YEDITEPE UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES

EFFECT OF WORKING CAPITAL MANAGEMENT AND SOLVENCY ON PROFITABILITY: CASE OF BIST BASIC METAL SECTOR COMPANIES

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ABSTRACT

EFFECT OF WORKING CAPITAL MANAGEMENT AND SOLVENCY ON PROFITABILITY: CASE OF BIST BASIC METAL SECTOR COMPANIES

In this research, effect of WCM (known for optimization of liquidity and efficiency) and solvency on profitability has been analyzed for basic metal sector companies listed in BİST in 2018-2022.

This research also includes comparison of financial ratios of companies that had initial public offering in 2022 and companies that had initial public offering before 2022.

Research findings show that working capital management has positive effect on profitability, as liquidity has effect on all of the studied profitability ratios.

Solvency also has positive effect on profitability, as solvency has positive effect on ROE.

No effect of recency of initial public offering (except for account receivable turnover) has been found.

This research should not be considered as investment advice.

Keywords: Working capital management, liquidity, solvency, efficiency, profitability, Initial public offering, Borsa İstanbul

ÖZET

ÇALIŞMA SERMAYESİ YÖNETİMİ VE ÖDENEBİLİRLİĞİN KÂRLILIĞA ETKİSİ: BİST ANA METAL SANAYİ ÖRNEĞİ

Bu araştırmada çalışma sermayesi yönetiminin (likidite ve verimliliğin optimizasyonu olarak bilinmektedir) ve ödenebilirliğin kârlılığa etkisi BİST'te 2018-2022 arasında kote olan ana metal sanayii firmalar için incelenmiştir.

Bu araştırmada aynı zamanda 2022'de ilk halka arzı gerçekleşen firmalar ile 2022'den önce ilk halka arzı gerçekleşen firmaların finansal oranlarının karşılaştırması da bulunmaktadır.

Araştırma bulguları çalışma sermayesi yönetiminin kârlılıkla arasında istatistiksel olarak anlamlı pozitif bir ilişkinin bulunduğunu göstermektedir, çünkü likidite ile arasında pozitif bir ilişkinin bulunmaktadır.

Ödenebilirlikle kârlılık arasında da pozitif bir ilişki görülmüştür, çünkü ödenebilirlik ile özkaynakların kârlılığı arasında pozitif bir ilişki bulunmaktadır.

Ticari alacakların devir hızı hariç ilk halka arzın yeniliğinin anlamlı bir fark oluşturmadığı görülmüştür.

Bu araştırma bir yatırım tavsiyesi kabul edilmemelidir.

Anahtar Kelimeler: Çalışma sermayesi yönetimi, likidite, ödenebilirlik, verimlilik, kârlılık, İlk halka arz

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LIST OF ABBREVIATIONS

APT: Accounts payable turnover

ART: Accounts receivable turnover

BİST: Borsa İstanbul

CCC: Cash conversion cycle

COGS: Cost of Goods Sold

CR: Current ratio

dof: Degrees of Freedom

DV: Dependent variable

FE: Fixed Effects

IPO: Initial Public Offering

IT: Inventory turnover

IV: Independent variable

KAP: Public disclosure platform

LTD: Long term debt/Total assets

NP: Net profit margin

OLS: Ordinary Least Squares

ROA: Return on assets

ROE: Return on equity

s.e.: Standard Error

SPSS: Statistical Package for Social Sciences

VIF: Variance Inflation Factor

WCM: Working Capital Management

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1. INTRODUCTION

Basic metal sector is a general name for companies in the sector of welding or refining metals from unrefined earth or waste material and emerging alloys and super-alloys. (“Basic metal production sector”, n.d.)

There are some analyses on financial position of Polish basic metal companies. (Pomykalski, Bakalarczyk, & Samolejova, 2014; Pomykalski, 2016)

Pomykalski et al. (2014) suggested that US subprime crisis caused decrease in profitability and asset turnover in basic metal companies in Poland in 2009 and 2010. Pomykalski et al. (2014) also suggests that the decrease in profitability and asset turnover in basic metal sector is significantly larger than all of the manufacturing companies in Poland, Pomykalski (2016) suggest that profitability has not recovered in 2014. Pomykalski et al. (2014) suggests that there is a need for continuous analysis of financial position for basic metal companies of Poland.

In Turkey, there have been researches on financial position of basic metal sector in 2016-2020 (Yetik, 2022), a comparative research of financial performance of BİST basic metal and accomodation sectors in 2017-2021 (Gürdal, 2022).

There are also researches on effect of CCC on profitability of BİST-100 companies. (Mutlu, 2019; Aygül, 2022)

Buğdaypınarı (2019) has analyzed effect of Liquidity, Efficiency and Solvency on Profitability of BİST hospitatily and food&beverage companies in 2012-2017.

To our knowledge, no research on effect of WCM and solvency of BİST basic metal companies on profitability in year span 2018-2022 exists. This thesis aims to fill this research gap.

1.1. Worldwide Economic Situation In 2018-2022

One of the most significant incidences between 2018-2022 is the COVID-19 outbreak. COVID-19 outbreak

- started in Wuhan in end of 2019,
- eventually spread to the world in 2020

- resulted in declaration of a pandemic in 11 March 2020. (“COVID-19 pandemic”, n.d.)

> “The pandemic has triggered severe social and economic disruption around the world, including the largest global recession since the Great Depression… Widespread supply shortages, including food shortages, were caused by supply chain disruptions…” (“COVID-19 pandemic”, n.d., para. 4)

1.1.1. Effects Of Pandemic On Businesses Worldwide

Chebbi, Ammer, & Hameed (2021) found “negative relationship between COVID-19 (as measured by the daily growth in the numbers of cases and deaths) and stock liquidity, implying that the COVID-19 pandemic decreases firm liquidity.” (p. 134)

According to Tarkom (2022, p. 8), pandemic “rendered firms inefficient in managing the WC [working capital].”

Tarkom (2022) also states that COVID-19 exposure causes an increase in cash conversion cycle, but firms that have more investment opportunities and deferred taxes and investment tax credit usually have lower cash conversion cycle.

1.1.2. Effects Of Pandemic On Turkish Businesses

The pandemic caused a spike in insolvencies in Turkish companies (Global Restructuring Trends, 2021).

According to “Global Restructuring Trends” (2021, p. 79), Turkish businesses has focused on

- “liquidity”,
- “cash preservation”
- “working capital management”

as response to pandemic.

As a response to pandemic, lending institutions such as banks announced loan packs. (“Salgın Destek Kredisi Bilgi Notu”, 2021)

2. THEORETICAL FRAMEWORK

2.1. Working Capital Management

Working capital is "part of capital (money) which is required for running day-to-day operations of a business or industry without a break." (Gupta & Gupta, 2021, p. 27)

Working capital management, "is the …science… of organizing a company's short-term resources to sustain ongoing activities, mobilize funds, and optimize liquidity." (Sagner, 2014, p. xiii)

Key elements of WCM, described by Sagner (2014) are:

- "The efficient utilization of current assets and current liabilities of a firm throughout each phase of the business operating cycle.
- The planning, monitoring, and management of the company's collections, disbursements, and bank account balances.
- The management of receivables, inventories, payables, and international transactions to minimize the investment in idle resources.
- The gathering and management of information to effectively use available funds and identify risk." (p. xiii)

According to Jaworski & Czerwonka (2022), there are three theories to explain WCM and profitability: Linear negative relationship, linear positive relationship, and non-linear dependence.

Short-term financial policies may be flexible or restrictive. (Ross, Westerfield, & Jordan, 2002, pp. 648-649)

"Short-term financial policies that are flexible with regard to current assets include such

actions as:

1. Keeping large balances of cash and marketable securities

2. Making large investments in inventory

3. Granting liberal credit terms, which results in a high level of accounts receivable

Restrictive short-term financial policies would be just the opposite:

1. Keeping low cash balances and making little investment in marketable securities

2. Making small investments in inventory

3. Allowing few or no credit sales, thereby minimizing accounts receivable" (Ross, Westerfield, & Jordan, 2002, pp. 648-649)

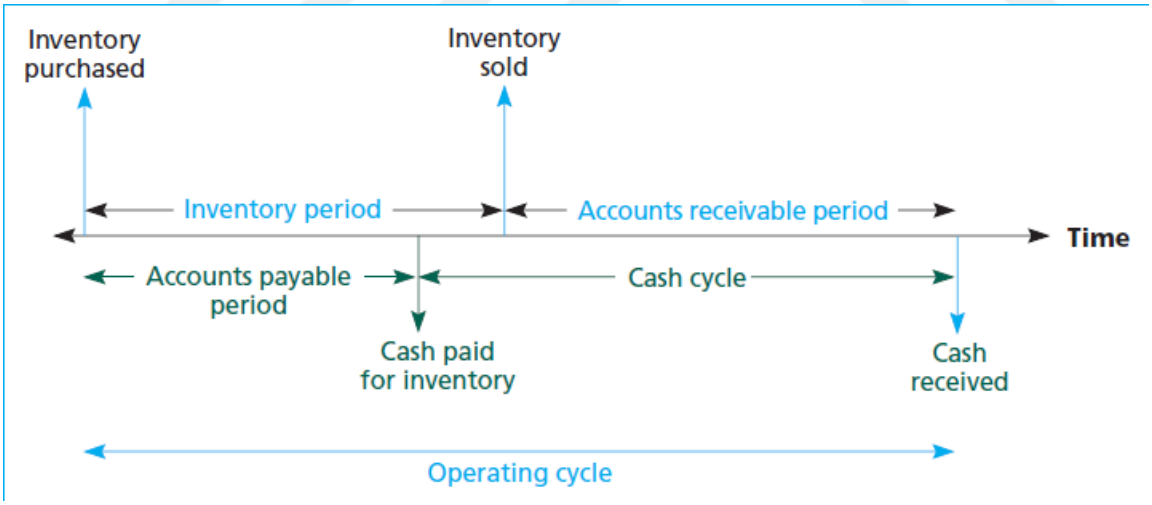
A company with a flexible policy has larger investment in current assets and smaller short term debt (Ross, Westerfield, & Jordan, 2002, p. 648), which implies that companies that have flexible policies are expected to have larger current ratios.

2.1.1. Operating Cycle

Operating cycle is "the time period between the acquisition of inventory and the collection of cash from receivables." (Ross, Westerfield, & Jordan, 2002, p. 642)

Figure 1

Operating cycle



Note. From (Ross, Westerfield, & Jordan, 2002, p. 643)

Credit policy influences amount and collection period of accounts receivable. (Ross, Westerfield, & Jordan, 2002)

More liberal credit policies (that have longer periods of collection) implies increased risk in incurring bad debt (Ross, Westerfield, & Jordan, 2002), which is debt that cannot be collected from debtors. (Tuovila, 2022b)

However, liberal credit policies may have positive effect on profitability by increasing sales quantity, therefore increasing revenues. (Ross, Westerfield, & Jordan, 2002, p. 713)

2.1.2. Cash Conversion Cycle

CCC is obtained by subtracting accounts payable period from operating cycle. (Ross, Westerfield, & Jordan, 2002)

According to Nobanee, Abdullatif, & AlHajjar (2011), cash conversion cycle is calculated using formula

$$Cash\ conversion\ cycle = 365 \times \left(\frac{Accounts\ receivable}{Sales} + \frac{Inventory}{Cost\ of\ goods\ sold} - \frac{Accounts\ payable}{Cost\ of\ goods\ sold}\right)$$

CCC is usually known to be negatively related with profitability. (Jaworski & Czerwonka, 2022).

In Belgian companies, there is evidence that CCC has insignificant effect on profitability. (Deloof, 2003)

In state-owned Chinese companies, CCC has shown no effect on profitability, but in non-state owned Chinese companies, CCC has negative effect on profitability. (Ren, Liu, Yang, Xiao, & Hu, 2019)

According to Aygül (2022), CCC and profitability had negative relation in BİST-100 companies in 2000-2018.

According to Vuran & Adiloğlu (2018), there is no relationship between CCC and ROA for manufacturing and merchandising companies in BİST in 2017.

