



Original Research

## **Net Working Capital Investment Policies, the Value of Financial Flexibility and Financial Constraint, Evidence From the Tehran Stock Exchange**

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### ABSTRACT

Companies pay attention to the value level of financial flexibility in making decisions related to optimizing investments and applying their net working capital policies. This issue will make profitable investment opportunities for companies more efficient and enable companies to gain more efficiency, as well as apply more optimal policies to keep cash. The purpose of this research is to investigate the effect of financial flexibility value and financial constraint on the speed of adjustment of net working capital, as well as the effect of financial constraint on the relationship between the value of financial flexibility and the speed of adjustment of net working capital in companies listed on the Tehran Stock Exchange. The appropriate pattern recognition test in combined data indicates the use of the regression model of the research using the panel data method with the fixed and random effects approach for the panel and pooled data patterns to estimate the regression model. The statistical sample includes 100 companies accepted to the Tehran Stock Exchange during the period from 2005 to 2020. The findings indicate that the value of financial flexibility has a positive and significant effect on the speed of adjustment of net working capital in the models of partial adjustments and error correction. Financial constraint has a positive and significant effect on the speed of net working capital adjustment, and it also has a positive and significant effect on the relationship between the value of financial flexibility and the speed of net working capital adjustment.

## **1 Introduction**

Financial flexibility affects almost all important financial policies of the company. Inflexible companies are more (less) sensitive to bad (good) news than flexible companies (Agha and Faff, [3]). Companies with high flexibility value pay less cash dividends, prefer share repurchase to cash dividends, tend to keep more cash and follow a conservative (low-leverage) debt policy [36]. Companies that have adequate financial flexibility can withstand financial pressures and provide the

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necessary funds for investment at a minimal cost when profitable opportunities arise [19]. There are many empirical studies showing that financial flexibility can lead to better stock performance as a result of reduction in investment deviation [28,7]. Net working capital can serve as a source of liquidity for the company and provide a way to avoid relying on other alternative internal financial reserves [22]. Therefore, it is reasonable to argue that there are internal connections between the components of net working capital, the level of internal financial flexibility and also the value of financial flexibility. Net working capital can help the company as a source of internal financial flexibility (Bates et al., [10]). When the amount of net working capital is optimal, the value of the firm will be maximum. This issue causes companies to adjust their net working capital ratio towards the optimal (target) ratio [2]. Based on the Trade-off theory, companies may have an optimal (or target) level of net working capital that balances its benefits and risks [4]. Various components (such as financial costs, company size, growth opportunities, financial constraint, company profitability, etc.) affect net working capital adjustment costs [13]. But variables such as the value of financial flexibility and the financial constraint of the companies have rarely been considered. Financial managers of companies often need financing to carry out development projects or provide their daily net working capital [32]. Companies are limited in financing when they face a gap between internal and external sources of allocated funds [26]. Financial constraints are the company's ability to finance its investments at the desired level [34]. In general, companies that do not have financial constraints or have less financial restrictions are companies that relatively have high liquid assets and have high net assets [23]. Considering that this study is one of the few studies that has presented the value of financial flexibility as an important factor determining the speed of adjustment of net working capital, it can contribute to accounting research in terms of understanding the relationship between the value of financial flexibility and the speed of capital adjustment. Help in net circulation and financial limitation. Therefore, this research is trying to fill this gap. It is expected that the results of this research can have added scientific value: firstly, it can lead to the expansion of theoretical foundations in relation to the value of financial flexibility, the speed of adjustment of net working capital and financial limitation. Second: The results of this research can provide useful information to the legislators in the field of drafting accounting standards and capital market. Third: It can suggest new ideas for conducting new researches in this field.

## 2 Theoretical Framework and Hypotheses

### 2.1 The Value of Financial Flexibility

In the theoretical concepts of financial reporting of Iranian accounting standards, financial flexibility is: the ability of an enterprise to take effective action to change the time and amount of its cash flows in such a way that the it can react to unexpected events and opportunities. show (auditing organization, [1]). Gamba and Triantis [21] define financial flexibility as: "A company's ability to obtain and change its capital structure with minimal transaction costs". They consider financial flexibility as important for the company in order to reduce the consequences of underinvestment (due to lack of access to financing opportunities) and to minimize financial constraint. Companies can achieve financial flexibility by using many methods, as an important and influential factor in the company's financial decisions. One of the most effective ways to meet the company's financing needs is to rely more on financial resources within the company such as cash flows and maintaining cash [18]. Companies that are limited for external financing, rely more on internal cash flows for their investment expenses [6]. Motivated by previous studies that provide evidence on the ways to achieve financial flexibility, the effects of financial flexibility and the value of financial flexibility on other firms' decision-making, as well as the relationships between the components of net working capital, two We combined the literature through the perspective of financial flexibility to examine the relationship between the value of financial flexibility and the speed of adjustment of net working capital. The company's effective investments in net working capital are valuable because they increase the company's performance and reduce risk,

which in turn reduce the company's cost of capital [5]. Net working capital can compete with fixed capital investment for a limited fund. Lack of internal financial resources can force companies to reduce investment in working capital elements [27].

