

## Determination of The Relationship Between Operating Cycle Risks and Other Risks: An Application on The Bist Textile Index\*

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### ABSTRACT

“Corporate Risk Management”, which has been applied in developed economies since the beginning of the 21st century, has changed the risk perceptions of corporations and tended to guide them from sectional to integrated risk perception. Corporations desiring to take measures to protect themselves against risk groups in which they are weak in sectional risk perception may overlook the impacts of other risk groups. For instance, a measure taken to increase forward sales to improve profitability may result in a loss in the liquidity or activity cycle of the corporation.

Although risk identification and grouping is a significant phase of corporate risk management, it is quite hard to measure these risks and to determine their quantitative impacts. Therefore, in this study, an easy risk classification was performed to cover the entire corporation. In this classification, the ratios obtained from the financial statements of the corporations were used as the variables representing the risks. To represent operating cycle risks, the “Accounts Receivable Turnover”, “Accounts Payable Turnover”, “Inventory Turnover”, “Current Assets Turnover”, “Total Assets Turnover” and “Equity Turnover” ratios were used. Then, the relevant financial ratios were determined by using the financial statements (for the years 2003-2014) of 17 corporations included in the BIST Textile Index.

Following the identification and calculation of the ratios representing the risks faced by the corporations, the impacts of the measures to be taken on other risk groups were investigated. For this purpose, correlation analysis was performed between the ratios selected to represent the operating cycle and the ratios representing the other risk groups, the strength and direction of the correlation were identified.

Correlation analyses revealed that specific cases were valid for each corporation but a concrete generalization could not be made between the operating cycle risks and other risk groups. On the other hand, a generalization could be made only within each corporation for each ratio separately.

**Keywords:** Financial Risk, Financial Ratios, Corporate Risk Management, BIST.

**Jel Classification:** G30, G32, G39.

## Faaliyet Döngüsü Riskleri ile Diğer Riskler Arasındaki İlişkinin Tespiti: Bist Tekstil Endeksi Üzerine Bir Uygulama

### ÖZET

21'inci yüzyılın başıyla birlikte özellikle gelişmiş ekonomilerde kullanılmaya başlayan “Kurumsal Risk Yönetimi” anlayışı işletmelerdeki risk algısını değiştirmiş ve işletmeleri bölümsel risk algısından bütünsel risk algısına yöneltmiştir. Bunun nedeni bölümsel risk algısında zayıf oldukları risk gruplarına yönelik önlemler almak işletmelerin diğer risk gruplarının etkilerini gözden kaçırma ihtimallerinin bulunmasıdır. Örneğin; bir işletmede karlılığı artırmak için vadeli satışları artırmaya yönelik alınan bir tedbir, likidite veya faaliyet döngüsünde bir bozulmaya neden olabilir.

Kurumsal risk yönetiminde riskleri tanımlayıp sınıflandırmak önemli bir aşama olmakla beraber, bu riskleri ölçmek ve etkilerini belirlemek niceliksel olarak oldukça zordur. Bu nedenle çalışmada öncelikle risklerin sınıflandırılması aşamasında işletmenin tamamını kapsayacak ve aynı zamanda uygulanması kolay olacak bir risk sınıflandırması yapılmıştır. Bu sınıflandırmada; işletmelerin finansal tablolarından elde edilen oranlar, riskleri temsil edecek değişken olarak kullanılmıştır. İşletmelerin faaliyet döngüsü risklerini temsilen; “Alacak Devir Hızı”, “Ticari Borç Devir Hızı”, “Stok Devir Hızı”, “Dönen Varlık Devir Hızı”, “Toplam Aktif Devir Hızı” ve “Öz Sermaye Devir Hızı” oranları kullanılmıştır. Daha sonra BIST Tekstil Endeksi’nde işlem gören şirketler içerisinde sağlıklı veri elde edilebilen 17 şirketin 2003 – 2014 yılları arasındaki finansal tablolarından yararlanılarak gerekli oranlar tespit edilmiştir.

Şirketlerin karşı karşıya oldukları riskler yani riskleri temsil eden oranlar belirlendikten ve hesaplandıktan sonra alınacak tedbirlerin diğer risk gruplarında yol açacağı etki araştırılmıştır. Bunun için faaliyet döngüsünü temsilen seçilen oranlar ile diğer belirlenmiş risk gruplarını temsil eden oranlar arasında korelasyon analizi yapılmış ve olabilecek etkinin gücü ile yönü belirlenmeye çalışılmıştır.

Yapılan korelasyon analizleri sonucunda, faaliyet döngüsü riskleri ile diğer risk grupları arasında genellemelerden ziyade her şirket için özel durumların geçerli olduğu, ancak tek tek oranlar ele alındığında ise her şirket için kendi içerisinde genelleme yapılabileceği sonucunda ulaşılmıştır.

