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# The Effects of Working Capital Management on Mining Firm's Profitability: Empirical Evidence from an Emerging Market

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## Abstract

Working capital management decisions are the most important among the financial decisions in terms of companies. Working capital expresses financing and management of the short-term investment; in other words, profitability and liquidity are among the main factors affecting the objectives of the companies. The management of working capital components in emerging markets such as Turkey, where financial markets have inadequate depth and financial product diversity, with insufficient saving volume and capital accumulation, is an important topic. In this chapter, we examine the relationship between the components of working capital and profitability; a sample consisting of Istanbul Stock Exchange (ISE) listed mining firms for the period of 2009Q4–2015Q3 that has been analyzed under a panel data analysis. The main reason for choosing the mining sector is because it is the most strategic sector in developing countries. As a result, empirical findings of the study show that growth (firm growth in sales) and INVP (inventory period) affect ROA (return on assets), which represent firm profitability positively, while size (firm size) affects firm profitability negatively. On the other hand, the other independent variables included in the regression model LEV (leverage), CCC (cash conversion cycle), and ACRP (accounts receivables period) have no statistically significant effects on firm profitability for mining sector in Turkey.

**Keywords:** working capital, working capital management, emerging markets, profitability, mining firms

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## 1. Introduction

Working capital, which represents the current assets of firms, is one of the main factors affecting business objectives such as profitability and liquidity. The fulfillment of payment obligations,

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increasing operating volume, and providing superiority to the competitor firms are closely related to working capital management. In fact, working capital management is not only limited to managing short-term assets but also involves short-term liabilities.

Working capital consists of cash and cash equivalents, receivables, and inventories. There are also many factors that influence working capital and its components; therefore, businesses need to be cautious in such decisions and should make detailed analyses. Working capital components' contribution to the purpose of the companies depends on the optimum management of it. In emerging markets where there are insufficient saving volume and capital accumulations, and inadequate financial market depth and financial product diversity are the main problems, working capital management is becoming more important.

This study has been done on mining sector firms in Turkey, which is one of the developing countries, in order to show the relationship between the components of working capital and profitability. In theoretical part of the study, literature review, importance of working capital management in emerging markets, and also general properties of mining companies are handled. In empirical part, panel data analysis is carried out 2009Q4–2015Q3 in mining sector, which is a strategic sector especially for the developing countries. The conclusion section includes a general evaluation and results.

## 2. The importance of working capital management in emerging markets

Emerging markets concept was used in economic literature for the first time by the International Finance Corporation (IFC) in 1981. IFC is one of the five<sup>1</sup> organizations affiliated to the World Bank. Emerging markets is a concept that is used to represent the markets of countries with high economic potential. These countries are expected to be ranked in the “developed country” class in the future and offer high-return opportunities to their investors [1]. These countries that grow very fast compared to developed countries also have higher risks associated with the sudden stop in economic growth, the sudden fluctuations in asset prices, and the economic and political instability.

According to the “Global Economic Prospects and the Developing Countries” published by the World Bank, developing countries constitute 80% of the world population and also represents 20% of the global economy. The number of multinational corporations operating in emerging markets is now over 20,000. According to *The Economist*, multinational corporations anticipate that 70% of their future growth will be from the emerging markets [2].

The concept of emerging markets has expanded to include almost all developing countries in the period from its existence to nowadays. The rapid development of trade in emerging markets, the efforts of financial liberalization, the growth in financial market, and the need to diversify international portfolio managers have caused investors and companies to focus on the

<sup>1</sup>The World Bank Group consists of five complimentary organizations. These are International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), International Finance Corporation (IFC), Multilateral Investment Guarantee Agency (MIGA), and International Center for Settlement of Investment Disputes (ICSID).

emerging markets of developing countries. According to the IFC, portfolio investments have continued to grow in emerging markets since the 1980s, with the exception of the financial crisis period. The geographical location of some of the developing countries is presented in **Table 1**.

Working capital management is even more important in emerging markets due to insufficient development of financial markets and inadequate capital accumulation. Global crises, which are more and more frequent today with increasing national and international competition, have made working capital management more important especially for developing country firms. The KPMG 2010 report about working capital management states that firms around the world place more emphasis on management of working capital after the crisis [4].

