered as an important factor (Financial Accounting Standards Board, 1987).

Monitoring the operational assets is one of the important duties of the managers. One of the important benefits of the rate of return on assets formula is that it forces the managers to control the operational assets. If additional assets are to be used in operations, it is like the increase in operating costs. The ROA is obtained by dividing the net income into total assets (Chen, 2005).

As mentioned before, there is an ideal and optimal range for the cash balance. In other words, when the company's cash balance is lower than the estimated optimal cash balance level, the company has an insufficient cash balance and when the company's cash balance is higher than the estimated optimal cash balance level, the company has an excess cash balance (Oler and Picconi, 2012).

There are several models for determining the ideal range of cash balance suggested by different researchers such as Baumol, Miller-Orr, Branc, Oler and Picconi, and Fund's new models. The Oler and Picconi's model is used in this research. Oler and Picconi (2010) began to study whether the Company's future performance and future returns are influenced by the deviation of the residual optimal cash or not. Their result which obtained during 1989-2006 shows that by deviating from the estimated optimal cash

balance (whether keeping higher or lower amount of cash than the optimal cash balance), the future rate of return on net operational assets ($RNOA_{t+1}$) and the rate of stock return for the next year of these companies start to decrease.

Oler and Picconi (2012) developed and finalized their previous model which is introduced in 2009 and they began investigating whether or not the deviation from the optimal cash balance (insufficient or excess cash) will affect the future performance of the company.

Martinez et al. (2008) examined the effect of cash holding on the company's value. The result of their research which includes 472 American industrial companies in the time period between 2001 and 2007 shows that there is an optimal cash balance level which constitutes 14 percent of the total assets and the deviation from this optimal cash balance level results in the value reduction.

Mikkelson and Partch (2003) used a sample of 89 companies listed in American Stock Exchange which have kept more than 25 percent of their assets at the end of 1986 to 1991 in cash in order to study their operational performance in comparison with the similar companies concerning the industry and size. The results of their study suggest that the operational performance of the companies with more cash holdings is higher than that of the other companies.

The results of Jensen (1986) studies show that with the excess cash balance caused by higher investments, the future rate of return on net operational assets ($RNOA_{t+1}$) starts to decline. However, they have only focused on one side of the spectrum and therefore, they failed to study the issue in companies with inadequate cash balance.

Research Hypotheses

According to the theoretical principles and literature review, the following hypotheses were formulated.

H₁: Higher cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a positive return on operational assets in the future.

H₂: Lower cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a negative return on operational assets in the future.

H₃: Higher cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a positive abnormal return in the future.

H₄: Lower cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a negative abnormal return in the future.

3. Research methodology

This paper is an applied research in terms of objective. The method of study is correlational in nature and content. The research has been carried out within the framework of inductive-deductive reasoning; the theoretical principles and literature review have been provided via websites, papers, and library studies in an inductive framework and the data collection in order to confirm or reject the hypotheses has been performed in a deductive way. Financial statements, attached notes to the financial statements as well as the basic information of the stock exchange board (which was collected in the Rahavard Novin Software and the exchange statistics department database) was used in order to collect the required information for this research.

Data Collection

The scope of this study, in terms of duration, is seven years, from 2010 to 2016 and in terms of place is chemical and pharmaceutical companies in Tehran Stock Exchange.

Screening methods have been used in order to select a sample that is a fitting representative for the target population. For this purpose, the following five criteria are considered and the company is selected as the research sample if it has met all of the criteria:

- The company is part of the chemical and pharmaceutical companies.
- The Company was listed on the Tehran Stock Exchange prior to 2010 and remains active until the end of 2016.
- The company has not changed its financial year during fiscal years 2010 to 2016 and its fiscal year ends in March.
- During the relevant period, its stock is actively traded on the stock exchange market.
- The required information of the Company is available.

After considering all of the above criteria, 30 companies remain as the screened populations which were all selected as the research sample. There are a total of 210 cases observed, among which 100 cases relate to the companies with excess cash and 110 cases relate to the companies with insufficient cash.

Research Variables

The variables present by Oler and Picconi (2012) were used to determine the optimal amount of cash balance.