2.2. Initial Public Offering

IPO is first issue of a company's equity to "sale to the general public on a cash basis." (Ross et al., 2002, p. 557)

One of the problems during initial public offering is determining a good offering price to investors, as an overpriced offering may result in investors not investing, and underpriced offerings may result in opportunity loss due to shares being sold at a price less than their worth. (Ross et al., 2002)

According to Pastusiak, Miszczyńska, & Krzeczewski, (2016), there are mixed findings of companies after IPO on different economies. Pastusiak et al. (2016) also points to the fact that small or medium companies that offer IPO are expected to have financial performance decline on a pace greater than large companies that offer IPO due to the fact that large companies having standard procedures.

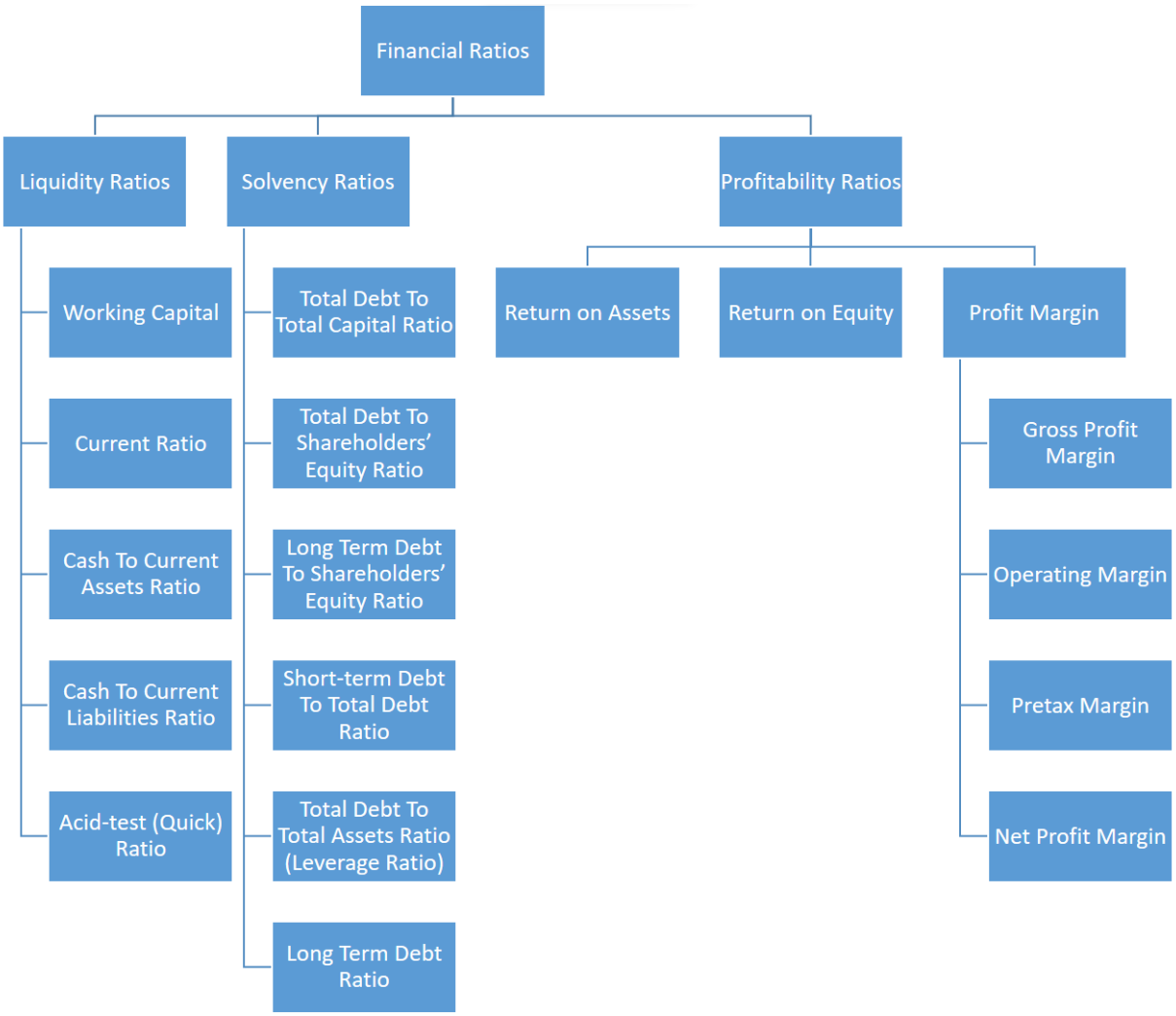
2.3. Financial Ratio Analysis

Ratio analysis is used for making inferences on financial standing of a company (Bloomenthal, 2022), and is a crucial tool for WCM analysis. (Sagner, 2014)

Some ratios that are useful for working capital management are liquidity ratios, activity utilization ratios, and leverage ratio. (Sagner, 2014, pp. 19-21)

Figure 2

Some financial ratios



Note. Own elaboration, adapted from Subramanyam (2014), Ross et al. (2002), Çabuk et al. (2019), Hayes (2022b)

2.3.1. Liquidity

Liquidity is a measure of possibility to satisfy short-term (usually one-year) cash needs. (Subramanyam, 2014)

Liquidity is composed of

- current assets
- current liabilities. (Subramanyam, 2014)

> "Current assets are cash and other assets reasonably expected to be (1) realized in cash or (2) sold or consumed within one year (or the normal operating cycle of the company if greater than one year)" Subramanyam (2014, p. 564)

Such as

- cash,
- "marketable securities maturing within the next fiscal year",
- accounts receivable,
- Inventories
- prepaid expenses. (Subramanyam, 2014, p. 564)

According to Tuovila (2022a, para. 7) current liabilities are

- "Accounts payable
- Short-term debt such as bank loans or commercial paper issued to fund operations
- Dividends payable
- Notes payable—the principal portion of outstanding debt
- The current portion of deferred revenue, such as prepayments by customers for work not yet completed or earned
- Current maturities of long-term debt
- Interest payable on outstanding debts, including long-term obligations
- Income taxes owed within the next year" (Tuvoila, 2022a, para. 7)

Liquidity and profitability usually have negative relation. (Szymańska & Lukoszová, 2021; Smith, 1980; Shin & Soenen, 2000)

Szymańska & Lukoszová (2021, p.137) have reported "a positive relationship between the liquidity and profitability of meat enterprises" in Poland in 2007-2018.

Miroslav, Vapa Tankosić, Miletić, & Ivaniš (2021) has found no relation between "liquidity and profitability of meat processing" (p. 792) companies of Serbia in 2016-2019.

2.3.1.1. Working Capital

According to Subramanyam (2014), working capital has formula

$$WC = Current\ assets - Current\ liabilities$$

According to Jaworski & Czerwonka (2022), linear negative relationship is the most commonly seen relationship between working capital and profitability.

2.3.1.2. Current Ratio

According to Subramanyam (2014), current ratio may be computed using formula

$$Current\ ratio = \frac{Current\ assets}{Current\ liabilities}$$

A higher current ratio implies that company may cover current liabilities more easily, has buffer for losses of assets, and has available liquid funds to safely overcome uncertainty and unexpected losses. (Subramanyam, 2014)

Eljelly (2004) has found current ratio to have significant negative relationship with net operating income.

Kuzucu (2019) has found current ratio to have insignificant effect on ROA for logistics companies listed in BİST for 2009-2018.

There has been findings of positive relation between current ratio and ROA on BİST manufacturing and merchandising companies in 2017 (Vuran & Adiloglu, 2018), and BİST food and beverage companies in 2008-2012 (Kendirli & Konak, 2014).

2.3.1.3. Acid-Test (Quick) Ratio

According to Subramanyam (2014), Quick ratio is computed using the formula

$$Quick\ ratio = \frac{Cash + Cash\ equivalents + Marketable\ securities + Accounts\ receivable}{Current\ liabilities}$$

Quick ratio is a tighter measurement for liquidity. (Subramanyam, 2014)

As inventory is “the least liquid current asset” (Subramanyam, 2014, p. 555), quick ratio does not include them in the numerator. (Subramanyam, 2014)

2.3.2. Efficiency

Efficiency ratios are useful to evaluate the degree of success of a company utilizing the assets and resources they have. (Schmidt, 2023)

Kušter (2022) has found negative association of efficiency on ROA in manufacturing companies of Belgrade Stock exchange.

2.3.2.1. Accounts Receivable Turnover

According to Subramanyam (2014) and Çabuk, Başar, Sevim, Karagül, Sayılır & Erol (2019), Accounts receivable turnover ratio is computed using the formula

$$Accounts\ receivable\ turnover = \frac{Net\ sales\ on\ credit}{Average\ accounts\ receivable}$$

In the formula, average accounts receivable is computed by taking the average of accounts receivable of the previous period and current period. (Subramanyam, 2014; Çabuk et al., 2019)

Amanda (2019) has found no significant relationship between accounts receivable turnover and profitability in Basic Chemical sector of Indonesian Stock Exchange in years 2013-2017.

2.3.2.2. Inventory Turnover

According to Subramanyam (2014), inventory turnover ratio is computed has formula

$$Inventory\ turnover = \frac{Cost\ of\ Goods\ Sold}{Average\ inventory}$$

In the formula, average inventory is computed by taking the average of inventory of the previous year and inventory of current year. (Subramanyam, 2014)

Amanda (2019) has found no relationship between inventory turnover and profitability in Basic Chemical sector of Indonesian Stock Exchange in years 2013-2017.

2.3.2.3. Accounts Payable Turnover

According to Subramanyam (2014), accounts payable turnover ratio is computed using the formula

$$Accounts\ payable\ turnover = \frac{Cost\ of\ Goods\ Sold}{Average\ accounts\ payable}$$

In the formula, average accounts payable is computed by taking the average of accounts payable of the previous period and current period. (Subramanyam, 2014)

2.3.3. Solvency

Solvency differs from liquidity by the analysis time frame, while liquidity analyzes short-time financial position of a company, solvency analyzes long-term financial situation of a company. (Subramanyam, 2014)

Solvency ratios are also known as long-term solvency ratios or leverage ratios. (Ross, Westerfield, & Jordan, 2002)

There is evidence that solvency has significant positive relation to profitability in meat processing companies of Serbia in 2016-2019 (Miroslav et al., 2021)

According to Dalci (2018, p. 426), there is "inverted U-shaped relationship" between short term loans/total assets and leverage ratio and DV's ROE and ROA in listed manufacturing companies in China in 2008-2016.

Jang & Tang (2009) has found leverage and profitability to have curvilinear relationship. Jang & Tang (2009) used LTD ratio to measure leverage and ROA to measure profitability.

Dalci (2018, p. 410) points that this relation found in his work and Jang & Tang (2009) may be explained by "…positive impact of financial leverage on profitability could be attributed to tax shield, whereas the negative impact might be because of bankruptcy cost, financial distress..."

There has been findings of significant negative relation between leverage ratio and ROA on BİST logistics companies in 2009-2018 (KUZUCU, 2019), BİST manufacturing and merchandising companies in 2017 (Vuran & Adiloglu, 2018), and BİST food and beverage companies in 2008-2012 (Kendirli & Konak, 2014).

Dwilaksono et al. (2010) has reported positive relation between LTD ratio and ROE in mining companies listed in Indonesian Stock Exchange.

Vătavu, (2015, p. 1314) has reported positive but insignificant relation between LTD ratio and ROE on "196 Romanian companies listed in Bucharest Stock Exchange."

Dasuki (2016) has found LTD ratio to have negative relationship with ROA and negative but insignificant relationship with ROE on Borsa İstanbul manufacturing companies in 2004-2013.

2.3.4. Profitability

2.3.4.1. Return On Assets Ratio

According to Çabuk, et al. (2019), return on net operating assets ratio is computed using the formula

$$Return\ on\ assets = \frac{Net\ profit}{Average\ total\ assets}$$

In the formula, average net operating assets is computed by taking the average of net operating assets of the previous period and current period. (Çabuk, et al., 2019)

2.3.4.2. Return On Equity Ratio

According to Çabuk, et al. (2019), return common equity ratio is computed using the formula

$$Return\ on\ equity = \frac{Net\ profit}{Average\ equity}$$

In the formula, average equity is computed by taking the average of equity of the previous year and equity of current year. (Çabuk, et al., 2019)

2.3.4.3. Profit Margin

Profit margins described in Figure 2 will be explained in this section.

