

FINANCIAL PERFORMANCE OF TURKISH DEFENSE FIRMS:  
A COMPARATIVE ANALYSIS

MBA THESIS

ENGİN COŞKUN

ANKARA, SEPTEMBER 2000

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A THESIS

Submitted to the Department of Management  
and Graduate School of Business Administration of

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In Partial Fulfillment of the Requirements

For the Degree of

Master of Business Administration

By

ENGİN COŞKUN

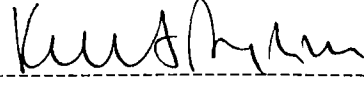
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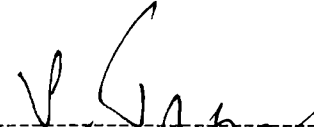
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ABSTRACT

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BY

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SUPERVISOR: ASSOC. PROF. CAN ŞİNGA MUGAN

SEPTEMBER, 2000

The importance of the Turkish defense firms that sell various products to the Turkish Armed Forces has been gradually increasing in the last decade. Furthermore, companies in defense industry have an important role in economy. Sales to the Turkish Armed Forces make up about 40% of their total revenues on average. However, the Turkish defense industry has not been examined financially yet, so the main objective of this study is to determine the financial performance of the Turkish defense industry firms by using financial ratios, and compare it with the manufacturing sector. The study period covers from 1994 to 1998, and seventeen ratios are used in four main categories for 30 firms in category.

Key words: Defense Industry, Turkish Defense Industry, Ratio Analysis

## ÖZET

TÜRK SAVUNMA SANAYİİ ŞİRKETLERİNİN FİNANSAL PERFORMANSI:

KARŞILAŞTIRMALI BİR ANALİZ

ENGİN COŞKUN

YÜKSEK LİSANS TEZİ, İŞLETME FAKÜLTESİ

TEZ DANIŞMANI: DOÇ. DR. CAN ŞİMGİ MUGAN

EYLÜL, 2000

Ülkemizde Türk Silahlı Kuvvetlerinin çeşitli ihtiyaçlarına yönelik üretim yapmakta olan savunma sanayii şirketlerinin ve savunma sanayiinin önemi gün geçtikçe artmaktadır. Ayrıca savunma sanayii şirketlerinin ekonomideki önemli rolü açıktır. Bu şirketlerin toplam gelirlerinin ortalama 40%'ı Türk Silahlı Kuvvetlerine yapılan satışlardan gerçekleşmektedir. Ancak, yapılan araştırma sonucunda Türk Savunma Sanayii şirketlerinin finansal olarak incelenmediği görülmüştür. Bu yüzden bu çalışmanın amacı finansal oranları kullanarak Türk Savunma Sanayii'nde çalışan şirketlerin finansal yapısını ortaya çıkarmak, ve bulguları imalat sektörü ile karşılaştırmaktır. Çalışma 1994 ile 1998 yılları arasını kapsamakta olup, toplam 60 şirket için dört ana kategoride toplam onyediler oranı kullanılmıştır.

Anahtar kelimeler: Savunma Sanayii, Türk Savunma Sanayii, Oran Analizi

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## **1. INTRODUCTION**

Defense industry is a group of public and private companies which produce strategical and tactical, offensive and defensive weapon systems and military accessories, and have a close cooperation with all economic activity areas mainly industries that produce investment goods (Şimşek 1989, p.31).

Decreasing the defense spendings will shorten the period of economic development, however no country can undervalue the importance of defense. Especially Turkey has to pay more attention to defense than many other countries. After the cold war, contrary to many countries Turkey found herself in a critical part of the world with full of crisis. Three sides covered with seas and connecting two continents, Turkey has a very special and geostrategic position (Milli Savunma Bakanlığı 1998, p.5). Because of many threats in the region, Turkey has become a front country instead of a wing country after the cold war. So being strength and balance element, Turkey pays more attention to defense.

Defense spendings account for an important part of the national budget, hence any difference in the spendings will affect the budget severely. Also employment rate, industrialization of the country, technology usage, training of the work force and the amount of the international political force will all be affected by the defense industry. Another important role will be on the quality side. Since standardization and quality are

the most important elements of the defense products, quality of the products are expected to improve as well.

Being an important part of the economic structure of the country, defense industry has some differences from other industries. These are (Şimşek 1997):

- It needs sensitive production techniques with high technology.
- It needs special quality standards.
- It requires trained manpower.
- It always uses the newest technology, and therefore R&D activities are crucial.
- It requires large amount of investment.
- Since there is only one buyer, it requires limited production according to the needs.
- The companies in this industry need to enter to international markets, in order to survive.
- More attention is paid to safety and secrecy.

Some other differences are:

- Price has secondary importance according to quality and timing. Also price is set according to the cost, unlike the price setting mechanism in highly competitive markets (Akgül 1986, p.40).
- Companies in this industry are not autonomous because the government sets the main policy and then companies set their own policies according to the main policy, and they also go under government inspection (Şimşek 1989, p.37).

- These companies generally don't have the flexibility to transform the production to civilian products (Şimşek 1989, p.39).

Although it is obvious that the companies in defense industry have an important role in economy, in Turkey the companies working for defense industry haven't been studied financially. Therefore, analyzing the financial positions of the defense firms is the aim of this study. In this study the defense firms and manufacturing sector will be compared by financial ratios, since the most important tool in understanding the industry's financial structure is ratio analysis. In the following parts of the thesis defense firms will be called as defense industry or defense sector and manufacturing sector will be called as control group.

There are some assumptions about defense sector at the beginning of the study. Owing to the fact that they are usually getting advance money, their account receivables would be less. Also they would have less debt. In addition their inventory management would be better than the control group. So generally they would be more profitable.

The evolution and characteristics of the Turkish defense industry are explained in chapter 2. Then brief information about ratio analysis is given in chapter 3. Also chapter 4 and chapter 5 explain data and methodology. Chapter 6 contains the results of the studies. Finally conclusion and discussions appear in chapter 7.

## **2. EVOLUTION AND CHARACTERISTICS OF TURKISH DEFENSE INDUSTRY**

Defense industry has a long history for Turks. During most of the life of the Ottoman Empire, defense industry was very strong. But after the 1<sup>st</sup> World War there was no ability to produce weapons anymore. The sector was constructed mainly during 1945-1950 period. Until 1965, it was in an unproductive period. The accelerating trend of the defense industry began with the crisis in Cyprus after the embargo of USA in 1974. The Undersecretariat for defense industries (SSM) coordinates the activities in this industry. Today 65% of all needs and 21% of main systems needs of Turkish Armed Forces are met by the Turkish defense industry (Milli Savunma Bakanlığı 1998, p.II)

There are three main groups in this sector. They are:

- Military factories, shipyards and reinforcement centers
- Public corporations and corporations related with the Turkish Armed Forces Strengthening Foundation
- Private companies

The undersecretariat for defense industries (SSM) was established in 1985 by parliamentary legislation as a separate legal entity with a budget of its own and has been given the responsibility of developing the national defense industry, while meeting the modern defense equipment needs of the Turkish Armed Forces. SSM finances the



projects with the Defense Industry Support Fund whose annual revenue totals some US\$ 1 billion.

SSM's main duties and functions are stated as (Undersecretariat for Defense Industries, 1997):

- To develop the capabilities of the national defense industry in order to satisfy the modernization requirements of the Turkish Armed forces,
- To organize and integrate the existing industrial capabilities in line with the requirements of the defense industry,
- To co-ordinate off-set trade issues and export of defense industry products,
- To promote export-oriented joint ventures between Turkish and foreign companies that are willing to bring in state-of-the art technologies,
- To plan the production of required weapon systems and equipment in state and private establishments,
- To research and develop modern weapon systems and equipment, to have their prototypes manufactured,
- To determine the terms and conditions of procurement,
- To make feasibility studies, technical and economic evaluations and to undertake contract negotiations, sign contracts, and execute production-follow-on quality control activities.

It is well known that overspending in defense will decrease the prosperity of that country. But it is very hard to find the optimum amount of spending. To find that point a strategic planning is done. It has four steps (Maliye Bakanlığı, 1993):

- Country safety benefits and commitments
- Threat acceptance and threat evaluation
- Defining defense policy and strategy
- Buying the necessary weapon systems and improving armed forces according to the strategic and political evaluations.

Turkey also has a strategic target plan. It contains 6 years period and is revised in 2 years time.

Defense spendings are always increasing according to the improvements in technology. The developed countries that have 1/4 of the worlds' population do 80% of the defense spendings. The main reason is to take preventive measures against wars. Because in war periods defense spendings take 60-70% of the government spendings, and continue for a period after the war.

Generally 3% of GNP and 18% of the government spendings of countries are defense spendings (Uysal 1997, p.38). In Turkey, defense spendings cover the biggest part of the budget with 9.42% and the main reason is the modernization of armed forces (Ulusal Strateji 1999, p.28). The spendings are done from:

- Ministry budget	35.4%
- Defense Industry Support Fund	18.3%
- USA security aid	15.3%
- Germany aid	0.6%
- Government and company credits	5.8%
- NATO Infrastructure Fund	9.8%
- Turkish Defense Fund	10.7%

- Private subsidy 3.7%
- Turkish Armed Forces Strengthening Foundation 0.4%

The entry barriers could be considered as high in the defense industry. There are more types of entry barriers in the defense industry than the other industries (Şimşek 1989, p.52-56). They are:

- High performance need
- High capacity in R&D and more technicians
- Expensive and special resource requirements
- More capital need
- Economies of scale
- Different structure of the demand
- Marketing problems
- High manufacturing overhead costs
- Regulatory policies
- Effects of procurement policies and applications

Also there are some other barriers for the companies that want to leave the industry.

