

## **The Effects of 2008 Global Economic Crisis on Manufacturing Companies Listed at Borsa Istanbul: Pre-crisis and Crisis Comparison**

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### **Abstract**

*Several studies have been conducted to find out the effects of the 2008 global economic crisis on economy in many countries. This article brings novelty to crisis literature as the effects were examined on micro basis over 157 Turkish manufacturing firms listed on Borsae Istanbul between 2008 and 2011 on a quarterly basis. Panel data analysis was conducted to see effects of selected financial variables (net working capital, inventories, earnings before interest and tax, short and long-term financial debt ratios) on firm financial performance (return on assets). The findings say that working capital and inventory management gained importance when the firms had high debt and scarce cash reserves. When the weight of external resources meaning high debt was higher compared to cash flows, their impact was magnified on profitability and vice versa. The underlined effect of long-term financial debt on profitability was diminished when the firm had excess cash in hand. Finally, firms with high cash holdings seem to be more prepared for negative effects of the crisis and the cash reserves play a precautionary role against the risks of debt. It can be concluded that in general, the performance of firms with conservative leverage policy, good liquidity management and high cash holdings was better compared to other firms during this global crisis.*

*Keywords: Crisis, Manufacturing companies, Profitability, Panel data analysis*

*JEL Codes: G01, C33, G32*

### **1. Introduction**

The global economic crisis initiated by subprime mortgage crisis in the US in August 2007 that spread out all over the world in 2008, is no doubt one of the most important economic events that the world has gone through. Its effects are compared to Great Depression of the 1930s. World trade volume which increased by 15,4% in 2008 recorded a significant contraction of 22,8% in 2009. This contraction is the largest decrease since World War II.

Central banks injected huge amounts of liquidity to money markets and governments in the US and Euro area seized many banks. The investment banking model has ended. Big banks and financial institutions announced big losses. Central banks decreased policy

interest rates to avoid credit crunch in the markets and governments announced special rescue packages to restore confidence in their economies. G-20 countries organized many meetings to work on a new financial system to be able to avoid such economic downturns in the near future. As economic and social aspects cannot be divided easily, many question marks have surged about the capitalism whether it is the right model for humanity. The numbers say that many countries had to face gross domestic product (GDP) contractions either in 2009 and/or in 2010 as a consequence of world trade decrease as seen in Table 1. This contraction has been felt much more on advanced economies than emerging and developing countries. The US recorded consecutive GDP contractions in 2008 and 2009 as the origin country of the crisis. Turkey, although being in the second group of least affected countries, is also affected because more than 50% of its foreign trade volume was with European Union (EU) as shown in Table 2.

**Table 1. GDP growth rates**

(% Annual Change)	Average									
	1994-2003	2004	2005	2006	2007	2008	2009	2010	2011	
World real GDP	3,4	4,9	4,5	5,2	5,4	2,8	-0,6	5,3	3,9	
Advanced Economies	2,8	3,1	2,6	3	2,8	0,0	-3,6	3,2	1,6	
USA	3,3	3,5	3,1	2,7	1,9	-0,3	-3,5	3,0	1,7	
Euro Area	2,2	2,2	1,7	3,3	3	0,4	-4,3	1,9	1,4	
Emerging & Developing Economies	4,4	7,5	7,3	8,2	8,7	6	2,8	7,5	6,2	
Central & Eastern Europe	3,4	7,3	5,9	6,4	5,4	3,2	-3,6	4,5	5,3	
Turkey	2,7	9,4	8,4	6,9	4,7	0,7	-4,8	9	8,5	

Source: IMF World Economic Outlook, April 2012.

**Table 2. Quarterly GDP growth rates of Turkey**

Year (% Change)	GDP (Annual)	Q1	Q2	Q3	Q4
1999	-3,4	-5,4	-1,6	-4,8	-1,6
2001	-5,7	1,3	-6,3	-6,5	-9,8
2008	0,7	7,0	2,6	0,9	-7,0
2009	-4,8	-14,7	-7,8	-2,8	5,9
2010	9,2	12,6	10,4	5,3	9,3
2011	8,5	11,9	9,1	8,4	5,2

Source: Turkish Statistical Institute (TURKSTAT)

This article is unique as panel analyses are conducted to discover the effects of the crisis on the micro side of the Turkish economy contrary to several research which uses macro data.

The paper is organized as follows. Section 2 covers previous research about crisis. Section 3 assesses results of the empirical analysis. Section 4 concludes.

## **2. Literature Review**

Global crisis of 2008 originated first in the US and many studies have been made since then. Most of the research conducted in different countries has studied effects of the crisis by using aggregate data. Now, many researches are on the way using firm-level data to understand real effects of the crisis.

### *2.1 Research Regarding Asian Crisis*

Claessens et al. (2000) studied the impact of Asian crisis on corporate performance in Singapore, Malaysia, Indonesia, Thailand and Korea. They compare return on assets (ROAs), ratio of debt to equity, long-term debt over total debt and maturity of debt structures of Asian countries to the US, European and Latin American countries. Then, they look for the effects of country, industry affiliation, company characteristics such as current company size, sales margin, sales growth, ownership concentration, leverage ratio and short-term debt ratio before the crisis and the environment related to the protection of shareholders' rights and creditors' rights; in company sales margin after the crisis in 1998. The results show that well operating firms before crisis sustained their performance and were less affected by the crisis. In other words, pre-crisis operating problems (reflected with sales margins and sales growth) were the major causes of financial pressures faced by the firms in 1998. This finding applies to both small and large firms. The performance of firms with higher leverage and a higher proportion of short-term debt tended to be poorer compared to other firms without these characteristics. They also underline that problems in the financial market and credit crunch were among the causes of deteriorating operational performance of companies. Firm-specific characteristics (especially non-financial ones) are the ones that affect most the margins in 1998.