## 2.2 The Speed of Adjustment of Net Working Capital

Net working capital usually refers to the difference between current assets and current liabilities. Except for cash, which is the most liquid current asset, other components of net working capital are usually non-cash, and the management of these components is expected to affect the level of cash held in the company [12]. Net working capital, the most important factor for maintaining liquidity is survival, debt payment and profitability [29]. Net working capital is an important source for improving the performance of companies and one of the main reasons for preventing financial constraint or even bankruptcy of most companies. If the net working capital management is not correct, it is possible that the company's sales and profits will decrease and the company may be unable to pay its debts and obligations on time [20]. Profitability, the ability to pay debts and, as a result, the survival of the company, depends a lot on the net working capital. Because net working capital is one of the key factors that prevent liquidity crisis [39]. A company must maintain its ability to pay its debts by properly managing net working capital and maintaining adequate liquidity in order to remain competitive in market [38]. Net working capital is the most important determinant of cash retention, company survival, debt repayment and business unit profitability [30]. There is a curvilinear relationship between investment in net working capital and company performance, and the optimal level of net working capital for companies with financial constraints is lower than for companies without financial constraints [9]. For various reasons, it is expected that the current amount of net working capital of companies is not equal to the optimal level of net working capital. For example, since companies' estimates of revenues are often uncertain, they cannot accurately plan purchases. In addition, companies cannot correctly predict the debt default rate and correctly estimate the amount of debt collection [31]. Also, companies may deviate from the optimal level of net working capital due to random or temporary shocks, changes in the prices of production factors or advances in technology. However, because of the benefits that target net working capital has for business units, they try to bring the actual level of net working capital closer to the target level. The speed at which companies correct the deviation between the actual and optimal levels of net working capital is called the speed of adjustment of working capital [4]. When the level of the company's net working capital is closer to its optimal level, the stock performance and the company's operational performance increase and the reduction in the net working capital of the surplus is spent on financing for investment in fixed assets. Such as cash purchases and capital expenditures in the coming years [5].

## 2.3 Financial Constraint

One of the basic points that the financial managers of companies pay attention to is the methods of providing financial resources. In order to secure their financial resources, companies always face limitations, which are called financial constraints. The meaning of the term financial constraint is that there is an obstacle in providing financial resources for desirable investments. The inability to secure funds for investments may be due to bad credit conditions and the inability to obtain loans, the inability to issue new shares, or the existence of illiquid assets. However, financial constraint cannot be synonymous with financial pressure or economic pressure or bankruptcy risk, although these terms are also related to financial constraint [23]. Financial managers of companies often need financing to carry out development plans or provide their daily net working capital [32]. Also, economic institutions and enterprises are highly dependent on financial markets to secure their capital. Companies are faced with two sources of internal financing and external financing in their financing decisions. Internal financing sources include cash flows from operating activities, asset sales, and accumulated profits, and external

financing sources include funds acquired through financial markets, such as issuing bonds, issuing new shares, and receiving financial facilities. It is from the bank. Managers must decide how to provide the funds they need and how to use the available financial resources. They can use these financial resources to pay dividends to shareholders, implement profitable investment projects, settle overdue debts and increase net working capital [17]. Internal financial constraints related to the resources (cash) within the companies are discussed and they can be presented under the title of agency theory. External financial restrictions are related to sources outside the business unit and are obtained through the issuance of bank loan bonds. These limitations can be based on information asymmetry. According to the second concept, managers have more information than investors about cash flows, investment opportunities and the real value of the company [8]. In general, companies that do not have financial constraints or have less financial constraints There are those who relatively have high liquidity assets and their net assets are high [23]. Following Fazzari and Petersen [16], net working capital as one of the effective factors to identify The financial limit is used and calculated through the difference of current assets and current liabilities divided by the total assets of the company.