They are:

- Existing of high amount of expensive resources
- Special structure of the workforce
- Current gains from R&D which is supported by the government
- Gains from exports
- Other non rational factors such as patriotism

Turkey faces generally the same problems of the developing countries while generating her own defense industry. These problems are (Şimşek 1989, p.180-187)(Milli Savunma Bakanlığı 1998, p.XII-XIII):

- Defense spendings occupy a major part of GNP but because of low GNP these spendings are not enough.
- Problems in transferring new technology to Turkey.
- Insufficiency of current production technology.
- High production costs.
- Financing problems.
- Lack of trained workforce.
- Economies of scale.
- Dependency on foreign industries.
- Regulatory policies.
- Price has primary importance more than technology and human resources.
- Firms in this industry concentrate on production however, there are major problems in maintenance.

As it is explained before the defense industry has great effects to the economy and Şimşek (1989) explains the effects as:

- It effects the resource distribution. When optimum amount of resources are used in defense industry then economic development will speed up.
- It affects the level of industrialization. It has both positive and negative effects. Such as using high technology, training workforce and high quality are

the positive effects to the industry. But difficulties in changing productions from defense to other sectors and short product lives are the negative effects.

- Companies in this sector gain from government supported R&D because with low costs they use the new technology in both defense products and civilian sectors. Since companies in this industry make important amount of exports, countries gain from defense industry.

- It effects the balance of payments. In the long, run effects of defense industry to the balance of payments is positive. Importing less and exporting more decreases the payments of the country.

- It effects the level of employment. But generally a technology intensive production is used and they don't create a big need for employment.

- It generally effects the inflation in a negative way.

- Its spin-off effects. The main ones are the goods produced by defense industry for commercial markets and the sources gained by exportation of defense products.

### **3. BRIEF OVERVIEW OF RATIO ANALYSIS**

As Gardiner (1995) explains, although being affected by some problems, ratio analysis continues to represent one of the financial world's most powerful and versatile tools. Gardiner (1995) expresses the usage areas of ratio analysis as:

- By companies when evaluating the creditworthiness of their debtors;
- By investors when considering the merit of alternative investments;
- By banks and other lenders before granting loans;
- By auditors when conducting analytical reviews of their clients;
- By merger and acquisition teams when considering potential targets, etc.

Lev (1974) states that financial statement analysis was first used in the second half of the nineteenth century. He further states that two major economic developments created this need: (a) the emergence of the corporation as the main organizational form of business enterprises, resulting in a separation of management from ownership, and (b) the fast-increasing role of financial institutions (e.g., banks, investment and insurance companies, etc.) as the major suppliers of capital for business expansion requiring a formal evaluation system of borrowers' credit worthiness. At that time credit analysis was the dominant function in the financial analysis, such as to request the balance sheets of prospective borrowers for credit evaluation was a routine work in 1890.

In the first decade of the twentieth century financial ratios were used and "scientific approach" to the financial analysis started. Again credit evaluation had a big importance,

so current ratio was seen as the most useful ratio. It was the most powerful tool to identify the solvency of the firm. But in a short a time the limitations of the ratio were recognized and new ratios were developed. Also the establishment of rule-of-thumb measures for various ratios, such as 2:1 for current ratio, were new developments. And the industry average was accepted as the major standard for ratio evaluation (Lev 1974,p.2).

In the 1920s and 1930s real data collection and proliferation of new ratios were important. So after then ratio analysis took the main structure and being continued until recently without any major development.

Financial analysis is done to make decisions related to future. Hoskin (1997) explains this with the help of prospective and retrospective analyses. While making a prospective (forward-looking) analysis the difficulty is that future is not certain. So using retrospective analysis, according to the past data, is the most powerful tool for the analysts. And times-series and cross-sectional analyses are the two major types of retrospective analysis. In time-series analysis the future of the company would be predicted according to the past data. In this analysis the analyst examines information from different time periods for the same company to estimate the future. But in cross-sectional analysis the data from one company is compared with other data. The other data would be the data of another company (in the same industry or in another industry) or the average of industry. Choosing the type of the analysis differs according to the type of decision. Also according to the purpose of the analysis the type of data varies. There are mainly three types of data:

- Raw financial data: The data that appears directly in the financial statements.
- Common size data: All items are expressed as a percentage of one item. Such as in a common size income statement, they are expressed as a percentage of sales revenue.
- Ratio data: While trying to make comparisons between various financial statements, common size data aren't enough. By using ratios these comparisons can be done and these ratios can be used in a time-series or cross-sectional analysis.

Foster (1986) also discusses about analyzing the data at a point in time and trends over time. In cross-sectional analysis there are two main techniques: (a) common-size statements and (b) financial ratio analysis. Since there are many ratios in literature he categorizes some of these ratios. He uses seven categories and nineteen ratios within these categories. The categories are (1) cash position, (2) liquidity, (3) working capital/cash flow, (4) capital structure, (5) debt service coverage, (6) profitability, and (7) turnover. Also in time-series analysis there are three techniques: (a) trend statements, (b) financial ratio analysis, and (c) variability measures. In trend statements one year is chosen as a base and then the statement items of subsequent years are expressed relatively to their value in the base year. Another technique is computing the variability measures for financial ratios and other variables over time. So the information contained in a single ratio measure is expanded beyond one fiscal year.

$$\frac{\text{Maximum value} - \text{minimum value}}{\text{Mean financial ratio}}$$



Lev (1974) first classifies the ratios according to the source of data: (a) balance sheet ratios, (b) income statement ratios, (c) fund statement ratios, and (d) mixed ratios. He sees the facilitation of financial statement interpretation as the main objective of ratio analysis by reducing the large numbers to a relatively small set of ratios. Being the symptoms of the firm's economic condition ratios get their value from the questions they provoke. While forming the ratios there are three main logical relationships: (a) ratios should relate matching components, (b) ratios should be formed only from elements based on common values, and (c) ratios should be formed only if the components are functionally related. But Lev (1974) finds these criteria inadequate. He thinks that the relationship generally sought is not the one between the numerator and the denominator but that between the ratio and some other economic indicator. Also he classifies the ratios according to the different economic aspects of the firm's operations: (a) profitability ratios, (b) short-term solvency (liquidity) ratios, (c) long-term solvency ratios, and (d) efficiency (turnover) ratios. This classification also serves to the needs of different users. Then he examines each ratio in two ways: (a) a time-series analysis, and (b) a cross-sectional analysis. In cross-sectional analysis he points out the arguments about the comparability of firms. If the firms: (a) belong to the same industry, (b) are of similar size, (c) use similar accounting methods, and (d) are located in the same geographical area then comparability is believed to be enhanced. But he explains that there is only little evidence to indicate that violating the comparability criteria will seriously disrupt financial statement analysis. He also points out the firm-size effect on ratios, which was summarized by Horrigan as follows:

- Short-term liquidity ratios are related to the size of firm in a positive, parabolic manner. That is, the relationship is positive for smaller firms and negative for larger firms.
- Long-term solvency ratios are also related to size of firm in a positive parabolic manner.
- Capital turnover ratios all vary inversely with size of firm.
- Profit margin ratios vary directly with size of firm.
- Return on investment ratios also vary directly with size of firm.

Lev (1974) also indicates two other analysis while examining ratios: (a) residual method which is a combination of time-series and cross-sectional analysis generally used for studying the behavior of stock prices, and (b) multivariate ratio analysis in which several ratios are combined into a model or an index providing a unique signal.

Ratio analysis and cash flow analysis are the two principal tools of financial analysis according to Palepu, Bernard and Healy (1996). The relations between various line items are examined by ratio analysis. Cash flow analysis allows the analyst to examine the firm's liquidity and how the firm is managing its operating, investing, and financing cash flows. Then they set the objective of ratio analysis as evaluating the effectiveness of the firm's policies in four areas. They are (1) operating management, (2) investment management, (3) financing strategy, and (4) dividend policies that help to achieve the growth and profit targets. And they mainly categorized the ratios according to these areas. While analyzing the ratios they thought that the analyst can (a) make a time-series comparison, (b) cross-sectional comparison, and/or (c) compare ratios to some absolute benchmark.

Gardiner (1995) uses five categories while evaluating the financial performance of a firm by using financial ratios. They are: (1) evaluation of an enterprise's liquidity and solvency, (2) judgement of its asset management and efficiency, (3) consideration of its gearing, (4) appreciation of its profitability, and (5) awareness of its stock market valuation and potential.

Giacomino and Mielke (1993) points out the importance of cash flow ratios. An important development was the preparation of cash flow statement but little has been done about cash flow ratios to date. Indeed cash flow from operations shows the primary activities of the firms such as the production and delivery of goods and services. So nine ratios using the data in cash flow statement are classified in two groups and used in the study. The groups are sufficiency ratios that evaluate the adequacy of cash flows for meeting a company's needs and efficiency ratios that evaluate how well the company generates cash flows relative to other years and other companies. And it was found that these ratios provide additional information (over traditional financial ratios) about the relationship between cash flow from operations and other important operating variables.