Working capital consists of funds linked to production factors for the period starting from the beginning of production to income generation [5]. Working capital refers to the firm's investment in short-term assets that can be converted into cash in less than a year. Cash and cash equivalents, inventories, and receivables that are current asset items in a balance sheet make up the components of working capital. However, management of working capital is not just about current assets; it also involves short-term liabilities. Especially in Western literature, working capital is stated as a "net working capital" which can be reached by the formula "current assets-current liabilities."

A manufacturing company fulfills three main functions such as production, sales, and collection. The components of working capital are internally related. If these three main functions are performed simultaneously in a company, there will not be a need for working capital. In this study, working capital concept is expressed as a total amount of current assets.

Middle and Eastern Europe	East Asia and Pacific	Latin America and Caribbean	South Asia	South Europe and Middle Asia	Sub-Sahara and Africa	Middle East and North Africa
Russia Federation	China	Argentina	Bangladesh	Azerbaijan	Angola	Afghanistan
The Czech Republic	Indonesia	Bolivia	India	Bulgaria	Burkina Faso	Algeria
Hungary	Malaysia	Brazil	Maldives	Croatia	Cameroon	Egypt
Lithuania	The Philippines	Chile	Nepal	Kazakhstan	Çahad	Iraq
Poland	South Korea	Colombia	Pakistan	Romania	Gambia	Iran
Slovenia	Taiwan	Mexico	Sri Lanka	Turkey	Kenya	Jordan
Estonia	Thailand	Paraguay		Turkmenistan	Nigeria	Kuwait
Georgia	Vietnam	Peru		Albania	South Africa	Morocco
Ukraine	Fiji	Uruguay		Bosnia and Herzegovina	Sudan	Saudi Arabia
Armenia	Cambodia	Venezuela		Moldova	Somalia	Tunisia
	Papua New Guinea	Nicaragua		Tajikistan		United Arab Emirates

Resource: [3].

**Table 1.** Developing countries according to geographical locations.

Effective management of working capital, which directly affects the company's liquidity and profitability, is important in terms of business finance. The management of working capital components also contributes business goal. This contribution is intended to maximize the net present value of the companies. Financial manager needs to consider and evaluate the cash-generating power of the company in the crisis period as well as interest in maximizing the net present value of the company during normal [6].

The main components of working capital, as previously mentioned, comprise current assets and short-term liabilities. The main objective of working capital management is to keep an optimal balance among each of the working capital components [7]. Working capital, which represents the current assets of companies, is one of the main factors affecting the profitability and liquidity of the company. The type of working capital management has an important effect on profitability and liquidity of the companies [8]. There needs to be a significant balance that working capital has to establish between these two factors. In other words, focusing on only optimal liquidity or profitability can have a negative effect on financial performance [9]. The optimal level of working capital for the companies can be achieved by balancing profitability and liquidity. The idle part of the working capital leads to decline in profitability, while the deficit in working capital causes the default risk.

The fact that working capital components are influenced by many factors necessitates financial managers to be careful in their decisions and financial analysis. Companies try to keep an optimal level of working capital that maximizes their value. Accomplishment of this aim depends on efficient working capital management.

### 3. Literature review

In finance literature, importance of working capital management has been a common thought among researchers. There have been various studies to analyze the relationship of working capital components and the profitability of firms. A lot of different indicators are used to represent working capital components like cash conversion cycle, inventory period, payment period, leverage, growth, etc. For the profitability of a firm, in different kinds of studies, we can see these indicators as return on asset ratio, return on equity and gross operating profit, net profit margin, etc. Some of them reveal that there is a positive relationship between working capital components and profitability, while others suggest that there is a negative relationship or no statistically significant relationship.

Some researchers are seen to use just return on asset indicator as a profitability measurement, as we have done in our study. For Turkey, Şamiloğlu and Demirgüneş [10] analyzed the effect of working capital management on firm profitability for the period of 1998–2007 manufacturing firms listed in Istanbul Stock Exchange (ISE). They have chosen return on assets as the measure of profitability. Empirical findings of the study showed that accounts receivables period, inventory period, and leverage affect firm profitability negatively, while growth (in sales) has a positive effect [10]. For Cyprus, Charitou et al. [11] investigated the effects of working capital management on firm's financial performance in an emerging market. Their data set consisted of 43 firms listed in the Cyprus Stock Exchange for the period of

1998–2007. Empirical results indicated that the cash conversion cycle and all its major components, namely, days in inventory, days in sales outstanding, and creditors payment period, were associated with firms' profitability. Days in inventory is inversely related to profitability. The sales growth has a positive coefficient with return on assets, meaning that growth leads to increase profitability [11]. In both studies, while inventory period has a negative effect, growth in sales has a positive effect on return on assets as a profitability measurement.