## 2.4 Background of the Research

In a research, [2] investigated the access to external financial resources, bargaining power and speed of adjustment of working capital in a sample of 137 companies to listed Tehran Stock Exchange between 2012 and 2018. In order to measure the adjustment speed and test the hypotheses, dynamic models and system generalized moments estimator were used. The findings of the test were consistent with the theory of balance (between costs and benefits of debts). Their research showed that awareness of the role of extra-organizational financial resources and bargaining power in increasing the speed of adjustment of working capital in order to achieve an optimal level of it, can provide useful information to managers of business units and investors. Qiyathund and Heydarzadeh (35) investigated the effect of financial constraints on the optimal working capital of companies listed on the Tehran Stock Exchange following Kaplan and Zingales [24] research. The number of 134 companies of Tehran Stock Exchange in the period of six years from 2014 to 2019 was selected according to the conditions of the society screening and the number of 1026 company-year observations were included in the statistical analysis. Research hypotheses were tested using multivariate regression analysis using mixed data method with fixed effects. The results of the estimation of the research models indicated that the financial constraint had a negative and significant effect on the optimal working capital in such a way that the companies with higher financial constraints had a lower optimal working capital. In a research, Sabouri, [37] examined the role of financial flexibility in sustainable development on the company's performance during the Covid-19 crisis with regard to tangible assets (case study: companies listed on the Tehran Stock Exchange). In order to analyze the hypotheses of the research, the statistical population was selected from among the companies of Tehran Stock Exchange during the years 2017 to 2020 and for 4 years and in the number of 101 companies. The research method used was descriptive-analytical. The findings showed that financial flexibility in sustainable development has a positive and significant role on the performance of the company during the Covid-19 crisis, considering the tangible assets of the companies admitted to the Tehran Stock Exchange. In a research, Dadashzadeh and Hejazi, [15] examined the relationship between the value of financial flexibility, investment efficiency and the speed of adjustment of net working capital in companies listed on the Tehran Stock Exchange. For this purpose, 118 companies were selected and financial information related to the years 2009 to 2015 was selected. Multivariate linear regression method was used to test research hypotheses. The results of this research indicated that there is a positive and significant relationship between the value of financial flexibility with the efficiency of investment in net working capital and the speed of adjustment of net working capital. Kyeong et al., [25] in a research entitled "Sales of durable goods: financial flexibility for limited cost transfer" concluded that companies with more durable output have more cash balance,

less tendency to pay dividends and have less financial leverage. Also, the relationship between durable goods and financial flexibility is equally strong in companies with low and zero leverage. Hao et al., [21] in a research entitled "The effect of financial flexibility of the company on sustainable innovation" examined methods for companies to ensure the development of sustainable innovation in the conditions of economic policy uncertainty. In fact, this study investigated the effect of national economic policy uncertainty as a threshold variable on firm financial flexibility in a sustainable innovation model in China's A-share market from 2007 to 2019. The research findings showed that financial flexibility can significantly improve the innovation ability of companies by releasing the negative effect of financing restrictions. Also, when the impact of policy uncertainty increases, companies can actively save financial flexibility and maintain sufficient financial resources. Chauhan and Banerjoo [13] investigated the relationship between financial constraint and optimal net working capital using a sample of 17,161 Indian companies during the period 1993 to 2015. To calculate the optimal working capital, the method of partial adjustments and adjustment speed towards the target was used. The results of the research showed that there is no systematic behavior for net working capital towards the target of Indian companies. Sang and Quang [38] investigated the effects of financial flexibility value on the efficiency of investment in working capital and the speed of adjustment of working capital by using a sample of 8204 American non-financial companies using the Falkender and Wang (2006) model in examined the length of the time period from 1978 to 2013. The results also showed that the speed of adjustment of working capital for companies with working capital above the target level is higher than for companies with a level lower than the optimal target are located. More importantly, their results showed that the value of financial flexibility increases the speed of working capital adjustment.

According to theoretical foundations and experimental researches, this research seeks to find scientific answers to the following questions:

**The first research question:** What effect does the value of financial flexibility have on the speed of adjustment of net working capital?

**The second research question:** What is the effect of financial constraint on the speed of adjustment of net working capital?

**The third research question:** What effect does financial constraint have on the relationship between the value of financial flexibility and the speed of adjustment of net working capital?

### **3 Research Methodology**

#### **3.1 Research Hypotheses**

**Hypothesis 1:** The value of financial flexibility has a significant effect on the speed of adjustment of net working capital (Partial adjustments model).

**Hypothesis 2:** The value of financial flexibility has a significant effect on the speed of adjustment of net working capital (Error correction model).

**Hypothesis 3:** Financial constraint has a significant effect on the speed of adjustment of net working capital.

**Hypothesis 4:** Financial constraint has a significant effect on the relationship between the value of financial flexibility and the speed of adjustment of net working capital.

#### **3.2 Research Method**

This research is a quantitative type of research and it is practical in terms of the result of implementation. According to the type of data and available analysis methods, in terms of the time of

conducting the research, it is a type of longitudinal (panel) research. In terms of the type of data used, the current research is of the mixed category (combination of time-interval series). Since this research was carried out with the aim of testing the hypothesis, it was of a quantitative type, therefore, in terms of its purpose, it is of an analytical type. Also, due to the fact that the dependent variable changes are predicted according to the independent variables changes, this research is of the correlation-regression analysis type. In terms of cognitive method, the current research is one of descriptive-correlation researches. In terms of the type of reasoning, the current research is of the hybrid category (ie deductive-inductive), and in terms of the time dimension, the current research is of the retrospective type (post-event). In terms of information gathering method, it is a part of library research and document mining, and finally, in terms of data analysis method, it is a part of statistical methods research. In this research, mixed data was used and according to the type of data, statistical tests of panel data were performed along with other tests related to regression analysis method. In order to perform statistical analysis, first the raw data were entered into the Excel software, and after the necessary preparation and calculations, they were entered into the statistical analysis software Eviews 12.