In their study Thanassoulis, Boussofiane and Dyson (1996) compare data envelopment analysis (DEA) and ratio analysis as alternative tools for assessing the performance of organizational units such as bank branches and schools. DEA is a linear programming based method designed to assess the relative efficiencies of decision making units. The two methods were compared in two dimensions: (1) the measure or measures of performance, and (2) the targets they provide. It is found that the two methods agree reasonably closely on performance of the units as a whole but disagree substantially on the relative performance of individual units. Also it is found that ratio

analysis, unlike DEA, is not suitable for setting targets so that units can become more efficient. But ratios provide useful information about performance of a unit and when two methods agree on performance ratios support the communication of DEA results to non-specialists. So if they are used jointly they would support each other.

Sudarsanam and Taffler (1995) studied financial ratio proportionality and inter-temporal stability. For a large sample of 514 companies, twenty-four ratios are considered and separate analyses are done in six industries. It is found that the proportionality condition is not satisfied for any of the ratios examined. For the ratio component relationship, loglinearity is a better description and it supports the use of industry median in ratio analysis. Also great care is necessary in the use of ratios in inter-industry and inter-temporal comparisons because there occurs a huge variation in the functional relationship of ratio components between one industry and another and over time.

Holmes and Sugden (1986) mention the relationship between ratios and inflation. When discussing past data, where both items in a ratio are monetary and are expressed in monetary terms of same date, dividing one term by the other removes the direct effect of inflation.

Hawkins (1986) points out the limitations of ratio analysis in his study as: (1) Ratio analysis deals with only quantitative data, not qualitative data. (2) To influence the ratios, short-run actions can be taken near to the statement dates. (3) Because of accounting differences, comparisons between companies could be misleading. (4) Different analysts use different definitions of common ratios. (5) Since the effect of inflation is not included in the ratios, it would distort the comparability of the ratios computed for different time

periods. (6) A ratio standing alone has no significance so ratios must be evaluated in their business context. (7) Since the ratios show the relationship in the past, it may not reflect the current or future position. Because of these limitations, ratio analysis must be used wisely to be a useful analytical tool.

Because of its limitations Akgüç (1990) states the important points while using ratio analysis. He explains the points as: (1) Meaningless ratios mustn't be used in the analysis. (2) Ratios mustn't be interpreted wrongly. (3) While evaluating the ratios, seasonal and conjectural changes must be taken into consideration. (4) Changes in a ratio could occur because of changes in numerator or denominator or both. (5) While interpreting ratios, other data from different sources must be considered. (6) Reevaluation of the statements must be considered while interpreting the ratios. (7) While evaluating a company according to the ratios, the ratios of other companies and industry average must be examined concurrently. (8) While comparing companies, the accounting and policy differences between companies shouldn't be forgotten. (9) Ratios show the performance of the companies in the past. But the important thing is what will happen in the future.

Akgüç (1990) also points out the difference between mean and median while finding the industry average. Usually median is used for finding the industry averages. Median is useful especially if standard error is large. But if standard error is low then mean can be used for finding the industry average.

In his study about the financial ratio patterns in the U.S. defense industry, Gürsoy (1994) uses fifteen financial ratios in four main categories including the period from 1983 to 1992. Only defense industry is analyzed and just thirty-eight firms of the U.S. defense Industry are examined. And the findings are briefly as:

- The profitability decreases during the test period.
- Efficiency of firms differs between the resources.
- The amount of debt increases during the test period.
- Generally the level of liquidity of the industry is lower than the rule of thumb.

#### **4. DATA**

In this study defense industry is compared with a control group for the period 1994 to 1998. Both groups contain 30 companies. The companies in defense sector are chosen from the Turkish Defense Industry Products Catalogue (1999-2000) that was distributed by Undersecretariat for Defense Industries. The two important criteria in choosing the defense companies are: (a) Industry: the companies are chosen from different sectors to diversify the sample; and (b) Total assets: the companies are chosen with different total assets to get companies with different sizes. The control group firms are matched with the defense industry companies in terms of the industries and the 1998 total assets of the defense companies.

In the sample of control group, there are 18 firms in machine manufacturing, 2 firms in textile, 1 firm in energy, 1 holding company, 1 firm in rock and land related manufacturing, 3 firms in chemistry and 4 firms in metal sector. On the other hand the sample of defense sector has 23 firms in machine manufacturing, 1 firm in textile, 1 firm in rock and land related manufacturing, 1 firm in chemistry and 4 firms in metal sector. Besides, in personal interview the general secretary of the Defense Industry Association stated that about 40% of the sales of defense firms in Turkey is directly related to defense products.

The audited annual financial statements of defense sector and control group are used. Financial statements of 11 companies are collected from firms, and the remaining financial statements are obtained from İstanbul Stock Exchange databases\*.

The sales of control group are given in Table-1 and the sales of defense sector are given in Table-2.

Table 1: Sales of control group (million TL)

Company	1994	1995	1996	1997	1998
1	62,536	17,189	77,206	45,021	1,036,265
2	1,249,489	3,160,711	5,738,442	10,834,736	21,425,140
3	5,811,605	9,901,532	23,841,478	44,089,752	85,911,616
4	2,380,884	5,181,736	9,451,950	17,975,201	34,999,315
5	1,026,840	1,897,554	3,636,431	9,066,064	18,045,285
6	26,110,531	52,273,048	93,116,332	172,790,577	288,428,183
7	3,049,200	6,868,970	13,861,966	27,606,834	43,590,938
8	5,940,883	11,576,307	21,887,051	55,742,064	100,266,723
9	1,615,841	3,234,129	7,890,986	14,574,639	23,806,760
10	832,100	1,852,731	2,898,288	5,018,563	9,729,273
11	145,116	417,770	958,019	2,306,811	4,055,175
12	105,197	248,030	527,693	897,814	1,265,938
13	1,300,649	3,288,601	6,440,224	16,316,425	25,989,164
14	226,672	586,742	1,204,784	2,547,951	3,803,221
15	321,266	426,721	948,679	1,498,080	1,630,845
16	615,123	890,142	1,832,517	2,446,598	2,496,183
17	874,686	2,105,867	2,961,037	6,196,960	10,658,182
18	1,606,909	4,133,312	7,951,888	14,553,665	26,746,625
19	4,873,177	17,694,871	45,427,503	139,252,239	196,457,385
20	6,556,020	15,403,363	26,805,198	49,958,510	73,019,072
21	0	1,127,170	3,592,869	7,098,863	10,933,385
22	6,596,152	8,458,727	17,996,843	32,602,195	38,167,509
23	168,244	469,572	984,681	2,790,175	5,585,536
24	8,093,965	15,770,598	30,471,860	66,053,701	132,728,629
25	466,101	1,342,506	3,450,994	6,187,476	9,705,255
26	144,080	382,062	1,594,373	4,180,006	6,928,512
27	19,245,759	31,714,203	45,322,936	127,948,648	181,146,615
28	160,424,405	316,917,124	700,259,705	1,331,700,862	1,833,835,609
29	3,570,723	8,302,462	15,772,201	33,520,869	56,856,559
30	4,040,992	8,304,323	24,222,588	80,729,332	195,002,672
Total	267,455,145	533,948,073	1,121,126,722	2,286,530,631	3,444,251,569

\* <http://www.imkb.gov.tr>



Table 2: Sales of defense sector (million TL)

Company	1994	1995	1996	1997	1998
1	2,994,695	4,031,707	12,579,572	24,801,822	50,699,761
2	1,968,615	4,360,667	9,212,510	22,502,409	47,371,060
3	26,891	58,673	83,990	355,625	458,982
4	88,216	109,972	285,933	516,639	1,275,602
5	3,860,592	6,728,061	12,583,876	26,202,647	45,488,626
6	681,991	1,485,186	2,059,764	5,140,742	8,530,404
7	5,443,179	12,782,931	24,571,051	46,065,876	71,562,339
8	214,470	428,983	790,166	1,883,964	3,194,949
9	418,874	1,118,632	2,302,628	4,606,624	8,278,070
10	538,213	1,905,209	2,518,985	7,446,363	16,131,886
11	20,569,674	33,826,167	73,704,752	164,209,364	239,032,725
12	355,635	853,256	1,155,835	2,111,958	4,028,134
13	0	60,190	773,679	2,299,960	3,791,023
14	540,123	1,159,983	1,867,413	3,572,877	5,084,448
15	14,668,260	32,039,091	57,326,029	86,545,091	117,423,962
16	606,652	1,109,929	2,427,352	5,454,417	10,369,036
17	1,422,592	3,110,558	6,413,054	10,632,220	14,363,912
18	4,700,077	7,384,093	19,158,602	40,708,234	55,097,373
19	1,953,123	5,653,063	8,856,129	11,459,127	27,903,246
20	564,566	1,328,509	2,172,770	4,902,063	7,252,313
21	4,682,111	9,893,645	15,228,411	33,842,105	48,178,208
22	0	0	0	5,539,433	9,433,439
23	12,537,553	16,446,471	28,943,068	47,428,590	73,761,857
24	141,882	167,252	203,499	516,628	238,954
25	3,821,623	8,827,861	15,257,192	30,768,200	54,645,564
26	0	0	2,923,631	5,947,344	10,935,458
27	1,139,971	1,898,751	3,073,261	6,758,617	13,358,456
28	3,493,995	11,214,692	24,869,550	52,983,943	87,583,604
29	0	462,569	1,877,594	4,056,821	4,887,701
30	210,898	601,107	2,076,878	4,553,535	7,244,018
Total	87,644,471	169,047,208	335,297,176	663,813,238	1,047,605,109

Total assets of control group are given in Table-3 and total assets of defense sector are given in Table-4.