**Anahtar Kelimeler:** Finansal Risk, Finansal Oranlar, Kurumsal Risk Yönetimi, BIST.

**JEL Sınıflandırması:** G30, G32, G39.

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## **1. INTRODUCTION**

The first theoretical work on “Corporate Risk Management” constituting the bases of works on this topic was published by The Committee of Sponsoring Organizations of the Treadway Commission (COSO) in 2004 under the title “Enterprise Risk Management Framework” (Erciyas, 2016, p. 2).

In this study, “Corporate Risk Management” was assessed theoretically. Then, the risks for textile industry businesses trading on the Borsa Istanbul (BIST) were classified and the relations between operating cycle risks and the other risk groups were identified. In this sense, the direction (positive or negative) and the strength ( $-1 < r < 1$ ) of the relation between operating cycle risks and the other risk groups were determined through correlation analysis.

The financial statements of textile industry businesses trading on the BIST for the years between 2003-2014 were used in this study. Businesses of whose financial data for the relevant years were not available were excluded from the analyses. The textile industry was selected since the majority of textile industry businesses are located in Kayseri. Thus, it was quite easy to reach the desired data.

## **2. LITERATURE REVIEW**

Risk can be defined as the probability of a case having a negative impact on reaching the desired targets (Bozkurt, 2010, p. 17). Risk management, on the other hand, can be defined as the identification, assessment management and control of potential cases and circumstances so as to provide a reliable assurance that the specified targets of the business are reached (Bozkurt, 2010, p. 19). Corporate risk management is a method used to manage the risks and to efficiently combine risk management practices with the commercial and financial objectives of the business (Grey & Dailun, 2005, p. 1). In another definition, corporate risk management means to abstain from circumstances that may negatively influence corporate activities (Foster, 2010, p. 1). Corporate risk management means to exhibit a systematic integrated approach while managing the risks encountered by the corporates (Gerry, 2001, p. 361). Corporate risk management focuses on risk definition, inspection of management, risk analysis and integrated execution action against all corporate risks in a corporate systematic manner (Gates & Nantes, 2006, p. 84). As in the case conventional risk management, in corporate risk management, companies focus the on management of risks instead of diminishing them, perform more integrated analyses and then implement a more efficient course of action (Bozkurt, 2010, p. 22).

Financial ratios are commonly employed in the literature for failure estimators. This is not the only way to use these ratios: they can also be used as a tool to assess the accuracy of various analyses (William H. Beaver, 1966, p. 71).

Maricica and Georgeta (2012), in their study, investigated the estimation power of financial ratios in a sample composed of firms trading in the Romanian stock market. The t-test results revealed significant differences especially in the profitability, financial position and leverage of the groups of firms (Maricica & Georgeta, 2012, p. 728).

In the present study, the “Financial Statement Analysis” (Akgüç, Mali Tablolar Analizi, 2006) and “Financial Management” (Akgüç, Finansal Yönetim, 2012) studies of Akgüç were used in the calculation and assessment of the ratios.

### 3. METHODOLOGY

The present study includes the application of a model which was developed using financial ratios for the objective identification and monitoring of financial corporate risks and to enlighten us about the measures to be taken against such risks for 17 corporations listed in the Borsa Istanbul Textile Index.

The corporations included in this study and the codes assigned to these corporations to ease the research works are provided in Table 1.

**Table 1.** The Corporations Included In The Model

Corp. Code	Short Name	Corporation Name	Corp. Code	Short Name	Corporation Name
01	ALTIN	Boyner Perakende ve Tekstil Yatırımları A.Ş.	10	KARSU	Karsu Tekstil Sanayii ve Ticaret A.Ş.
02	ARSAN	Arsan Tekstil Ticaret ve Sanayi A.Ş.	11	KORDSA	Kordsa Global Endüstriyel İplik ve Kord Bezi Sanayi ve Ticaret A.Ş.
03	ATEKS	Akın Tekstil A.Ş.	12	LUKSK	Lüks Kadife Ticaret ve Sanayii A.Ş.
04	BİSAŞ	Bişaş Tekstil Sanayi ve Ticaret A.Ş.	13	MNDRS	Menderes Tekstil Sanayi ve Ticaret A.Ş.
05	BOSSA	Bossa Ticaret ve Sanayi İşletmeleri T.A.Ş.	14	SKTAS	Söktaş Tekstil Sanayi ve Ticaret A.Ş.
06	BRMEN	Birlik Mensucat Ticaret ve Sanayi İşletmesi A.Ş.	15	SONME	Sönmez Filament ve Sentetik İplik ve Elyaf Sanayi A.Ş.
07	DERİM	Derimod Konfeksiyon Ayakkabı Deri Sanayi ve Ticaret A.Ş.	16	YATAS	Yataş Yatak ve Yorgan Sanayi ve Ticaret A.Ş.
08	DESA	Desa Deri Sanayi ve Ticaret A.Ş.	17	YUNSA	Yünsa Yünlü Sanayi ve Ticaret A.Ş.
09	İDAŞ	İdaş İstanbul Döşeme Sanayii A.Ş.			