### 3.3 Research Variables

#### 3.3.1 Independent Variables

##### Value of Financial Flexibility (VOFF)

To calculate the value of the financial flexibility, the following steps are taken:

##### First step: estimation of cash market value using Falkender and Wang (2006) model:

$$\begin{aligned}
 r_{i,t}-r_{i,t}^B &= \gamma_0 + \gamma_1 \Delta C_{i,t} / M_{i,t-1} + \gamma_2 SGR_{i,t} + \gamma_3 \Delta E_{i,t} / M_{i,t-1} + \gamma_4 T_{i,t} + \gamma_5 \text{Spread}_{i,t} \\
 &+ \gamma_6 \text{TANG}_{i,t} + \gamma_7 SGR_{i,t} * \Delta C_{i,t} / M_{i,t-1} + \gamma_8 \Delta E_{i,t} / M_{i,t-1} * \Delta C_{i,t} / M_{i,t-1} + \gamma_9 T_{i,t} * \Delta C_{i,t} / M_{i,t-1} \\
 &+ \gamma_{10} \text{Spread}_{i,t} * \Delta C_{i,t} / M_{i,t-1} + \gamma_{11} \text{TANG}_{i,t} * \Delta C_{i,t} / M_{i,t-1} + \gamma_{12} C_{i,t-1} / M_{i,t-1} + \gamma_{13} \Delta NA_{i,t} / M_{i,t-1} \\
 &+ \gamma_{14} \Delta RD_{i,t} / M_{i,t-1} + \gamma_{15} \Delta I_{i,t} / M_{i,t-1} + \gamma_{16} \Delta D_{i,t} / M_{i,t-1} + \gamma_{17} ML_{i,t} + \gamma_{18} NF_{i,t} / M_{i,t-1} + \varepsilon_i
 \end{aligned} \quad (1)$$

In the above model, symbols  $i$  and  $t$  represent the company and year under investigation, respectively, and the variable  $\Delta X$  also represents the first-order difference of the above variables. It is assumed that the expected changes in the  $X$  variable are equal to zero (except for the cash holding variable). The definitions of other variables in model (1) are as follows:  $r_{i,t}-r_{i,t}^B$  is the company's annual cumulative surplus return, such that  $r_{i,t}$  is the company's annual stock return and  $r_{i,t}^B$  represents the total return of the market (portfolio) at the end of year  $t$ .  $C_{i,t}$  keeping the company's cash (sum of cash and short-term investments of the company),  $M_{i,t-1}$  the market value of the company at the beginning of the period,  $SGR_{i,t}$  the growth rate of the company's sales,  $\Delta E_{i,t}$ : net operating profit (loss) before the deduction of interest and taxes of the company,  $\text{Spread}_{i,t}$ : the difference between the offer price of buying and selling the company's shares (information asymmetry),  $\text{TANG}_{i,t}$ : the total tangible fixed assets of the company (asset return),  $\Delta I_{i,t}$ : the company's interest expense,  $D_{i,t}$ : dividend paid to the company's common shareholders,  $ML_{i,t}$ : the company's market leverage (ratio of total liabilities to total assets),  $NF_{i,t}$ : cash flow resulting from the company's financing activities,  $\Delta NA_{i,t}$ : changes in non-cash current assets,  $\Delta RD_{i,t}$ : change in the company's research and development cost. All variables are in the scale of stock market value. To calculate the cumulative annual excess return:  $r_{i,t}-r_{i,t}^B$ , the following relationship is used:

$$r_{i,t} = \{(1+\alpha+\beta) * (P_{i,t} + \text{DPS}) - P_{i,t-1} - \alpha(1000)\} / \{P_{i,t-1} + \alpha(1000)\} \quad (2)$$

$\alpha$  and  $\beta$ : percentage of capital increase from claims and cash receipts, accumulated profit and company reserves,  $P_t$ : stock price of company  $i$  in year  $t$ ,  $\text{DPS}$ : cash profit per share. The expected cash holding

is calculated as follows:

$$C_{i,t} - C_{i,t-1}/M_{i,t-1} = \alpha_0 + \alpha_1 \text{Spread}_{i,t-1} + \alpha_2 \text{CF}_{i,t-1}/M_{i,t-1} + \alpha_3 \text{Size}_{i,t-1} + \varepsilon_{i,t} \tag{3}$$

In the relation above,  $\text{CF}_{i,t-1}$  is the cash flow resulting from the company's operational activities. Information asymmetry  $\text{Spread}_{i,t-1}$  is also calculated as follows:

$$\text{Spread}_{i,t} = \frac{1}{D_i} \sum_{D=1}^D \frac{1}{\sum \text{Volume}_{i,t}} \sum_{T=1}^T (2 \times \frac{|\text{Price}_{i,t} - (\text{Ask}_{i,t} + \text{Bid}_{i,t})/2|}{(\text{Ask}_{i,t} + \text{Bid}_{i,t})/2} \times \text{Volume}_{i,t}) \tag{4}$$

D: the number of stock trading days,  $\text{Volume}_{i,t}$ : the volume of the company's stock trading,  $\text{Ask}_{i,t}$ : the highest bid price of the stock,  $\text{Bid}_{i,t}$  the lowest bid price of the stock and  $\text{Price}_{i,t}$ : the stock price.