Another study conducted by Hong et al. (2007) analyzed the investment behavior of Korean firms before and after the 1997 financial crisis. This study is especially chosen as it gives again an idea how to undertake pre-post analysis for the recent crisis. They use 400 listed firms in Korea Stock Exchange. The sample period is divided into two sub-periods, i.e. 1994-1997 and 1998-2001. They set investment ratio as their dependent variable and 1-year lagged Tobin's q (market value of equity/book value of equity), 1-year lagged cash flow and industry effects as their independent variables. Before crisis, Korean firms were suffering of excessive investment, high leverage and low profitability. They find that both Korean conglomerates ('chaebol')-affiliated firms and non-chaebols lowered their

investment ratios dramatically after the crisis. The two sub-groups of firms' investment ratio have become approximately the same. There was a significant difference before the crisis resulting in an over investment problem by chaebols. The debt/asset ratio in both groups decreased significantly after the crisis. The investment reduction was more pronounced in chaebol firms who had a higher debt/asset ratio prior to the crisis.

Kim and Stone (1999) evaluate the relationship between corporate leverage level of countries and their output adjustment when countries face a liquidity shock. In that case, companies cut first dividends then their investments and sell their physical assets at a discount to pay back their debts. If these actions are not sufficient to cover their obligations, they go bankrupt and sell their capital this time at a larger discount. In the low-debt case, firms do not sell their assets thus there are no bankruptcies even with a liquidity shock. In the medium-debt case, corporate leverage is high enough that firms have to decrease their investments, sell their physical assets with capital inflows cut-off to the country. Bankruptcies can be prevented by precautionary measures. These actions decrease output. In the high-debt case, some firms even go bankrupt besides elimination of investments and their capital assets are liquidated at a very larger discount. This time, output contraction is larger. Their model provides evidence that a corporate sector with high leverage can increase the impact of a credit cut-off on the real economy. This explains, in a sense, the case of highly leveraged Asian companies in 1997.

Davis and Stone (2004) underline that how corporate financial structure is an important factor of determining real economy performance after a financial crisis (banking and/or currency crisis). Companies finance their investment and their inventories through internal funds first, then in order through bank lending, equity issuance and bond issuance. This order of corporate financing is corresponding to the development stage of a country's financial system. The empirical analyses conducted reveal that declines in inventory and investment are among the main contributors of post-crisis GDP contraction; so does corporate leverage. Financial crises affect much more corporate sectors in emerging markets than in industrial countries. This is a natural consequence due to the fact that industrial countries possess a developed financial system with multiple channels of corporate financing compared to the less developed financial system of emerging countries. According to them, overall economic stability indicators should also watch corporate sector's balance sheets to be able to foresee economic fragilities.

In another study, Stone (2000) also finds out that crisis-induced output contractions are driven by high levels of corporate debt, openness, and exchange rate over-appreciation.

Aslan et al. (2011) examine if financial flexibility in pre-crisis period plays a major role in corporate investment and performance of East Asian firms in crisis and post-crisis period. There are different ways to attain financial flexibility: by holding cash, a modest leverage policy or by adjusting at the same time cash and leverage levels. They divided firms into six sub-groups according to their pre-crisis leverage ratios and cash holdings (low cash, high cash, low leverage, high leverage, low cash high leverage and high cash low leverage). The results provide evidence that leverage and not the cash is the main factor of investment in the crisis period. Cash has mainly a precautionary role against financial distress. The net debt (total debt-cash holdings) increases as the leverage increases in crisis period. Flexible firms in pre-crisis period do not count on internal resources to undertake investments during crisis. Post-crisis corporate financial structure does not show much deviation from crisis period but only firms prefer to make more cash reserves to feel safe. Thus, financial flexibility is no more as important as before in post-crisis period.

Song and Lee (2012) focus on structural change in liquidity management policies undertaken by firms before and after crisis from a long-term perspective. They analyzed cash reserves of 5,059 East Asian firms before (1990-1996) and after the Asian crisis (1999-2006) and investigate the relation between investments and cash ratios. The results show that financially unconstrained firms have higher cash savings compared to constrained firms before crisis. This continued during overall sample period (1990-2006). After crisis, there was no difference between them; all firms increased their cash ratios. This significant increase in cash holdings after crisis is mainly due to a reduction in capital expenditures. The findings also reveal that post-crisis cash holding policy does not alter corresponding to firm type whether it is financially constrained or unconstrained (large, dividend paying or low-leveraged firms). This is why the results are not completely in line with the precautionary motive of cash expressed in previous literature.

Pomerleano (1999) analyzes the performance of Asian firms and compares them to firms of Latin America and developed countries. This analysis indicates that Asian firms made excessive investment expenditures which caused excessive leverage decreasing their profitability, return on equity and return on capital. Benmelech and Dvir (2011) focus on the importance of short-term debt in financial crises. Most people believe that the short-term debt increases fragility of firms due to roll-over difficulties during crisis times. Their empirical analysis shows that short-term debt does not cause financial crises instead it is a sign of financial weaknesses and acts as early warning system. In the recent 2008 crisis, the ratio of short-term debt is again very high and we can now state that it is an indicator of financial vulnerability of firms.

Mulder et al. (2002) study how corporate financials can warn for a crisis and give some clues about its depth. Variables that reflect financial leverage levels, maturity structure of debt, liquidity availability and profitability ratios and its cash flow generating capacity are used in their empirical research for Mexican, Asian and Russian crises. Among them, a high leverage ratio and a high ratio of short-term debt to working capital are key indicators of crisis vulnerability. If the magnitude of credits given to firms by banking system is high then impact of these two corporate ratios become more powerful in relation to crisis depth.