Gross Profit Margin

Gross profit margin is useful to determine how much percent of revenue remains as profit and how much percentage of revenue is lost to COGS, and usually does not consider company-wide expenses. (Hayes, 2022c)

According to Çabuk, et al. (2019), gross profit margin may be found using formula

$$Gross\ profit\ margin = 1 - \frac{Cost\ of\ goods\ sold}{Net\ sales}$$

Operating Margin

According to Hayes (2022a), operating margin is calculated by the formula

$$Operating\ margin = \frac{Operating\ Earnings}{Revenue}$$

Operating earnings, also known as EBIT, is calculated "as revenue minus cost of goods sold (COGS) and the regular selling, general, and administrative costs of running a business, excluding interest and taxes." (Hayes, 2022a, para. 8)

Pretax Margin

According to Liberto (2020) and Hayes (2022a), pretax margin is calculated by formula

$$Pretax\ margin = \frac{Operating\ Earnings - Interest\ expense}{Revenue}$$

Net Profit Margin

According to Murphy (2022, para. 7) net profit margin considers all expenses a company incurs, including

- "Total revenue
- Additional income streams

- COGS and other operational expenses
- Interest expense on debt obligations
- Investment income and income from secondary operations
- One-time payments for unusual events such as lawsuits and taxes" (Murphy, 2022, para.7)

According to Murphy (2022), net profit margin is computed by formula

$$Net\ profit\ margin = \frac{Net\ income}{Revenue}$$

2.4. Summary Of Previous Findings

Summary of previous findings on foreign stock exchanges and BİST have been compiled in Tables 1 and 2, where +: Positive relation, -: Negative relation, 0: No relation.

The findings of the researches in the literature will be considered when forming hypotheses.

Table 1

Researches on foreign stock exchanges

RESEARCH	**FINDINGS**	**RESEARCH SCOPE**	**IV**	**DV**
(Szymańska & Lukoszová, 2021)	+	Meat processing companies in Poland, 2007-2018	Quick ratio	ROA
Miroslav et al. (2021)	0	Meat processing companies in Serbia, 2016-2019	Current ratio	ROA
(Eljelly, 2004)	-	Joint stock companies of Saudi Arabia, 1996-2000		Pretax margin
(Kušter, 2022)	-	Manufacturing companies in Belgrade Stock Exchange	Inventory turnover	ROA
(Amanda, 2019)	0	Basic Chemical Sector of Indonesian Stock Exchange, 2013-2017		

(Kušter, 2022)	-	Manufacturing companies in Belgrade Stock Exchange	Accounts payable turnover	
(Amanda, 2019)	0	Basic Chemical Sector of Indonesian Stock Exchange, 2013-2017	Accounts receivable turnover	ROA
(Kušter, 2022)	-	Manufacturing companies in Belgrade Stock Exchange		
Miroslav et al. (2021)	+	Meat processing companies in Serbia, 2016-2019	LTD ratio	
(Jang & Tang, 2009)	Curvilinear	Hotels listed in NAICS, 1990-2004	LTD ratio	
Dwilaksono et al (2010)	+	Mining companies listed in Indonesian Stock Exchange		ROE
(Vătavu, 2015)	0	Companies in Bucharest Stock Exchange		
(Dalci, 2018)	Curvilinear	Manufacturing firms listed in China, 2008-2016	Leverage ratio	ROA
(Jaworski & Czerwonka, 2022)	-	Warsaw Stock Exchange firms, 1998-2016	Cash conversion cycle	

(Deloof, 2003)	0	Belgian nonfinancial companies, 1992–1996	Cash conversion cycle	Operating income

Table 2

Researches on BİST

RESEARCH	FINDINGS	RESEARCH SCOPE	IV	DV
Kuzucu (2019)	0	BİST logistics companies, 2009-2018	Current ratio	ROE
Kendirli & Konak (2014)	+	BİST food and beverage companies, 2008-2012		ROA
(Vuran & Adiloglu, 2018)	+	BİST merchandising and manufacturing companies, 2017		
(KUZUCU, 2019)	-	BİST logistics companies in 2009-2018	Leverage ratio	
(Vuran & Adiloglu, 2018)	-	BİST manufacturing and merchandising companies in 2017		

(Kendirli & Konak, 2014)	-	BİST food and beverage companies in 2008-2012		
(Dasuki, 2016)	0	Borsa İstanbul Manufacturing companies in 2004-2013	LTD ratio	
(Vuran & Adiloglu, 2018)	0	BİST merchandising and manufacturing companies, 2017	Cash conversion cycle	ROA
(Aygül, 2022)	-	BİST-100 firms, 2000-2018		Operating margin

3. METHODOLOGY

3.1. Source and Nature Of Data

All of the data are obtained from KAP, the companies analyzed are companies under Basic Metal Sector in years 2018-2022, which are provided in Table 3.

Table 3

Basic Metal Companies Listed in KAP

NO.	CODE	IPO in 2022
1	AYES	no
2	BRSAN	no
3	BURCE	no
4	BURVA	no
5	CELHA	no
6	CEMAS	no
7	CEMTS	no
8	CUSAN	no
9	DMSAS	no
10	DOKTA	no
11	ERBOS	no
12	EREGL	no
13	ISDMR	no
14	IZMDC	no
15	KRDMA, KRDMB, KRDMD	no
16	SARKY	no
17	TUCLK	no
18	YKSLN	no
19	PNLSN	no
20	BMSTL	yes
21	BMSCH	yes
22	ERCB	yes

23	KCAER	yes

Note. Adapted from KAP, company numbers and order are changed as there are companies that had recent initial public offerings, IPO section added by author

Companies coded as

- BMSTL,
- BMSCH,
- ERCB,
- KCAER

had their initial public offerings in 2022.

Some of the other fairly recent IPO's are:

- PNLSN (2021),
- YKSLN (2019)

3.2. Research Questions

Following research questions were formed according to Theoretical Framework:

1) What are the factors influencing return on assets on basic metal companies in BİST?
2) What are the factors influencing return on equity on basic metal companies in BİST?
3) What are the factors influencing net profit margin on basic metal companies in BİST?
4) Is there a difference between performance of companies which had recent initial public offerings and companies that did not have recent initial public offerings?

3.3. Hypotheses Development

The hypotheses are developed according to previous findings in literature review.

There are contradicting findings in literature (see Tables 1, 2) on

- Liquidity and profitability
    - Positive relation findings
    - Negative relation findings
- Solvency and profitability
    - Positive findings
    - Negative findings
    - Curvilinear findings

For contradicting findings, researches based on BİST are considered during hypotheses development.

Table 4

Hypothesis Development

RELATIONAL HYPOTHESES				
	IV	DV	DIRECTION	ADAPTED FROM
H1	CR	ROA	+	Kendirli & Konak (2014), Vuran & Adiloglu (2018)
H2	CR	NP	+	Kendirli & Konak (2014), Vuran & Adiloglu (2018)
H3	CR	ROE	+	Kendirli & Konak (2014), Vuran & Adiloglu (2018)
H4	ART	ROA	-	Kuster (2022)
H5	ART	NP	-	Kuster (2022)
H6	ART	ROE	-	Kuster (2022)
H7	APT	ROA	-	Kuster (2022)
H8	APT	NP	-	Kuster (2022)
H9	APT	ROE	-	Kuster (2022)
H10	IT	ROA	-	Kuster (2022)
H11	IT	NP	-	Kuster (2022)
H12	IT	ROE	-	Kuster (2022)
H13	CCC	ROA	-	Jaworski & Czerwonka (2022), Aygül (2022)
H14	CCC	NP	-	Jaworski & Czerwonka (2022), Aygül (2022)
H15	CCC	ROE	-	Jaworski & Czerwonka (2022), Aygül (2022)
H16	LTD	ROA	-	Kendirli & Konak (2014), Vuran & Adiloglu (2018), Kuzucu (2019)
H17	LTD	NP	-	Kendirli & Konak (2014), Vuran & Adiloglu (2018), Kuzucu (2019)
H18	LTD	ROE	+	Dwilaksono et al. (2010), Miroslav et al. (2021)
HYPOTHESIS FOR IPO Performance				
H19				Ross et al. (2002), Pastusiak et al (2016)

3.4. Research Hypotheses

To address the research questions, following hypotheses were formed:

H1: CR and ROA has positive relationship on basic metal companies in BİST.

H2: CR and NP has positive relationship on basic metal companies in BİST.

H3: CR and ROE has positive relationship on basic metal companies in BİST.

H4: ART and ROA has negative relationship on basic metal companies in BİST.

H5: ART and NP has negative relationship on basic metal companies in BİST.

H6: ART and ROE has negative relationship on basic metal companies in BİST.

H7: APT and ROA has negative relationship on basic metal companies in BİST.

H8: APT and NP has negative relationship on basic metal companies in BİST.

H9: APT and ROE has negative relationship on basic metal companies in BİST.

H10: IT and ROA has negative relationship on basic metal companies in BİST.

H11: IT and NP has negative relationship on basic metal companies in BİST.

H12: IT and ROE has negative relationship on basic metal companies in BİST.

H13: CCC and ROA has negative relationship on basic metal companies in BİST.

H14: CCC and NP has negative relationship on basic metal companies in BİST.

H15: CCC and ROE has negative relationship on basic metal companies in BİST.

H16: LTD and ROA has negative relationship on basic metal companies in BİST.

H17: LTD and NP has negative relationship on basic metal companies in BİST.

H18: LTD and ROE has positive relationship on basic metal companies in BİST.

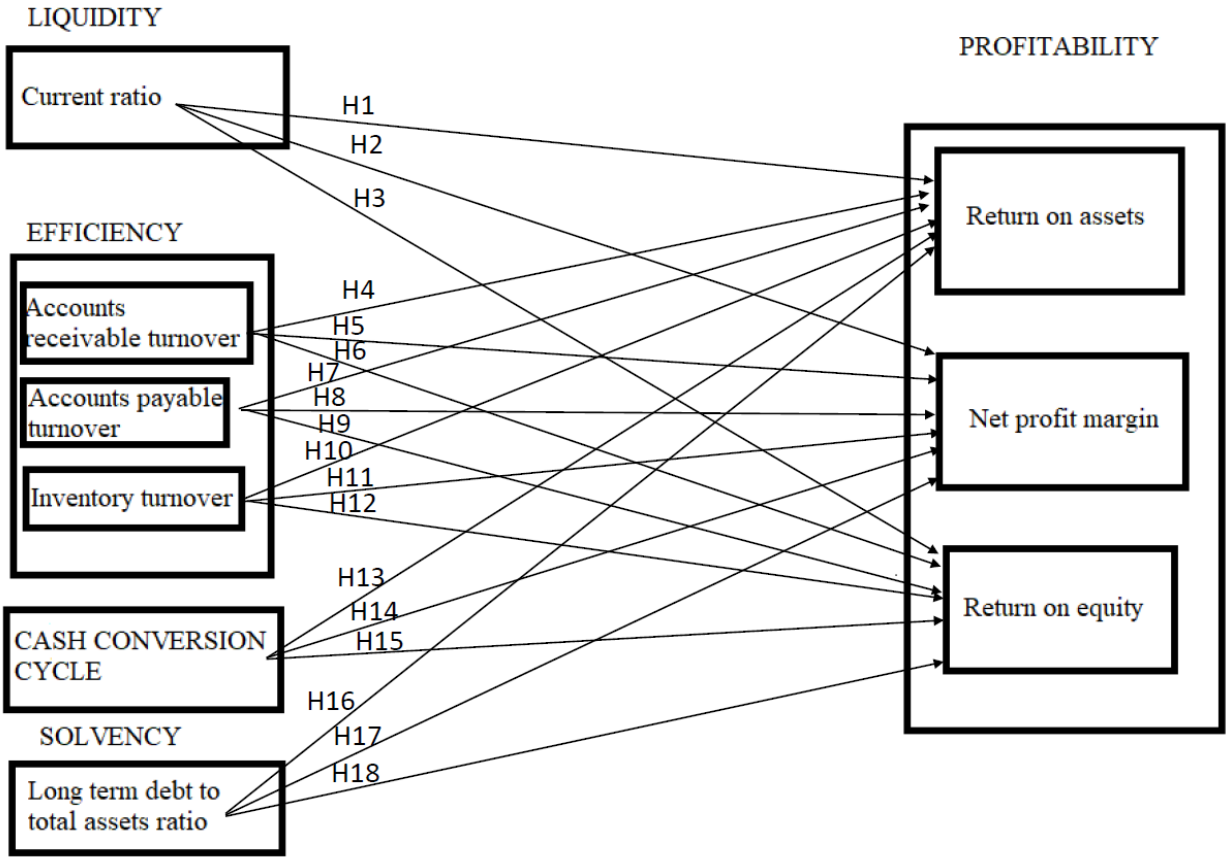
H19: Companies that had recent initial public offerings have lower performance than companies that did not have recent initial public offerings.