Making use of return on equity as a measure of profitability, Sharaf and Haddad [12] examined the relationship between working capital management and profitability using panel data analysis for a sample that consists of 43 industrial companies listed in the Amman Stock Exchange in Jordan, during the period of 2000–2012. The results show a significant negative relationship between cash conversion cycle and profitability, whereas a positive relationship between payables deferral period and return on equity as a measurement of profitability [12].

For Kenya, Mathuva [13] looked at the influence of working capital management components on corporate profitability for companies listed on the Nairobi Stock Exchange (NSE) for the period of 1993–2008. Net operating profit was chosen as the dependent variable. The key findings from the study were, firstly, a highly significant negative relationship was found between the time it takes for firms to collect cash from their customers (accounts collection period) and profitability. This means that the more profitable a firm is the shorter the cash collection time will be from their customers. Secondly, a highly significant positive relationship was found between the period taken to convert inventories into sales (the inventory conversion period) and profitability. In our study also, we obtained the same result that the inventory period positively affects firm profitability. This means that firms which maintain sufficiently high inventory levels reduce costs of possible interruptions in the production process and loss of business due to scarcity of products. This reduces the firm supply costs and protects them against price fluctuations. Thirdly, a highly significant positive relationship was found between the time it takes the firm to pay creditors (average payment period) and profitability. This implies that the longer a firm takes to pay its creditors, the more profitable it is [13].

Some of the researchers used gross operating profit as a profitability indicator in their studies. Rahman et al. [14] examined the relationship between working capital management and profitability of 10 sample companies listed in Chittagong Stock Exchange (CSE) of Bangladesh with primary and secondary data. The study clearly asserts that sample companies listed in CSE have enough scope to enhance their profitability by the use of working capital in more efficient ways [14]. On the other hand, Husain and Alnefae [15] selected to analyze the impact of working capital management and the profitability of 18 listed agriculture and food companies of Saudi Arabia for the period of 2009–2014. Gross operating profit as dependent variable and average collection period, average payment period, inventory turnover in days, and cash conversion cycle as independent variables were used. The regression analysis revealed that there is no significant impact of working capital management on profitability for this sample [15].

Many researchers have focused on the relationship between different types of profitability measures and working capital management. Most of these studies support the conclusion that there is a negative relation between profitability and working capital management measures, like the average collection period, inventory turnover in days, and cash conversion cycle. Ahmadi et al. (2012) investigated the relationship between working capital and profitability

at companies of food industry group member Tehran Stock Exchange. They used operational profit as profitability. The results showed that average accounts collection period, average inventory turnover period in days, average payment period, and cash conversion cycle have a negative relation with profitability [16]. On the other hand, Arbidane and Ignatjeva (2013) examined the effect of working capital on profitability of Latvian manufacturing firms on the sample of 182 firms for the period of 2004 to 2010. For profitability, return on assets and gross operating profitability indicators were determined. The results of the research that has been performed in relation to Latvian manufacturing enterprises confirm the existence of a correlation between components of working capital and profitability [17]. Aregbeyen (2013) analyzed the effect of working capital management on the profitability of a sample of 48 large manufacturing firms quoted on the Nigerian Stock Exchange (NSE) for the period of 1993–2005. Profitability was alternatively measured by gross operating profit, net operating income, and return on assets. The results indicated that the firms have been inefficient in their working capital management, and this caused significant reductions in profitability. Manufacturing firm in Nigeria should shorten average collection period, average pay period, inventory turnover days, and reduce their cash conversion cycle to be successful [18]. Moreover, Alavinasab and Davoudi [19] who focused on return on assets and return on equity ratios for profitability measurement selected 147 listed companies on Tehran Stock Exchange for the period of 2005–2009. The results show a negative significant relationship between cash conversion cycle and both return on assets and return on equity [19]. Singhania et al. [20] used cash conversion cycle as a measure of working capital management, whereas gross operating profit was a proxy for the firms' profitability. The sample consisted of Indian manufacturing companies of BSE-500 index of the Bombay Stock Exchange for the period from 2005 until 2012. The results revealed that cash conversion cycle of a company has a negative correlation with its profitability [20]. Furthermore, Şamiloğlu and Akgün [21] examined the relationship between working capital management and performance, using variables such as profitability between accounts receivables period, account payable period, and cash conversion cycle on Istanbul Stock Exchange (ISE). One hundred and twenty manufacturing firms were selected for a period of 10 years from 2003 to 2012. The results showed that a significant and negative relationship exists between accounts receivables period and return on asset, return on equity, operating profit margin, and net margin in manufacturing industry [21].