Model (1) will be estimated using the data integration method at the level of the whole year-companies. The way to estimate the model is ordinary or generalized least squares regression. After identifying the indicators that determine the value of financial flexibility, we aggregate them in a combined measure in two stages. First, the market's reaction to the changes in cash is measured and analyzed, and based on this analysis, a weight is assigned to each variable. In the second step, the final measure of financial flexibility value is calculated for each company-year.

Second step: calculating the value of financial flexibility (final value of cash)

Based on the estimated regression coefficients of unexpected changes in cash and the interactive effect of financial flexibility value factors in model (1), the value of financial flexibility for each company-year is calculated by the following equation:

$$\text{VOFF}_{i,t} = \lambda_1 + \lambda_6 \text{SGR}_{i,t} + \lambda_7 \Delta E_{i,t}/M_{i,t-1} + \lambda_8 \text{Spread}_{i,t} + \lambda_9 \text{TANG}_{i,t} \tag{5}$$

In the above model,  $\text{VOFF}_{i,t}$ : the value of the company's financial flexibility and reflects the value that the shareholders attribute to the company's financial flexibility through the estimated weights (from model 1). The definitions of other variables are similar to the definitions mentioned in model (1).

Financial constraint (FC)

The model of Kaplan and Zingales (1997) which was localized by Tehrani and Hesarzadeh (2008) by re-estimating the coefficients with current conditions is as follows:

$$\text{KZ}_{\text{IRAN}} = 17.33 - 37.48 \text{CASH}_{i,t} - 15.21 \text{DIV}_{i,t} + 3.39 \text{LEV}_{i,t} - 1.40 \text{MTB}_{i,t} \tag{6}$$

In relation to the above:

$\text{CASH}_{i,t}$ : the total cash and short-term investments of the company,  $\text{DIV}_{i,t}$  : the ratio of the company's dividend to total assets,  $\text{LEV}_{i,t}$  : is the company's leverage ratio (equivalent to the ratio of total liabilities to total assets),  $\text{MTB}_{i,t}$  : is the ratio of the company's market value to the book value of equity. KZ values are divided into statistical quintiles and according to the table below, the data included in the sample are separated into two groups of companies with financial constraints and companies without financial constraints.

For each of the criteria of financial constraints, model (6) is estimated for each pair of companies (with financial constraints and without financial constraints) and the difference between the two groups of companies is tested. How to estimate ordinary or generalized least squares regression.

**Table 1:** The method of distinguishing companies with financial constraints using the KZ index

Type of quintet	quintet	Quintet	Quintet	quintet	Quintet
Quintile percentage	0-%20	%20-%40	%40-%60	%60-%80	%80-%100
Financial limitation	-	-	-	✓	✓

### 3.3.2 The dependent variable

Speed of adjustment of net working capital (SOAWC)

Net working capital is a function of the following factors:

$$NWC_{i,t} = \gamma_0 + \gamma_1 SGR_{i,t-1} + \gamma_2 SVOL_{i,t-1} + \gamma_3 CF_{i,t-1} + \gamma_4 DIFF_{i,t-1} + \gamma_5 GPM_{i,t-1} + \gamma_6 Age_{i,t-1} + \gamma_7 MP_{i,t-1} + \gamma_8 Spread_{i,t} + \gamma_9 Size_{i,t-1} + Ind_i + Year_t + \delta_{i,t} \quad (7)$$

In the above model,  $NWC_{i,t}$ : Company's net working capital,  $SGR_{i,t-1}$ : Company's sales growth rate,  $SVOL_{i,t-1}$ : Company's sales volatility,  $CF_{i,t-1}$ : Flow operating cash of the company,  $DIFF_{i,t-1}$ : financial helplessness of the company,  $GPM_{i,t-1}$ : gross profit margin of the company,  $Age_{i,t-1}$ : age of the company,  $MP_{i,t-1}$ : market power of the company,  $Spread_{i,t}$ : information asymmetry,  $Size_{i,t-1}$ : company size (natural logarithm of total company assets),  $Ind_i$ : artificial variable of the industry,  $Year_t$ : artificial variable of the year,  $\delta_{i,t}$ : deviation from the optimal net working capital of the company.