The ratios of risk groups for 17 corporations and definitions are provided in Table 1.

**Table 2. Ratios In Risk Groups**

<b>Liquidity Risk Ratios – X<sub>1</sub></b>		
<b>Variable</b>	<b>Ratio</b>	<b>Calculation</b>
X <sub>11</sub>	Current Ratio	Current Assets / Current Liabilities
X <sub>12</sub>	Liquid Ratio	Liquid Assets / Current Liabilities
X <sub>13</sub>	Cash Ratio	Cash and Cash Equivalents / Current Liabilities
X <sub>14</sub>	Cash Ratio - Total Assets Ratio	Cash and Cash Equivalents / Total Assets
X <sub>15</sub>	Cash Ratio - Net Sales Ratio	Cash and Cash Equivalents / Net Sales
X <sub>16</sub>	Liquid Assets - Total Assets Ratio	Liquid Assets / Total Assets
<b>Financial Structure Risk Ratios – X<sub>2</sub></b>		
<b>Variable</b>	<b>Ratio</b>	<b>Calculation</b>
X <sub>21</sub>	Current Liabilities - Total Debts Ratio	Total Assets / Current Liabilities
X <sub>22</sub>	Current Liabilities - Total Resources Ratio	Total Resources / Current Liabilities
X <sub>23</sub>	Fixed Assets - Equity Ratio	Equity / Fixed Assets
X <sub>24</sub>	Total Debts -Total Assets Ratio	Total Resources / Total Debts
X <sub>25</sub>	Bank Credits - Total Debts Ratio	Total Debts / Bank Credits
X <sub>26</sub>	Bank Credits - Total Assets Ratio	Total Assets / Bank Credits
<b>Operating Cycle Risk Ratios – X<sub>3</sub></b>		
<b>Variable</b>	<b>Ratio</b>	<b>Calculation</b>
X <sub>31</sub>	Accounts Receivable Turnover	Net Sales / Accounts Receivable
X <sub>32</sub>	Accounts Payable Turnover	Cost of Sales / Accounts Payable
X <sub>33</sub>	Inventory Turnover	Cost of Sales / Average Inventory
X <sub>34</sub>	Current Assets Turnover	Net Sales / Current Assets
X <sub>35</sub>	Total Assets Turnover	Net Sales / Total Assets
X <sub>36</sub>	Equity Turnover	Net Sales / Average Equity
<b>Profitability Risk Ratios – X<sub>4</sub></b>		
<b>Variable</b>	<b>Ratio</b>	<b>Calculation</b>
X <sub>41</sub>	Net Profit Margin	Net Profit / Net Sales
X <sub>42</sub>	Gross Profit Margin	Gross Profit / Net Sales
X <sub>43</sub>	Activity Profit Margin	Operating Income/ Net Sales
X <sub>44</sub>	Interest Coverage Ratio	EBITDA / Paid Interest
X <sub>45</sub>	Return on Equity	Net Profit / Equity
X <sub>46</sub>	Return on Assets	Net Profit / Total Assets
<b>Growth Risk Ratios –X<sub>5</sub></b>		
<b>Variable</b>	<b>Ratio</b>	<b>Calculation</b>
X <sub>51</sub>	Net Profit Margin Growth Ratio	(Net Profit / Net Profit <sub>t-1</sub> ) - 1
X <sub>52</sub>	Net Sales Growth Ratio	(Net Sales <sub>t</sub> / Net Sales <sub>t-1</sub> ) - 1
X <sub>53</sub>	Equity Growth Ratio	(Equity <sub>t</sub> / Equity <sub>t-1</sub> ) -1
X <sub>54</sub>	Asset Growth Ratio	(Asset <sub>t</sub> / Asset <sub>t-1</sub> ) - 1
X <sub>55</sub>	Fixed Asset Growth Ratio	(Fixed Asset <sub>t</sub> / Fixed Asset <sub>t-1</sub> ) - 1
X <sub>56</sub>	Current Asset Growth Ratio	(Current Asset <sub>t</sub> / Current Asset <sub>t-1</sub> ) - 1

While selecting the ratios, attention was paid to include six ratios in each group so as to represent all the characteristics of the group. Attention was also paid to ensure that the positive or negative large or small outcomes of all ratios were in the same direction.

While making the grouping, to prevent or reduce the affect of a small positive value of a ratio and a large positive value of a ratio to each other which are in the same or another group, they should be in the same direction. Therefore in financial structure ratios, to prevent the neutralization of small positive values and a large value for other ratios, large values have been made positive by reversing the financial structure ratios.