3.5. Research Model

Illustration of hypothesized relations of independent variables with respect to dependent variables of hypotheses H1-H18 is given in Figure 3.

Figure 3

Research model



3.6. Analysis Methods

3.6.1. Correlation Analysis

Correlation measures "linear relationship between pairs of variables". (Richardson, 2015, p. 41) Correlation does not have directions of independent or dependent variable. (Richardson, 2015)

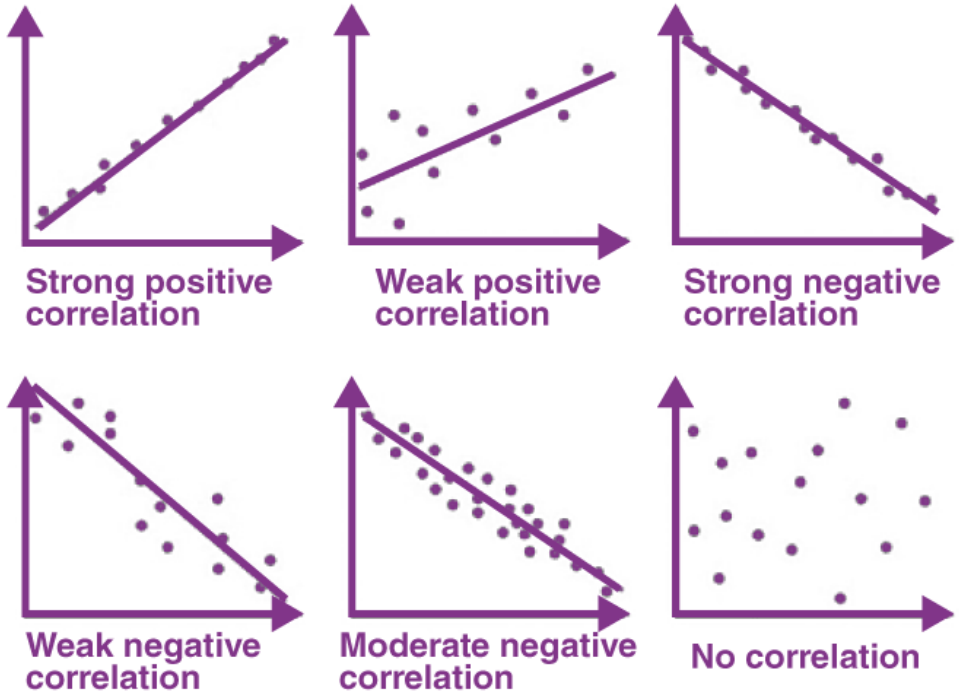
A higher correlation suggests higher linear relationship between variables. (Richardson, 2015)

Correlation may be detected by putting the data in a scatterplot. (Richardson, 2015)

If the data is, in general, evenly dispersed in the plot that a line could be drawn through them, data has high correlation, while if the data appears to be randomly scattered, data has low correlation. (see Figure 4) (Richardson, 2015)

Figure 4

Scatterplot



Note. From https://cdn1.byjus.com/wp-content/uploads/2021/03/Correlation.png

According to Richardson (2015), correlation has formula

$$r = \frac{n\left(\sum X \cdot Y\right) - \left(\sum X\right) \cdot \left(\sum Y\right)}{\sqrt{\left[n \cdot \left(\sum X^2\right) - \left(\sum X\right)^2\right] \cdot \left[n \cdot \left(\sum Y^2\right) - \left(\sum Y\right)^2\right]}}$$

Source: Richardson (2015, p. 16)

According to Richardson (2015, p. 28), significance of correlation may be tested by hypothesis testing, where hypotheses are formed as:

$$H0: \rho = 0$$

$$H1: \rho \neq 0$$

This hypothesis test uses a t-statistic, formulated as follows:

$$t_{n-2} = \frac{r}{\sqrt{\frac{(1-r^2)}{(n-2)}}}$$

Source: Richardson (2015, p. 29)

where

- r is the correlation,
- n is the number of data.

3.6.2. Multicollinearity

Multicollinearity occurs due to independent variables having high correlation. (Wu, 2020)

To avoid multicollinearity in regression analysis, which may result in an overfitted model (Wu, 2020), correlation analysis will been done on data and determine variables with high correlation.

According to Birol (2017), if there are variables that have more than 70% correlation, one of the variables should be omitted. This guideline will be considered during correlation analysis and subsequently regression analysis.

According to Buğdaypınarı (2019), another way of checking for multicollinearity is by computing VIF values; if VIF<10 for all variables, there is no multicollinearity.

According to "EViews 11 User Guide" (2019), there are two types of VIF:

- Centered: Used for models with constant term
- Uncentered: Used for models without constant term

3.6.3. Regression Analysis

Regression is different from correlation, as it is not only a measure of linear association, but it is a model to describe relationship between variables. (Richardson, 2015)

Regression has directions of independent or dependent variable. (Richardson, 2015)

According to Richardson (2015, p.56), some statistics of regression are:

- Multiple R: May have value of [-1,1]; as R gets closer to -1 or 1, the relationship between IV(s) and DV get stronger.
- R^2: Is the squared value of multiple R, may have value of [0,1]. It is "the percentage of variation in dependent variable explained by independent variable" (p. 56)
- Adjusted R^2: In multiple regression, R^2 increases by introduction of "new variables even if those variables do not help explain the dependent variable. Adjusted R^2 adjusts for this issue so models with different number of variables may be compared." (p. 56)
- Standard error (s.e.): "Measures the variability in the predictions made based on resulting regression model." (p. 56)
- Coefficient (β)

According to Walpole, Myers, Myers, & Ye (2016), to test significance of a β coefficient, t-test is used, having hypotheses

$$H0: \beta_i = 0$$

$$H1: \beta_i \neq 0$$

According to Walpole et al (2016), statistic for test is

$$t = \frac{\beta}{s.e.}$$

3.6.3.1. Simple Regression Analysis

Simple regression analysis is a method for computing effect of an independent variable on a dependent variable. (Richardson 2015)

According to Richardson (2015, p. 42), simple regression has equation

$$Y = \beta_0 + \beta_1 x + \varepsilon$$

Where

- "β0 represents the intercept" (Richardson, 2015, p.41)
- "β1 represents the slope" (Richardson, 2015, p.41)
- ε is the error term.

3.6.3.2. Multiple Regression Analysis

Multiple linear regression differs from simple regression by the number of independent variables; while simple regression analysis analyzes effect of a single independent variable on a dependent variable, multiple regression analyzes effects of a set of independent variables on a dependent variable. (Richardson, 2015)

According to Richardson (2015, p. 71), multiple regression has equation

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon$$

Where

- "β_0 is the Y-intercept" (Richardson, 2015, p.71)
- "β_i from i=1 to k is the slope of the regression with respect to variable X_i" (Richardson, 2015, p.71)
- ε is the error term. (Richardson, 2015)

For multiple regression models; ANOVA tests if at least one of the IV's have relationship with DV. (Richardson, 2015; Walpole et al., 2016)

According to Richardson (2015), ANOVA has hypotheses

$$H0: \beta_1 = \beta_2 = \cdots = \beta_k = 0$$

$$H1: At\ least\ one\ \beta_i \neq 0$$

3.6.3.3. Panel Regression Analysis

Panel regression analysis differs from simple and multiple regression analyses by structure of data, while simple and multiple regression analyses has data for a single entity on a cross section of time, panel data is "pooling of observations on a cross-section of households, countries, firms, etc., over several time periods" (Woolridge, 2001; Baltagi, 2021, p.1)

Panel regression analysis has several models: Fixed effects, random effects and OLS. (Torres-Reyna, 2007)

According to Baltagi (2021, p. 6), advantages of panel data are;

- "Controlling for individual heterogeneity"
- "Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency."
- "Panel data are better able to study the dynamics of adjustment. Cross-sectional distributions that look relatively stable hide a multitude of changes."
- "Panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data."
- "Panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time-series data."
- "Micro-panel data gathered on individuals, firms, and households may be more accurately measured than similar variables measured at the macro level. Biases resulting from aggregation over firms or individuals may be reduced or eliminated."

3.6.3.4. Pooled Ordinary Least Squares

According to Woolridge (2001, p.49), OLS regression has formula

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon$$

Where

- "β0 is the Y-intercept" (Richardson, 2015, p.71; Woolridge, 2001)
- "βi from i=1 to k is the slope of the regression with respect to variable Xi" (Richardson, 2015, p.71; Woolridge, 2001)
- ε is the error term. (Richardson, 2015; Woolridge, 2001)

The pooled OLS equation may be rewritten as

$$Y_i = \boldsymbol{x}_i \beta + \boldsymbol{\varepsilon}_i$$

Source: Woolridge, 2001, p. 52

This rewritten form of equation suggests that pooled OLS model does not consider for time or company dependence, which may reduce explanatory power of model.

3.6.3.5. Fixed Effects Model

FE controls for individual characteristics of entities (for this case, companies) and also controls for changes in variables over time, and may consider for entities, time or both. (Torres-Reyna, 2007)

> "Fixed effects models are designed to study causes of changes within a person [or entity]." (Kohler et al, 2009; as cited in Torres-Reyna, 2007, p. 35)

The entity fixed regression model has formula

$$Y_{it} = \alpha_i + \beta X_{it} + u_i + e_{it}$$

Note. From (Torres-Reyna, 2007, p. 18)

The model for fixed entity and time effect has formula

$$Y_{it} = \alpha_i + \beta X_{it} + \delta_t + u_i + e_{it}$$

Note. From (Torres-Reyna, 2007, p. 19)

> "Where:
>
> Y_{it} is the outcome variable (for entity i at time t)
>
> a_i is the unknown intercept for each entity (n entity-spesific intercepts)
>
> X_{it} is the vector of predictors (for entity i at time t)
>
> δ_t is the unknown coefficient for the time regressors (t) [only in the time fixed model]
>
> u_i [is] within-entity error term
>
> e_{it} [is] overall error term" (Torres-Reyna, 2007, p. 19)

In this research, three models will be formed.

Model 1: $ROA_{it} = b_{0i} + b_1 CR_{it} + b_2 ART_{it} + b_3 CCC_{it} + b_4 LTD_{it} + b_5 IT_{it} + b_6 APT_{it} + \delta_t + u_i + e_{it}$

Model 2: $NP_{it} = b_{0i} + b_1 CR_{it} + b_2 ART_{it} + b_3 CCC_{it} + b_4 LTD_{it} + b_5 IT_{it} + b_6 APT_{it} + \delta_t + u_i + e_{it}$

Model 3: $ROE_{it} = b_{0i} + b_1 CR_{it} + b_2 ART_{it} + b_3 CCC_{it} + b_4 LTD_{it} + b_5 IT_{it} + b_6 APT_{it} + \delta_t + u_i + e_{it}$

In this thesis, models 1-3 will be formed using fixed effects for time and entities (companies) using EViews 11. After analyses of models, redundant fixed effects tests will be

done to each model, which tests the model by comparing the model with cross-section fixed and period fixed models and a model with only common intercept. (“EViews 11 User Guide II”, 2019)

According to “EViews 11 User Guide II” (2019), hypotheses for each of these tests are formed as

H0: Effect is redundant

H1: Effect is not redundant

If the tests have p-values smaller than 0.05, the conclusion “effect is not redundant” will be drawn, otherwise effects will be considered redundant. (“EViews 11 User Guide II”, 2019)

3.6.4. Comparison Of Groups

For data of 2022, two groups of companies will be formed; recent IPO and non-recent IPO, as labelled in IPO section of Table 3.