### *2.2. Research Regarding the 2008 Global Crisis*

Claessens et al. (2011) examine channels by which the effects of 2007 global crisis have been transmitted to the firms. They use three channels: external financing conditions, international trade and domestic demand channels. The three main issues investigated are as follows: 1) Are firms that were more dependent on external financing prior to the crisis more affected by the global crisis and 2) Are these firms perform differently during the crisis based on their sensitivity level to demand or 3) to trade shocks. Their data was consisted of 7.722 manufacturing firms from 42 countries. The empirical strategy here is to check whether before crisis classifications of firms in terms of their characteristics –degree of their financial dependence, demand sensitivity and exposure to trade– help to explain changes in firm performance following the crisis. Sector and firm level indices are both constructed to find out elasticity of these three channels. To analyze firm performance, they take changes from 2007 to 2008/2009 in ratios of profits/assets, sales/assets and investments/sales as dependent variables. They find that firm level profits are more affected in sectors that are more sensitive to demand shocks. This result underlines that there was a significant global demand shock during the crisis. The impact of crisis on profit is also more pronounced for trade-sensitive sectors. This finding is consistent with decrease in global trade during crisis. Similar to profit, sales declined significantly for those sectors more sensitive to demand and trade. Sales over assets also decreased significantly for those sectors with greater needs for working capital. This result suggests that working capital problems due to the global crisis reduced firm-level sales. No significant relationships are found related to capital investment. Same analyses are conducted with firm-level indices. However, sector level findings are more reliable compared to firm level results as the latter has some endogeneity problems like firms with lower profitability have to obtain more external financing.

Campello et al. (2010) conducted a survey to 800 chief financial officers (CFOs) from North America, Europe, and Asia to analyze the crisis effects. The aim is to understand CFOs' preferences on different sources of liquidity like credits, cash holdings and profits

and the relation between liquidity management and company expenditure plans like investment, technology, and employment expenditures during a crisis period. The results of the survey indicate that firms that own more cash holdings and have more cash flows tend to use less credit, thus firms with sufficient internal funds choose not to use external funds during a crisis. The reason for this is the increased credit costs. When firm profitability and its cash flow increase, the capacity of firm to raise more credits also increases. Meanwhile, if firms with higher cash flows prefer to hold more cash in their pockets, they tend to use less credits during difficult times. Thus, cash flows and cash holdings of a firm have opposing effects on the use of credits. At the average level of cash, an increase in credits does not change a firm's investment plans. In contrast; investment, technology and employment expenditures are decreased when a firm lacks credits. At the higher level of cash, raising more credits increases investment plans of a firm. At this level, availability of credits diminishes the negative effects of crisis on real-side decisions, such as capital investment, technology spending and employment.

Campello et al. (2009) conducted a second survey but this time among 1.050 chief financial officers (CFOs) in 39 countries in North America, Europe and Asia to see real effects of financial constraints during 2008 global crisis. The survey provides evidence that financially constrained firms prefer to hold more cash to be able to use it in difficult times. Most of these firms reject to undertake profitable investments due to external finance difficulties and even some firms plan to sell their assets for cash during crisis. They also plan to decrease their technology, marketing and employment expenditures. Financially constrained firms substantially burn out their cash holdings and plan to cease dividend payments. However, unconstrained firms' indicators stay constant; in other words, stay as they were before crisis. These results are valid in all the three continents.

Campello et al. (2010) investigate this time the behavior of firms corresponding to internal and external finance resources after 2008 global economic crisis. They survey 397 US firms' CFOs. Firms become more conservative and prefer to use their internal cash flows instead of using from their credit capacity. This evidence is in line with the findings of Santos (2011) whose article finds that credits became more costly and harder to obtain.

Duchin et al. (2010) also examine the effects of internal and external finance availability on investment with firm-level data for the period July 1, 2006–June 30, 2008. Their base regression takes investment before and after crisis as dependent variable and cash holdings, net debt, external financing constraints and dependence on external finance as independent variables. The results underline that post-crisis investment of financially constrained firms declined significantly. The post-crisis decline in investment is

particularly severe for firms in industries that are historically more dependent on external finance or external equity finance (Rajan and Zingales, 1998). These firms' post-crisis investment was also strongly affected by their cash reserves. Meanwhile, net short-term debt has a negative relationship with post-crisis changes in investment contrary to long-term debt. They grouped firms into high-cash (top quintile) and low-cash (bottom quintile) portfolios based on their cash balances. With the precautionary savings role, high-cash firms recorded abnormal returns in their stock prices compared to low-cash firms by the end of 2007. It is seen that financial liquidity increases value of investment during the crisis.

Tong and Wei (2009) perform an empirical analysis with 3.823 firms in 24 emerging countries if the manufacturing firms had to face some degree of liquidity constraint and how this effect was reflected in post-crisis stock price changes during 2007-2009 crisis. This liquidity constraint is caused by contraction in capital inflows (foreign portfolio flows, foreign loans and foreign direct investments (FDIs)). Firms need external finance either for long-term investment and/or working capital. They find that stock price decreases more when firms are more dependent on external finance for working capital than for investment. Leveraged firms have to face higher declines in their stock price during crisis. Emerging economies that have a higher pre-crisis exposure to foreign portfolio investments and foreign loans have more severe liquidity shocks compared to countries that have a higher pre-crisis exposure to FDIs.