Following the determination of ratio groups and the calculation of these ratios, they should be standardized using a common criterion for the outcomes of the model to ensure reliability. For this purpose, the following processes were applied to the research data:

- i. Data for the years between 2003-2014 were used for each corporation and their ratios, classified based on their risk groups, were calculated,
- ii. The exponential weighted moving average of the ratios was calculated for each year and with these averages, the sectoral averages and standard deviations of the ratios were calculated,
- iii. The exponential weighted moving averages, standard deviations and sectoral averages of the ratios were used to standardize these ratios between 0-1 so as to fit normal distribution,
- iv. Six ratios for each of the five normally distributed risk groups were then subjected to cluster analysis based on risk groups and separate risk levels were formed for each risk group of each corporation.

The exponential weighted moving average (EWMA) method was used while taking the average of the 12-year data of the corporations. This method is based on the time-dependent movement of the variables and focuses more on quantitative variations in periods close to the relevant calculation period. In other words, higher weights are assigned to the data of recent periods and lower weights are assigned to those of older. Determination of the weighting coefficients is an important step of EWMA. In the Risk Metrics database developed by J.P. Morgan Bank, the  $\lambda$  value used is 0.94. The  $\lambda$  value calculated according to J.P. Morgan Bank provides the closest value to realized volatility (J.P. Morgan/Reuters, 1996). The equation is provided below

$$EWMA_t = \lambda Y_t + (1 - \lambda).EWMA_{t-1} \quad (1)$$

where

$EWMA_t$  : Exponential weighted moving average at the time t

$\lambda$  : Coefficient

$Y_t$  : Independent data at the time t

$EWMA_{t-1}$  : Exponential weighted moving average at the time (t - 1) (Purnanandam, 2008).

Corporations perform risk assessments for various risk groups and try to take measures against those in which they are weak. However, since corporations are integrate bodies, the relevant measures to be taken may influence other risk groups. For instance, a measure taken to improve profitability through increasing credit sales may

result in a disruption in liquidity or activity cycle. It is therefore important to know of such likely impacts and their directions and levels beforehand. Thus, whether or not a change in a ratio will have an effect on the risk ratios of other risk groups as well as its own risk group, the direction and levels of possible effects should be determined and the level of the measure to be taken should be adjusted accordingly.

Following the identification of the groups of ratios and their calculations, all ratios were standardized based on normal distribution. Then, correlation analysis was performed with SPSS software and a correlation matrix was created for each corporation.

Correlation coefficients vary between -1 and +1. The coefficient is 0 when there is no relationship, +1 when there is a relationship in the same direction and -1 when there is a relationship in the inverse direction (Yıldız & Bircan, 2006, p. 315).

More than one method is used in correlation analysis. In the present study, the Carl Pearson – Product Moment (Pearson Correlation) Coefficient was used. The Pearson coefficient is used to measure the degree of linear relationship between two variables (Yıldız & Bircan, 2006, p. 317).

The correlation coefficient “r” was calculated with the following equation (Yıldız & Bircan, 2006, p. 351):

$$r = \frac{\sum x_i y_i - \frac{\sum x_i \sum y_i}{n}}{\sqrt{\left[ \left( \sum x_i^2 - \frac{(\sum x_i)^2}{n} \right) \left( \sum y_i^2 - \frac{(\sum y_i)^2}{n} \right) \right]}}$$

(1)

The significance of correlation coefficients can be tested with the aid of t-distribution. In case of small sample sizes and unknown standard deviations of a universe, the t-test allows us to determine whether or not an average value of a group is different from a previously determined one or whether or not there are differences between independent groups.

## **4. FINDINGS**

Correlation matrices indicating the relationships between the activity cycle ratios created as a result of analyses and the ratios in each of the other groups are provided respectively in the tables which are available in the appendix.

Table 3 presents the relationships between the Accounts Receivable Turnover Rate and the other ratios. No ratios with quite high correlations with the Accounts Receivable Turnover Rate Ratio were found. There were generally positive correlations with regard to the Accounts Receivable Turnover Rate and the other ratios. However, the Accounts Receivable Turnover Rate had negative correlations with the Liquid Assets / Total Assets Ratio of 7 corporations and the Fixed Assets / Equity Ratio of 5 corporations.

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Table 4 presents the relationships between the Accounts Payable Turnover rate and the other ratios. No ratios with quite high correlations were found with the Accounts Payable Turnover rate. However, this ratio was highly correlated with the Activity Profit Margin Ratio, Net Sales Growth Ratio and Current Asset Growth Ratio of only 1 corporation. There were mostly positive relationships between the Accounts Payable Turnover Rate and the other ratios.