Following the experimental technique that has recently been used in research to estimate the speed of adjustment of financial leverage and cash holding by Falkender et al (2012), Jiang and Lai (2016) and an et al (2015), in this research, a model traditional partial adjustments will be used to examine the dynamics of these adjustments as follows (Song and quang, 2016):

$$NWC_{i,t} - NWC_{i,t-1} = \Delta NWC_{i,t} = \rho_0 + \rho_1 (NWC_{i,t}^* - NWC_{i,t-1}) + \varepsilon_{i,t} \quad (8)$$

$NWC_{i,t}$ : Net working capital of company  $i$  in year  $t$ ,  $NWC_{i,t}^*$ : target level of net working capital of company  $i$  in year  $t$ ,  $\Delta NWC_{i,t}$ : adjustment in net working capital of company  $i$  during Period  $t$ ,  $\varepsilon_{i,t}$ : the remainder of the model (other factors).

The fitted values of model (7) will be used as an index of the determining factors of net working capital. Assuming that the target level of net working capital can be fully explained through the determinants included in model (7). In other words,  $NWC_{i,t}^* = \beta X_{i,t}$ . so that the vector  $X$  represents the factors affecting the level of net working capital, including the net working capital of the previous year. The term  $(NWC_{i,t}^* - NWC_{i,t-1})$  is also the amount of deviation of net working capital from the target level.  $\rho_1$  also represents the speed of adjustment, which measures the speed of adjustment of the actual net working capital towards the target net working capital, and it is a value between zero and one. When the adjustment speed value is one, adjustment is complete (Liao et al., 2015; Jiang and Lai, 2016; Brisker and Wang, 2016). The advantage of this method is that it allows interaction to be included in the model to examine the factors affecting the speed of adjustment.

Model (8) can be rewritten in the following form:

$$NWC_{i,t} = (1 - \rho)NWC_{i,t-1} + \rho\beta X_{i,t} + \varepsilon_{i,t} \quad (9)$$

### 3.3.3 Moderating Variable

Financial constraint

### 3.3.4 Control Variables

The selection of control variables was made based on the study of the theoretical foundations of the research and the control variables used in the research of Song and quang(2016) whose required information could be calculated according to the data of the Tehran Stock Exchange.

**Management entrenchment:** To measure management entrenchment, three indicators of CEO duality, managerial ownership and Risk of overinvestment have been used.



- **CEO Duality:** If the CEO is the chairman or vice chairman of the board of directors in a company, the virtual variable 1 is used, and vice versa, if he is not the chairman or vice chairman of the board of directors, the virtual variable zero is used.
- **Managerial ownership:** It shows the percentage of shares held by the members of the board of directors.
- **Risk of overinvestment:** In this research, the model of Chen et al., [14] was used to measure the risk of overinvestment.

$$Inv_{i,t} = \alpha_0 + \alpha_1 NG_{i,t-1} + \alpha_2 REWGROW_{i,t-1} + \alpha_3 NG_{i,t-1} * \alpha_2 REWGROW_{i,t-1} + \epsilon_{i,t} \quad (10)$$

In this model  $Inv_{i,t}$ : the result of dividing the total tangible and intangible assets of the company by the total assets,  $NG_{i,t-1}$ : the negative growth of the company's sales. If the company's sales growth in year t-1 is negative, it is considered equal to one and zero otherwise.  $REWGROW_{i,t-1}$ : The company's sales growth and is equivalent to the company's sales percentage from year t-2 to t-1.

**Gross profit margin (GPM):** It is the result of dividing the company's gross profit by the company's sales revenue.

**Profit Volatility (SVOL):** is the standard deviation of the company's current three-year sales rate.

**Market power (MP):** The result of dividing the company's annual sales revenue by the total annual sales revenue in the specific industry of each company.

### 3.4 Hypothesis Test Models

Model (11) of research to test the first research hypothesis (Song and quang, 2016):

$$SOAWC_{i,t} = (\Gamma_0 + \Gamma_1 VOFF_{i,t-1} + \Gamma_2 X_{i,t-1}) \times TWCR_{i,t} + E_{i,t} \quad (11)$$

In pattern (1), the opposite relationship is established:  $TWCR_{i,t} = NWC_{i,t}^* - NWC_{i,t-1}$ . Also,  $\gamma_1$  is the desired variable that measures the effect of financial flexibility value on the speed of adjustment of net working capital.  $\gamma_2$  is the vector of mutual regression coefficients between the control variables and the adjustment speed of the company's net working capital?