Table-3: Total assets of control group (million TL)

Company	1994	1995	1996	1997	1998
1	120,043	252,524	382,934	705,705	1,051,004
2	1,028,039	2,257,901	5,322,694	10,469,049	19,276,537
3	2,708,318	3,925,609	11,722,995	22,580,905	35,452,290
4	1,276,930	3,223,157	6,522,582	12,432,078	21,212,359
5	765,597	1,899,742	9,103,619	16,979,506	35,778,021
6	14,285,665	25,411,679	49,634,037	98,127,841	157,559,387
7	2,577,675	4,123,738	7,593,444	16,717,331	27,774,845
8	3,892,495	7,686,637	18,933,973	34,721,180	67,905,769
9	1,425,729	3,204,574	5,057,782	10,798,799	17,918,036
10	662,307	1,291,020	2,191,852	4,438,509	6,098,140
11	125,325	318,705	836,160	2,192,590	4,168,545
12	166,526	327,961	511,970	1,362,664	2,586,364
13	1,049,372	2,497,777	6,023,175	13,754,429	28,951,109
14	148,154	479,322	1,132,836	2,147,294	3,870,536
15	500,614	717,003	1,278,496	1,493,320	2,190,295
16	974,945	1,042,189	2,246,910	3,179,875	3,971,619
17	333,145	788,727	1,436,976	3,053,977	5,595,040
18	970,208	2,420,621	4,319,187	7,629,826	13,752,713
19	3,038,597	9,222,858	25,515,057	65,940,123	89,397,783
20	3,167,398	6,984,708	11,752,499	26,106,282	43,787,585
21	0	1,099,219	1,786,126	6,235,360	9,718,388
22	6,552,023	9,855,166	17,174,677	32,122,317	54,441,244
23	88,894	216,240	559,082	3,116,199	4,338,353
24	5,197,811	8,821,576	16,751,098	41,415,067	99,601,478
25	604,934	1,705,862	3,421,751	7,701,336	10,885,031
26	189,402	361,412	1,017,345	2,581,476	6,255,427
27	3,529,218	6,436,229	7,613,154	26,660,234	31,231,627
28	38,725,179	73,560,941	152,343,443	249,290,758	502,555,308
29	2,572,959	5,243,963	9,837,745	20,737,457	40,678,896
30	2,933,927	7,224,662	20,139,397	82,302,710	145,587,973
Total	99,611,429	192,601,722	402,162,996	826,994,197	1,493,591,702

Table-4: Total assets of defense sector (million TL)

Company	1994	1995	1996	1997	1998
1	2,329,419	3,647,743	9,093,094	17,694,066	39,374,210
2	1,069,371	2,870,845	5,204,837	14,820,208	30,780,945
3	28,407	73,474	140,857	289,324	338,240
4	66,248	120,981	199,001	318,221	718,576
5	5,201,063	9,242,974	18,808,205	37,548,587	67,206,415
6	590,309	729,220	1,207,454	2,912,687	5,576,051
7	5,779,636	11,962,331	23,283,028	43,702,227	66,380,744
8	157,963	341,296	622,978	1,386,139	2,129,359
9	299,945	709,604	1,946,481	4,103,223	10,082,633
10	419,283	893,170	1,853,017	3,877,479	7,179,998
11	42,954,835	77,770,131	139,993,258	237,926,262	386,597,361
12	1,006,836	1,820,631	2,535,774	3,832,699	5,413,711
13	0	151,474	1,033,483	3,155,789	12,190,136
14	523,579	1,263,712	1,807,052	2,956,183	2,784,963
15	21,322,195	39,286,324	76,177,183	128,197,358	160,699,574
16	721,637	1,502,326	3,263,556	7,170,645	17,722,520
17	1,354,325	2,220,966	3,739,352	6,779,575	9,940,504
18	7,040,897	9,882,761	18,364,247	28,485,541	41,842,306
19	1,248,867	2,527,526	3,614,925	6,185,830	19,389,947
20	433,128	850,209	1,658,101	3,644,006	7,938,537
21	2,132,991	3,594,642	5,964,666	12,328,138	21,066,889
22	0	0	0	11,938,845	23,603,433
23	16,141,324	21,550,626	30,511,753	40,709,227	44,287,432
24	737,552	751,654	720,643	516,393	27,366
25	5,217,329	13,689,240	22,524,588	39,522,628	80,587,081
26	0	0	4,890,954	9,030,332	15,925,309
27	1,167,935	1,707,433	2,617,262	4,191,683	6,908,004
28	1,687,411	5,851,211	13,046,468	24,094,425	38,091,166
29	0	560,171	1,455,369	3,756,061	4,661,535
30	146,114	339,055	754,887	2,465,797	4,132,907
Total	119,778,600	215,911,730	397,032,474	703,539,578	1,133,577,850

Mean and median of total assets of both sectors are shown in Table-5.

Table-5: Mean and median of total assets (million TL)

	1994		1995	
	Control Group	Defense Sector	Control Group	Defense Sector
Mean	3,434,877	4,606,869	6,420,057	7,711,133
Median	1,049,372	1,118,653	2,459,199	1,764,032
	1996		1997	
	Control Group	Defense Sector	Control Group	Defense Sector
Mean	13,405,433	13,690,775	27,566,473	23,451,319
Median	5,672,935	3,263,556	11,615,439	6,482,703
	1998			
	Control Group	Defense Sector		
Mean	49,786,390	37,785,928		
Median	20,244,448	14,057,722		

Mean and median of sales of both sectors are shown in Table-6.

Table-6: Mean and median of sales (million TL)

	1994		1995	
	Control Group	Defense Sector	Control Group	Defense Sector
Mean	9,222,591	3,370,941	17,798,269	6,037,400
Median	1,606,909	1,281,282	3,261,365	1,901,980
	1996		1997	
	Control Group	Defense Sector	Control Group	Defense Sector
Mean	37,370,891	11,561,972	76,217,688	22,127,108
Median	7,165,605	2,923,631	14,564,152	6,352,980
	1998			
	Control Group	Defense Sector		
Mean	114,808,386	34,920,170		
Median	24,897,962	12,146,957		

## 5. METHODOLOGY

In this study the most common ratios in the literature are selected for analysis. Increasing the number of ratios will cause information overload and therefore will not be useful in making decisions based on the outcomes of the analysis. They are examined in four main categories. The categories are:

(a) Liquidity ratios: Indication of the firm's ability to meet its short-term financial obligations. It is especially important for short-term lenders, such as banks and merchandise suppliers (Lev 1974, p.22).

(b) Leverage ratios: Leverage ratios indicate the firm's ability to meet both the principal and interest payments on long-term obligations. These ratios stress the long-run financial and operating structure of the firm (Lev 1974, p.24-25).

(c) Profitability ratios: The firm's operational performance is evaluated by these ratios. These ratios indicate the firm's efficiency in using the capital committed by stockholders and lenders (Lev 1974, p.15).

(d) Efficiency ratios: By using these ratios the efficiency of specific assets are measured instead of overall efficiency of assets. So for calculating ratios usually the sales figure is used in the numerator and the balance of an asset in the denominator (Lev 1974, p.27).

The formulas of the selected ratios in each category are given in appendix.

In this study two main approaches are used. (a) The ratios are computed for every firm. Then, in each sector the means and medians of these ratios are calculated for every year. Moreover, by using these figures the financial performance of the industries are determined. Then a time-series analysis in each sector and a cross-sectional comparison between the industries are carried out. (b) In each sector, for every ratio, the five-year ratio values of the companies are gathered. And the overall means and medians of these ratio values are found. These overall means and medians are used for evaluating the financial performance of the industries. Then a cross-sectional comparison is done according to these figures.

In statistical tests two-tailed Mann-Whitney test is used to compare the medians of each year's financial ratio values. "This is one of the most powerful of the nonparametric tests, and is a very useful alternative to the parametric t test when the researcher wishes to avoid the t test's assumptions or when the measurement in the research is weaker than interval scaling" (Siegel 1988, p.128-129). The null hypothesis is that defense sector and control group have the same distribution.

As regards comparing the overall means of both industries, two-tailed t-test is used. The null hypothesis is that defense sector and control group don't have any significant difference.

## **6. RESULTS**

The results are examined in four main categories. They are:

- 1) Liquidity ratios
- 2) Leverage ratios
- 3) Profitability ratios
- 4) Efficiency ratios

Means, medians and significance levels of all ratios are given from Table-7 to Table-23.

### **6.1 Liquidity ratios:**

By using these ratios the firm's ability to meet its short-term financial obligations are indicated. These ratios indicate how well the organization manages its working capital and operating cycle. If the ratio is too low then it means that there will be problems in payments of the loans but if the ratio is too high then it means that the management of liquid assets could be improved.

