Int. J. Nonlinear Anal. Appl. In Press, 1–8
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/ijnaa.2023.30611.4448

The effect of net working capital on the market value of companies listed in the Tehran stock exchange using autoregressive distributed lag (ARDL)

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(Communicated by Farshid Khojasteh)

Abstract

The purpose of this research was to investigate the net effect of working capital on the company's market value. The statistical population of the current research was the companies admitted to the Tehran Stock Exchange between 2011 and 2021, and the samples included 150 companies that have characteristics such as data availability, financial statements, etc. The analysis of corporate financial information was performed by Autoregressive Distributed Lag (ARDL) in the Eviews software environment. The result of the research showed that net working capital has a significant effect on the value of companies listed on the Tehran Stock Exchange.

Keywords: net working capital, market value, Autoregressive Distributed Lag
2020 MSC: 91B24, 91B84

1 Introduction

Working capital in all organizations, and especially in smaller organizations, accounts for a huge part of the organization's capital, and its management based on the management mechanisms of supply chain elements is also very important because it directly affects the liquidity and profitability of companies. Therefore, company managers are looking to invest in profitable projects to increase the value of the company. These projects need financing [9]. Companies that are unable to provide these resources from within the company refer to external sources of capital. If companies face problems in accessing external capital market resources, they have financial limitations [13]. But when external financing is more expensive, the company invests the cash kept to continue its activities in projects with a positive net present value, which ultimately leads to an increase in the value of the company. Therefore, the amount of cash kept for investing in projects with positive net present value will be very effective in companies that are facing financial constraints. The optimal level of liquidity is the minimum level of liquidity that is necessary to support commercial and production activities, and since the key factor of the optimal level of liquidity is the turnover of liquidity, excessive liquidity cannot be a criterion for good performance, but in general It has a direct relationship with the value of the company [5].

Working capital is considered as a vital factor for the activity of an economic enterprise, and the effective management of working capital is one of the basic prerequisites for the success of the enterprise. Working capital management

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Received: March 2023 *Accepted:* May 2023

seeks to strike a delicate balance between maintaining liquidity to support day-to-day operations and maximizing short-term investment opportunities [6]. Enterprise value is a long-term measure of a firm's performance. For this reason, working capital is under the control of the company and is independent of macroeconomic factors and allowing the company to easily change the economic environment and increase its economic added value. Effective management of working capital helps to increase the firm's free cash flow, thereby maximizing the firm's value [1]. Compared to investment in fixed assets, investment in working capital is more sensitive to financing constraints. Considering that a company's fixed asset investment decision is set before the financial year, the company will try to maintain a stable path for its fixed asset investment, but cash fluctuations may occur, and this may require compensation through the use of foreign funds (external financing) [12]. Unfortunately, a company that faces financing restrictions may not be able to provide financing without incurring heavy costs. Hence, it may look for a cheaper alternative, one of these alternatives may be working capital that allows liquidity to be released in the short term and, given its short-term nature, will be reversible [2].

Nowadays, in all business units, working capital accounts for a huge part of the organisation's capital, and its management is also very important. Working capital is an important factor for the success of any business unit and requires adequate control and management. Working capital management seeks to achieve conditions that the company does not face excess or a lack of liquidity [8]. If the company faces a lack of liquidity, failure to maintain the desired level of liquidity for a company will cause that company to be unsuccessful in using short-term investment opportunities and to access the raw materials needed to produce goods and meet the needs of customers [1]. don't have time. Also, it is possible that the business unit will face problems in fulfilling its obligations on time, which will have a bad effect on its reputation. Such a company will not be able to take advantage of favourable market conditions and accept profitable projects due to a lack of resources [7]. Also, the company will not be able to provide the equipment it needs and use cash discounts. The continuation of this situation may cause the fall of the company's stock price and eventually lead to the termination of the business unit's activity with a decrease in value. On the other hand, stock price fluctuations are normal and occur every day in all stock exchanges. The stock price is influenced by internal factors and external factors, and each of these factors affects the stock price of companies [11]. Changes in the company's stock price also affect the company's value in a way. From the internal factors of the company, we can mention the profitability, losses and management of the company, and more importantly, the working capital. Of course, to check the net relationship between working capital and company value, we can refer to the relevance value. The value of relevance states that the price or value of shares depends on what factor, and in this research, one of its important factors, i.e., net working capital, is investigated [9].