Model 1:

$$\begin{aligned} Cash_{i,t} = & \beta_0 + \beta_1[\text{Market – to – Book}]_{i,t} + \beta_2[\text{Sales Growth}]_{i,t} + \beta_3[\text{Firm Size}]_{i,t} \\ & + \beta_4[\text{Cash from Opiration}]_{i,t} + \beta_5[\text{Net Working Capital}]_{i,t} \\ & + \beta_6[\text{Capital Expenditure}]_{i,t} + \beta_7[\text{R\&D}]_{i,t} + \beta_8[\text{Dividend Dummy}]_{i,t} \\ & + \beta_9[\text{Firm Age}]_{i,t} + \beta_{10}[\text{Tax Burden}]_{i,t} + \beta_{11}[\text{Year Dummies}]_{i,t} + \varepsilon_{i,t} \end{aligned}$$

Cash = Cash balance held in the company.

Market – to – Book = Market value to book value of the company's assets.

Firm Size = Size of the company equal to the logarithm of total sales.

Cash from Operation = Cash obtained through operations.

Net Working Capital = (Working Capital – Cash) / (Total Assets – Cash).

Capital Expenditure = (Capital Expenditure) / (Total Assets – Cash).

R&D = Research and Development Expenditure.

Dividend Dummy = an imaginary variable, it is 1 if the company had dividends last year, otherwise, it would be 0.

Firm Age = Age of the Company.

Tax Burden = (Tax Costs) / (Total Assets – Cash).

Year Dummies = a virtual variable, it is 1 if the firm age is higher than the average firm age of the samples, otherwise, it would be 0.

After calculating the optimal cash balance using the above formula, we will do as below in order to test the hypotheses:

To test the first hypothesis, we will use a regression model as it is described below (model 2):

$$\begin{aligned} RNOA_{i,t+1} = & \beta_0 + \beta_1[\text{Excess Cash}]_{i,t} + \beta_2[\text{Net Working Capital}]_{i,t} + \beta_3[\text{Sales Growth}]_{i,t} \\ & + \beta_4[\text{Leverage}]_{i,t} + \beta_5[\text{Firm Size}]_{i,t} + \beta_6[\text{RNOA}]_{i,t} + \beta_7[\text{Year Dummies}]_{i,t} + \varepsilon_{i,t} \end{aligned}$$

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= Beginning net operating assets / operating income after taxes.

Excess Cash = Excess cash balance = Max (0, insufficient/excess cash).

Leverage = Company's debt ratio = (total debts) / (total assets – cash).

To test the second hypothesis, we will use a regression model as it is described below (model 3):

$$RNOA_{i,t+1} = \beta_0 + \beta_1 [Insufficient\ Cash]_{i,t} + \beta_2 [Net\ Working\ Capital]_{i,t} + \beta_3 [Sales\ Growth]_{i,t} + \beta_4 [Leverage]_{i,t} + \beta_5 [Firm\ Size]_{i,t} + \beta_6 [RNOA]_{i,t} + \beta_7 [Year\ Dummies]_{i,t} + \varepsilon_{i,t}$$

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Insufficient cash = cash deficit = Min (0, insufficient/excess cash) × (-1).

After being calculated, the excess and insufficient cash variables will be divided into total assets minus cash.

To test the third hypothesis, we will use a regression model as follows (model 4):

$$CAR_{i,t} = \beta_0 + \beta_1 [Excess\ Cash]_{i,t} + \beta_2 [Net\ Working\ Capital]_{i,t} + \beta_3 [Sales\ Growth]_{i,t} + \beta_4 [Leverage]_{i,t} + \beta_5 [Firm\ Size]_{i,t} + \beta_6 [Year\ Dummies]_{i,t} + \varepsilon_{i,t}$$

Abnormal return on stock i at time t is given by the following equation:

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

where:

$R_{i,t}$ is the actual return of stock I in the day t and is calculated from the following equation:

$$R_{i,t} = \frac{(P_{t+1} - P_t) + D + M + N}{P_t}$$

P_{t+1} = Price on the day after the day number t.

P_t = Price in the day number t.

D = Net income.

M = Priority benefits.

N = Shared profit benefits.

Expected return ($R_{i,t}$) is calculated by using the capital asset pricing model (CAPM) in the following way:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_i$$

Where α and β are coefficients of the regression line and ε is the equation error.

$R_{m,t}$ or the expected return on the market is to be calculated from the following equation:

$$R_{m,t} = \frac{TEDPIX_{t+1} - TEDPIX_t}{TEDPIX_t}$$

Where TEDPIX is the Tehran Stock Exchange dividend and Price Index.