To compare groups, first a normality test must be done, if data are normal, parametric tests should be used, otherwise nonparametric tests should be used. (Pastusiak et al, 2016)

There is several goodness of fit tests, but as the number of recent IPO companies for 2022 is low (4 companies), Shapiro-Wilk test will be used as it is more appropriate for small sample sizes. (Mishra, et al., 2019)

From the Shapiro-Wilk test of each ratio of each group, the inference of normal distribution of data will be drawn if p-value is larger than 0.05 and parametric test will be used if both groups have $p>0.05$, if $p<0.05$ for either one of the two groups, nonparametric test will be used. (Mishra et al., 2019)

If data is normally distributed, independent two samples may be compared using the t-test. (Walpole, Myers, Myers, & Ye, 2016)

According to Walpole et al. (2016), t-test has statistic

$$t = \frac{\overline{x_1} - \overline{x_2}}{s.e.}$$

where, if two samples have equal variance, s.e. has formula

$$s_p\sqrt{1/n_1 + 1/n_2}$$

Source: Walpole et al. (2016, p. 364)

where ${s_p}^2$ has formula

$$s_p^2 = \frac{s_1^2(n_1 - 1) + s_2^2(n_2 - 1)}{n_1 + n_2 - 2}$$

Source: Walpole et al. (2016, p. 364)

Assuming equal variances, t-test has dof of $n_1 - n_2 - 2$

According to Walpole et al. (2016, p. 365), if two samples do not have equal variance, s.e. becomes

$$s.e. = \sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}}$$

Under unequal variances, dof of t-test is calculated by following formula:

$$v = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{(s_1^2/n_1)^2/(n_1 - 1) + (s_2^2/n_2)^2/(n_2 - 1)}$$

Source: Walpole et al. (2016, p. 365)

The equality of variances may be tested by F-test. (Walpole et al., 2016)

According to Walpole et al. (2016), F-test has hypotheses

$$H_0: {\sigma_1}^2 = {\sigma_2}^2$$

$$H_1: {\sigma_1}^2 = {\sigma_2}^2$$

and test statistic

$$F = \frac{{s_1}^2}{{s_2}^2}$$

For F statistic of dof (4-1,19-1), α=0.05; F=3.16 (Walpole et al 2016, p. 761), this means

- if the F statistic is is larger than 3.16, we will assume unequal variances,
- otherwise assume equal variances.

According to Walpole et al. (2016), t-test has hypotheses

$$H0: \mu_1 = \mu_2$$

$$H1: \mu_1 \neq \mu_2$$

If the test has p< 0.05, conclusion of inequality of means will be drawn. (Walpole et al., 2016)

For data that do not follow normal distribution, independent two samples may be compared using nonparametric Wilcoxon Rank-sum test (Walpole et al., 2016).

According to Walpole et al. (2016), Wilcoxon Rank-sum test has hypotheses

$$H0: \widetilde{\mu_1} = \widetilde{\mu_2}$$

$$H1: \widetilde{\mu_1} \neq \widetilde{\mu_2}$$

Where $\widetilde{\mu_1}$ and $\widetilde{\mu_2}$ is the median value of each group. (Walpole et al., 2016)

If the test has p< 0.05, conclusion of inequality of medians will be drawn. (Walpole at el., 2016)

3.6.5. T-Test Approaches

As can be seen from previous sections of this thesis, t-test is an important method for making statistical decisions. Methods to make a decision between H0 and H1 are:

- Critical value: If the t statistic
  - is larger than critical t value on the table, decide H1. (Walpole et al, 2016)
  - If t statistic is smaller than critical t value, decide H0. (Walpole et al, 2016)
- p-value: For a defined significance value α (for this thesis, α=0.05);
  - if p < α, decide H1. (Walpole et al, 2016)
  - If p>α, decide H0. (Walpole et al, 2016)

4. RESEARCH FINDINGS

4.1. Descriptive Statistics

Descriptive statistics for calculated ratios are given in Table 5.

Table 5

Overall Descriptive Statistics Basic Metal Companies Listed in KAP (2018-2022)

	Observations	Min	Max	Mean	St. Dev.
CR	95	0.43	9.00	1.8595	1.45752
ART	95	-0.13	64.69	8.3694	11.69791
CCC	95	-266.04	417.97	81.9200	110.37722
LTD	95	0.01	0.64	0.1296	0.10453
ROA	95	-0.14	0.55	0.0905	0.11438
ROE	95	-1.64	1.15	0.1665	0.39196
NP	95	-0.18	0.97	0.0820	0.13982
IT	95	1.61	25.18	5.7623	4.01444
APT	95	2.02	312.65	19.3442	40.94419
Valid N (listwise)	95				

Further information to accompany the descriptive statistics in Table 5 are:

- The lowest CR is in year 2020 by IZMDC
- The lowest ART is in year 2022 by DMSAS
- The lowest LTD is in year 2019 by CUSAN
- The lowest ROA is in year 2019 by IZMDC
- The lowest ROE is in year 2019 by IZMDC
- The lowest NP is in year 2018 by CEMAS
- The lowest IT is in year 2019 by BURVA
- The lowest APT is in year 2020 by TUCLK
- The highest CR is in year 2021 by CEMAS
- The highest ART is in year 2022 by BMSCH
- The highest LTD is in year 2019 by DOKTA

- The highest ROA is in year 2022 by CEMTS
- The highest ROE is in year 2018 by DOKTA
- The highest NP is in year 2021 by CEMAS
- The highest IT is in year 2018 by AYES
- The highest APT is in year 2021 by AYES

Descriptive statistics for each year are given in Table 6.

Table 6

Descriptive Statistics for each year

	Observations	Min	Max	Mean	St. Dev.	Observations
2018	CR	17	0.54129	4.45194	1.67284	1.029237017
	ART	17	2.66854	14.6644	6.78849	3.212906744
	CCC	17	-48.062	183.49	83.5059	64.26483875
	LTD	17	0.01473	0.41115	0.15503	0.107786328
	ROA	17	-0.1062	0.29773	0.07127	0.105521624
	ROE	17	-0.6833	1.14694	0.16566	0.369313693
	NP	17	-0.1808	0.25871	0.05697	0.109771591
	IT	17	2.55178	25.1827	6.55136	5.527120331
	APT	17	2.11498	44.9359	11.4782	11.53741534
2019	CR	18	0.47128	7.80455	1.8864	1.690686137
	ART	18	0.29463	9.80594	1.60124	2.406023392
	CCC	18	-266.04	417.971	-35.711	146.3267483
	LTD	18	0.01384	0.63523	0.15896	0.143147117
	ROA	18	-0.1394	0.12605	0.02567	0.067012235
	ROE	18	-1.6429	0.91757	-0.0021	0.472101601
	NP	18	-0.147	0.131	0.02207	0.078876009
	IT	18	1.60618	15.82	5.32459	3.74212114
	APT	18	2.68274	25.9625	9.11022	6.837203741
2020	CR	18	0.42982	5.56786	2.02205	1.413653331
	CCC	18	14.2041	273.829	117.184	64.12191588
	ART	18	2.1206	50.08	8.75057	11.33226687
	LTD	18	0.02139	0.42129	0.14886	0.098413087

	ROA	18	-0.1049	0.22159	0.05274	0.070603287
	ROE	18	-1.2024	0.56422	0.059	0.360340389
	NP	18	-0.0887	0.19728	0.05837	0.073420495
	IT	18	1.8616	17.513	5.11392	3.570663299
	APT	18	2.02375	57.2486	10.8791	13.27778079
2021	CR	19	0.68673	9.00461	2.05688	1.948372419
	ART	19	2.44295	62.6957	10.9963	14.32406694
	CCC	19	-63.677	302.902	120.329	91.02807028
	LTD	19	0.01363	0.35287	0.10662	0.082974947
	ROA	19	-0.1265	0.42708	0.14308	0.129915464
	ROE	19	-1.2594	0.62772	0.27083	0.417740329
	NP	19	-0.0723	0.9698	0.15316	0.220562597
	IT	19	1.913	14.4928	5.23827	3.038904213
	APT	19	2.05503	312.646	29.7118	71.48657399
2022	CR	23	0.79643	5.33933	1.68596	1.154626425
	ART	23	-0.1259	64.6923	12.3662	15.60150886
	CCC	23	6.61191	383.417	113.48	88.84563394
	LTD	23	0.00673	0.30967	0.09192	0.076399935
	ROA	23	-0.1239	0.54903	0.14151	0.129116647
	ROE	23	-0.6301	0.81003	0.29692	0.286343331
	NP	23	-0.0756	0.61696	0.10702	0.130694296
	IT	23	2.16706	20.0863	6.4621	4.084218902
	APT	23	2.27436	173.515	31.2276	47.74906567

Further information to accompany Table 6 are:

- In year 2018,
    - Lowest CR is by DOKTA
    - Lowest ART is by CELHA
    - Lowest LTD is by CUSAN
    - Lowest ROA is by IZMDC
    - Lowest ROE is by IZMDC
    - Lowest NP is by CEMAS
    - Lowest IT is by EREGL

    - Lowest APT is by CELHA
    - Highest CR is by CEMTS
    - Highest ART is by ISDMR
    - Highest LTD is by DOKTA
    - Highest ROA is by CEMTS
    - Highest ROE is by DOKTA
    - Highest NP is by ISDMR
    - Highest IT is by AYES
    - Highest APT is by SARKY
- In year 2019,
    - Lowest CR is by IZMDC
    - Lowest ART is by IZMDC
    - Lowest LTD is by CUSAN
    - Lowest ROA is by IZMDC
    - Lowest ROE is by IZMDC
    - Lowest NP is by CEMAS
    - Lowest IT is by BURVA
    - Lowest APT is by TUCLK
    - Highest CR is by CEMTS
    - Highest ART is by AYES
    - Highest LTD is by DOKTA
    - Highest ROA is by ERBOS
    - Highest ROE is by DOKTA
    - Highest NP is by ISDMR
    - Highest IT is by AYES
    - Highest APT is by SARKY
- In year 2020,
    - Lowest CR is by IZMDC
    - Lowest ART is by CELHA
    - Lowest LTD is tied by CEMTS and YKSLN
    - Lowest ROA is by IZMDC
    - Lowest ROE is by IZMDC
    - Lowest NP is by IZMDC

    - Lowest IT is by YKSLN
    - Lowest APT is by TUCLK
    - Highest CR is by CEMTS
    - Highest ART is by IZMDC
    - Highest LTD is by DOKTA
    - Highest ROA is by CEMTS
    - Highest ROE is by DOKTA
    - Highest NP is by CEMAS
    - Highest IT is by AYES
    - Highest APT is by AYES
- In year 2021,
    - Lowest CR is by IZMDC
    - Lowest ART is by TUCLK
    - Lowest LTD is by ERBOS
    - Lowest ROA is by IZMDC
    - Lowest ROE is by IZMDC
    - Lowest NP is by IZMDC
    - Lowest IT is by BURVA
    - Lowest APT is by TUCLK
    - Highest CR is by CEMAS
    - Highest ART is by IZMDC
    - Highest LTD is by DOKTA
    - Highest ROA is by CEMTS
    - Highest ROE is by DOKTA
    - Highest NP is by CEMAS
    - Highest IT is by AYES
    - Highest APT is by AYES
- In year 2022,
    - Lowest CR is by DMSAS
    - Lowest ART is by DMSAS
    - Lowest LTD is by AYES
    - Lowest ROA is by DMSAS
    - Lowest ROE is by DMSAS

- Lowest NP is by DMSAS
- Lowest IT is by BURVA
- Lowest APT is by TUCLK
- Highest CR is by CEMAS
- Highest ART is by BMSCH
- Highest LTD is by TUCLK
- Highest ROA is by CEMTS
- Highest ROE is by AYES
- Highest NP is by CEMAS
- Highest IT is by AYES
- Highest APT is by BMSCH

Table 7

Descriptive Statistics for Group 1 (IPO before 2022)

	Observations	Min	Max	Mean	St. Dev.
CR	19	0.8	5.34	1.7548	1.26109
ART	19	-0.13	41.58	10.0617	11.76373
LTD	19	0.01	0.31	0.0953	0.08197
ROA	19	-0.12	0.55	0.145	0.14056
ROE	19	-0.63	0.81	0.3053	0.31295
NP	19	-0.08	0.62	0.1135	0.14321
IT	19	2.17	20.09	6.1107	4.11316
APT	19	2.27	151.84	27.3196	39.47717
CCC	19	8.07	383.42	119.156	89.70399

Table 8

Descriptive Statistics for Group 2(IPO in 2022)

	Observations	Min	Max	Mean	St. Dev.
CR	4	1.11	1.63	1.3589	0.24859
ART	4	8.85	64.69	23.3125	27.59127
LTD	4	0.03	0.14	0.0759	0.04557
ROA	4	0.04	0.17	0.1249	0.0571
ROE	4	0.11	0.36	0.2571	0.10528
NP	4	0.05	0.11	0.0765	0.0263
IT	4	5	14.07	8.131	4.04008
APT	4	4.22	173.51	49.7909	82.5405
CCC	4	6.61	204.61	86.5214	91.82664

Descriptive statistics for Group 1 and Group 2 will be useful for t-test.