Table 5 presents the relationships between the Inventory Turnover Rate and the other ratios. No ratios with quite high correlations with the Inventory Turnover Rate were found. However, this ratio was highly correlated with the Cash Ratio, Cash Ratio / Total Assets Ratio, Cash Ratio / Net Sales Ratio, Activity Profit Margin Ratio and Return on Assets Ratio of only 1 corporation. There were generally positive correlations between the Inventory Turnover Ratio and the other ratios and there were no negative relationships over which a generalization could be made.

Table 6 presents the relationships between the Current Assets Turnover Rate and the other ratios. There were quite high correlations between the Current Assets Turnover Rate and the Total Assets Turnover Ratio of 12 corporations over which a generalization could be made. This ratio was also highly correlated with the Gross Profit Margin Ratio, Return on Assets Ratio, and Equity Growth Ratio of only 1 corporation. There were generally positive relationships between the Current Assets Turnover Rate and the other ratios, but there were negative relationships between this ratio and the Liquid Assets / Total Assets Ratio of 6 corporations.

Table 7 presents the relationships between the Total Assets Turnover Rate and the other ratios. There were high correlations between the Total Assets Turnover Rate and Total Asset Turnover Rate Ratio of 12 corporations, Debts / Total Assets Ratio of 11 corporations and Bank Credits / Total Assets Ratio and Total Assets Turnover Rate Ratio of 10 corporations. There were also high correlations between the Total Assets Turnover Rate and Equity Growth Ratio, Fixed and Current Assets Growth Ratio of 1 corporation. There were generally positive relationships between the Total Assets Turnover Rate and the other ratios.

Table 8 presents the relationships between the Equity Turnover Rate and the other ratios. No ratios with quite high correlations with the Equity Turnover Rate were found over which a generalization could be made. There were high correlations between the Equity Turnover Rate and Debts / Total Assets Ratio of 11 corporations. There were negative correlations between the Equity Turnover Rate and Debts / Total Assets Ratio of 8 corporations and the Bank Credits / Total Assets Ratio of 6 corporations. There were generally positive relationships between the Equity Turnover Rate and the other ratios.

Correlation analysis revealed that there were no ratios with highly significant relationships with the Accounts Receivable Turnover Ratio of the “Operating Cycle Ratios” group. In general, there were positive relationships between the Accounts Receivable Turnover and the other ratios. However, there were negative relationships between the Liquid Assets / Total Assets Ratio of 7 corporations and between the Fixed Assets / Equity Ratio of 5 corporations.

Although no ratios were highly correlated with the Accounts Payable Turnover Ratio, the ratio was highly correlated with the Operating Profit Margin Ratio, Net Sales Growth Ratio and Current Asset Growth Ratio of only 1 corporation.

No ratios were highly correlated with the Inventory Turnover Ratio and there was a positive relationship in general. Only the Cash Ratio, Cash Ratio / Total Assets Ratio, Cash Ratio / Net Sales Ratio, Operating Profit Margin and Assets Profitability of 1 corporation had high correlations.

## **5. CONCLUSION**

Although risk definition and classification are important phases of corporate risk management, the measurement of these risks and identification of their impact are vital issues. Therefore, we aimed to develop a method to determine the classified risk levels and effects of possible measures to be taken against such risks on other risk groups. Analyses were performed for 5 different risk groups using textile companies which traded in the BIST. Initially 6 ratios were identified for each risk group and these ratios were calculated for each year by using the available data of these corporations covering a 12-year period.

Following the identification and calculation of risks with which the corporations are faced, the effects of possible measures to be taken against such risks on the other risk groups were investigated. For this purpose, correlation analyses were performed to identify the level and direction of the potential effects of these measures. Correlation analyses revealed specific generalizations for each corporation rather than a concrete generalization among the risk groups. It was observed that specific and separate generalizations could be made for each corporation by taking each ratio into consideration separately. The present analyses also revealed that the direction of relationships had greater importance than the level of relationship and the directions of the relationships between the same ratios may differ from one corporation to another.

## **REFERENCES**

- Akgüç, Öztin (2012), *Finansal Yönetim*, Avcıol Basım Yayın, İstanbul.
- Akgüç, Öztin (2006), *Mali Tablolar Analizi*, Avcıol Basım Yayın, İstanbul.
- Beaver, William H. (1966), "Financial Ratios As Predictors of Failure", *Journal of Accounting Research*, Vol. 4, pp. 71-111.
- Bozkurt, Cengiz (2010), "Risk, Kurumsal Risk Yönetimi ve İç Denetim", *Denetişim*, Issue 4, pp. 17-30.
- Erciyes, Mehmet (2016), "Finansal Açından Kurumsal Risk Yönetimi: Reel Sektöre Yönelik Bir Uygulama(Yayınlanmamış Doktora Tezi)", Erciyes Üniversitesi Sosyal Bilimler Enstitüsü, Kayseri.
- Foster, Mark Grant (2010), "Enterprise Risk Management: The Full Picture, In L. Taylor, AON Global Risk Consulting, London, pp.1-43.