According to the estimates of α and β above, regardless of the estimation error and with the placement of $R_{m,t}$ calculated by the following formula, we can predict the expected return:

$$E(R_{i,t}) = \alpha_i + \beta_i R_{m,t}$$

In order to test the research hypotheses, we should calculate these abnormal returns for the periods around the net profit announcements. To do so, it is necessary to accumulate abnormal returns for the desired periods:

$$CAR_i = \sum_{t=1}^n AR_{i,t}$$

To test the fourth hypothesis, we will use a regression model as follows (model 5):

$$CAR_{i,t} = \beta_0 + \beta_1[Insufficient\ Cash]_{i,t} + \beta_2[Net\ Working\ Capital]_{i,t} + \beta_3[Sales\ Growth]_{i,t} + \beta_4[Leverage]_{i,t} + \beta_5[Firm\ Size]_{i,t} + \beta_6[Year\ Dummies]_{i,t} + \varepsilon_{i,t}$$

4. Results

Calculation of the optimal cash level measurement

In order to test the research hypotheses, we must first calculate the optimal level of cash and in order to test for the optimal level of cash, we must first calculate optimal level of cash using the estimated coefficients, then insert the optimal level of corporate cash into our regression model in order to review and test the model.

The results of the estimated coefficients:

Model	Correlation Coefficient	Coefficient of Determination	Adjusted Coefficient of Determination	Standard Error of Estimate	Durbin-Watson Statistic
1	0.946a	0.896	0.875	246295.862	2.394

Table 1.
The correlation coefficient, coefficient of determination and the Durbin-Watson Test between the regression independent and dependent variable of the optimal level of cash

The correlation coefficient, coefficient of determination, and the adjusted coefficient of determination of the optimal level of cash estimation model are presented in aboveTable.

Durbin-Watson Test statistic is 2.394 which is in the range of 1.5 to 2.5, the lack of autocorrelation between the errors cannot be ruled out ,therefore, the optimal level of cash regression model can be used.

The following output includes an analysis of regression variance in order to evaluate the certainty of a linear relationship between the dependent and independent variables in the optimal level of cash model.

Model	Squares Sum	Degrees of Freedom	Squares Average	F-Statistic	Significance	
1	Regression	2.815E13	11	2.559E12	42.193	0.000 ^d
	Remaining	3.276E12	199	6.066E10		
	Total	3.143E13	210			

Table 2.
Regression variance analysis of optimal level of cash

The results of the optimal level of cash model presented above reveal that the model is significant and the Fisher statistic distribution and the obtained significance level also confirms this.

According to the Table 3, the regression equation is as follows:

$$Cash_{i,t} = -1068837.2 + -374521.78 * [Sales\ Growth]_{i,t} + 205930.58 * [Firm\ Size]_{i,t} + 0.195 * [Cash\ from\ Opration]_{i,t}$$

Now, according to the regression coefficients obtained above, we can now calculate the optimal level of firm’s cash. Now, we use the resulting values for the regression test of the research hypotheses’ model.

Model	Symbol	Unstandardized Coefficient		Standardized Coefficient	T-Statistic	Significance	Collinearity Statistics	
		B	Standard error of the coefficient of column B	Beta			Tolerance	Variance inflation factor
1	(Constant)	-1068837.2	443255.44		-2.411	0.019		
	Market to Book	-2929.847	26248.992	-0.006	-0.112	0.912	0.607	1.646
	Sales Growth	-374521.78	92933.307	-0.2	-4.03	0	0.787	1.271
	Firm Size	205930.58	70002.921	0.229	2.942	0.005	0.317	3.151
	Cash from Operation	0.195	0.021	0.69	9.351	0	0.354	2.822
	Net Working Capital	-365060.05	187181.62	-0.12	-1.95	0.056	0.512	1.953
	Capital Expenditure	-214062.99	780956.86	-0.014	-0.274	0.785	0.758	1.319
	R.D	-0.221	0.154	-0.071	-1.436	0.157	0.783	1.277
	Dividend Dummy	79397.649	80185.89	0.05	0.99	0.327	0.748	1.338
	Firm Age	-28418.517	30159.351	-0.046	-0.942	0.35	0.803	1.245
	Tax Burden	1946429.5	2619565.9	0.043	0.743	0.461	0.579	1.728
	Year Dummies	-16427.251	74258.66	-0.012	-0.221	0.826	0.682	1.465

According to the Table 3, the regression equation is as follows:

$$Cash_{i,t} = -1068837.2 + -374521.78 * [Sales Growth]_{i,t} + 205930.58 * [Firm Size]_{i,t} + 0.195 * [Cash from Opration]_{i,t}$$

Now, according to the regression coefficients obtained above, we can now calculate the optimal level of firm's cash. Now, we use the resulting values for the regression test of the research hypotheses' model.