#### **6.1.1 Current ratio:**

Current ratio measures the ability to meet short-term obligations. It was the only ratio used to evaluate the credit worthiness of the firms in the early times of financial analysis. Even today it is the best known measure of liquidity.

The generally accepted standard of current ratio is two. If the ratio is low, the company may not be able to pay off bills as rapidly as it should. But if it is too high, it would mean that the money that would be working for the business is tied up in government securities, cash savings, or other safe funds (Gill 1990, p.36).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are provided in Table-7.

Table-7: Results of current ratio

<b>Current ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	n	29	30	30	30	30	
	mean	1.723	1.784	2.000	2.037	1.737	1.853
	median	1.657	1.624	1.622	1.395	1.385	1.508
Defense sector	n	26	28	29	30	30	
	mean	1.586	1.514	1.552	1.680	1.705	1.625
	median	1.411	1.410	1.506	1.761	1.618	1.505

Except the means of control group in 1996 and 1997, all the other ratios are lower than two. Therefore, the levels of current ratios for both industries are not generally suitable according to the rule of thumb. Then it means that the firms would have difficulties in short-term payments.

In the test period both industries generally have an inclining trend until 1997, then a declining trend. So they are getting worse at the end of the test period. However, on average control group seems to have more ability to meet short-term obligations during the test period.

In overall calculations the ratios of control group are slightly higher than defense sector, but still lower than the rule of thumb to be enough for short-term payments.



In countries like Turkey there is a widespread usage of current liabilities. Therefore 1.5 for current ratio would be enough (Sevilengül 1993, p.159). According to this level the abilities of both industries to meet short-term obligations are adequate on average.

No significant difference is found between industries according to the statistical tests.

### 6.1.2 Quick (acid-test) ratio:

Quick ratio is the same as the current ratio except inventories. While examining the near term liquidity, quick ratio is the best measure since it deals with those assets that can be converted to cash in a short time. This ratio therefore provides a stricter test of liquidity than the current ratio (Lev 1974, p.23).

The rule of thumb for quick ratio is one. If it is lower than one, it means that the firm is dependent on the inventories. So inventories for sale get more importance.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-8.

Table-8: Results of quick ratio

<b>Quick ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	n	29	30	30	30	30	
	mean	1.143	1.286	1.476	1.530	1.308	1.348
	median	1.127	1.045	1.053	0.946	1.028	1.037
Defense sector	n	26	28	29	30	30	
	mean	1.020	1.010	1.056	1.170	1.088	1.084
	median	0.838	0.978	1.009	1.134	0.956	0.979

Except the medians of defense sector in 1994, 1995 and 1998 and the median of control group in 1997 all other ratios are higher than one. On the contrary of current ratio

the levels of quick ratio for both industries are generally suitable according to the rule of thumb. Therefore, it can be concluded that the firms in both industries may not have problems in near term liquidity.

Both industries generally have an inclining trend until 1997, but a declining trend after then. Consequently, it can be seen that after 1997 both sectors are getting worse in near term liquidity. But on average control group seems to be in a better position than defense sector.

In overall calculations the median of control group is slightly higher than defense sector. But the mean of control group is 25% higher than defense sector. According to the rule of thumb generally both sectors are good in near term liquidity, but control group has better position than defense sector.

According to the statistical tests there is no significant difference between industries.

### **6.1.3 Cash ratio:**

"Cash and marketable securities form an important reservoir that the firm can use to meet its operating expenditures and other cash obligations when and as they fall due" (Foster 1986, p.60). More than a 20% is desired for cash ratio (Bektöre 1998, p.245).

A high cash ratio means there is enough cash resource available to the firm. It may also indicate the firm is not using its cash in an optimum way. If there is a too low cash ratio, there may be problems with payments.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-9.

Table-9: Results of cash ratio

Cash ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	0.153	0.077	0.108	0.060	0.153	0.109**
	median	0.031	0.033	0.035	0.021**	0.026*	0.029
Defense sector	n	26	28	29	30	30	
	mean	0.160	0.219	0.197	0.190	0.196	0.189**
	median	0.059	0.085	0.053	0.061**	0.156*	0.070

( \* ) =  $0.01 < \text{sig.} \leq 0.05$

( \*\* ) =  $\text{sig.} \leq 0.01$

All the ratios are lower than 20% apart from the mean of defense sector in 1995. However, average of defense sector is very close to the 20% level. Hence it seems that defense sector has an adequate cash position. According to the trends of industries, it can be stated that defense sector is getting better in cash position. On the other hand, control group generally doesn't have as good cash position as the defense sector.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. No significance was found in 1994, 1995 and 1996. But in 1997 and 1998 significances were experienced. So the null hypotheses can be rejected in 1997 and 1998. This indicates that there is a significant difference in the cash ratio levels between sectors in these years. Also it is seen that while median of defense sector is increasing after 1996, median of control group is decreasing. And after 1997 while median of defense sector has a sharp upward trend, median of control group is slightly increasing. So after 1996 cash ratios of both sectors are differentiating from each other.

A t-test was used to compare the overall means of sectors. As significances found in 1997 and 1998 in Mann-Whitney test, also significance was found in t-test between the overall sector means. Since the difference between sectors is significant, the null

hypothesis can be rejected. And this refers that there is a significant difference in the cash ratio levels between the sectors.

#### 6.1.4 Inventories / Assets ratio:

Inventories / assets ratio provides information about the proportion of inventories in total assets. Since inventories are less liquid than other current assets this ratio may help the analyst to conclude about the liquidity of the firm.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are provided in Table-10.

Table-10: Results of inventories/assets ratio

<b>Invent./Assets ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	n	29	30	30	30	30	
	mean	0.232	0.225	0.227	0.218	0.173	0.215
	median	0.222	0.206	0.207	0.196	0.170	0.204
Defense sector	n	26	28	29	30	30	
	mean	0.223	0.221	0.210	0.213	0.217	0.215
	median	0.184	0.196	0.169	0.198	0.201	0.193

The calculated ratios are between 16% and 23%. During the test period control group has shown a downward trend. The defense sector companies also had downward trend until 1996, but upward trend after. Especially in 1998, defense sector has values greater than 20% while control group has values lower than 20%. Furthermore, according to 1998 data control group is using fewer inventories. So these figures indicate that while control group is decreasing the amount of inventories in total assets, defense sector is increasing its inventories at the end of the test period.

In overall calculations both means are the same. But medians of both sectors slightly differ, in that median of control group is greater than defense sector. It may point that control group is using slightly more inventories than defense sector in their total assets.

No significant difference is found between industries according to the statistical tests.

## **6.2 Leverage ratios:**

Leverage ratios show the amount of nonequity capital that is used to finance the assets of the firm. High values of these ratios indicate high proportion of assets financed by nonshareholder parties (Foster 1986, p.65).

It is obvious that when the percentage of owners' equity increases, the financial structure of the firm gets stronger and the risk of lenders decrease. Up to the firms' risk limit, increase of liabilities would also increase the profitability (Sevilengül 1993, p.163).

Debt financing policy has several potential benefits (Palepu 1996, p.4-14):

- Debt is typically cheaper than equity.
- In most countries, interest on debt financing is tax deductible.
- Debt financing can impose discipline on the firm's management and motivate it to reduce wasteful expenditures.
- It is often easier for management to communicate its proprietary information on the firm's strategies and prospects to private lenders than to public capital markets.

### 6.2.1 Debt ratio:

Debt ratio is the first and broadest test of leverage ratios. It describes the proportion of short- and long-term liabilities in total assets. The higher the debt ratio, the greater the likely risk for the lender. Generally the desired value of the debt ratio is 50% (Sevilengül 1993, p.165).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-11.

Table-11: Results of debt ratio

Debt ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	0.567	0.592	0.619	0.651	0.634	0.612
	median	0.530	0.557	0.600	0.646	0.618	0.609
Defense sector	n	26	28	29	30	30	
	mean	0.624	0.652	0.699	0.706	0.650	0.653
	median	0.507	0.511	0.562	0.519	0.537	0.531

All ratios are over 50% in the test period. So, the levels of debt ratios for both industries are not suitable. However, in countries like Turkey there is a widespread usage of liabilities. Consequently, the value of debt ratio up to 60% is acceptable in Turkey. And in overall calculations except median of defense sector, all other ratios are above 60%. Therefore, it indicates that generally both sectors are using high amount of debt, and that there is a risk in both industries for the lender.

In the test period both industries generally have the same trend. They have an upward trend until 1997, then have a declining trend. It means that they are decreasing the percentage of debts after 1997. Also the cash ratios show that generally both industries are getting better in cash positions at the end of the test period.

In overall calculations the debt usage differs according to mean and median as it occurred during the test period. Means indicate that defense sector uses more debt than the control group, while median values show that control group uses more debt than defense sector.

Statistical tests indicate no significant difference between the industries.

### 6.2.2 Debt to equity ratio:

The proportion of short and long-term debt to owners' equity is expressed as debt to equity ratio. "Debt to equity ratio, indicating the firm's capital structure, is also a measure of the financial risk associated with the common stocks." This ratio with some shortcomings is widely used as an indicator of lenders' risk (Lev 1974, p.25).