4.2. Correlation Analysis

Correlation analysis has been done on IBM SPSS 25.0.

Table 9

Correlations

		CR	ART	LTD	ROA	ROE	NP	IT	APT	CCC
CR	Pearson Correlation	1	-0.113	-.370**	.596**	.208*	.736**	-.216*	-0.037	0.186
	Sig. (2-tailed)		0.274	0.000	0.000	0.043	0.000	0.036	0.720	0.071
ART	Pearson Correlation	-0.113	1	-0.126	0.021	-0.142	-0.092	.376**	.551**	-0.005
	Sig. (2-tailed)	0.274		0.224	0.839	0.169	0.374	0.000	0.000	0.963
LTD	Pearson Correlation	-.370**	-0.126	1	-.387**	0.011	-.261*	-0.085	-.205*	-0.141
	Sig. (2-tailed)	0.000	0.224		0.000	0.918	0.011	0.415	0.046	0.174
ROA	Pearson Correlation	.596**	0.021	-.387**	1	.692**	.741**	-0.035	0.157	.269**
	Sig. (2-tailed)	0.000	0.839	0.000		0.000	0.000	0.738	0.129	0.008
ROE	Pearson Correlation	.208*	-0.142	0.011	.692**	1	.444**	0.082	0.098	0.169
	Sig. (2-tailed)	0.043	0.169	0.918	0.000		0.000	0.431	0.342	0.102
NP	Pearson Correlation	.736**	-0.092	-.261*	.741**	.444**	1	-0.175	-0.048	.225*
	Sig. (2-tailed)	0.000	0.374	0.011	0.000	0.000		0.089	0.641	0.028
IT	Pearson Correlation	-.216*	.376**	-0.085	-0.035	0.082	-0.175	1	.359**	-.294**
	Sig. (2-tailed)	0.036	0.000	0.415	0.738	0.431	0.089		0.000	0.004
APT	Pearson Correlation	-0.037	.551**	-.205*	0.157	0.098	-0.048	.359**	1	-0.002
	Sig. (2-tailed)	0.720	0.000	0.046	0.129	0.342	0.641	0.000		0.986
CCC	Pearson Correlation	0.186	-0.005	-0.141	.269**	0.169	.225*	-.294**	-0.002	1
	Sig. (2-tailed)	0.071	0.963	0.174	0.008	0.102	0.028	0.004	0.986	

*p<0.05, **p<0.01

According to Table 9, significant correlations are:

- CR↔LTD (r= -37%, p=0.000)
- CR↔ROA (r= -59.6%, p=0.000)
- CR↔ROE (r= +20.8%, p=0.043)
- CR↔NP (r= +73.6%, p=0.000)
- CR↔IT (r= -21.6%, p=0.036)
- ART↔IT (r= +37.6%, p=0.000)
- ART↔APT (r= +55.1%, p=0.000)
- LTD↔ROA (r= -38.7%, p=0.000)
- LTD↔NP (r= -26.1%, p=0.011)
- LTD↔APT (r= -20.5%, p=0.046)
- ROE↔ROA (r= +69.2%, p=0.000)
- NP↔ROA (r= +74.1%, p=0.000)
- CCC↔ROA (r= +26.9%, p=0.000)
- NP↔ROE (r= +44.4%, p=0.000)
- CCC↔NP (r= +22.5%, p=0.028)
- APT↔IT (r= +35.9%, p=0.000)
- CCC↔IT (r= -29.4%, p=0.004)

According to Table 9, correlations larger than 70% are:

- CR↔NP (r= +73.6%)
- NP↔ROA (r= +74.1%)

As there are no two independent variables that have more than 70% correlation, the correlation analysis does not show any signs of multicollinearity.

4.3. Multicollinearity Test

As all of the models 1-3 have constant term, centered VIF values will be considered during multicollinearity evaluation.

Table 10

Centered VIF values

IV	Centered VIF
Constant	--
CR	1.080747
ART	1.105001
CCC	1.177454
LTD	1.185913
IT	1.279842
APT	1.165583

According to Table 10, all independent variables have VIF < 10.

From the correlations and VIF values, we may reach the conclusion of no presence of multicollinearity.

Both of the correlation analyses and VIF analyses show no multicollinearity, therefore all of the variables will be included in regression analysis.

4.4. Panel Regression Analysis

Panel regression analyses for each dependent variable has been done using EViews 11.

Decision on running the model by FE or OLS is made by two criteria:

- Maximizing R^2, therefore maximizing explanatory power and accuracy of models.
- Results of redundant FE test.

Table 11

R^2 and F values of OLS and FE models

	Companies	Year	Adjusted R^2	F (ANOVA)	p (ANOVA)
Model 1 (ROA)	OLS	OLS	39.70%	11.32	0.000000
	OLS	Fixed	51.40%	10.957	0.000000
	Fixed	OLS	47.80%	4.069	0.000000
	Fixed	Fixed	59.70%	5.35	0.000000
Model 2 (NP)	OLS	OLS	52.00%	17.998	0.000000
	OLS	Fixed	66.80%	16.96	0.000000
	Fixed	OLS	64.80%	7.185	0.000000
	Fixed	Fixed	71.30%	8.283	0.000000
Model 3 (ROE)	OLS	OLS	12.10%	3.166	0.007360
	OLS	Fixed	20.80%	3.48	0.000719
	Fixed	OLS	43.90%	3.63	0.000000
	Fixed	Fixed	50.76%	4.029	0.000000

Table 11 shows that for all of the models, regardless of FE or OLS, the models have some level of explanatory power on DV's, due to all of the ANOVA p-values being significant.

As can be seen from Table 11, using fixed effect for both cross section and period maximizes adjusted R^2 for all models, satisfying first criteria.

From Table 11, we may explain

- maximum 59.70% of variance on ROA by the selected set of independent variables; by using fixed effects for cross section and period.
    - Explanatory power of IV's increases by 20% compared to OLS
- maximum 71.30% of variance on NP by the selected set of independent variables; by using fixed effects for cross section and period.
    - Explanatory power of IV's increases by 19.30% compared to OLS
- maximum 50.76% of variance on ROE by the selected set of independent variables; by using fixed effects for cross section and period.
    - Explanatory power of IV's increases by 38.66% compared to OLS.

Table 12

Results of Redundant FE

MODEL	EFFECT	dof	p
Model 1 (ROA)	Cross section	(22,62)	0.0391*
	Period	(4,62)	0.0004**
	Both	(26,62)	0.0008**
Model 2 (NP)	Cross section	(22,62)	0.0115*
	Period	(4,62)	0.0022**
	Both	(26,62)	0.0001**
Model 3 (ROE)	Cross section	(22,62)	0.0001**
	Period	(4,62)	0.0165*
	Both	(26,62)	0.0000**

The redundant fixed effects test for all models for both period and cross section are significant, satisfying second criteria.

Findings of both adjusted R^2 values and redundant FE tests give strong reason to continue with fixed effects model.

Table 13

Results of Panel Regression Analyses (coefficients)

β	ROA	NP	ROE
CR	0.032695**	0.104934**	0.085072*
ART	0.00116	0.000143	0.008386
CCC	-4.86E-06	-3.69E-05	-0.000332
LTD	0.152246	-0.180387	1.721051*
IT	-0.003077	-0.008803	0.006635
APT	-6.27E-05	-0.000396	0.000353

* $p<0.05$, **$p<0.01$

T statistics of models 1-3 are as in Table 14. EViews reports 26 dof on FE (see Table 12). Two tailed t value at 5%, 26 dof is 2.056 (Walpole et al 2016, p. 757).

Table 14

Results of Panel Regression Analyses (t statistics)

t	ROA	NP	ROE
CR	3.253694*	10.11582*	2.235098*
ART	0.835372	0.099824	1.594758
CCC	-0.039287	-0.288881	-0.707751
LTD	0.856109	-0.98261	2.555031*
IT	-0.436252	-1.209169	0.248382
APT	-0.235336	-1.441828	0.349607

*t > $t_{critical} = 2.056$

In Tables 13 and 14,

- CR has
  - positive relationship with ROA,
  - positive relationship with NP,
  - positive relationship with ROE,
- LTD ratio
  - has positive relationship with ROE,
  - does not have any relationship with ROA.
  - does not have any relationship with NP.
- ART, CCC, IT, APT does not have any relationship with ROA, NP and ROE

Therefore, relationships H1, H2, H3 and H18 are supported.

Relationships hypothesized between H4 to H17 are not supported, see Table 15 for details.

In Tables 13 and 14, the β_0 (constant term) is not included, this is because significance of those terms do not provide information on our hypotheses, but are part of our regression equations.

To obtain the computed regression equations, constants are required and therefore are provided in Table 15.

Table 15

Constant terms for regression models

Model 1 (ROA)	0.019587
Model 2 (NP)	-0.029542
Model 3 (ROE)	-0.302907

The computed regression equations, using FE for periods and cross sections are:

Model 1: $ROA_{it} = 0.019587 + 0.032695 \times CR_{it} + 0.00116 \times ART_{it} - 4.86 \times 10^{-6} \times CCC_{it} + 0.152246 \times LTD_{it} - 0.003077 \times IT_{it} - 6.27 \times 10^{-5} \times APT_{it}$

Model 2: $NP_{it} = -0.029542 + 0.104934 \times CR_{it} + 0.000143 \times ART_{it} - 3.69 \times 10^{-5} \times CCC_{it} - 0.180387 \times LTD_{it} - 0.008803 \times IT_{it} - 0.000396 \times APT_{it}$

Model 3: $ROE_{it} = -0.302907 + 0.085072 \times CR_{it} + 0.008386 \times ART_{it} - 0.000332 \times CCC_{it} + 1.721051 \times LTD_{it} + 0.006635 \times IT_{it} + 0.000353 \times APT_{it}$

4.5. Comparison Of 2022 IPO And Non-2022 IPO Companies

All of the tests in this section has been done in IBM SPSS 25.0.

Table 16

Shapiro-Wilk Test for Group 1 and Group 2

Test Results		
Ratio	Group 1	Group 2
	2022 IPO	Before 2022 IPO
CR	0.502	0.000
ART	0.002	0.000
LTD	0.802	0.013
ROA	0.151	0.136
ROE	0.663	0.029
NP	0.770	0.000
IT	0.096	0.000
APT	0.004	0.000
CCC	0.462	0.009

From Table 16, it can be seen that only ROA ratio is normally distributed for both groups (i.e. has p value larger than 0.05 for both groups), therefore ROA will be compared using two samples t-test, other ratios will be compared using Wilcoxon test.