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- Gates, Stephen - Nantes, Audencia (2006), "Incorporating Strategic Risk into Enterprise Risk Management", *Journal of Applied Corporate Finance*, Vol.18, Issue 4, 81-90.
- Gerry, Dickson (2001), "Enterprise Risk Management: Its Origins and Conceptual Foundation", *The Geneva Papers on Risk and Insurance*, Vol. 26, Issue 3, 360-366.
- Grey, William - Dailun, Shi (2005), *Enterprise Risk Management: A Value Chain Perspective; Hand Book of Integrated Risk Management for e-Business; Measuring, Modeling, and Managing Risk*, J. Ross Publishing, USA.
- J.P. Morgan/Reuters, (1996), "Risk Matrics - Technical Document", <https://www.msci.com/documents/10199/5915b101-4206-4ba0-ae2-3449d5c7e95a> (Accessed: 20.02.2017).
- Maricica, Moscalu - Georgeta, Vintila (2012), "Business Failure Risk Analysis using Financial Ratios", *Procedia - Social and Behavioral Sciences*, Issue 62, 728-732.
- Purnanandam, Amiyatosh (2008), "Financial Distress and Corporate Risk Management: Theory an Evidence", *Journal of Financial Economics*, Issue 87, 706 - 739.
- Yıldız, Necati - Bircan, Hüdaverdi (2006), *Uygulamalı İstatistik*, Nobel Yayın Dağıtım, Ankara.

APPENDIX

Table 3: Correlations of Accounts Receivable Turnover Rate with the other ratios

Ratios	Corporation Codes																
	1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	
X <sub>11</sub>	-.698*							.597*			.848**	-.712**	-.602*		.755**	.944**	
X <sub>12</sub>	-.602*						-.658*		-.697*		.842**	-.696*	-.614*			.799**	
X <sub>13</sub>	.683*										.925**						
X <sub>14</sub>	.801**										.869**	.579*					
X <sub>15</sub>	.600*		.643*					-.578*			.685*	.608*					
X <sub>16</sub>	-.661*		-.838**		-.819**		-.736**		-.886**		.762**			-.622*	-.645*		
X <sub>21</sub>				.597*	.638*								-.594*			.930**	
X <sub>22</sub>			.707*								.595*	-.629*	-.616*		.665*	.974**	
X <sub>23</sub>	-.741**	-.678*						.630*			.847**	-.769**	-.610*	-.674*		.713**	
X <sub>24</sub>	-.599*		.861**					.578*			.857**	-.599*				.972**	
X <sub>25</sub>			.772**	.963**	.798**						.764**	-.675*					
X <sub>26</sub>		-.582*	.722**	.945**	.621*						.813**	-.642*				.916**	
X <sub>32</sub>			-.782**		.804**			.686*	.709**	.722**	.799**					.773**	
X <sub>33</sub>					.820**	.764**		.771**									
X <sub>34</sub>	.815**	.605*		.691*	.922**	.887**	.583*	.940**	.814**		.801**						
X <sub>35</sub>			-.887**					.775**			.903**	-.637*				-.751**	
X <sub>36</sub>	.965**	.747**	-.788**					.765**			.929**		.745**			.812**	
X <sub>41</sub>								.576*									
X <sub>42</sub>														.700*			
X <sub>43</sub>														.610*			
X <sub>44</sub>								.678*		-.658*	.676*						
X <sub>45</sub>														.610*			
X <sub>46</sub>														.612*			
X <sub>53</sub>					.634*			.637*						.593*			
X <sub>54</sub>														.615*			
X <sub>55</sub>					.619*			.650*						.604*			

Table 4: Correlations of Accounts Payable Turnover Rate with the other ratios

Ratios	Corporation Codes														
	1	2	3	4	5	7	8	9	10	11	12	13	14	16	17
X <sub>11</sub>	.597*		.676*			.603*		.900**	-.706*		.670*				.659*
X <sub>12</sub>	.654*		.744**				.826**	.885**	-.708*		.649*				.673*
X <sub>13</sub>						.780**	.592*				.621*				.658*
X <sub>14</sub>						.783**	.720**								
X <sub>15</sub>						.763**	.627*								
X <sub>16</sub>			.914**		-.723**	-.589*	.937**	.871**	-.673*						
X <sub>21</sub>		.626*	.748**				-.607*								.776**
X <sub>22</sub>	.680*				.780**	.739**									.732**
X <sub>23</sub>			.642*				.866**	.958**					.607*		
X <sub>24</sub>			-.752**		.752**	.896**	.584*	.739**					.630*	.731**	.724**
X <sub>25</sub>	-.590*		-.650*		.779**	.783**					.707*				
X <sub>26</sub>					.789**	.833**					.716**		.614*		.666*
X <sub>31</sub>			-.782**		.804**			.686*	.709**	.722**	.799**				.733**
X <sub>33</sub>					.746**	-.790**	.735**	.906**							
X <sub>34</sub>				-.633*	.857**	.848**		.840**	.692*		.806**				
X <sub>35</sub>			.810**		.679*	.743**		.970**			.670*		.669*		
X <sub>36</sub>			.853**			-.733**		.872**			.793**				
X <sub>41</sub>							.680*	.660*				.615*			
X <sub>42</sub>							-.710**							-.669*	
X <sub>43</sub>								.740**							
X <sub>44</sub>							.730**	.814**			.611*				
X <sub>45</sub>							.764**	.619*				.609*			
X <sub>46</sub>							.769**	.702*				.633*			
X <sub>51</sub>						-.595*			.626*						
X <sub>52</sub>								.701*							
X <sub>53</sub>					.591*			.647*							
X <sub>54</sub>								.738**					-.623*		