In general accepted standard for this ratio is one (Sevilengül 1993, p.165). If the ratio is high, it means that lenders are having greater risk and firm's ability to obtain money from outside resources is limited. On the contrary if the ratio is low it can be assumed that the firm has flexibility to get credit and lenders' have less risk, but still the firm is not reaching its full profit potential.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-12.

Table-12: Results of debt to equity ratio

Debt to equity ratio		1994	1995	1996	1997	1998	Overall
Control group	n	28	29	29	28	29	
	mean	1.832	4.285	3.470	2.648	3.402	3.127
	median	1.139	1.195	1.441*	1.671*	1.611	1.462
Defense sector	n	24	26	25	27	28	
	mean	1.603	4.552	1.378	2.674	1.646	2.371
	median	1.336	1.044	1.182*	0.910*	1.005	1.086

(\*) = 0.01 < sig. <= 0.05

Only the median of defense sector in 1997 is lower than one. Then, it seems that the debt usage is high. Therefore, there is a risk for lenders. Also as it is explained before the high debt ratios indicate the same result for both industries.

Neither the means of the control group nor defense sector show a trend in the test period. But medians of both control group and defense sector have an upward trend. So, according to medians it can be concluded that the proportion of debt to equity is increasing, which means the risk of lenders is growing for most of the companies. And according to medians, majority of control group uses more debt than defense sector in the test period.

In 1995 mean of defense sector experienced an extremely high value. Also mean of control group experienced a near high value. However, the medians of both sectors are not as high as means. So this difference may be caused by extreme values in the data set.

In overall calculations the means indicate great risk for both industries owing to their usage of high amount of debt. But control group is more risky than defense sector. On the other hand by regarding medians the debt usage of defense sector seems to be adequate.

In Turkey, an acceptable debt to equity ratio is up to the proportion of 60/40 (Sevilengül 1993, p.165). According to this rule, if medians are taken as the base it can be concluded that the debt usage of both sectors are adequate.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. No significance is found in 1994, 1995 and 1998, then the null hypothesis can't be rejected in these years. Nevertheless, in 1996 and 1997 significances are found and the null hypotheses can be rejected. And this indicates that there is a significant difference in the debt to equity ratio levels between sectors in these years.



In debt ratio, according to medians it is seen that control group uses more debt than defense sector. Moreover, in debt to equity ratio according to medians control group is always using more debt than defense sector in the test period, and significances are found. In addition, owners' equity turnover ratio shows that control group may have less owners' equity and more debt than defense sector, and significant difference is observed in this ratio as well.

### 6.2.3 Current liabilities / total debt ratio:

This ratio shows the formation of debts according to their duration. Since most Turkish firms have a tendency towards short-term debts, in Turkey this ratio is found to be high usually (Sevilengül 1993, p.167).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-13.

Table-13: Results of Current liabilities / total debt ratio

<b>Cur.Lia./T.Debt ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	N	29	30	30	30	30	
	Mean	0.832	0.856	0.780	0.773	0.778	0.803
	Median	0.851	0.877	0.792	0.830	0.802	0.840
Defense sector	N	26	28	29	30	30	
	Mean	0.796	0.834	0.807	0.803	0.771	0.804
	Median	0.834	0.867	0.875	0.849	0.823	0.839

All calculated ratios are between 77% and 88% in the test period. As it is explained before these ratios are quite high in Turkey. So they indicate great amount of short-term debt usage. Also liquidity ratios indicate that there would be shortcomings in

short-term payments. So these figures point out some problems connected to this financing policy.

Both industries commonly have an upward trend from 1994 to 1995, but a downward trend after. And at the end of the test period the ratios are between 77% and 82% with slight decrease. Nonetheless, defense sector seems to have more short-term debt than control group on average.

In overall calculations the ratios of both industries are nearly the same. And all the ratios are between 80% and 84%. Since these values are rather high, it can be concluded that both industries use a great amount of short-term debt for financing the firms. Statistical tests did not show any significant differences either.

No significant difference is found between industries according to the statistical tests.

#### **6.2.4 Property, plant, and equipment / Owners' equity ratio:**

This ratio provides information about how property, plant, and equipment are financed. If it is less than one, it indicates that property, plant, and equipment are financed by owners' equity, and also that the other part of the owners' equity is used for other assets. Nevertheless, if this ratio is greater than one, it indicates that property, plant, and equipment is financed not only by owners' equity but also by debt. And at this time the debt must be long-term debt. The rule of thumb for this ratio is usually 65%. But it differs in industries.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-14.

Table-14: Results of PPE / OE ratio

PPE / OE ratio		1994	1995	1996	1997	1998	Overall
Control group	N	28	29	29	28	29	
	Mean	0.535	0.638	0.966	1.038	0.794	0.794
	Median	0.417	0.432	0.496	0.535	0.737	0.524
Defense sector	N	24	26	25	27	28	
	Mean	0.773	2.222	0.606	1.524	0.665	1.158
	Median	0.659	0.571	0.478	0.532	0.626	0.575

The calculated means and medians of both sectors differ from 202% to 42%. But without the means of defense sector the range is between 104% and 42%. Consequently, the latter indicates that property, plant, and equipment is financed by owners' equity and a part of owners' equity is generally used for other assets.

Usually there is an upward trend during the test period. But mean of defense sector has sharp upward trends in 1994-1995 and 1996-1997, and downward trends in 1995-1996 and 1997-1998. In general defense sector had greater ratios before but vice versa occurred at the end.

In years 1995 and 1997 property, plant, and equipment of defense sector are financed notably by great amount of debt according to means. So it is obvious that in these years the financing policy of defense sector has serious problems. Also in 1996 and 1997 control group had great ratios that indicates some problems.

In overall calculations it can be concluded that both industries are good at using owners' equity in property, plant, and equipment. But only mean of defense sector has slightly greater value.

Statistical tests show no significant difference between the industries.

### 6.2.5 Account receivable / total assets ratio:

This ratio helps to get a conclusion about the accounts receivable policy of the firm. Also it provides information about the liquidity of the firm. Low account receivable/total assets ratio is required.

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-15.

Table-15: Results of Account receivables / total assets ratio

Acc.Rec./T	Ass.ratio	1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	0.381	0.415	0.358	0.353	0.375	0.377**
	median	0.362**	0.429**	0.353	0.336	0.373	0.364
Defense sector	n	26	28	29	30	30	
	mean	0.253	0.244	0.296	0.303	0.275	0.274**
	median	0.243**	0.223**	0.264	0.271	0.225	0.252

( \*\* ) = sig.<= 0.01

The ratios of both industries have a range between 42% and 22%. But when each industry's ranges are examined separately, it is seen that defense sector has a range between 30% and 22%, and control group has a range between 42% and 33%. So, it indicates that the amount of account receivable in total assets in control group is always more than defense sector at any time in the test period. And these figures indicate that control group has always more accounts receivables in their total assets, which is more risky.

In overall calculations again it occurs that defense sector is better than control group in accounts receivable policy.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. Significance between the medians of two industries is determined in 1994 and 1995. So

the null hypotheses can be rejected in these years, which indicates that there is significant difference between sectors in 1994 and 1995. Due to the fact that there is no significance in 1996, 1997 and 1998, the null hypotheses can't be rejected.

A t-test was used to compare the overall means of sectors. There is significance between industries and the null hypothesis can be rejected. Therefore, the results show that there is a significant difference in the means of the account receivable/total assets ratios between the sectors.

It can be determined that after the economic crisis in 1994, control group had problems in account receivables. But on the other hand it is seen that defense sector didn't have important problems as control group and had less account receivables.

### **6.3 Profitability ratios:**

The ability of a firm to generate revenues in excess of expenses is called profitability. And, "Profitability ratios are designed for the evaluation of the firm's operational performance..... The ratios thus yield an indicator of the firm's efficiency in using the capital committed by stockholders and lenders" (Lev 1974, p.15).

#### **6.3.1 Return on assets (ROA) ratio:**

The profit generated by the use of the assets of the business is measured by ROA. From the point of lenders a high ROA is desired, because it indicates good performance or effective use of firm's assets by management. Then a low ROA will indicate poor performance, or ineffective employment of the assets by management (Gill 1990, p.56).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-16.

Table-16: Results of ROA ratio

ROA ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	0.325	0.341	0.268	0.356	0.302	0.320
	median	0.370	0.355	0.284	0.377	0.308	0.335
Defense sector	n	26	28	29	30	30	
	mean	0.341	0.336	0.289	0.441	0.291	0.346
	median	0.259	0.326	0.327	0.339	0.259	0.302

All calculated ratios are between 25% and 44% in the test period. When the 1995-1997 ratios of some other industries that are published by Turkish Central Bank are examined, the ratios of defense sector and control group seem to be slightly better.

Generally ratios of both industries have the same trend during the test period. First a downward trend occurs until 1996, then an upward trend to 1997. After 1997 again a downward trend is noticed. 1997 seems to be the best year for both industries in the test period. But in the last year both industries had a less profitable period. And profitability according to ROA between industries differs according to means and medians.

In overall calculations there is not a noteworthy difference between industries. But profitability between industries differs according to means and medians. When mean is used, defense sector seems to be more profitable, but when median is used, control group seems to be more profitable. Since the profitability slightly differs between industries it is seen that both of them have nearly same efficiencies in the use of assets.

No significant difference is found between industries according to the statistical tests.