Model (12) of research to test the second research hypothesis (Song and quang, 2016):

$$SOAWC_{i,t} = (\varphi_0 + \varphi_1 VOFF_{i,t-1} + \varphi_2 X_{i,t-1}) * DTWCR_{i,t} + (\theta_0 + \theta_1 VOFF_{i,t-1} + \theta_2 X_{i,t-1}) * LDWCR_{i,t} + \eta_j + \nu_t + \epsilon_{it} \quad (12)$$

In the pattern above:

$$DTWCR_{i,t} = NWC_{i,t}^* - NWC_{i,t-1}$$

$$LDWCR_{i,t} = NWC_{i,t-1}^* - NWC_{i,t-1}$$

Model (15) of research to test the third research hypothesis (Song and quang, 2016):

$$SOAWC_{i,t} = B_0 + B_1 FC_{i,t} + B_2 GPM_{i,t} + B_3 SOVL_{i,t} + B_4 MP_{i,t} + B_5 GINDEX_{i,t} + E_{i,t} \quad (13)$$

Model (16) of research to test the fourth research hypothesis (Song and quang, 2016):

$$SOAWC_{i,t} = (\Delta_0 + \Delta_1 VOFF_{i,t-1} + \Delta_2 X_{i,t-1}) \times TWCR_{i,t} + FC + E_{i,t} \quad (14)$$

In models (13), (14) and (16), the term  $X_{i,T-1}$  means control variables.

### 3.5 Sample Selection Process

The statistical population of the research is all the companies accepted and active in the Tehran Stock Exchange in a 16-year period, including the time period from 2005 to 2020. The statistical sample was selected using the systematic elimination method.

**Table 2:** Determining the sample size

Description	Number
The number of companies listed to the Tehran Stock Exchange until the end of 2020	711
The number of companies delisted from the stock market during the research period	(57)
The number of companies that entered the stock market in the research period	37
The number of companies with fiscal years do not end on march 20 in the research time period	(128)
The number of companies changed their fiscal year in the research time period	(20)
The number of companies engaged in investment and financial mediation in the research period	(31)
The number of companies with a trading break of more than six months in the time period of the research	(123)
A number of companies lacking the information required for research	(215)
Total observations in the final analysis	100

## 4 Research findings

### 4.1 Descriptive Statistics

**Table 3:** Descriptive Statistics of Research Variables

Variables	Number	Average	Mean	Maximum	Minimum	Standard deviation
<b>VOFF</b>	1600	0.445776	0.116209	17.65713	-33.04685	6.183768
<b>SOAWC</b>	1600	12.87665	11.88765	11.9976	8.8877	0.08776
<b>FC</b>	1600	15.91412	17.08911	31.14247	-37.65197	5.262114
<b>GPM</b>	1600	0.263976	0.249183	1.0000	-2.175607	0.186825
<b>SVOL</b>	1600	0.512651	0.266804	61.03621	0.006464	2.517354
<b>MP</b>	1600	0.016892	0.005595	0.499090	0.0000	0.031328

### 4.2 Checking the Reliability of Research Variables

**Table 4:** The Results of Reliability Test of Variables

Variables	Test of Levin, Lin and Cho	The level of significance
<b>VOFF</b>	-32.998	0.0000
<b>SOAWC</b>	-276.376	0.0000
<b>GINDEX</b>	-2.65060	0.0000
<b>FC</b>	-9.58187	0.0000
<b>MP</b>	-6.67562	0.0000
<b>SVOL</b>	-127.398	0.0000
<b>GPM</b>	-19.5868	0.0000

### 4.3 Limer's F and Hausman Test

**Table 5:** The Results of Limer's F Test for Research Models

	آماره	The level of significance	The accepted method
<b>Model(11)</b>	7.08	0.0000	Panel data
<b>Model(12)</b>	5.85	0.0000	Panel data
<b>Model(13)</b>	0.41	0.261	Pooled data
<b>Model(14)</b>	2.70	0.0000	Panel data

According to the statistics and level of error of the Limer's F test for models (11, 12, and 14), it is necessary to perform the Hausman test to choose between the pattern of panel data with fixed effects or panel data with random effects. The results of the Hausman test are also shown in Table (6).

**Table 6:** Hausman test results for research models

	آماره	The level of significance	The accepted method
<b>Model(11)</b>	0.0000	0.0001	Fixed effects pattern
<b>Model(12)</b>	6.78	0.23	Random effects pattern
<b>Model(13)</b>	0.0000	0.0001	Fixed effects pattern

### 4.4 Results of Research Models:

In the following, the results of the estimation of the research models are shown in tables (7) to (10) with the preferred method.

**Table 7:** The Results of Estimating Model (11).

Variables	Coefficient	t statistic	Prob
$\alpha_0$	0.020757	53.71364	0.0000
VOFF	0.002032	13.08955	0.0000
GINDEX	0.166297	252.6833	0.0000
GPM	0.185474	211.1270	0.0000
SVOL	50.187589	3055.771	0.0000
MP	0.191407	22.08917	0.0000
<b>R-squared</b>	0.766545		
<b>Adjusted R-squared</b>	0.748777		
<b>Durbin-Watson statistic</b>	1.472023		
<b>F statistic</b>	103012.1		
<b>Prob(F-statistic)</b>	0.0000		

According to the results obtained in Table (7) from the estimation of Hypothesis (1), the positive coefficient of the value of financial flexibility indicates that the increase in the value of financial flexibility increases the speed of adjustment of net working capital. As a result, this hypothesis is confirmed at the confidence level of 0.95. The result of the test of this hypothesis is in accordance with the theoretical foundations of the research and it is also consistent with the research results of Dadashzadeh and Hejazi (2019) and the research results of Yang and Quang (2016).