All the researchers above have investigated the effects of working capital components on the profitability of firms. To carry out a somewhat similar research but in a different country and sector, namely, the Turkish mining sector, research data and method section describes the variables that will be used for the investigation and also the data sample.

#### **4. General properties of mining firms**

Mining is one of the most important sources of income and foreign exchange for countries. For this reason, the mining sector has become a strategic sector among countries. About 30 million people work in mines around the world. Considering the amount of employment each miner has created employment for other workers in different sectors and also the family

members they are obliged to look at, mining is a giant sector closely related to 300 million people in the world [22].

There are some differences that distinguish the mining industry from other sectors. These features are:

- When the mines are produced, they cannot be replaced because of depletion.
- The investment repayment period is quite long.
- No chance of choosing a location.
- Operation has to be at the place of production.
- A labor-intensive sector that contributes to employment.
- The high cost of regeneration when activities are interrupted.

The mining sector, which has great importance in development and economic progress of countries, creates significant added value. Share of mining in GNP is 5% in the USA, 4% in Germany, 3.7% in Canada, 6.5% in Australia, 22% in Russia Federation, 8.5% in Chile, 6.5% in South Africa, 3% in Brazil, and 1.2% in Turkey. While the share of mining in GNP was 44% in the 1940s in Turkey, it started to decrease gradually in the 1950s. After the transition to the planned economy period, this deceleration accelerated to 1% in the 2000s [23].

Turkey's mineral resources are almost as diverse as mineral sources of a continent. There are more than 40 different minerals in Turkey. Despite of all inadequacies related to searching for boron, marble, thorium, trona, zeolite, pumice, and celestite mines, Turkey has the largest reserves for these elements. However, the mining sector in Turkey plays a very small role in the Turkish economy. While Turkey ranks 29th among the 152 countries in terms of the variety of mineral resources produced, Turkey is in the tenth place when it is based on production made in the form of mining. According to producer countries, Turkey is ranked 52nd with the share of 0.16%. The amount of value added created by this production reaches 2–2.5 billion dollars, and its share in GNP is around 1–1.5%, depending on the years. When the mining sector and other sectors based on mining sector are considered together, the share of added value in GNP is around 12%, which means that 22 billion dollars has been created [24].

## **5. Research data and method**

### **5.1. The objectives and importance of the study**

The aim of this study is to reveal the relationship between working capital components (firm size, leverage, firm growth in sales, cash conversion cycle, accounts receivables period, inventory period) and profitability (return on assets) in the mining sector firms which trade in the Istanbul Stock Exchange (ISE). The data are taken from balance sheets and income statements of companies, quarterly from 2009Q4 till 2015Q3, and analyzed using the panel data analysis. Other goals include showing the impact of working capital on profitability in emerging markets and making managers understand the effect of working capital decisions on profitability.

## 5.2. Study sample and variables

The study sample includes mining sector firms listed on the Istanbul Stock Exchange (ISE) during the period of 2009Q4–2015Q3. All financial statements have been obtained from <https://www.kap.org.tr/tr/>. The study covers six companies operating in mining sector. The names of the companies included in analysis are shown in **Table 2**.

	ISE	Business fields	Net working capital <sup>a</sup>
1	İhlas Real Estate Project Development and Trade, Inc. <sup>b</sup>	Metallic ore production	17,648,656
2	İpek Natural Energy Resources Research and Production, Inc.	Crude oil and natural gas production	1,830,100
3	Koza Gold Enterprises, Inc.	Coal mining	1,829,124
4	Koza Anatolia Metallic Mining Operations, Inc.	Metallic ore production	1,481,806
5	Metal Real Estate, Inc.	Coal mining	-8,296,551
6	Park Electricity Production Mining Industry and Trade, Inc.	Coal mining	178,655,858

Resource: [25].

<sup>a</sup>Net working capital is calculated by “current assets-current liabilities.” These amounts are from the third quarter of 2015.

<sup>b</sup>İhlas Real Estate Project Development and Trade, Inc., which has been working as a İhlas Mining until April 14, 2017 has finished the mining part field of the company due to major work accidents, long-term bureaucratic procedures, difficulties in applying the mining law and regulations, fluctuating price movements, etc.