### *2.3. Research about Effects of Crises on Turkish Companies*

Many studies are conducted on cash holding strategy of firms before and after crisis. One of them is Arslan et al. (2006)'s work that analyzes impact of cash reserves in corporate investment. This analysis is performed with firm-level data in pre-crisis (1998-2000) and crisis period (2001-2002) for Turkey by setting cash holding quantiles. They state that cash holdings seem to be a cushion against cash flow fluctuations. Particularly, it gains more importance for financially constrained firms and during a crisis period. The empirical results provide evidence that firms with more growth opportunities tend to save more not to bypass valuable investment projects when cash flows are decreased and external finance becomes costly. Small firms need more cash reserves as they are more subject to information asymmetry problems. Firms hold more cash as their cash flow increases and low and intermediate level of short-term debt behave like a substitute of cash holdings. At the high level, cushioning role of cash takes its place on the stage to minimize risk of financial distress. In summary, investment of financially constrained firms is more sensitive to cash reserves.

Büyükşalvarcı and Abdioğlu (2010) focus on factors that determine working capital requirement (WCR) of Turkish manufacturing firms listed on Istanbul Stock Exchange (ISE) during 2002-2006. Then, they divide the sample into two periods: pre-crisis period (2005-2007) and crisis period (2008-2009). The variables chosen are leverage ratio, ROA, ROE, EBITDA margin, net sales growth, inventory and receivables turnover, gross and net profit margins, fixed assets ratio, Tobin's q and log of firm market value. The model shows that both leverage ratio and fixed assets ratio have a negative relationship with WCR in all periods, ROA only in the second year of crisis period, inventory turnover and Tobin's q in crisis period and receivable turnover in the pre-crisis period respectively. In other words, firms that can increase their external finance resources make long-term investments and increase their asset usage effectiveness, will need less WCR.

Karaca and Çiğdem (2013) conduct an empirical analysis with 135 firms' quarterly financial ratios between 1991 and 2011 to discover the effects of 1994, 2001 and 2008 crises on manufacturing companies. They used factor analysis such that three factors are determined by grouping 15 financial ratios. Factor 1 is named as productivity factor as it includes turnover rates such as asset turnover, inventories turnover, receivables turnover etc. Factor 2 is named risk factor as it encompasses liquidity ratios. Factor 3 is called profitability factor as it takes into account profitability ratios. Then, they conduct a discriminant analysis to find out which factors affect more the selected firms during pre-crisis and post-crisis periods. Profitability factor is the most important factor for 1994 and 2001 crises whereas risk factor is the most significant one for 2008 crisis.

Korkmaz and Karaca (2014) study twelve financial ratios of 78 firms from the manufacturing industry between 2000 and 2011 to understand their profitability structure by conducting panel analysis. They determine earnings per share, ROE and ROA as dependent variables in their model. The results are found as follows: as total debt increases, their earnings per share and ROE decrease; the increase in assets increases ROE; and finally as the total debt increases, ROA decreases.

#### *2.4. Other Relevant Studies Concerning Corporate Policies*

Almeida et al. (2004) state that firms with higher cash reserves have more opportunities to invest in profitable projects. In line with this argument, financially constrained firms tend to save more cash for future. Similarly, Acharya et al. (2005) find that cash holdings secure investment expenditures against financing problems. Both studies find evidence that cash reserves become a financing alternative for new investments.

Stone and Weeks (2001) looked for major factors of output contractions and found that the degree of cut-off of private capital inflows, corporate balance sheet indicators, imports to GDP and financial breadth were the main contributors. Mulder et al. (2002) conclude that the corporate leveraged financing, short-term debt to working capital and shareholders rights are major indicators of a future crisis.

Until this point, precautionary role of cash holdings was emphasized in many articles but there is the opposite side of the coin. First Jensen (1986) then DeAngelo and DeAngelo (2007) indicate that managers tend to burn their high cash holdings for negative net present value projects instead of investing in profitable projects. This brings the idea that having high cash reserves is not a value-increasing policy in contrary optimal financial policy requires low cash holdings.

Fazzari et al. (1988) examine effects of financing constraints on corporate investment. Their model is different as they take into account cash flow instead of cost of capital. As firms have more difficulties to get access to external finance, their investment becomes more sensitive to cash flow and cash and marketable securities constitute a source of low-cost for investment. Their empirical research is an example of the cushion effect of cash flow to reduce investment sensitivity to macroeconomic shocks, hence cash flow fluctuations.

Opler and Titman (1994) analyze the relationship between financial distress and corporate performance. The analysis indicates that highly leveraged firms' sales drop more severely compared to less leveraged firms and their equity value declines are greater during economic downturns. Smaller firms' sales are much more affected than large firms' sales however the decline in their market value of equity is less than the average decline experienced by large firms during economic distress. In addition, leveraged firms invest less and their employment grows slowly compared to less leveraged firms.

Cleary (1999) focus on investment sensitivity of financially constrained and unconstrained firms to liquidity distress. The findings state that firm investment decisions are sensitive to internal funds rather than debts. And more interestingly, investment expenditures of financially unconstrained firms are more sensitive to the availability of liquidity than those of financially constrained firms. This is probably related to creditworthiness of firms.

### **3. Empirical Research**

In the light of the research mentioned in the previous section, an empirical analysis is conducted for Turkish firms to see the real effects of the global crisis.

### 3.1 Data and Sample Selection

In this study, financial data of 176 manufacturing firms listed in the Borsa Istanbul has been collected for the period 2006Q1-2011Q3. 19 firms are excluded from this list because either their financial statements are not announced as they have gone into financial distress or they are delisted or merged with other firms. The final data includes 157 listed manufacturing firms. The quarterly financial statements' data are obtained via FINNET. These financial statements are prepared according to International Financial Reporting Standards (IFRS). The data is also checked with the balance sheets and income statements obtained from Borsa Istanbul. The abbreviations for financial figures and the definitions of financial ratios used in this study are listed in the following tables.