**Table 5: Correlations of Inventory Turnover Rate with the other ratios**

Ratios	Corporation Codes													
	2	3	5	6	7	8	9	10	11	12	14	15	16	17
X <sub>11</sub>							.875**					-.624*	-.657*	
X <sub>12</sub>	.616*				.645*		.871**					-.687*	.728**	
X <sub>13</sub>												-.830**		
X <sub>14</sub>												-.793**		
X <sub>15</sub>												-.789**		
X <sub>16</sub>	.811**		.800**		.756**	.828**	.821**						.774**	.681*
X <sub>21</sub>		.711**										.591*		
X <sub>22</sub>			.593*				.590*			.597*		-.752**		
X <sub>23</sub>						.714**	.839**							
X <sub>24</sub>					-.783**		.696*					-.854**		
X <sub>25</sub>			.784**	.801**			-.651*							
X <sub>26</sub>			.666*	.760**								.815**		
X <sub>31</sub>			.820**	.764**			.771**							
X <sub>32</sub>			.746**		-.790**	.735**	.906**							
X <sub>34</sub>			.925**	.861**	-.763**	.650*	.920**			.738**		.887**		
X <sub>35</sub>	.722**			.839**	-.703*	.872**	.936**				.599*	.934**		
X <sub>36</sub>				.800**	.716**		.908**		.647*			.858**		
X <sub>41</sub>				.633*			.743**							
X <sub>42</sub>													-.768**	-.585*
X <sub>43</sub>							.756**							
X <sub>44</sub>				.724**			.761**							.626*
X <sub>45</sub>						.673*								.596*
X <sub>46</sub>						.613*								
X <sub>52</sub>				.673*			.795**	.641*	.928**					
X <sub>53</sub>							.692*		.834**					.621*
X <sub>54</sub>				.639*			.785**		.801**					
X <sub>55</sub>							.713**		.768**					

Table 6: Correlations of Current Assets Turnover Rate with the other ratios

Ratios	Corporation Codes																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
X <sub>11</sub>							.680*		.775**			.773**			-.592*		
X <sub>12</sub>									.740**	-.608*		.775**			-.668*		
X <sub>13</sub>			-.586*									.616*			-.807**		
X <sub>14</sub>			-.635*							-.595*					-.814**		
X <sub>15</sub>			-.601*							-.646*				-.612*	-.757**		
X <sub>16</sub>				-.602*	-.919**		-.767**		.602*	-.759**	-.631*	.653*	-.826**				
X <sub>21</sub>					.609*					-.711**					.836**		
X <sub>22</sub>					.656*		.789**	-.600*	.614*		.624*	.626*			-.699*		
X <sub>23</sub>									.785**			.588*					-.708**
X <sub>24</sub>							.955**		.698*	.733**				.619*	-.825**	.599*	
X <sub>25</sub>	.676*			.738**	.821**	.648*	.830**							.773**			
X <sub>26</sub>				.715**	.706*	.619*	.858**			.679*				.722**	.595*		
X <sub>31</sub>	.815**	.605*		.691*	.922**	.887**	.583*		.940**	.814**		.801**					
X <sub>32</sub>				-.633*	.857**		.848**		.840**	.692*		.806**					
X <sub>33</sub>					.925**	.861**	.763**	.650*	.920**			.738**			.887**		
X <sub>35</sub>	.790**	.736**			.595*	.700*	.938**	.933*	.905**			.865**		.783**	.987**	.907**	.667*
X <sub>36</sub>	.795**	.722**				.585*	-.585*	.940**	.872**			.889**			.974**		
X <sub>41</sub>									.651*								-.659*
X <sub>42</sub>														-.684*			
X <sub>43</sub>									.637*								-.620*
X <sub>44</sub>							.700*		.740**								-.686*
X <sub>46</sub>																	-.620*
X <sub>52</sub>							.661*		.610*								
X <sub>53</sub>									.700*								
X <sub>54</sub>									.687*								-.593*
X <sub>55</sub>									.716**								
X <sub>56</sub>												-.650*	-.630*				-.585*