**Table 2.** Mining companies operating in Istanbul stock exchange (ISE).

This study investigates the effects of firm size, leverage, firm growth in sales, cash conversion cycle, accounts receivables period, and inventory period on firm profitability. The dependent variable of the regression model is the return on assets. Formulas of variables are given in **Table 3**.

Variables	Formula	Literature
<b>Dependent variable</b>		
ROA	Net income/total assets	Şamiloğlu and Demirgüneş [10] Alavinasab and Davoudi [19] Singhania et al. [20] Madhou et al. [27] Muralidhara and Shollapur [28] Sharaf and Haddad [12] Şamiloğlu and Akgün [21]
<b>Independent variables</b>		
Size (firm size)	$\ln_{Total\ Assets}$ (natural logarithm of total assets)	Şamiloğlu and Demirgüneş [10] Singhania et al. [20] Madhou et al. [27] Sharaf and Haddad [12] Şamiloğlu and Akgün [21] Muralidhara and Shollapur [28]

Variables	Formula	Literature
Lev (leverage)	Total debt/total assets	Şamiloğlu and Demirgüneş [10] Singhania et al. [20] Madhou et al. [27] Muralidhara and Shollapur [28] Şamiloğlu and Akgün [21]
Growth (firm growth in sales)	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$	Şamiloğlu and Demirgüneş [10] Singhania et al. [20] Sharaf and Haddad [12]
CCC (cash conversion cycle)	$(ACRP + INVP) - (\text{accounts payables} \times 365) / \text{cost of sales}$	Şamiloğlu and Demirgüneş [10] Alavinasab and Davoudi [19] Singhania et al. [20] Madhou et al. [27] Sharaf and Haddad [12] Husain and Alnefae [15]
ACRP (accounts receivables period)	$(\text{accounts receivables} \times 365) / \text{sales}$	Şamiloğlu and Demirgüneş [10] Singhania et al. [20] Sharaf and Haddad [12] Husain and Alnefae [15] Şamiloğlu and Akgün [21] Muralidhara and Shollapur [28]
INVP (inventory period)	$(\text{inventories} \times 365) / \text{cost of sales}$	Şamiloğlu and Demirgüneş [10] Singhania et al. [20] Sharaf and Haddad [12] Şamiloğlu and Akgün [21] Muralidhara and Shollapur [28] Husain and Alnefae [15]

**Table 3.** Dependent variable and independent variables.

#### Definition of dependent variable: profitability

ROA: return on assets is used for profitability measurement. The reason of choosing is that ROA represents the ratio of how much a firm has earned on its assets [26].

#### Definitions of independent variables: working capital components

Size: firm size is measured by the natural logarithm of total assets. The size of the firm can change according to small or large companies' situation. While large companies can obtain more favorable, extended credit terms from suppliers, smaller ones may be required to pay immediately. Another size of a firm that can make a difference is that bigger companies can purchase larger quantities of products [29].

Lev: leverage shows the rate of the company's debt relative to its assets and its potential risks. In other words, how much the assets of the firm is financed by external debt.

Growth: firm growth in sales is a percentage that represents an increase, decreases in sales volume from period to period, and has an impact on working capital behavior [12].

CCC: cash conversion cycle is a main comprehensive and powerful measure of managing working capital and assessing liquidity in companies [30]. CCC shows the time between spending cash for resources and cash receipts from product sales [31].

ACRP: accounts receivables period reflects in how many days receivables are collected and gives some indication of how fast companies can collect payments from sales.

INVP: inventory period is also called as inventory collection period. It indicates the frequency with which firms convert their cumulative of raw material into finished goods and then sell those products.

### 5.3. Research methodology

Regression models created using the panel data are called panel regression models. Other names for panel data are pooled data, micro panel data, pooled time series and cross-sectional data, longitudinal data, etc. Pooled panel regression model that is frequently used in the literature will be used in this study. Pooled data are elements of both time series and cross-sectional data [32].

Panel regression model used in the study is as follows:

$$ROA = a_1 + \beta_{i1}(SIZE) + \beta_{i2}(LEV) + \beta_{i3}(GROWTH) + \beta_{i4}(CCC) + \beta_{i5}(ACRP) + \beta_{i6}(INVP) + \varepsilon_i \quad (1)$$

According to the Hausman test results that will be mentioned later, in this study the fixed effect model that was found appropriate to was used.