**Table 3. Financial ratios used in the study**

FINANCIAL RATIOS		
1	EBITTA	ebit / total assets
2	EBITDATA	ebitda / total assets
3	NWCTA	net working capital / total assets
4	InvTA	Inventories / total assets
5	InvTURN	cost of goods sold / average inventory
6	RecTURN	net sales / average receivables
7	ASSETTURN	net sales / average total assets
8	CURRENT RATIO	current assets / current liabilities
9	FIX ASSETSTA	fixed assets / total ssets
10	CAPEXTA	capital expenditures / total assets
11	CashholdTA	cash holdings / total assets
12	SHETA	total shareholders' equity / total assets
13	OPERPROFITMARG	operating profit / net sales
14	NETINCMARG	net income / net sales
15	ROA	net income / total assets
16	ROE	net income / shareholders' equity
17	ROS	net income / net sales
18	TOTDEBTTA	total debt / total assets
19	stfideTA	short-term financial debt / total assets
20	ltfideTA	long-term financial debt / total assets
21	Tot debt burden	interest expenditures + short-term liabilities / net sales
22	Int debt burden	interest expenditures / net sales
23	Interest ExpTA	interest expenditures / total assets
24	ROIC	return on invested capital (EBIT/Invested capital)

**Table 4. Financial and non-financial figures used in the study**

FINANCIAL FIGURES		
1	Cash	cash
2	Mark Sec	marketable securities
3	ST Trade Rec	short-term trade receivables
4	Inventories	inventories
5	CUR ASSETS	current assets
6	LT Trade Rec	long-term trade receivables
7	Fix Assets	fixed assets
8	TOT ASSETS	total assets
9	ST Fin Debts	short-term financial debt
10	ST Trade Pay	short-term trade payables
11	ST LIAB	short-term liabilities
12	LT Fin Debts	long-term financial debt
13	LT Trade Pay	long-term trade payables
14	LT LIAB	long-term liabilities
15	TOT SHE	total shareholders' equity
16	Net Sales	net sales
17	COGS	cost of goods sold
18	GROSS PROFIT	gross profit
19	Opex	operating expenses
20	Other Oper Inc	other operating income
21	Other Oper Exp	other operating expense
22	OPER PROFIT-LOSS	operating profits
23	Fin Inc	financial income
24	Fin Exp	financial expenses
25	Net Fin Inc-Exp	net financial income
26	Inc BefTax	income before tax
27	NET INC-LOSS	net income
28	Depr and Amort Exp	depreciation and amortization expense
29	EBIT	earnings before interest and tax
30	EBITDA	earnings before interest and tax+depreciation and amortization
31	NWC	net working capital
32	Tot Debt	total debt (current liabilities+long-term liabilities)
33	Total Fin Debt	total financial debt
34	Net Debt	net debt (total debt-cash holdings)
35	Cash Holdings	cash+marketable securities
36	Change in Sales	quarterly change in net sales
37	Change in EBIT	quarterly change in EBIT
38	Change in EBITDA	quarterly change in EBITDA
39	Capex	capital expenditures
40	INVESTED CAPITAL	invested capital (net working capital + fixed assets)
41	Interest Exp	interest expenditures
NON-FINANCIAL FIGURES		
42	Company age	number of years from the establishment to 2006
43	Employees No	total number of employees (workers included)

### 3.2 Determination of Pre-Crisis and Crisis Periods

To discover the crisis effects will be easier when the data is divided into two subgroups: pre-crisis period (2006Q1-2008Q3) and crisis period (2008Q4-2011Q3). This division is

made according to the results of Emerging Markets-Financial Stress Index, Financial Pressure Index and the macroeconomic parameters like industrial production index, capacity usage (beginning of contraction in September 2008), employment rate and GDP contraction (first contraction of 7% in 2008Q4).

When the search of an official announcement by CBRT is conducted to find out a date for the start of the crisis in Turkish economy, the results focus on some points:

- First, the CBTR announced that they decided to make their first overnight borrowing rate cut in November 19, 2008 to attenuate the slowing of economic activities (Başçı, 2008). This can be assumed as the official beginning of the global crisis in Turkey. The FED made its first rate cut in August 2007 to avoid credit crunch risk in the US where this month is used by many researchers as the beginning of crisis. Furthermore, in almost all the reports of CBRT, the beginning of the global crisis in the world was accepted as August 2007 (TCMB, 2008).

- Second, in a report published in July 2009 by CBRT, the beginning of the global crisis in Turkey was indicated as July 2008 where the first monthly drop of industrial production index occurred. The end of the crisis was set again according to the same parameter as April 2009 (Yükseler, 2009). This report's suggestions are limited from the end date perspective as the report can only use data belonging to 2007, 2008 and 2009.

### *3.3 Crisis Effects on the Aggregate Financial Ratios of Firms*

When main financial ratios of pre-crisis period with those of crisis period are compared in Table 5, the results are as follows;

- The extreme maximum and minimum values exist in both periods. This is the sign that there are problematic or marginal firms in both pre-crisis and crisis periods. These firms are traded on Secondary National and Watch-list Companies Markets due to their financial and operational problems. They are not suppressed as outliers because they exist and are assumed to belong to the sample of 157 firms listed in Borsa Istanbul.

- EBITTA (EBIT/Total Assets) and EBITDATA (EBITDA/Total Assets) ratios have similar mean values although the minimum value has become smaller and the maximum value larger respectively in crisis.

- The mean value of NWCTA (Net Working Capital/Total Assets) ratio has deteriorated by 30% and the standard deviation increased in the crisis period. This is due to the significant increase in average stfideTA (Short-term Financial Debt/Total Assets) by 50% although average CashholdTA (Cash Holdings/Total Assets) increased but slightly.