### 6.3.2 Return on equity (ROE) ratio:

"ROE is a comprehensive indicator of a firm's performance because it provides an indication of how well managers are employing the funds invested by the firm's shareholders to generate returns. On average over long periods, large publicly traded firms in the U.S. generate ROEs in the range of 11 to 13 percent" (Palepu 1996, p.4-3).

While evaluating the ROE, the most important point is the opportunity cost of the equity (Sevilengül 1993, p.187).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-17.

Table-17: Results of ROE ratio

ROE ratio		1994	1995	1996	1997	1998	Overall
Control group	n	28	29	29	28	29	
	mean	0.206	0.321	0.165	0.296	0.244	0.247
	median	0.204	0.366	0.309	0.421	0.375	0.302
Defense sector	n	24	26	25	27	28	
	mean	0.197	0.389	0.386	0.925	0.264	0.432
	median	0.148	0.437	0.365	0.496	0.264	0.329

In the test period the ratios display a wide range, from 15% to 93%. In general, the ratios that are calculated in 1997 indicate a profitable year in the test period.

The trends of the ratios for both industries seem to be the same in the test period. They have an upward trend until 1997 and a downward trend after. So it can be concluded that the profitability of owners' equity was poor in 1994, but increased until 1997. In 1998 again firms of both industries had a less profitable year. In addition, generally the figures indicate that defense sector gains more profit.

In 1997 except mean of defense sector, the other ratios experienced values between 30% and 50%. But mean of defense sector experienced a value of roughly 93% in 1997 (the highest value in the test period).

Overall, it can be concluded that defense sector is more profitable than control group. And no significant difference is found between industries according to the statistical tests.

### 6.3.3 Return on sales ratio:

This ratio, "indicates management's ability to operate the business with sufficient success not only to recover the cost of the merchandise or services, the expenses of operating the business, and the cost of borrowed funds, but also to leave a margin of reasonable compensation to the owners for putting their capital at risk" (Helfert 1987, p.27).

There is not a generally accepted standard for this ratio and it depends on the business and/or the industry. Also price and volume are important components of the ratio. Usually high values for this ratio are accepted as good, but in some industries low ratios may not mean too much (Gill 1990, p.50).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are plotted in Table-18.

Table-18: Results of Return on sales ratio

Return on sales ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	0.045	0.039	0.093	0.182	0.039	0.080
	median	0.042	0.067	0.091	0.072	0.059	0.063
Defense sector	n	26	28	29	30	30	
	mean	-0.164	-0.100	-0.157	0.107	0.079	-0.032
	median	0.043	0.059	0.100	0.091	0.080	0.082



Because of the extreme bad profits of some firms of the defense sector, range between the calculated means and medians of both sectors is so wide. In that, while the lowest profit for defense sector is -16% in 1994, the control group experienced a profit of 18% in 1997.

Both industries have an upward trend until 1997 but a downward trend after. Especially the mean of defense sector had a sharp upward trend between 1996 and 1997. In addition, according to medians defense sector seems to be more profitable after 1995. But it is only more profitable than control group in 1998 according to the mean. Generally 1997 seems to be the most profitable year for both industries during the test period.

Only the means of defense sector from 1994 to 1996 experienced minus profits. At the same time the medians of the same sector are nearly the same of control group. Consequently, it can be assumed that this difference may be caused by extreme values in the data set.

In overall calculations the difference between the means of both sectors are noteworthy. When there is an 8% profit in control group, the defense sector experienced -3.2%. It indicates that control group is the profitable one between two industries. But it is not the same case in medians. On the contrary of means, the median of defense sector is slightly higher than control group. It refers that defense sector is more profitable than control group. And this different profitability situation occurs because of extreme values in defense sector. Because some firms in defense sector had important amount of loss according to their sales and decreased the overall mean sharply.

Statistical tests indicate no significant difference between the industries.

## **6.4 Efficiency ratios:**

Usually in efficiency ratios the numerator is the sales figure and the denominator is the balance of an asset. And the objective of efficiency ratios is to indicate various aspects of operational efficiency (Lev 1974, p.27).

When it comes to keep the business in balance, efficiency ratios are an important landmark. Although the other ratios play a part in maintaining the balance in the business, efficiency ratios usually highlight the position sooner (Gill 1990, p.57). In these ratios the attention is focused on specific assets rather than on the overall efficiency of asset utilization measured by the profitability ratios.

### **6.4.1 Inventory turnover ratio:**

"The inventory turnover ratio gives analysts some idea of how fast inventory is sold or, alternatively, how long inventory is held prior to sale" (Hoskin 1997, p.361). But mainly it indicates the efficiency of the firms' inventory management.

High inventory ratios indicate more efficient management of inventories, but a lower-than-optimal inventory level may be as costly to the firm. So maintaining an optimal inventory level must be the objective of inventory management (Lev 1974, p.29).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are plotted in Table-19.

The values of medians of both industries have a narrow range between 3.8% and 6.3%. But the means at the same time have a range between 4.2% and 16.1%. Since every industry requires different amounts of inventories, it is difficult to compare the

values between sectors. However, since control group generally has the same structure with the defense sector, comparing these sectors would be meaningful.

Table-19: Results of Inventory turnover ratio

Inv.turnover ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	13.196	16.092	10.042	7.612	12.017	11.754
	median	5.936*	5.745	4.704	6.229	6.330	5.816
Defense sector	n	26	28	29	30	30	
	mean	4.246	8.496	7.943	6.800	6.656	6.896
	median	3.856*	4.843	5.080	5.485	5.030	4.799

( \* ) =  $0.01 < \text{sig.} \leq 0.05$

Control group usually has higher values during the test period. Moreover, in 1994, 1995 and 1998, the means of control group experienced extremely high values. This difference may be caused by extreme values in the data set. On the other hand, though both sectors had near inventories/assets ratios, control group had great sales figure than defense sector. And some big firms, having important amount of sales, in control group had great inventory turnover ratios. Therefore, these sales figures would be another reason of the difference.

In overall calculations again control group has greater ratios.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. Significance between the medians of two industries is determined in 1994. As a result the null hypothesis can be rejected. And it suggests that there is significant difference between sectors in 1994. This significance can occur because of the sales figures explained above. Since there is no significance in the other part of the test period, the null hypotheses can't be rejected.

#### 6.4.2 Asset turnover ratio:

Asset turnover ratio measures the ability of the firm to generate sales in relation to assets. Mainly "It indicates how many times annual sales cover total assets" (Foster 1986,p.69).

The generally accepted standard for this ratio varies between businesses and industries. For manufacturing firms a value between two and four is accepted. However, for commercial firms a higher ratio is expected (Bektöre 1998, p.258).

When ratio is low, assets are not fully employed or too many assets chase too few sales. Also a high ratio may indicate that more sales are generated with fewer assets (Gill 1990, p.69).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-20.

Table-20: Results of Asset turnover ratio

Asset turnover ratio		1994	1995	1996	1997	1998	Overall
Control group	n	29	30	30	30	30	
	mean	1.870	1.975	1.494	1.899	1.702	1.794*
	median	1.636**	1.877	1.393	1.778	1.640	1.660
Defense sector	n	26	28	29	30	30	
	mean	1.331	1.537	1.588	1.664	1.551	1.563*
	median	1.123**	1.236	1.408	1.605	1.515	1.354

( \* ) =  $0.01 < \text{sig.} \leq 0.05$

( \*\* ) =  $\text{sig.} \leq 0.01$

Since most of the firms in the groups are manufacturing ones, their ratios are expected between two and four for the rule of thumb. But none of the ratios are above two. They are all between one and two. So it indicates that both of the industries' assets are not fully employed.

Defense sector has an upward trend until 1997 and a downward after. But control group has a fluctuating trend. It has an upward trend between 1994-1995 and 1996-1997, and a downward trend between 1995-1996 and 1997-1998. And the figures refer that except 1996 control group is always generating more sales with fewer assets than defense sector. But in 1996 defense sector is using its capacity slightly more than control group.

In overall calculations control group has higher mean and median values than defense sector. It points out that assets of control group are more employed than defense sector.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. Significance between the medians of two industries is determined in 1994. So the null hypothesis can be rejected. It indicates that there is significant change between sectors in 1994. As there is no significance in the other part of the test period, the null hypothesis can't be rejected.

A t-test was used to compare the overall means of sectors. There is significance between industries and the null hypothesis can be rejected. Consequently, a significant difference is seen in the means of asset turnover ratios of both sectors.

Control group had more sales than defense sector. But the assets of control group were less than defense sector before 1996. So some firms in control group had big ratio values and the averages of control group are generally higher than defense sector.

#### **6.4.3 Owners' equity turnover ratio:**

This ratio indicates how productive the owners' equity is used. A high ratio indicates that the owners' equity is used economically and productively. But an extremely high

value may point to less amount of owners' equity and more debt in the financial position of the firm. On the contrary a low ratio refers that the owners' equity is more than needed and is not used productively. Since the ratio differs according to industries, there is not a generally accepted standard for this ratio (Akdoğan 1998, p.626).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-21.