### 5.4. Constraints of the study

In this study, mining sector listed in Istanbul Stock Exchange (ISE) is chosen as a sample. Although there are many operating mining companies in Turkey, few companies are open to the public. Only quoted companies are included in the study because financial information of unquoted companies is not readily available. This constitutes the greatest constraint of the research. Also, the dates of publicly traded companies are different from each other; therefore, data set is limited between 2009Q4 and 2015Q3.

### 5.5. Empirical results

#### 5.5.1. Descriptive statistics

Descriptive statistics for dependent and independent variables are calculated in the panel data form. The results are given in **Table 4**.

When we look at the values given in **Table 5**, we can say that size, growth, CCC, and INVP have negative values so the distribution is left tailed. Other variables are positive so the distribution is right tailed.

#### 5.5.2. Stationarity tests

The stationarity of series is tested with Augmented Dickey-Fuller test; Im, Pesaran, and Shin W-stat test; Phillips-Perron test; and Levin, Lin, and Chu test. These tests were developed to observe the stationarity of the data and whether it contains a unit root. In this sample the series contain unit root so the first differences of the series have been used in analysis to avoid

	ROA	Size	Lev	Growth	CCC	ACPR	INVP
Mean	4.944843	2.866556	2.411620	0.736065	4.376339	3.351357	4.570842
Median	3.260348	2.977405	2.220768	0.958676	4.863107	3.500431	5.099591
Maximum	12.47728	3.068666	5.768931	2.043083	8.224957	8.139257	6.474505
Minimum	0.826349	2.630181	0.457901	0.009356	0.104758	0.024990	1.000000
Std. Dev.	3.842894	0.163158	0.922734	0.410556	1.690290	1.628396	1.705792
Skewness	0.658287	-0.221510	1.642497	-0.012713	-1.031479	0.071150	-1.346429
Kurtosis	1.797728	1.160462	5.600206	2.790192	3.378884	2.999412	3.419309

**Table 4.** Summary statistics for the main study variables.

	ROA	Size	Lev	Growth	CCC	ACPR	INVP
ROA	<b>1.000000</b>						
Size	-0.657983	<b>1.000000</b>					
Lev	-0.028854	-0.413378	<b>1.000000</b>				
Growth	0.038117	-0.099312	0.284882	<b>1.000000</b>			
CCC	0.197224	0.273313	-0.578595	-0.117231	<b>1.000000</b>		
ACPR	0.106368	0.241622	-0.348518	-0.080037	0.721644	<b>1.000000</b>	
INVP	0.165374	0.386480	-0.702069	-0.154342	0.908750	0.579284	<b>1.000000</b>

**Table 5.** Correlation matrix.

spurious regressions. Stationarity test results are shown in **Table 6**. The lag length of variables subjected to test is determined by Schwarz information criteria.

As seen in **Table 6**, no variables has reached the probability value greater than 0.05. In other words, the data is stationary. As a result, stationarity of the data has made possible to establish this model.

### 5.5.3. Regression analysis

There are two different types of panel data analysis. One of them is fixed effects, and the other one is random effect model. In this study, panel data fixed effect model is used. The Hausman test is used to select this model, and the result shows that it gives better results than the random effect panel data analysis (**Table 7**). The hypotheses are as follows:

$H_0$ : Random effect model is appropriate.

$H_1$ : Random effect model is inappropriate (fixed effect model is appropriate).

The Hausman test results explicitly show that the null hypothesis ( $H_0$ ), which states "random effect model is appropriate," is rejected, since p value (0.0000) is less than 0.05. Based on the Hausman test results, fixed effect model panel data analysis is appropriate for this model (**Table 8**).

Variables	Augmented Dickey-Fuller		Im, Pesaran, and Shin W-stat		Phillips-Perron		Levin, Lin, and Chu	
	t-Statistic	p-Value	t-Statistic	p-Value	t-Statistic	p-Value	t-Statistic	p-Value
ROA	-6.748	0.0000	-6.943	0.0000	9.442	0.0000	-6.754	0.0000
Size	-4.839	0.0000	-3.898	0.0000	7.3447	0.0000	-4.839	0.0000
Lev	5.980	0.0000	-6.280	0.0000	5.6167	0.0000	-2.418	0.0000
Growth	11.980	0.0000	-11.700	0.0000	7.538	0.0000	-7.408	0.0000
CCC	5.5775	0.0000	-9.794	0.0000	5.469	0.0000	-7.951	0.0000
ACPR	9.616	0.0000	-9.214	0.0000	11.569	0.0000	-9.987	0.0000
NPV	3.935	0.0000	-9.400	0.0000	5.872	0.0000	-8.707	0.0000

Table 6. Stationarity tests of variables.