**Table 7: Correlations of Total Assets Turnover Rate with the other ratios**

Ratios	Corporation Codes																
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	
X <sub>11</sub>				.787**					.882**		.741**	.714**	.701*	-.567*		-.760**	
X <sub>12</sub>				.694*					.857**		.738**	.710**	.652*	-.651*			
X <sub>13</sub>											.757**			-.800**			
X <sub>14</sub>											.791**			-.809**			
X <sub>15</sub>			-.597*											-.744**			
X <sub>16</sub>		.676*	.878**			.826**	-.584*		.840**		.922**	.658*				.603*	
X <sub>21</sub>				.698*						-.693*				.784**		-.727**	
X <sub>22</sub>			-.753**	.839**	.592**							.592*	.642*	-.708**		-.836**	
X <sub>23</sub>				.764**		.586*			.921**	.717**	.888**	.808**	.777**			-.586*	
X <sub>24</sub>			-.822**	.767**	.635*		.804**		.703*		.777**	.606*	.785**	-.835**	.800**	-.842**	
X <sub>25</sub>	.631*		-.805**		.663*	.945**	.663*			.668*		.610*	.852**				
X <sub>26</sub>	.675*		-.770**		.687*	.836**	.685*				.605*	.626*	.832**	.685*		-.725**	
X <sub>31</sub>			-.887**						.775**		.903**	-.637*				-.751**	
X <sub>32</sub>			.810**		.679*		.743**		.970**		.670*		.669*				
X <sub>33</sub>		.722**				.839**	-.703*	.872**	.936**				.599*	.934**			
X <sub>34</sub>	.790**	.736**			.595*	.700*	.938**	.933**	.905**		.865**		.783**	.987**	.907**	.667*	
X <sub>36</sub>		.747**	.915**		.611*	.967**		.832**	.923**		.978**			.959**		.895**	
X <sub>41</sub>						.577*	.641*		.612*	.591*							
X <sub>43</sub>						.733**			.698*								
X <sub>44</sub>						.785**	.788**		.791**				.738**				
X <sub>45</sub>		-.644*					.611*			.595*							
X <sub>46</sub>		-.614*					.721**		.592*				.682*				
X <sub>52</sub>						.706*	.683*		.706*								
X <sub>53</sub>									.639*								
X <sub>54</sub>						.695*			.708**								
X <sub>55</sub>						.622*			.629*								
X <sub>56</sub>						.644*											

Table 8: Correlations of Equity Turnover Rate with the other ratios

Ratios	Corporation Codes																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
X <sub>11</sub>	-.755**						-.615*	-.617*	.710**			.770**					-.762**
X <sub>12</sub>	-.661*								.696*			.760*			-.617*	-.588*	
X <sub>13</sub>	.688*											.775**	.699*		-.744**		
X <sub>14</sub>	.819**											.739**	.873**		-.755**		
X <sub>15</sub>	.619*					-.618*							.879**		-.690*		
X <sub>16</sub>	-.656*		.814**			.852**	.782**		.713**			.842**					.643*
X <sub>21</sub>															.847**		-.793**
X <sub>22</sub>	-.586*						-.772**	-.686*			-.626*		-.621*	-.613*	-.661*		-.878**
X <sub>23</sub>	-.795**		.754**						.748**			.830**		-.647*			
X <sub>24</sub>	-.722**		-.723**				-.775**	-.670*		-.686*	-.744**	.747**	-.781**	-.595*	-.787**		-.882**
X <sub>25</sub>			-.683*			.886**	-.653*				-.614*	.616*					
X <sub>26</sub>			-.638*			.738**	-.681*			-.608	-.728**	.674*	-.629*				-.703*
X <sub>31</sub>	.965**	.747**	-.788**						.765**			.929**		.745**			-.812**
X <sub>32</sub>			.853**				-.733**		.872**			.793**					
X <sub>33</sub>						.800**	.716**		.908**		.647*					.858**	
X <sub>34</sub>	.795**	.722**				.585*	-.585*	.940**	.872**			.889**			.974**		
X <sub>35</sub>		.747**	.915**		.611*	.967**		.832**	.923**			.978**			.959**		.895**
X <sub>41</sub>				.611*		.620*											
X <sub>43</sub>						.730**			.612*								.658*
X <sub>44</sub>						.788**			.708**								
X <sub>52</sub>						.730**			.746**		.729**						.863**
X <sub>53</sub>					.771**				.808**		.591*						.852**
X <sub>54</sub>					.660*	.770**			.763**	.602*	.669*						.752**
X <sub>55</sub>					.694*	.726**			.734**	.646*	.609*						.693*
X <sub>56</sub>						.675*					.695*				.606*	.618*	