4.5.1. T-Test for ROA

From Tables 7 and 8 (see Descriptive Statistics section), we may compute the t test statistic by first computing the F statistic to test equality of group variances.

For group 2, standard deviation is s=0.0571, therefore $s_2{}^2$=0.0326.

For group 1, standard deviation is s=0.14056, therefore $s_1{}^2$=0.0197.

Computing F statistic by F= 0.0326/0.0197=1.65; we see that F statistic is smaller than 3.16, so we may assume equal variances.

According to the SPSS output, t value under equal variances is 0.276 and p=0.785>0.05. Therefore, there is no difference between 2022 IPO companies and before 2022 IPO companies in terms of ROA.

4.5.2. Nonparametric Tests

Table 17

Comparison of Group tests and results (Nonparametric)

Ratio	p-value
CR	0.907
ART	0.044*
LTD	0.907
ROE	0.725
NP	0.907
IT	0.138
APT	0.725
CCC	0.456

*p<0.05

Table 17 shows only statistically significant difference (p<0.05) is for ART ratio.

Table 18

Medians of Group 1 and 2

Ratio	Median of Group 1	Median of Group 2
CR	1.2999	1.3492
ART	6.6075	9.855
LTD	0.0929	0.0699
ROA	0.1213	0.1444
ROE	0.2419	0.2791
NP	0.1032	0.0722
IT	5.2774	6.7288
APT	8.6675	10.7128
CCC	89.128	67.4318

from Table 18, it can be seen that 2022 IPO companies (Group 2) have higher median accounts receivable turnover than companies that did not have IPO in 2022 (Group 1).

Therefore, H19 is not supported.

4.6. Summary Of Research Findings

Summary of the research findings are given in Table 19, and are compared with hypothesized relationships.

Table 19

Summary of Research Findings

RELATIONAL HYPOTHESES						
	IV	DV	HYPOTHESIZED DIRECTION	FINDINGS DIRECTION	p value	Significance
H1	CR	ROA	+	+	0.0018	at 1%
H2	CR	NP	+	+	0.0000	at 1%
H3	CR	ROE	+	+	0.0290	at 5%
H4	ART	ROA	-	+	0.4067	--
H5	ART	NP	-	+	0.9208	--
H6	ART	ROE	-	+	0.1159	--
H7	APT	ROA	-	-	0.8147	--
H8	APT	NP	-	-	0.1544	--
H9	APT	ROE	-	+	0.7278	--
H10	IT	ROA	-	-	0.6642	--
H11	IT	NP	-	-	0.2312	--
H12	IT	ROE	-	+	0.8047	--
H13	CCC	ROA	-	-	0.9688	--
H14	CCC	NP	-	-	0.7736	--
H15	CCC	ROE	-	-	0.4818	--
H16	LTD	ROA	-	+	0.3952	--
H17	LTD	NP	-	-	0.3296	--
H18	LTD	ROE	+	+	0.0131	at 5%
HYPOTHESIS FOR IPO Performance						
H19				For ROA, see section 4.5.1. T-Test for ROA. For other variables, see Tables 17 and 18.		

From Table 19, we may see

- significant relationships
    - H1 (CR → ROA),
    - H2 (CR → NP),
    - H3 (CR → ROE),
    - H18 (LTD → ROE)
- insignificant relationships
    - H7 (APT → ROA),
    - H8 (APT → NP),
    - H10 (IT → ROA),
    - H11 (IT → NP),
    - H13 (CCC→ ROA),
    - H14 (CCC → NP),
    - H15 (CCC → ROE),
    - H17 (LTD → ROE) occurred in hypothesized directions;
- insignificant relationships of
    - H4 (ART → ROA),
    - H5 (ART → NP),
    - H6 (ART → ROE),
    - H9 (APT → ROE),
    - H12 (IT → ROE),
    - H16 (LTD → ROA) did not occur in hypothesized directions.

5. CONCLUSION

5.1. Discussion and Conclusion

From the results of research, working capital management has shown to make BİST basic metal production companies more profitable.

Companies that have more liquidity are shown to be more profitable from the research results, as current ratio has positive relation with all of the profitability ratios, which gives similar results to the PwC report "Global Restructuring Trends" (2021,p. 79) on Turkish businesses, as well as previous findings (KENDİRLİ & KONAK, 2014; Vuran & Adiloglu, 2018) in literature on BİST for different sectors, for results on Polish meat enterprises (Szymańska & Lukoszová, 2021); but contradicts results of Saudi Arabian enterprises (Eljelly, 2004), and Serbian meat enterprises (Miroslav, et al., 2021).

APT, ART, IT, and CCC has shown no effect on ROA, NP and ROE, contradicting Belgrade manufacturing companies (Kušter, 2022), Warsaw Stock Exchange firms (Jaworski & Czerwonka, 2022), giving mixed results in BİST by analysis time frames, index and sector (contradicting Aygül, 2022 on BİST-100 firms, while giving similar results to Vuran & Adiloglu, 2018), and giving similar results to Belgian nonfinancial companies (Deloof, 2003).

The results of relationships between liquidity and efficiency on profitability suggest that companies that have flexible strategy (as discussed in theoretical framework) are more profitable, remembering that companies that have flexible strategy should theoretically have higher current ratios, and liberal credit terms. Our results have shown that selected profitability ratios of this research can be increased by increasing the current ratio; and efficiency and CCC has shown no effect on profitability, so the length of time period until receivables and inventories are realized in cash does not have any effect on profitability, so liberal credit terms may be employed without compromising profitability. Research findings suggests that one of the ways to make companies more profitable is to employ a flexible strategy.

Solvency has shown positive effect on return on equity, therefore basic metal enterprises of BİST may increase their return on equity by taking out loans. This may be due to the ability of long term loans to stimulate production and operating capacities of the

companies. This finding is similar to findings on Mining Companies in Indonesian Stock Exchange (Dwilaksono & others, 2010), but contradicts findings on Companies in Bucharest Stock Exchange (Vătavu, 2015); and also contradicts previous findings on BİST (Dasuki, 2016). The contradiction between this research and of Dasuki (2016) may be due to the analyzed company group (Basic Metal Sector companies vs. Manufacturing Companies in general on BİST) or the analysis time frame (2004-2013 vs. 2018-2022), and also new entrants (companies that were private in time frame of Dasuki, 2016 but went public during time of this this research)

5.2. Research Limitations

The limitations of this research are the limited data set (annual financial reports for 2018-2022) and unavailability of data for Turkish Basic Metal companies that are not listed in BİST.

This research also does not include analyses for BİST in general, or manufacturing companies other than basic metal sector, which implies that effects that are not specific to basic metal companies (such as factors that affect the world economy, Turkish economy and the general situation of BİST) may also be reflected to research results.

Also, this research includes all listed basic metal companies in BİST, but companies on indices such as BİST-100, BİST-50 and BİST-30 may have differing performances that may show different findings.

5.3. Suggestions for Future Research

Future researches may analyze year 2023 and beyond to make inferences on how companies are holding up and also make inferences on financial situation of new companies, if there will be companies that have recent initial public offerings.

Future researches may follow a comparative approach on several categories of companies listed in BİST, may use indices of BİST (100, 50, or 30) for comparison, or making comparative analysis of BİST basic metal companies and basic metal companies of other stock exchanges, which would be helpful to identify the effects that are inside or outside the scope of basic metal sector, such as the economic situation of Turkey and world.

This research is in no means an investment advice.

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APPENDIX A: REGRESSION ANALYSES RESULTS

Regression analysis for ROA (Model 1)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 04/25/23 Time: 12:27
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019587	0.063925	0.306412	0.7603
CR	0.032695	0.010049	3.253694	0.0018
ART	0.001160	0.001388	0.835372	0.4067
CCC	-4.86E-06	0.000124	-0.039287	0.9688
LTD	0.152246	0.177834	0.856109	0.3952
IT	-0.003077	0.007052	-0.436252	0.6642
APT	-6.27E-05	0.000266	-0.235336	0.8147

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

Root MSE	0.058659	R-squared	0.734197
Mean dependent var	0.090488	Adjusted R-squared	0.597008
S.D. dependent var	0.114380	S.E. of regression	0.072610
Akaike info criterion	-2.139426	Sum squared resid	0.326880
Schwarz criterion	-1.252290	Log likelihood	134.6227
Hannan-Quinn criter.	-1.780957	F-statistic	5.351720
Durbin-Watson stat	1.714521	Prob(F-statistic)	0.000000

Regression analysis for NP (Model 2)

Dependent Variable: NP
Method: Panel Least Squares
Date: 04/25/23 Time: 12:30
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.029542	0.065990	-0.447674	0.6559
CR	0.104934	0.010373	10.11582	0.0000
ART	0.000143	0.001433	0.099824	0.9208
CCC	-3.69E-05	0.000128	-0.288881	0.7736
LTD	-0.180387	0.183580	-0.982610	0.3296
IT	-0.008803	0.007280	-1.209169	0.2312
APT	-0.000396	0.000275	-1.441828	0.1544

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

Root MSE	0.060554	R-squared	0.810439
Mean dependent var	0.081976	Adjusted R-squared	0.712601
S.D. dependent var	0.139818	S.E. of regression	0.074956
Akaike info criterion	-2.075833	Sum squared resid	0.348342
Schwarz criterion	-1.188697	Log likelihood	131.6021
Hannan-Quinn criter.	-1.717364	F-statistic	8.283485
Durbin-Watson stat	2.019091	Prob(F-statistic)	0.000000

Regression analysis for ROE (Model 3)

Dependent Variable: ROE
Method: Panel Least Squares
Date: 04/25/23 Time: 12:31
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.302907	0.242131	-1.251004	0.2156
CR	0.085072	0.038062	2.235098	0.0290
ART	0.008386	0.005258	1.594758	0.1159
CCC	-0.000332	0.000468	-0.707751	0.4818
LTD	1.721051	0.673593	2.555031	0.0131
IT	0.006635	0.026713	0.248382	0.8047
APT	0.000353	0.001009	0.349607	0.7278

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

Root MSE	0.222185	R-squared	0.675249
Mean dependent var	0.166484	Adjusted R-squared	0.507636
S.D. dependent var	0.391955	S.E. of regression	0.275030
Akaike info criterion	0.524120	Sum squared resid	4.689767
Schwarz criterion	1.411256	Log likelihood	8.104299
Hannan-Quinn criter.	0.882590	F-statistic	4.028617
Durbin-Watson stat	2.075273	Prob(F-statistic)	0.000001

Redundant FE Test for Model 1

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.782877	(22,62)	0.0391
Cross-section Chi-square	46.568475	22	0.0017
Period F	5.887838	(4,62)	0.0004
Period Chi-square	30.588331	4	0.0000
Cross-Section/Period F	2.679124	(26,62)	0.0008
Cross-Section/Period Chi-square	71.541409	26	0.0000

Cross-section fixed effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 04/25/23 Time: 12:29
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001936	0.029745	0.065089	0.9483
CR	0.046650	0.006436	7.248633	0.0000
ART	-0.001293	0.000909	-1.422151	0.1587
CCC	1.20E-05	9.64E-05	0.124130	0.9015
LTD	-0.047081	0.090933	-0.517755	0.6060
IT	0.001971	0.002475	0.796433	0.4280
APT	0.000331	0.000252	1.311878	0.1931

Effects Specification

Period fixed (dummy variables)

Root MSE	0.074951	R-squared	0.566040
Mean dependent var	0.090488	Adjusted R-squared	0.514378
S.D. dependent var	0.114380	S.E. of regression	0.079707
Akaike info criterion	-2.112390	Sum squared resid	0.533675
Schwarz criterion	-1.816678	Log likelihood	111.3385
Hannan-Quinn criter.	-1.992900	F-statistic	10.95664
Durbin-Watson stat	1.349938	Prob(F-statistic)	0.000000

Period fixed effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 04/25/23 Time: 12:29
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-0.007206	0.066840	-0.107815	0.9145
CR	0.027037	0.011248	2.403752	0.0190
ART	0.002507	0.001443	1.736942	0.0871
CCC	0.000188	0.000107	1.760997	0.0829
LTD	-0.080732	0.189501	-0.426023	0.6715
IT	0.003101	0.007182	0.431765	0.6673
APT	0.000189	0.000297	0.635720	0.5272