Correlated random effects (Hausman test)			
Test summary	Chi square statistic	Chi square f.	Prob.
Cross-sectional random	30.041109	6	0.0000

Table 7. Hausman test results.

Dependent variable	ROA			
Method	Panel fixed effect model			
Sample period	2009Q4–2015Q3			
Sample number	136			
Variable	Coefficient	Std. error	t-Statistic	Prob.
C	48.21348	4.341295	11.10578	0.0000
Size	-16.72289	1.451334	-11.52243	0.0000
Lev	-0.031608	0.338043	-0.093504	0.9257
Growth	0.339326	0.745787	0.454990	0.0050
CCC	-0.363589	0.357237	-1.017780	0.3109
ACPR	-0.047350	0.188328	-0.251424	0.8019
INPV	1.366229	0.338755	4.033088	0.0001
Adj.	0.712325			
F-statistic	13.20995			
Prob. (F-statistic)	0.000000			
Durbin-Watson	1.725998			

Table 8. Panel data analysis results.

The purpose of the panel data analysis is to find out the significant impact of working capital components on profitability of mining companies, which are listed in Istanbul Stock Exchange (ISE). **Table 8** shows the results of regression analysis pertaining to ROA (return on assets) and components of working capital including size (firm size), Lev (leverage), growth (firm growth in sales), CCC (cash conversion cycle), ACRP (accounts receivables period), INVP (inventory period). The adjusted  $R^2$  of the model is 0.712 which indicates that 71.2% of the variation in the dependent variable is explained by the model. The Durbin-Watson test statistic tests the null hypothesis that the residuals from a regression are not autocorrelated against the alternative. The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates a positive autocorrelation; and a value toward 4 indicates a negative autocorrelation. In this study the result of Durbin-Watson test is 1.7259, which means that there is no autocorrelation. In addition, prob. value of F-statistic (0.0000) is less than 0.05 so the model is statistically significant.

## 6. Conclusion

The significance of working capital management has increased even more in developing countries with insufficient capital accumulation after the global financial crisis. The researches reveal that companies that are operating in developing countries and succeed in working capital management are affected less in financial crisis. This study empirically investigated the relationship between working capital components and profitability of a sample of six mining sector firms quoted on Istanbul Stock Exchange (ISE) for the period from 2009Q4 to 2015Q3. The independent variables are size (firm size), Lev (leverage), growth (firm growth in sales), CCC (cash conversion cycle), ACRP (accounts receivables period), and INVP (inventory period). The dependent variable of this study is ROA (return on assets) that represents firm profitability.

The results of regression analysis show that growth (firm growth in sales) and INVP (inventory period) affects ROA (return on assets) positively, while size (firm size) affects firm profitability negatively. The other independent variables included in the regression model Lev (leverage), CCC (cash conversion cycle), and ACRP (accounts receivables period) have no statistically significant effects on firm profitability for mining sector in Turkey.

The whole results of study can be disclosed step by step. The positive relationship between INVP (inventory period) and ROA (return on assets) can be explained by the companies' tendency of holding more stocks from 2009 to 2015 that indicates the post crisis period. In this period, it is considered that mining firms invested in stocks to protect against the increases in stock price or aimed to earn by possible increases in stock price.

Other positive relations are found between growth (firm growth in sales) and ROA (return on assets). Firms especially in developing countries tend to credit sale in the post crises period in order to increase sales amounts. As a result, because of this reason, sales amounts are growing compared to the previous period. Growth in sales leads to more efficient use of firms' assets, and in this case, it can affect its profitability in a positive way.

There is a negative relationship between size (firm size) and ROA (return on assets) in this study. As the firm size increases, assets are growing, and more resources are allocated to the assets. It is considered that cost of financing resulting from the increase of investment amount to current and fixed assets has a negative effect on return on assets.

The study was conducted only taking into account internal factors related to the firms. In the future studies, external factors (general economic situation, inflation, etc.) can be taken into account. If the data of firms operating in mining sectors, which are nonpublic companies, are found reliably, analyses can be applied on a wider sample.

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