Mean CashholdTA ratio increased from 6.7% to 8% after crisis. That behavior change is in line with the precautionary role of cash holdings as mentioned in previous research.

- InvTA (Inventories/Total Assets) ratio became 15.4% in the crisis period. Before, it was used to be 17.4%. In addition InvTURN (Inventory Turnover) also decreased due to contraction in net sales, thus in cost of goods sold. There is a similarly significant decrease in RecTURN (Receivable Turnover) due to net sales contraction.

- These firms made lower sales with their assets after the crisis.

- Average current ratio decreased by 50% after crisis due to significant increase in short-term financial debt.

- FIXASSETSTA (Fixed Assets/Total Assets) ratio has deteriorated by 3% and CAPEXTA (Capital Expenditures/Total Assets) by nearly 60% in the crisis period. CAPEX is calculated as the change in fixed assets thus it can become negative if there are any assets sales or value losses. It can be concluded that firms ceased to make any further investments to be more cautious witnessing a severe crisis that affected their investment behaviors.

- The SHETA (Shareholders' Equity/Total Assets) ratio diminished by 10% following the crisis. This can be explained with the losses recorded by many firms, melting down their equity.

- Profitability margins were also affected by the crisis. Gross profitability margin decreased from 21% to 18%. However, this reduction is unseen in operating profitability. The latter ratio that is used to be 12.5% before the crisis became 53.6% in crisis. This is due to stable operating expenditures and contraction in net sales. Another reason can be that Turkish companies are more prudent to diminish the effects of this global crisis by managing their business more efficiently in this period. Big layoffs also took place.

- ROA (Return on Assets), ROS (Return on Sales) and NETINCMARG (Net Income Margin) significantly worsened due to low net profits or net losses (by 65% for ROA and 95% for ROS and NETINCMARG, respectively) announced by firms during crisis period. ROE ratio results do not look significant due to strong outliers effect.

- The mean stfideTA increased from 10.4% to 15.6% and the mean ltfideTA (Long-term Financial Debt/Total Assets) from 9.5% to 11.1%, respectively in the crisis. Overall, average TOTDEBTTA (Total Debt/Total Assets) ratio increased by 10%. This caused higher interest expenditures for the firms. The average IntExpTA (Interest Expenditures/Total Assets) ratio increased by nearly 50% (from 3.8% to 5.9%) although interest rates decreased during the crisis period.

**Table 5. Descriptive statistics (Pre-crisis and Crisis)**

PRE-CRISIS							CRISIS						
Variable	Obs	Mean	Median	Std. Dev.	Min	Max	Variable	Obs	Mean	Median	Std. Dev.	Min	Max
EBITTA	1571	0,068	0,060	0,123	-2,812	0,688	EBITTA	1881	0,071	0,050	0,105	-0,433	1,755
EBITDATA	1571	0,093	0,080	0,125	-2,777	0,704	EBITDATA	1881	0,094	0,070	0,109	-0,423	1,781
NWCTA	1727	0,164	0,180	0,264	-2,167	0,739	NWCTA	1880	0,115	0,160	0,418	-4,419	0,771
InvTA	1727	0,174	0,149	0,119	0,000	0,715	InvTA	1880	0,154	0,130	0,119	0,000	0,746
InvTURN	1571	7,037	2,840	65,112	0,000	2489,348	InvTURN	1867	6,299	2,780	26,253	0,000	788,923
RecTURN	1567	30,097	3,300	232,399	0,000	5633,618	RecTURN	1880	4,098	2,640	6,128	0,000	109,984
ASSETTURN	1570	0,675	0,560	0,642	0,000	10,276	ASSETTURN	1881	0,560	0,470	0,449	0,000	5,008
CURRENTRATIO	1727	5,078	1,620	116,712	0,100	4851,481	CURRENTRATIO	1880	2,320	1,530	3,681	0,019	79,250
FIXASSETSTA	1727	0,375	0,370	0,180	0,000	0,911	FIXASSETSTA	1880	0,363	0,370	0,185	0,000	0,950
CAPEXTA	1570	0,005	0,000	0,064	-0,716	0,932	CAPEXTA	1881	0,002	-0,002	0,066	-1,872	0,491
CashholdTA	1727	0,067	0,040	0,082	0,000	0,498	CashholdTA	1880	0,080	0,040	0,096	0,000	0,613
SHETA	1727	0,505	0,580	0,396	-3,438	0,986	SHETA	1880	0,456	0,530	0,579	-9,573	0,995
OPERPROFITMARG	1723	0,125	0,070	1,664	-10,040	47,778	OPERPROFMARG	1871	0,536	0,050	29,613	-261,267	951,769
NETINCMARG	1723	0,035	0,030	2,115	-45,778	50,709	NETINCMARG	1871	0,002	0,030	25,019	-262,585	785,641
ROA	1570	0,020	0,021	0,131	-3,245	0,637	ROA	1881	0,007	0,012	0,131	-3,710	0,981
ROE	1570	-0,100	0,047	6,390	-249,740	30,810	ROE	1881	-0,028	0,024	0,611	-15,031	5,184
ROS	1723	0,035	0,030	2,115	-45,778	50,709	ROS	1871	0,002	0,030	25,019	-262,585	785,641
TOTDEBTTA	1727	0,495	0,420	0,396	0,014	4,438	TOTDEBTTA	1880	0,544	0,470	0,579	0,005	10,573
stfideTA	1727	0,104	0,058	0,130	0,000	1,160	stfideTA	1880	0,156	0,108	0,199	0,000	2,233
ltfideTA	1727	0,098	0,037	0,213	0,000	2,893	ltfideTA	1871	0,111	0,033	0,298	0,000	5,892
Tot debt burden	1723	1,341	0,640	6,319	0,006	240,510	Tot debt burden	1871	12,924	0,760	169,867	0,089	4759,458
Int debt burden	1723	0,095	0,038	0,241	0,000	4,623	Int debt burden	1871	1,081	0,079	15,711	0,000	473,078
Int ExpTA	1570	0,038	0,022	0,055	0,000	0,761	Int ExpTA	1881	0,059	0,035	0,119	0,000	3,728