The Test of normality of variables

To perform the regression analysis, initially, the normality of the variables is examined by the K-S test. The null hypothesis and the alternative hypothesis of the normality test are as follows:

$$\begin{cases} H_0 : \text{The data follow a normal distribution} \\ H_1 : \text{The data do not follow a normal distribution} \end{cases}$$

According to the table 4 at next page, since the significance level (Sig) of the variables is greater than 0.05, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. In other words, the data are normally distributed. So, assuming the normality of the dependent variables in this study is accepted.

Hypothesis testing

Now, it is time to categorize and analyze the collected data using the appropriate statistical techniques which are compatible with the research methodology, variable types, etc. Finally, the hypothesis that hassled us to this step of the research will be tested. In other words, this section describes the research data and the analysis and evaluation of each of the assumptions and hypotheses and describes the hypothesis tests results separately.

The first hypothesis test

SPSS Software output related to model 2 (first research hypothesis) is described in the table 5 and the related graphs are presented.

According to the Table 5, the regression equation is expressed as follows:

$$RNOA_{i,t+1} = 2.1648 * [Excess Cash]_{i,t} + 0.924 * [RNOA]_{i,t}$$

The First Hypothesis Test Results

H₁:A higher cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a positive return on operational assets in the future.

As can be seen in Table 5, the Durbin-Watson Statistic is 1.755 indicating that the errors are independent of each other and the regression can be used. The calculated adjusted coefficient of determination is 0.929 which indicates that the changes in two variables provide a good fit. The positive correlation coefficient between two variables which is between future return on operational assets and cash is above the estimated optimal level of pharmaceutical and chemical companies and its value is 0.966. The F-statistic equals 186.120 and Sig=0.000 which indicates that the regression significance at the 95% confidence interval.

Thus, the null hypothesis is rejected and the relationship is approved between future return on operating assets and cash balance higher than the estimated optimal level (Excess Cash) of pharmaceutical and chemical companies. The t-statistic values indicate significant cash rate above the estimated optimal level in the pharmaceutical and chemical companies. According to the t-statistic value, the relationship between

Normality Test for the Companies with Excess Cash

Normality Test for the Companies with Insufficient Cash

Symbol	Future Return on Operational Assets Ratio	Abnormal Return	Symbol	Future Return on Operational Assets Ratio	Abnormal Return
Number of Data	100	100	Number of Data	110	110
Average	0.240195	0.1549	Average	0.211367	-0.1289
Standard Deviation	0.1571634	0.71241	Standard Deviation	0.1458487	0.39981
The maximum absolute deviation	0.065	0.155	The maximum absolute deviation	0.136	0.058
The Maximum Positive Deviation	0.065	0.155	The Maximum Positive Deviation	0.136	0.058
The Maximum Negative Deviation	-0.043	-0.114	The Maximum Negative Deviation	-0.088	-0.05
Z-statistic	0.652	1.545	Z-statistic	1.424	0.608
Significance	0.789	0.117	Significance	0.135	0.853

Model	Symbol	Coefficients	t-statistic	Significance	Confirm/ Reject
2	Constant Coefficient	-0.058	-0.764	0.447	Reject
	Excess Cash	2.1648	10.068	0.000	Confirm
	Net Working Capital	-0.034	-1.794	0.076	Reject
	Sales Growth	0.017	0.805	0.423	Reject
	Leverage	-0.071	-1.751	0.083	Reject
	Firm Size	0.019	1.661	0.100	Reject
	Return on Operational Assets	0.924	24.602	0.000	Confirm
	Year Dummies	-0.007	-0.459	0.648	Reject
Total Number of Observations		100	Coefficient of Determination		0.934
Correlation Coefficient	0.966	Adjusted Coefficient of Determination		0.929	
		F-Statistic		186.12	
Durbin-Watson Statistic		1.755	F Significance		0.000

Table 5.
Regression
analysis
results and
coefficients
of the
model 2

the independent variable (higher cash balance than the estimated optimal level in pharmaceutical and chemical companies) and the future return on operational assets is a direct (positive) one.