Many studies have shown that the value of the company is significantly affected by the working capital and its management [1]. In addition, the value of the company is determined based on the current and future free cash flow of the company. Net working capital is one of the important components of free cash flow. In such a way that the net increase in working capital in each period, the free cash flow of that period decreases, but the future free cash flows improve through the possible growth of sales and profitability of the company [3]. Although much research has been done to show that working capital management on company value, no research was found that directly examines the impact of net working capital on company value. Therefore, it seems necessary to show the net effect of working capital on the value of the company. Therefore, this research investigates the net effect of working capital on the value of companies admitted to the Tehran Stock Exchange during the years 2011 to 2021 by using the data and financial information of the companies admitted to the Tehran Stock Exchange. In other words, it raises the question of whether net working capital has a significant effect on the value of companies admitted to the Tehran Stock Exchange.

2 Research methodology

2.1 Research method

Due to the fact that this research uses past information to test hypotheses, it is a type of post-event research. This research is a quasi-experimental research in the field of accounting and financial research. The statistical population of this research includes all companies admitted to the Tehran Stock Exchange, except investment and holding companies, during the period between 2011 and 2021 as a statistical population. The reason for choosing the mentioned community is: 1- availability of stock market information, 2- correctness of stock market information, and 3- high reliability and validity of stock market information. The sampling method in this research is screening or systematic elimination, and to screen the society, the sampling includes companies that have all the following conditions:

1. To select a homogeneous sample, the companies must have been admitted to the Tehran Stock Exchange before 2011 and their shares have been traded on the stock exchange since the beginning of 2021.

2. To select active companies, the transactions of these companies during the years 2011-2021 in the Tehran Stock Exchange have not suffered a break (six months).
3. In terms of increasing comparability, the financial period of the companies should end in March.
4. Do not have a change in activity or financial year between the years under study.
5. It is possible to obtain the information required by the companies
6. No intermediary companies, banks and investments.

According to the above limitations, the statistical sample of the research is 150 member companies of Tehran Stock Exchange.

2.2 Research model and how to calculate variables

The statistical model used in the research is a multivariate regression model.

$$\text{Value}_{it} = \alpha_{it} + \alpha_1 NWC_{it} + \alpha_2 dum_{it} + \alpha_3 NWC_{it} * dum_{it} + \alpha_4 MB_{it} + \alpha_5 LEV_{it} + \alpha_6 ROE_{it} + \alpha_7 SIZE_{it} + \varepsilon_{it} \quad (2.1)$$

2.2.1 Dependent variable: company value (Value)

The value of the company is considered as a dependent variable, which is obtained by dividing the logarithm of the market value of equity at the end of the year and the market value of equity at the end of the year:

$$\text{Value}_{it} = LN\frac{MVE}{BVE} \quad (2.2)$$

2.2.2 Independent variable: Net operating working capital (NWC)

The main independent variable of this research is net working capital, which is measured using the following relationship:

$$LN(NWC)_{i,t} = LN(X_{i,t} - Y_{i,t} + Z_{i,t}) \quad (2.3)$$

in the above equation:

X: Commercial accounts payable

Y: inventory of goods

Z: Commercial accounts receivable

2.2.3 Control variables

dum: virtual variable; The number 1 is meant for companies with more financial constraints and zero for companies with less financial constraints. The way to measure this model is to calculate the kz values and then the companies are sorted from small to large and finally the companies in the bottom two quintiles are known as financial limited asset companies.

$$kz_{it} = 17.33 - 37.486 \text{ CASH HOLDING}_{it} + 15.216 DIV_{it} + 3.494 LEV_{it} - 1.402 MTB_{it} \quad (2.4)$$

CASH HOLDING: ratio of cash and short-term investment to assets at the beginning of the period

DIV: Dividend to assets ratio

LEV: total debt to total assets in the first period

MTB: The market value of the company (the sum of the market value of equity and the book value of debt) divided by the book value of assets.