### 3.4 Methodology

The aim is to analyze effects of the crisis on Turkish manufacturing firms. Many trials are conducted to reach a meaningful model. ROE, ROS and ROA are put into model as dependent variable. Financial items and ratios listed in Table 5 indicating liquidity and leverage position of a firm are put into model either in level or in ratios as independent variables. After these trials, the model including ROA (ratio of net income to average total assets) as dependent variable and NWCTA (ratio of net working capital to total assets), InvTA (ratio of inventories to total assets), EBITTA (ratio of earnings before interest and tax to total assets), stfideTA (ratio of short-term financial debt to total assets) and ltfideTA (ratio of long-term financial debt to total assets) as independent variables is chosen as the final model. The model uses 3.607 firm-quarter observations. All of these results are obtained by using STATA version 12.

#### 3.4.1 Panel Data Assumptions

There are four main assumptions to reach a statistically sound model.

1. The error term  $u$  is a random variable with mean or expected value of zero; that is  $E(u)=0$ .

2. The variance of  $u$  is denoted by  $\sigma^2$  and is the same for all values of the independent variables.

3. The values of  $u$  are independent.

4. The error term  $u$  is a normally distributed random variable.

There can be some problems in relation to data that confront these assumptions. These are multicollinearity, autocorrelation and heteroscedasticity problems. Multicollinearity refers to correlation among the independent variables. It is a potential problem when the absolute value of the sample correlation coefficient exceeds 0.70 for any two of the independent variables (Anderson et al., 1996). The data includes both time-series data and cross-sectional data of many firms. Autocorrelation is associated with time-series data and heteroscedasticity with cross-sectional data (Gujarati, 2006). When the correlation matrix is calculated for the model, no multicollinearity problem exists as indicated in Table 6.

**Table 6. Correlation matrix**

	ROA	NWCTA	InvTA	EBITTA	stfideTA	ltfideTA
ROA	1,0000					
NWCTA	0,4802	1,0000				
InvTA	-0,0482	0,1929	1,0000			
EBITTA	0,7020	0,1774	-0,0658	1,0000		
stfideTA	-0,3796	-0,6868	0,1164	-0,0348	1,0000	
ltfideTA	-0,4055	-0,3823	-0,0656	0,0444	0,3104	1,0000

### 3.4.2 Fixed Effects (FE) and Random Effects (RE)

As the sample data includes both time-series and cross sectional data of several firms, use of panel data will be much more informative for a researcher. While conducting this analysis, two techniques as fixed-effects (FE) and random effects (RE) are used.

FE explores the relationship between predictor and outcome variables within an entity (country, person, company, etc.). Each entity has its own individual characteristics that may or may not influence the predictor variables (for example being a male or female could influence the opinion toward certain issue or the political system of a particular country could have some effect on trade or GDP or the business practices of a company may influence its stock price). When using FE, the assumption is that something within the individual may impact or bias the predictor or outcome variables and it is necessary to control for this. This is the rationale behind the assumption of the correlation between entity's error term and predictor variables. FE removes the effect of those time-invariant characteristics from the predictor variables so the predictors' net effect can be assessed.

Another important assumption of the FE model is that those time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. Each entity is different therefore the entity's error term and the constant term (which captures individual characteristics) should not be correlated with the others. If the error terms are correlated then FE is not suitable since inferences may not be correct and the relationship should be modeled probably using RE.

Whereas the rationale behind RE model is that, unlike the FE model, the variation across entities is assumed to be random and uncorrelated with the independent variables included in the model. If differences across entities have some influence on the dependent variable then RE should be used. In summary, FE technique assumes that coefficients of independent variables change according to entities (person, company etc.) and/or time. However, RE technique assumes that these change effects are included in the model via error terms. The decision which technique should be adopted is taken via Hausman test (Reyna, 2012).

After calculating FE and RE of the chosen panel model, it is necessary to apply Hausman test statistic to be able to decide on the right model. Hausman test uses a null hypothesis that lies on RE model. If the Prob>chi2 value is smaller than 0.05 and the test statistic chi-square is big enough then the null hypothesis is rejected and FE model should be used.

The results indicate that FE should be used to estimate coefficients of the chosen model for the whole sample period, pre-crisis and crisis periods. The autocorrelation and heteroscedasticity problems should also be checked on the panel data. For this, Breusch-Pagan LM test of independence is conducted and null hypothesis is rejected which means that the error terms of cross-sections are correlated ( $\chi^2(12246)=50799.136$ ,  $P=0.0000$ ). There is also need to check for the autocorrelation problem for time series data. Wooldridge (2002) test for autocorrelation in panel data is run and again null hypothesis is rejected which means that there is autocorrelation on a panel data basis ( $F(1,156)=85.990$  and  $P=0.0000$ ). To find any evidence on the heteroscedasticity, Modified Wald test for groupwise heteroscedasticity in FE regression model is conducted and the result shows that the null hypothesis is rejected meaning that the model is not in line with constant variance assumption ( $\chi^2(157)=2.7$ ,  $P=0.0000$ ). Same tests are used for the pre-crisis and crisis periods. Since autocorrelation and heteroscedasticity exist for all periods, Generalized Least Squares (GLS) estimation procedure is used to estimate the equations instead of FE.