**Table 8:** The results of estimating model (12).

Variables	Coefficient	t statistic	Prob
$\alpha_0$	0.020757	53.71364	0.0000
VOFF	0.002032	13.08955	0.0000
GINDEX	0.166297	252.6833	0.0000
GPM	0.185474	211.1270	0.0000
SVOL	0.187589	3055.771	0.0000
MP	0.191407	22.08917	0.0000
<b>R-squared</b>	0.732455		
<b>Adjusted R-squared</b>	0.714433		
<b>Durbin-Watson statistic</b>	1.472023		
<b>F statistic</b>	103012.1		
<b>Prob(F-statistic)</b>	0.0000		

According to the results obtained in table (8) from the estimation of Hypothesis (2), the positive coefficient of the value of financial flexibility indicates that increasing the value of financial flexibility increases the speed of adjustment of net working capital. As a result, this hypothesis is confirmed at the confidence level of 0.95. The result of testing this hypothesis is consistent with the research of Song and Kuang (2016).

**Table 9:** results of estimating model (13)

Variables	Coefficient	t statistic	Prob
$\alpha_0$	-0.000376	-0.474617	0.0000
Fc	14.70071	31.88734	0.0000
GINDEX	0.166546	265.3871	0.0000
GPM	0.187406	235.4911	0.0000
SVOL	0.187655	2678.122	0.0000
MP	0.172546	22.20354	0.0000
<b>R-squared</b>	0.706653		
<b>Adjusted R-squared</b>	0.704320		
<b>Durbin-Watson statistic</b>	1.616440		
<b>F statistic</b>	79915.85		
<b>Prob(F-statistic)</b>	0.0000		

According to the results obtained in table (9) from the estimation of Hypothesis (3), the positive coefficient of the financial constraint indicates that increasing financial constraint increases the speed of adjustment of net working capital. As a result, this hypothesis is confirmed at the confidence level of 0.95. The result of testing this hypothesis is consistent with the research of Song and Kuang (2016). According to the results obtained in table (10) from the estimation of Hypothesis (4), the positive coefficient of the financial constraint indicates that increasing financial constraint increases the relationship between the speed of adjustment of net working capital and the value of financial flexibility. As a result, this hypothesis is confirmed at the confidence level of 0.95. The result of testing this hypothesis is consistent with the research of Song and Kuang (2016).

**Table 10:** Results of Estimating Model (14).

Variables	Coefficient	t statistic	Prob
$\alpha$	-0.003252	-2.6735	0.0000
VOFF	0.002179	15.41873	0.0000
FC	0.0087	33.83071	0.0000
GINDEX	0.166445	270.1731	0.0000
GPM	0.187283	246.0195	0.0000
SVOL	0.187617	2968.895	0.0000
MP	0.178764	24.30797	0.0000
R-squared	0.594333		
Adjusted R-squared	0.587777		
Durbin-Watson statistic	1.612303		
F statistic	97192.77		
Prob(F-statistic)	0.0000		

## 5 Conclusions

Investing in the net working capital of the company depends on the limitation of financial resources. Companies that have a higher internal financing capacity and have access to the capital market have a higher capital turnover. According to the findings of the research, the financial constraint has a positive and meaningful relationship with the speed of adjustment of net working capital, which is in accordance with the findings of the research of Sang and Quang (2016). Financially limited companies are sensitive to the issue of being able to react to unexpected opportunities due to their distance from the capital market and they try to use all their power to preserve their credibility from the competition in the capital market. In order to maintain the guarantee of financial health, they have a favorable net working capital. As a result, increasing the financial limit increases the speed of adjustment of net working capital. Also, the speed of adjustment of net working capital is a decreasing function of the financial constraint level. According to the findings of the research, financial restriction has a positive and significant effect on the relationship between the value of financial flexibility and the speed of adjustment of net working capital. Companies facing higher levels of financial constraints tend to pay less dividends and use appropriate investment policies to increase free cash flow in order to reduce the possibility of needing foreign funds in the future. As a result, it can be said that the limitation in providing financial resources affects the relationship between the value of financial flexibility and the speed of adjustment of the company's actual net working capital to the company's optimal net working capital. The following research is suggested:

- Examining the value of financial flexibility with other influential variables in the decision-making process of large companies.
- Investigating the value of financial flexibility with other research variables based on local models in Iran.
- Providing native models for each of the research variables and retesting the research hypotheses.

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