LEV: It is defined as the book value of total liabilities divided by total assets at the end of year t.

MB: as a growth opportunity for the company and is calculated from the ratio of market value to book value of equity.

LEV: It was the financial leverage of the company and is obtained by dividing the book value of total liabilities by total assets at the end of the year.

ROE: It represents the return on equity and is calculated from the dividend before the contingent items on the book value of equity at the end of the year.

SIZE: It indicates the size of the company, and the logarithm of the market value of equity is obtained at the end of the year.

2.3 Analysis methods and data collection tools

The present study applied the approach to distributive interruptions (ARDL) for the collective review of variables. Most recent studies suggest that the ARDL model is superior to other common methods for investigating co-integration, such as the Engle and Granger methods. The first reason is that regardless of whether the available variables are in model I(0) or I(1), they can be used. Another reason is that this method is relatively more efficient in small or limited samples compared to other methods. Therefore, this method has been used in this study. It should be noted that the ARDL method cannot be used in the presence of I(2). The general form of the ARDL pattern $(p, q1, q2, ..., qk)$ can be expressed as follows:

$$\varphi(L,P)Y_t = \sum_{i=1}^{k} \beta_i(L,q_i)X_{it} + \delta W_t + \mu_t \tag{2.5}$$

$$Q(L,P) = 1 - \varphi_1 L - \varphi_2 L^2 - ... - \varphi_p L^p \tag{2.6}$$

$$\beta_i(L,q_i) = \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + ... + \beta_{i_{q_i}}L^{q_i} \qquad i = 1,2,3,...,k \tag{2.7}$$

in the above relation, L represents the time interrupt operator of the first order, such that $LY = Y_{t-1}$, Expresses the dependent variable, X_t represents the vector of explanatory variables, q_i the number of optimal interrupts associated with each of the explanatory variables, P the number of optimal interrupts related to the dependent variable and W_t are vectors of definite variables such as the width of the origin, seasonal variables, time trends or exogenous variables with fixed intervals. The corresponding equation is estimated using Eviews software. In the next step, using one of the criteria of Akaike, Schwartz-Bayesian, Hanan-Quinn or adjusted coefficient of determination, the optimal interruptions of the model are selected. From the above criteria, Pesaran and Shin [10] propose the Schwartz-Bayesian criterion for determining the optimal interruptions of the model. This criterion saves the number of interruptions due to the small sample size; In the end, fewer degrees of freedom are lost. To determine the long-run relationship, the value of the t-statistic can be compared with the critical quantities presented by Banerjee, Dolado and Mestre [4]. The value of the t-statistic to test the hypothesis of a long-run relationship ($H_0 : \sum_{i=1}^{p} \varphi_i - 1 \geq 0$) is calculated as follows:

$$t = \sum_{i=1}^{p} \hat{\beta}_i - 1 / \sum_{i=1}^{p} S_{\hat{\beta}_i} \tag{2.8}$$

where $S_{\hat{\beta}_i}$ is the standard deviation of the coefficients of the intermittent variables. If the computational value of t is greater than the critical value, Hypothesis zero based on which indicates the absence of a long-term relationship, is rejected, and we accept the existence of a long-term relationship. In addition, Eviews software provides an error correction model (ECM) according to the selected model. In order to derive the error correction model based on the ARDL $(p, q_1, q_2, ..., q_k)$ model, the variables $W_t, Y_t, X_{1t}, ..., X_{kt}$ are considered in terms of values with interrupts and their first-order difference; and the ECM model gives the following relation.