The second hypothesis test SPSS Software output related to model 3 (second research hypothesis) is described in the next table and the related graphs are presented.

According to the Table 6, the regression equation is expressed as follows:

$$RNOA_{i,t+1} = -3.5978 * [Insufficient\ Cash]_{i,t} - 0.070 * [Leverage]_{i,t} + 0.837 * [RNOA]_{i,t}$$

The Second Hypothesis Test Results

H₂:A lower cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a negative return on operational assets in the future.

As can be seen in Table 6, the Durbin-Watson Statistic is 1.845 indicating that the errors are independent of each other and the regression can be used. There is a positive correlation coefficient between the two variables and its value is 0.976. The F-statistic equals 290.919 and Sig=0.000 value indicates regression significance at the 95% confidence interval. Thus the null hypothesis is rejected and the relationship is approved between future return on operating assets and cash balance lower than the estimated optimal level (Insufficient cash) of pharmaceutical and chemical companies. The t-statistic values indicate significant cash rate below the estimated

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Model	Symbol	Coefficients	t-statistic	Significance	Confirm/ Reject
3	Constant Coefficient	0.052	0.63	0.53	Reject
	Insufficient Cash	-3.5978	-14.507	0.000	Confirm
	Net Working Capital	0.000	-0.068	0.946	Reject
	Sales Growth	0.008	0.346	0.73	Reject
	Leverage	-0.070	-2.705	0.008	Confirm
	Firm Size	0.002	0.166	0.869	Reject
	Return on Operational Assets	0.837	24.095	0.000	Confirm
	Year Dummies	-0.004	-0.355	0.723	Reject
Total Number of Observations		110	Coefficient of Determination		0.952
Correlation Coefficient		0.976	Adjusted Coefficient of Determination		0.949
Durbin-Watson Statistic		1.845	F-Statistic		290.919
			F significance		0.000

Table 6.
Regression
analysis results
and
coefficients of
the model 3

optimal level in the pharmaceutical and chemical companies. According to the t-statistic value, the relationship between the independent variable (lower cash balance than the estimated optimal level in pharmaceutical and chemical companies) and the future return on operational assets is an inverse one.

The third hypothesis test SPSS Software output related to model 4 (third research hypothesis) is described in the following table and the related graphs are presented.

Model	Symbol	Coefficients	t-statistic	Significance	Confirm/ Reject
4	Constant Coefficient	-2.091	-1.67	0.098	Reject
	Excess Cash	1.2306	14.826	0.000	Confirm
	Net Working Capital	0.388	1.241	0.218	Reject
	Sales Growth	-0.451	-1.296	0.198	Reject
	Leverage	1.756	2.624	0.01	Confirm
	Firm Size	0.156	0.808	0.421	Reject
	Year Dummies	-0.3	-1.203	0.232	Reject
Total Number of Observations		100	Coefficient of Determination		0.337
Correlation Coefficient		0.47	Adjusted Coefficient of Determination		0.272
Durbin-Watson Statistic		2.204	F-Statistic		4.214
			F significance		0.000

Table 7.
Regression
analysis
results and
coefficients of
the model 4

According to the table above, the regression equation is expressed as follows:

$$CAR_{i,t} = 1.2306 * [Excess Cash]_{i,t} + 1.756 * [Leverage]_{i,t}$$

The third hypothesis test results

H₃: A higher cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a positive abnormal return in the future.

As can be seen in Table 7, the Durbin-Watson Statistic is 2.2 indicating that the errors are independent of each other and the regression can be used. There is a positive correlation coefficient between the two variables and its value is 0.470. The F-statistic equals 4.214 and Sig=0.000 values indicate regression significance at the 95% confidence interval. Thus, the null hypothesis is rejected and the relationship between the future abnormal return and cash balance higher than the estimated optimal level of pharmaceutical and chemical companies is approved. The t-statistic values indicate significant cash rate above the estimated optimal level in the pharmaceutical and chemical companies. According to the t-statistic value, the relationship between the independent variable (higher cash balance than the estimated optimal level in pharmaceutical and chemical companies) and the future abnormal return is a direct one.