Table-21: Results of OE turnover ratio

OE turnover ratio		1994	1995	1996	1997	1998	Overall
Control group	n	28	29	29	28	29	
	mean	5.676	7.855	7.341	8.041	7.394	7.261**
	median	3.599	4.851*	3.544	5.143*	5.007*	4.318
Defense sector	n	24	26	25	27	28	
	mean	3.714	4.116	3.753	3.728	4.037	3.870**
	median	3.313	3.882*	3.397	3.157*	3.293*	3.380

( \* ) =  $0.01 < \text{sig.} \leq 0.05$

( \*\* ) =  $\text{sig.} \leq 0.01$

The calculated ratios in the test period differ between 8% and 3.2%. But except the means of control group OE turnover ratio for both industries seems to be between 5.1% and 3.2%.

Both industries have different fluctuating trends along the test period. But it can be concluded that control group is using the owners' equity more productively.

In overall calculations the figures indicate that control group is generally using the owners' equity more productively than defense sector.

Mann-Whitney test was used to compare the medians of sectors from 1994 to 1998. Significance between the medians of two industries is noted in 1995, 1997 and 1998. Consequently, the null hypotheses can be rejected in these years. And this expresses

that there is significant change between sectors in 1995, 1997 and 1998. Since there is no significant difference in 1994 and 1996, the null hypothesis can't be rejected.

A t-test was used to compare the overall means of sectors. There is significant difference between industries and the null hypothesis can be rejected, which indicates a significant change in the means of owners' equity turnover ratios of both sectors.

#### **6.4.4 Working capital turnover ratio:**

Working capital is the difference between current assets and current liabilities (Foster 1986, p.64). "This ratio is supposed to indicate the adequacy of the working capital reservoir in supporting the firm's volume of trade" (Lev 1974, p.30). It mainly measures how effectively a company's working capital is used to generate and process sales.

High ratios indicate effective usage of working capital. However only for increasing this ratio, keeping less amount of working capital is not appropriate (Sevilengül 1993, p.178).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-22.

Table-22: Results of WC turnover ratio

<b>WC turnover ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	n	29	30	30	30	29	
	mean	2.412	15.819	16.149	0.080	2.870	7.466
	median	4.247	4.927	4.697	4.521	4.194	4.497
Defense sector	n	26	28	29	30	30	
	mean	6.802	2.809	5.273	4.436	11.913	6.216
	median	3.323	3.442	3.878	3.598	4.981	3.699

Due to the extremely low value of the mean of control group in 1998 there is a wide range between the calculated ratios in the test period. They differ between 16% and -32%. But, except the means of control group, working capital turnover ratio for both industries seems to be between 12% and 2.5%.

The trends of medians of both industries are generally horizontal during the test period between 3% and 5%. However, the means of control group are so different from the others. In 1998 the mean of control group experienced an extreme value. And this difference may be caused by extreme values in the data set.

According to medians it can be concluded that firms of control group are using working capital a little more effective than firms of defense sector. But by regarding means only in 1995 and 1996 control group seems to be more effective. And in 1998 the industry indicates an extremely worse capital usage.

In overall calculations it again points out that control group is more effective in using the working capital according to medians. But according to means defense sector is using the working capital more effective than control group.

No significant difference is found between industries according to the statistical tests.

#### **6.4.5 Accounts receivable turnover ratio:**

Accounts receivable turnover ratio provides information about the accounts receivable policy of the firm. "It measures how many times during a year the accounts receivable balance turns over" (Hoskin 1997, p.360). It helps to make a conclusion about the liquidity of a firm.



A high ratio indicates less risk in the accounts receivable. And in this situation low current and quick ratios can be accepted. However, a low ratio indicates that the loss occurred from the accounts receivable will be high (Bektöre 1998, p.253).

By analyzing means and medians of both sectors, the conditions of industries are examined. The results and the significance levels are given in Table-23.

Table-23: Results of A/R turnover ratio

<b>A/R turnover ratio</b>		<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>Overall</b>
Control group	n	29	30	30	30	30	
	mean	7.988	9.318	11.414	12.287	12.132	10.613
	median	4.551	4.686	4.612	5.737	5.539	5.087
Defense sector	n	26	28	29	30	30	
	mean	7.884	8.362	6.550	7.286	10.501	8.165
	median	4.525	6.020	5.559	5.721	6.652	5.789

Control group has an upward trend until 1997 and a downward trend afterwards. And defense sector has usually upward trend except 1995-1996. Since the downward trend of control group's parameters are little at the end of the test period, it seems that control group is decreasing the risk in the accounts receivable during the test period. Also after 1996 the same conclusion can be given about the defense sector.

By regarding means it can be concluded that control group is better in accounts receivable turnover. On the other hand the medians indicate that defense sector has slightly higher values than control group.

In overall calculations according to medians defense sector is better in accounts receivables. On the contrary, as to means control group is better.

The statistical tests indicate no significant difference.

## 7. CONCLUSION AND DISCUSSIONS

Turkey is one of the most important countries in the world according to her geostrategic position. This position urges having a strong defense industry in Turkey. Therefore, in Turkey the defense industry can not be undervalued. And, the Turkish defense industry is developing parallel to the importance of her position. But there is no financial analysis about defense industry. So this study aims to analyze the financial performance of the Turkish defense industry firms by using financial ratios. And also the study includes a comparison between defense and manufacturing sectors in Turkey.

The assumptions explained before and other characteristics of defense industry are examined in four main categories by seventeen ratios. A summary of findings about the calculated ratios of both industries follows.

**Liquidity:** The industries seem to be good according to quick ratio but not suitable according to current ratio. Although the trends of both sectors indicate that they are getting worse at the end of the test period, control group seems to have more ability to meet short-term obligations. On the other hand, although none of the sectors has good cash positions, defense sector seems better. In addition, according to the trends while control group is decreasing its inventories, defense sector is increasing. So it is observed that control group is using less inventories at the end of the test period.

**Leverage:** Both industries are using a high amount of debt. The trend shows that until 1997 the amount of debt is increasing but after than it is decreasing. Besides, control

group has more debt than defense sector. This indicates a great risk for the lenders. Also the amount of short-term debt is quite high. This is the general financing policy of Turkish firms that has financial problems. But it is seen that there is a downward trend after 1995 on average for current liabilities. And defense sector seems to have more short-term debt than control group. On the other hand the amount of account receivables indicate that control group has always more accounts receivable than defense sector.

Profitability: While the profitability of both sectors was not enough in 1994, it increased until 1997 and reached the highest value in 1997 during the test period. But in the last year the profitability of both industries decreased. And the main reason for this decrease is the effects of economic crisis occurred in Southeast Asia in 1997. But generally defense sector is seen as more profitable than control group.

Efficiency: Figures indicate that both industries' assets are not fully employed. But control group is generating more sales with fewer assets than defense sector. Also control group is better in management of inventories. In addition, control group is using less owners' equity or using the owners' equity more productively.

The general financial performance of the industries indicate that defense sector has less amount of account receivables and debt than control group. Also defense sector is more profitable than control group. So these are the expected results according to the assumptions of the study. But it seems that the efficiency of defense sector is worse than control group on the contrary of assumptions. Hence, it seems that defense industry could improve the efficiency of assets and obtain better results.

Having a strong defense industry is an important necessity of Turkey. Moreover, being a strong industry requires an adequate financial performance. So the financial

performance of the defense firms must be analyzed. But after a search it is seen that the defense firms aren't analyzed financially in Turkey. Therefore, in this study the financial analysis of the Turkish Defense Industry is done. And the results of the study indicate that financial analysis is an important tool for identifying the structure of the firms. Therefore before signing the defense related contracts, the financial statements of the tendering companies should be analyzed in order to make sure that they have adequate financial performance. Furthermore, defense firms could be forced to have good financial performance and this will develop the defense industry. On the other hand, an important part of the defense budget could be saved after these efforts.

## **APPENDIX:**

(a) Liquidity ratios:

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

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventories}}{\text{Current liabilities}}$$

$$\text{Cash ratio} = \frac{\text{Cash} + \text{Marketable securities}}{\text{Current liabilities}}$$

$$\text{Inventories/Assets ratio} = \frac{\text{Inventories}}{\text{Total assets}}$$

(b) Leverage ratios:

$$\text{Debt ratio} = \frac{\text{Total liabilities}}{\text{Total assets}}$$

$$\text{Debt to equity} = \frac{\text{Total liabilities}}{\text{Total owners' equity}}$$

$$\text{Current liabilities / Total debt ratio} = \frac{\text{Current liabilities}}{\text{Total debt}}$$

$$\text{P.P.\&E. / O.E. ratio} = \frac{\text{Property, plant, and equipment}}{\text{Owners' equity}}$$

$$\text{Account receivable / Total assets ratio} = \frac{\text{Account receivable}}{\text{Total assets}}$$

(c) Profitability ratios:

$$\text{Return on assets} = \frac{\text{Net income before tax} + \text{Interest payments}}{\text{Average total assets}}$$

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Average owners' equity}}$$

$$\text{Return on sales} = \frac{\text{Net income}}{\text{Net sales}}$$

(d) Efficiency ratios:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

$$\text{Asset turnover} = \frac{\text{Net sales}}{\text{Average total assets}}$$

$$\text{Owners equity turnover} = \frac{\text{Net sales}}{\text{Average owners' equity}}$$

$$\text{Working capital turnover} = \frac{\text{Net sales}}{\text{Working capital}}$$

$$\text{Accounts receivable turnover ratio} = \frac{\text{Net sales}}{\text{Average accounts receivable}}$$

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