$$\Delta Y_t = -\phi(L,P)ECM_{t-1} + \sum_{i=1}^{k} \beta_{i0}\Delta X_{it} + \delta \Delta W_t - \sum_{j=1}^{p-1} \varphi_j \Delta Y_{t-j} - \sum_{i=1}^{k} \sum_{j=1}^{q_{t-1}} \beta_{ij} \Delta X_{i,t-j} + U_t \tag{2.9}$$

the above equations are estimated by the OLS method, and by performing the necessary tests, the short-term dynamic structure of the model is determined. In the error correction model, ECM_{t-1} indicates the rate of adjustment toward long-run equilibrium. This coefficient shows what part of the imbalance of the dependent variable Y_t during the previous period is corrected in the current period. It is expected that the sign of this variable is negative and its value is between zero and -1. In this research, the library method was used to collect data and information, and data related to sample companies were extracted from sources such as Denasaham, Rahavard Novin, Bourse site, etc.

3 Findings

In order to study the general characteristics of variables and their detailed analysis, it is necessary to be familiar with descriptive statistics related to variables. Table 1 shows the descriptive statistics of the data related to the variables used in the research.

The table above shows the descriptive statistics for the model variables, which represent the descriptive parameters for each variable separately. These parameters mainly include information about central indicators, such as maximum, minimum, mean and average, as well as information about dispersion indicators, such as standard deviation. The most important central indicator is the average, which represents the equilibrium point and center of gravity of the

Table 1: Descriptive statistics related to research variables

Variables	Average	Middle	Max	Min	SD
Value	2.11	1.79	4.39	0.52	1.23
NWC	6.18	5.78	9.21	3.62	2.06
MB	2.28	1.91	5.9	0.50	1.34
LEV	0.558	0.571	1.09	0.06	0.18
ROE	0.42	0.47	5.81	−2.26	1.65
SIZE	13.95	13.66	18.45	10.81	1.54

distribution, and is a good indicator to show the centrality of the data. For example, the average variable of a NWC is -2.11, which shows that most of the data related to this variable is centered around this point. Also, the median of the fair value accounting (MB) is equal to 1.91, which indicates that half of the data is less than this value, and the other half is more than this value. Dispersion parameters are generally a criterion for determining the degree of dispersion of data from each other, or the extent of their dispersion relative to the average. One of the most important parameters of dispersion is standard deviation. The value of this parameter is 1.54 for the company size variable and 0.18 for the financial leverage variable. Before testing the research hypotheses to determine the relationship between research variables, a single root test for the variables should be performed. The econometrics and unit root text indicate that the unit root test based on panel data is more powerful and accurate than the unit root test of time series. In this research, in order to test the unit root has been used the Lin and Chou method has been used. Hypothesis zero in this test indicates the instability of the variable. In this case, if the probability values are less than 0.05, assumption zero will be rejected.

H0: Variables are unstable.

H1: Variables are stable.

Table 2: Stability test results for model variables

Variables	Coefficient	Sig
Value	−9.41	0.00
NWC	−12.69	0.00
MB	−23.72	0.00
LEV	−14.46	0.00
ROE	−31.21	0.00
SIZE	−10.38	0.00

Stability results for panel data are presented in the table above. Based on the results, all variables are stable because the probability values of all variables are less than 0.05, and the zero hypothesis based on instability will be rejected.

To estimate the research models, first, the optimal model selection test is performed. In order to determine the optimal interruption, the Schwarz-Bayesian criterion was used. The results are presented in Table 3.

Table 3: Optimal model selection test

Variables	Coefficient	Sig
D(-1) Value	0.007	0.7652
D(-1) NWC	−0.247	0.0000
D(-1) DUM	0.093	0.0000
D(-1) LEV	0.006	0.6941
D(-1) ROE	0.165	0.0000
D(-1) SIZE	0.128	0.0000
Optimal interruption in model	(1,1,1,1,1)	

According to the results of the above test, the optimal model for determining the relationships of selected variables can be determined. According to the results of the above test, the optimal model can be used to determine the relationships of the selected variables. For example, the optimal interrupt for a five-factor model was (1,1,1,1,1), And the numbers from left to right represent the number of interruptions 1 for the independent and control variables,

respectively. To confirm the robustness of the selected model, the following diagram shows that the optimal models are preferable to other self-explanatory vector modes:

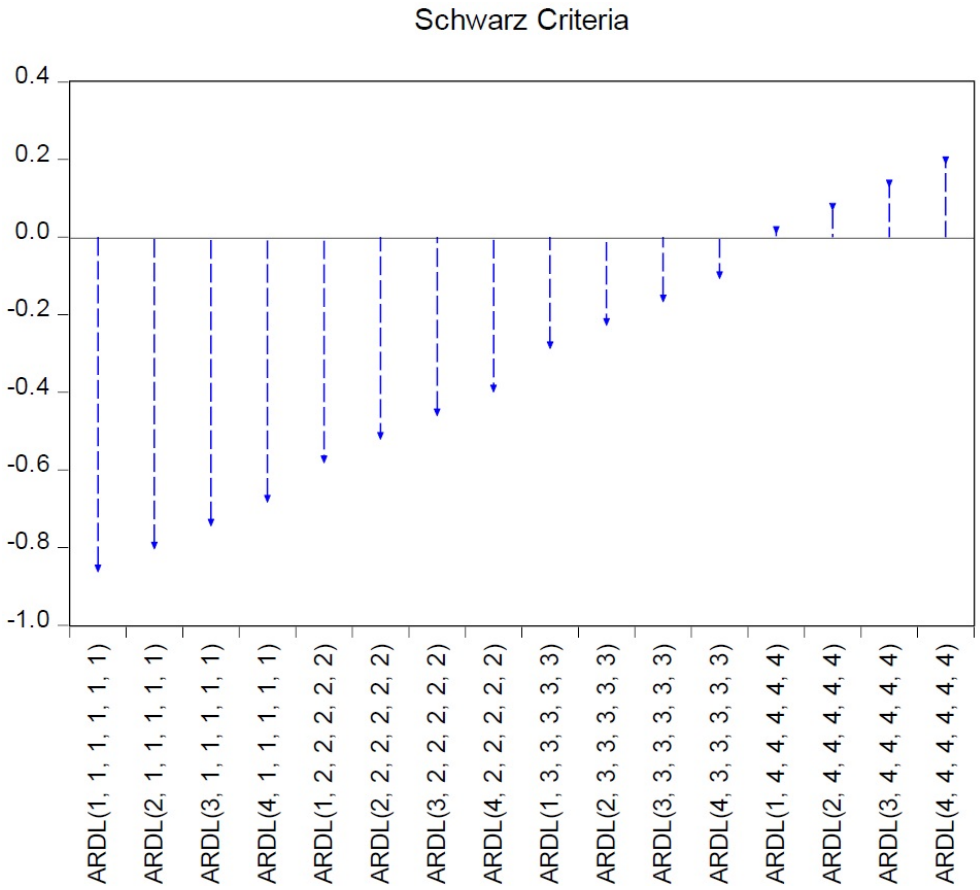

Figure 1: Drawing some examples of the best cases for selecting the optimal interrupt in the research model

Since the selected criterion for determining the optimal interruptions of the model is Schwartz-Bayesian and also, and the basis of the Schwarz-Bayesian criterion is large and is the absolute value of this criterion. Therefore, using this criterion, some of the best states for selecting the optimal interrupt are drawn; for example, in the research model, the interval (1,1,1,1,1,1) with a statistical value of (12.39) on the interrupts (2,1,1,1,1,1) (3,1,1,1,1,1) and other interruptions with a standard value of less than -12.39 are preferred. With these interpretations, by selecting the optimal models, long-term relationships between variables between research variables are estimated. To determine the long-run relationship, the value of the t-statistic can be compared with the critical values presented by Banerjee, Dolado and Mestre [4]. If the computational value of t is greater than the critical value, Hypothesis zero is rejected due to the lack of a long-term relationship and the existence of a long-term relationship is accepted. The result of computational statistics t in the research model was -5.16; and since it is greater in absolute magnitude than the critical value of Banerjee, Dolado and Mestre [4] (-3.28), therefore, the null hypothesis is rejected in favour of the opposite hypothesis due to the lack of a long-term relationship. The results of long-term and short-term relationships of variables are presented in the following table:

The coefficients of the regression model listed in the above table show that there is a positive relationship between the net working capital and the market value of companies admitted to the Tehran Stock Exchange. In other words, the coefficient related to the variable of net working capital, which shows the number 0.12, indicates that with an increase of one unit of net working capital, the value of the companies admitted to the Tehran Stock Exchange can increase by 0.12%. had an increase. Also, considering that the significance level is less than 5%, therefore, this relationship is reliable and meaningful, and the first assumption of the research can be rejected. Therefore, net working capital has a significant effect on the market value of companies listed on the Tehran Stock Exchange. It also shows that there is a negative and significant relationship between financial constraints and company value. The coefficient related to the variable of financial restriction, which shows the value -0.11, indicates that by increasing the financial restriction by one unit, the value of the companies accepted in the Tehran Stock Exchange market can decrease by 0.11%. Also, the

Table 4: Estimation of the research model

Variables	**Coefficient**	**Sig**
Long-term Effect		
NWC	0.127	0.0328
DUM	−0.114	0.0000
NWC ∗ DUM	0.095	0.0063
MB	0.036	0.0947
LEV	0.072	0.1274
ROE	0.031	0.0153
SIZE	0.051	0.8792
Short-term Effect		
D(-1) NWC	0.065	0.0000
D(-1) DUM	−0.043	0.0000
D(-1) NWC ∗ DUM	0.021	0.0092
D(-1) MB	0.016	0.4528
D(-1) LEV	026	0.6538
D(-1) ROE	0.001	0.0472
D(-1) SIZE	0.002	0.6248
C	0.192	0.0000
ECM	−0.892	0.0000

existence of financial restrictions has reduced the effect of net working capital on the value of companies admitted to the Tehran Stock Exchange. Also, considering that the significance level is less than 5%, this relationship is reliable and significant. In the following, the error correction model (ECM) is used to examine how short-term imbalances in the pricing of capital assets towards long-term equilibrium occur. The ECM coefficient shows that in each period, a few percent of the short-term imbalance is adjusted to achieve the long-term equilibrium. Based on the results, the ECM coefficient was -0.8 and considering that the level of significance of the coefficients is less than 0.05%, it is significant. This figure indicates that in each period, 89% of the short-term imbalance of stock price falls is adjusted to achieve long-term equilibrium; Therefore, it can be said that the adjustment towards equilibrium is relatively fast.

4 Conclusion

The result of the estimation of the research hypothesis based on the significant relationship between the net working capital and the value of the companies listed on the Tehran Stock Exchange shows that there is a positive relationship between the net working capital and the market value of the companies listed on the Tehran Stock Exchange. has it. The lower the amount of working capital, the managers prefer to increase the investment in working capital, increase the company's sales and receive more discounts due to timely payment from their suppliers. However, there is a turning point in working capital; from that point onward, the more investment is made in working capital, the value of the company will decrease, which is the reason for the higher interest cost and the higher probability of bankruptcy and credit risk of companies. At low levels of working capital, which is below the optimal level, there are higher sales and more discounts due to timely payment, and therefore, working capital has a positive effect on the company's performance. Conversely, the opportunity cost and financing costs of time effects at higher levels of working capital than the optimal level result in a negative relationship between working capital and firm performance.

Users of accounting and financial information are suggested to pay attention to the working capital of the target company, components of working capital and other financial dimensions of the company, such as the financing structure, in their investment decisions. Also, accounting standard setters and stock exchange policymakers should encourage companies to provide more information about working capital components, research and development costs separately and in supplementary notes. It is also suggested that managers pay attention to the optimal level of working capital due to the costs of moving away from it, which leads to a decrease in the value of the company. They also avoid negative effects on company performance due to lost sales and discounts for early payments or additional financing costs. It is also suggested to establish an optimal working capital management system to prevent bankruptcy by managing receipts and payments and controlling financial limits.

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