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	0.068905	R-squared	0.633228
Mean dependent var	0.090488	Adjusted R-squared	0.477628
S.D. dependent var	0.114380	S.E. of regression	0.082668
Akaike info criterion	-1.901654	Sum squared resid	0.451048
Schwarz criterion	-1.122050	Log likelihood	119.3286
Hannan-Quinn criter.	-1.586636	F-statistic	4.069587
Durbin-Watson stat	1.821279	Prob(F-statistic)	0.000001

Cross-section and period fixed effects test equation:
Dependent Variable: ROA
Method: Panel Least Squares
Date: 04/25/23 Time: 12:29
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001407	0.032275	-0.043583	0.9653
CR	0.041814	0.007068	5.915741	0.0000
ART	-0.000454	0.000969	-0.467882	0.6410
CCC	0.000182	8.90E-05	2.049467	0.0434
LTD	-0.146468	0.098356	-1.489158	0.1400
IT	0.002463	0.002704	0.910806	0.3649
APT	0.000403	0.000277	1.453555	0.1496

Root MSE	0.085479	R-squared	0.435565
Mean dependent var	0.090488	Adjusted R-squared	0.397081
S.D. dependent var	0.114380	S.E. of regression	0.088814
Akaike info criterion	-1.933727	Sum squared resid	0.694130
Schwarz criterion	-1.745547	Log likelihood	98.85204
Hannan-Quinn criter.	-1.857688	F-statistic	11.31804
Durbin-Watson stat	1.336738	Prob(F-statistic)	0.000000

Redundant FE test for Model 2

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.106386	(22,62)	0.0115
Cross-section Chi-square	53.023736	22	0.0002
Period F	4.698074	(4,62)	0.0022
Period Chi-square	25.150987	4	0.0000
Cross-Section/Period F	3.263734	(26,62)	0.0001
Cross-Section/Period Chi-square	81.920930	26	0.0000

Cross-section fixed effects test equation:
Dependent Variable: NP
Method: Panel Least Squares
Date: 04/25/23 Time: 12:30
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.057002	0.031767	-1.794387	0.0763
CR	0.074732	0.006873	10.87299	0.0000
ART	-0.001106	0.000971	-1.139002	0.2579
CCC	-9.05E-05	0.000103	-0.879619	0.3816
LTD	0.132696	0.097115	1.366385	0.1755
IT	0.000461	0.002643	0.174593	0.8618
APT	-0.000164	0.000269	-0.608973	0.5442

Effects Specification

Period fixed (dummy variables)

Root MSE	0.080046	R-squared	0.668756
Mean dependent var	0.081976	Adjusted R-squared	0.629322
S.D. dependent var	0.139818	S.E. of regression	0.085126
Akaike info criterion	-1.980847	Sum squared resid	0.608702
Schwarz criterion	-1.685135	Log likelihood	105.0902
Hannan-Quinn criter.	-1.861357	F-statistic	16.95895
Durbin-Watson stat	1.066379	Prob(F-statistic)	0.000000

Period fixed effects test equation:
Dependent Variable: NP
Method: Panel Least Squares
Date: 04/25/23 Time: 12:30
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.065621	0.067053	-0.978643	0.3313
CR	0.100529	0.011284	8.909349	0.0000
ART	0.001522	0.001448	1.051089	0.2971
CCC	0.000164	0.000107	1.536844	0.1291
LTD	-0.361536	0.190104	-1.901781	0.0616
IT	-0.002662	0.007205	-0.369428	0.7130
APT	-0.000172	0.000298	-0.578016	0.5652

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	0.069124	R-squared	0.752983
Mean dependent var	0.081976	Adjusted R-squared	0.648188
S.D. dependent var	0.139818	S.E. of regression	0.082932
Akaike info criterion	-1.895297	Sum squared resid	0.453925
Schwarz criterion	-1.115692	Log likelihood	119.0266
Hannan-Quinn criter.	-1.580278	F-statistic	7.185280
Durbin-Watson stat	2.039591	Prob(F-statistic)	0.000000

Cross-section and period fixed effects test equation:
Dependent Variable: NP
Method: Panel Least Squares
Date: 04/25/23 Time: 12:30
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.064436	0.035189	-1.831141	0.0705
CR	0.069919	0.007706	9.073059	0.0000
ART	-2.05E-05	0.001057	-0.019438	0.9845
CCC	0.000125	9.71E-05	1.287639	0.2012
LTD	0.026651	0.107235	0.248531	0.8043
IT	0.000776	0.002948	0.263224	0.7930
APT	-8.23E-05	0.000302	-0.272417	0.7859

Root MSE	0.093195	R-squared	0.550994
Mean dependent var	0.081976	Adjusted R-squared	0.520380
S.D. dependent var	0.139818	S.E. of regression	0.096831
Akaike info criterion	-1.760876	Sum squared resid	0.825105
Schwarz criterion	-1.572696	Log likelihood	90.64162
Hannan-Quinn criter.	-1.684837	F-statistic	17.99807
Durbin-Watson stat	1.091654	Prob(F-statistic)	0.000000

Redundant FE test for Model 3

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.316543	(22,62)	0.0001
Cross-section Chi-square	73.897965	22	0.0000
Period F	3.286992	(4,62)	0.0165
Period Chi-square	18.270847	4	0.0011
Cross-Section/Period F	3.654476	(26,62)	0.0000
Cross-Section/Period Chi-square	88.275486	26	0.0000

Cross-section fixed effects test equation:
Dependent Variable: ROE
Method: Panel Least Squares
Date: 04/25/23 Time: 12:31
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.181911	0.130096	-1.398282	0.1657
CR	0.084734	0.028148	3.010338	0.0034
ART	-0.013263	0.003977	-3.334801	0.0013
CCC	0.000168	0.000421	0.398827	0.6910
LTD	0.932218	0.397714	2.343940	0.0214
IT	0.022521	0.010824	2.080628	0.0405
APT	0.001935	0.001103	1.754821	0.0829

Effects Specification

Period fixed (dummy variables)

Root MSE	0.327814	R-squared	0.293071
Mean dependent var	0.166484	Adjusted R-squared	0.208912
S.D. dependent var	0.391955	S.E. of regression	0.348617
Akaike info criterion	0.838835	Sum squared resid	10.20886
Schwarz criterion	1.134547	Log likelihood	-28.84468
Hannan-Quinn criter.	0.958325	F-statistic	3.482375
Durbin-Watson stat	1.079623	Prob(F-statistic)	0.000719

Period fixed effects test equation:
Dependent Variable: ROE
Method: Panel Least Squares
Date: 04/25/23 Time: 12:31
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23

Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.420297	0.237282	-1.771298	0.0811
CR	0.066674	0.039929	1.669805	0.0997
ART	0.011930	0.005124	2.328379	0.0230
CCC	0.000269	0.000379	0.711168	0.4795
LTD	1.132710	0.672725	1.683765	0.0970
IT	0.030080	0.025498	1.179712	0.2423
APT	0.001071	0.001054	1.016537	0.3131

Effects Specification

Cross-section fixed (dummy variables)

Root MSE	0.244611	R-squared	0.606382
Mean dependent var	0.166484	Adjusted R-squared	0.439392
S.D. dependent var	0.391955	S.E. of regression	0.293472
Akaike info criterion	0.632234	Sum squared resid	5.684298
Schwarz criterion	1.411839	Log likelihood	-1.031124
Hannan-Quinn criter.	0.947253	F-statistic	3.631252
Durbin-Watson stat	2.008198	Prob(F-statistic)	0.000009

Cross-section and period fixed effects test equation:
Dependent Variable: ROE
Method: Panel Least Squares
Date: 04/25/23 Time: 12:31
Sample: 2018 2022
Periods included: 5
Cross-sections included: 23
Total panel (unbalanced) observations: 95

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.200105	0.133507	-1.498841	0.1375
CR	0.068847	0.029238	2.354728	0.0208
ART	-0.010299	0.004010	-2.568557	0.0119
CCC	0.000770	0.000368	2.089932	0.0395
LTD	0.614557	0.406850	1.510525	0.1345
IT	0.024487	0.011185	2.189403	0.0312
APT	0.002117	0.001146	1.846516	0.0682

Root MSE	0.353582	R-squared	0.177562
Mean dependent var	0.166484	Adjusted R-squared	0.121487
S.D. dependent var	0.391955	S.E. of regression	0.367376
Akaike info criterion	0.905967	Sum squared resid	11.87694
Schwarz criterion	1.094148	Log likelihood	-36.03344
Hannan-Quinn criter.	0.982006	F-statistic	3.166491
Durbin-Watson stat	1.102500	Prob(F-statistic)	0.007360

Variance Inflation Factors

Variance Inflation Factors
Date: 04/25/23 Time: 12:43
Sample: 2018 2022
Included observations: 95

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.058628	73.63187	NA
CR	0.001449	7.371667	1.080747
ART	2.77E-05	3.537539	1.105001
CCC	2.19E-07	3.027224	1.177454
LTD	0.453728	10.76394	1.185913
IT	0.000714	31.03732	1.279842
APT	1.02E-06	1.643609	1.165583

APPENDIX B: STATISTICAL TESTS FOR IPO COMPANIES

Shapiro-Wilk Test for 2022 IPO Companies

	Shapiro-Wilk		
	Statistic	df	Sig.
CR	0.914	4	0.502
ART	0.648	4	0.002
LTD	0.964	4	0.802
ROA	0.823	4	0.151
ROE	0.941	4	0.663
NP	0.959	4	0.770
IT	0.797	4	0.096
APT	0.664	4	0.004
CCC	0.906	4	0.462

Shapiro-Wilk Test for non-2022 IPO Companies

	Shapiro-Wilk		
	Statistic	df	Sig.
CR	0.692	19	0.000
ART	0.662	19	0.000
LTD	0.867	19	0.013
ROA	0.924	19	0.136
ROE	0.888	19	0.029
NP	0.728	19	0.000
IT	0.733	19	0.000
APT	0.646	19	0.000
CCC	0.858	19	0.009

Independent Samples t-test for ROA

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ROA	Equal variances assumed	1.199	0.286	0.276	21	0.785	0.02005	0.07257	-0.13086	0.17097
	Equal variances not assumed			0.466	12.221	0.650	0.02005	0.04307	-0.07360	0.11371

Mann-Whitney U-test for other variables

	CR	ART	LTD	ROE	NP	IT	APT	CCC
Mann-Whitney U	36.000	13.000	36.000	33.000	36.000	19.000	33.000	28.000
Wilcoxon W	226.000	203.000	46.000	43.000	46.000	209.000	223.000	38.000
Z	-0.162	-2.028	-0.162	-0.406	-0.162	-1.541	-0.406	-0.811
Asymp. Sig. (2-tailed)	0.871	0.043	0.871	0.685	0.871	0.123	0.685	0.417
Exact Sig. [2*(1-tailed Sig.)]	.907[b]	.044[b]	.907[b]	.725[b]	.907[b]	.138[b]	.725[b]	.456[b]

Mean and Median Values of Ratios for non-2022 IPO Companies

		CR	ART	LTD	ROA	ROE	NP	IT	APT	CCC
N	Valid	19	19	19	19	19	19	19	19	19
	Missing	0	0	0	0	0	0	0	0	0
Mean		1.7548	10.0617	0.0953	0.1450	0.3053	0.1135	6.1107	27.3196	119.1557
Median		1.2999	6.6075	0.0929	0.1213	0.2419	0.1032	5.2774	8.6675	89.1280

Mean and Median Values of Ratios for 2022 IPO Companies

		CR	ART	LTD	ROA	ROE	NP	IT	APT	CCC
N	Valid	4	4	4	4	4	4	4	4	4
	Missing	0	0	0	0	0	0	0	0	0
Mean		1.3589	23.3125	0.0759	0.1249	0.2571	0.0765	8.1310	49.7909	86.5214
Median		1.3492	9.8550	0.0699	0.1444	0.2791	0.0722	6.7288	10.7128	67.4318