The Fourth Hypothesis Test

SPSS Software output related to model 5 (fourth research hypothesis) is described in the following Table and the related graphs are presented.

Model	Symbol	Coefficients	t-statistic	Significance	Confirm/ Reject
5	Constant Coefficient	1.54	1.786	0.077	Reject
	Insufficient Cash	-1.4987	-18.97	0.000	Confirm
	Net Working Capital	0.171	1.159	0.249	Reject
	Sales Growth	0.557	2.174	0.032	Confirm
	Leverage	-0.415	-1.598	0.113	Reject
	Firm Size	-0.232	-1.494	0.138	Reject
	Year Dummies	-0.16	-1.436	0.154	Reject
Total Number of Observations		100	Coefficient of Determination		0.199
Correlation Coefficient		0.446	Adjusted Coefficient of Determination		0.152
			F-Statistic		4.262
Durbin-Watson Statistic		2.08	F significance		0.000

Table 8.
Regression
analysis
results and
coefficients
of the
model 5

According to the table above, the regression equation is expressed as follows:

$$CAR_{i,t} = -1.4987 * [Insufficient Cash]_{i,t} + 0.557 * [Sales Growth]_{i,t}$$

The Fourth Hypothesis Test Results

H₄: A lower cash balance than the estimated optimal level in the pharmaceutical and chemical companies will result in a negative abnormal return in the future.

As can be seen in Table 8, the Durbin-Watson Statistic is 2.08 indicating that the errors are independent of each other and the regression can be used. There is a positive correlation coefficient between the two variables and its value is at 0.446. The F-statistic equals 4.262 and Sig=0.000 value indicates regression significance at 95% confidence interval. Thus, the null hypothesis is rejected and the relationship between the future abnormal return and cash balance lower than the estimated optimal level of pharmaceutical and chemical companies is approved. The t-statistic values indicate significant cash rate below the estimated optimal level in the pharmaceutical and chemical companies. According to the t-statistic value, the relationship between the independent variable (lower cash balance than the estimated optimal level in pharmaceutical and chemical companies) and the future abnormal return is an inverse one.

5. Discussion and conclusion

As mentioned earlier, the main objective of this study is to investigate the impact of inadequate or excess cash on the future performance of chemical and pharmaceutical companies on the Tehran Stock Exchange for the period of 2010 to 2016. In this regard, four hypotheses were proposed and according to the tests and analyses that were conducted through regression and correlation, all four research hypotheses were confirmed and we found that there is a positive linear relationship between the cash balance higher than the estimated optimal level of cash balance in the pharmaceutical and chemical company with future return on operational assets and abnormal returns. In other words, by increasing the cash balance over the estimated optimal cash balance for the pharmaceutical and chemical companies, the future return on operational assets and the abnormal return are expected to increase and by reducing the cash balance below the estimated optimal cash balance for the pharmaceutical and chemical companies, the future return on operational assets and the abnormal return are expected to decrease. The results of these two research hypotheses (Hypotheses I and III) do not match with that of the Oler and Picconi in 2010 and 2012; however, the results of these two hypotheses are in conformity with the results of the research of Mikkelson and Partch (2003). According to the conducted tests and analyses, there is a negative linear relationship between the cash balance lower than the estimated optimal level of the cash balance in the pharmaceutical and chemical company with the future return on operational assets and abnormal returns. In other words, by increasing the cash balance below the estimated optimal cash balance for the pharmaceutical and chemical companies, the future return on operational assets and the abnormal return are expected to decrease. The results of these two research hypotheses (Hypotheses II and IV) do match with that of the Oler and Picconi in 2010 and 2012.

Given the results of this paper, it is recommended to the managers and their councilors in pharmaceutical and chemical companies to attempt to keep their cash balance above the optimal level; because according to the results of this research, If the cash balance of pharmaceutical and chemical companies is higher than the optimal level, then the future returns on operational assets and abnormal return will be positive and this will increase the efficiency of the company and increase the shareholders' return on investment for these companies. They should also note that if the cash balance of pharmaceutical and chemical companies is lower than the optimal level, then the future returns on operational assets and abnormal return will be negative and this will lead to a reduction of the shareholders' final return for these companies.

6. References

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