### 3.5 Empirical Results

The selected financial figures of sample firms are analyzed to find out main factors affecting firm performance and employment decisions of firms.

#### 3.5.1 Firm Profitability with Respect to Crisis

In Table 7 ProfitabilityDum is a dummy variable taking the value of 1 if the firm records positive net income for a quarter and 0 if it announces a quarterly net loss. This analysis will help to understand the main differences between profitable and unprofitable firms. Thus, firms will be able to undertake necessary decisions to record profits even during an economic crisis.

**Table 7. Descriptive statistics according to firm profitability (Pre-crisis & Crisis)**

	= 0						= 1							
	Variable	Obs	Mean	Median	Std. Dev.	Min	Max	Variable	Obs	Mean	Median	Std. Dev.	Min	Max
PRE-CRISIS	EBITTA	520	-0.01	0.00	0.15	-2.81	0.32	EBITTA	1051	0.11	0.09	0.08	-0.03	0.69
	EBITDATA	520	0.02	0.03	0.15	-2.78	0.34	EBITDATA	1051	0.13	0.11	0.09	0.00	0.70
	NWCTA	579	0.03	0.10	0.34	-2.17	0.66	NWCTA	1148	0.23	0.21	0.18	-1.02	0.74
	InvTA	579	0.19	0.16	0.13	0.00	0.68	InvTA	1148	0.17	0.14	0.11	0.00	0.71
	InvTURN	519	3.69	2.10	6.47	0.00	87.01	InvTURN	1052	8.69	3.20	79.40	0.00	2489.35
	RecTURN	519	12.60	2.43	72.67	0.00	1250.297	RecTURN	1048	38.76	3.66	279.18	0.00	5633.62
	ASSETTURN	519	0.49	0.44	0.33	0.00	1.84	ASSETTURN	1051	0.77	0.62	0.73	0.00	10.28
	CURRENTRATIO	579	1.69	1.22	2.06	0.10	25.13	CURRENTRATIO	1148	6.79	1.78	143.13	0.22	4851.48
	FIXASSETSTA	579	0.40	0.40	0.20	0.00	0.91	FIXASSETSTA	1148	0.36	0.36	0.17	0.00	0.82
	CAPEXTA	519	0.00	0.00	0.08	-0.60	0.93	CAPEXTA	1051	0.01	0.00	0.05	-0.72	0.78
	CashholdTA	579	0.04	0.01	0.06	0.00	0.50	CashholdTA	1148	0.08	0.05	0.09	0.00	0.50
	SHETA	579	0.33	0.40	0.51	-3.00	0.97	SHETA	1148	0.60	0.63	0.28	-3.44	0.99
	OPERPROFITMARG	576	-0.13	-0.03	0.59	-10.04	1.11	OPERPROFITMARG	1147	0.25	0.11	1.98	-0.25	47.78
	NETINCMARG	576	-0.35	-0.10	2.00	-45.78	0.00	NETINCMARG	1147	0.23	0.07	2.14	0.00	50.71
	ROA	519	-0.07	-0.04	0.17	-3.24	0.00	ROA	1051	0.07	0.05	0.07	0.00	0.64
	ROE	519	-0.50	-0.06	11.11	-249.74	30.81	ROE	1051	0.10	0.08	0.13	-1.58	1.36
	ROS	576	-0.35	-0.10	2.00	-45.78	0.00	ROS	1147	0.23	0.07	2.14	0.00	50.71
	TOTDEBTTA	579	0.67	0.60	0.51	0.03	3.99	TOTDEBTTA	1148	0.40	0.37	0.28	0.01	4.44
	stfideTA	579	0.15	0.12	0.16	0.00	1.16	stfideTA	1148	0.08	0.05	0.10	0.00	0.56
	ltfideTA	579	0.15	0.07	0.28	0.00	2.67	ltfideTA	1148	0.07	0.02	0.16	0.00	2.89
Tot debt burden	576	2.53	1.13	10.61	0.04	240.51	Tot debt burden	1147	0.74	0.47	1.57	0.01	46.00	
Int debt burden	576	0.18	0.11	0.29	0.00	3.42	Int debt burden	1147	0.05	0.02	0.20	0.00	4.62	
Int ExpTA	519	0.07	0.05	0.08	0.00	0.76	Int ExpTA	1051	0.02	0.02	0.03	0.00	0.23	
CRISIS	EBITTA	722	0.01	0.00	0.07	-0.43	0.55	EBITTA	1159	0.11	0.09	0.10	-0.04	1.76
	EBITDATA	722	0.03	0.02	0.08	-0.42	0.59	EBITDATA	1159	0.13	0.11	0.11	-0.03	1.78
	NWCTA	721	-0.05	0.05	0.59	-4.42	0.67	NWCTA	1159	0.22	0.21	0.21	-1.14	0.77
	InvTA	721	0.17	0.13	0.14	0.00	0.75	InvTA	1159	0.15	0.13	0.10	0.00	0.68
	InvTURN	713	4.61	2.21	9.40	0.00	107.27	InvTURN	1154	7.34	3.05	32.53	0.00	788.92
	RecTURN	721	4.08	2.22	7.13	0.00	81.20	RecTURN	1159	4.11	2.80	5.42	0.00	109.98
	ASSETTURN	722	0.45	0.35	0.40	0.00	2.46	ASSETTURN	1159	0.62	0.53	0.47	0.00	5.01
	CURRENTRATIO	721	1.85	1.13	4.65	0.02	79.25	CURRENTRATIO	1159	2.61	1.77	2.89	0.11	39.54
	FIXASSETSTA	721	0.40	0.39	0.21	0.00	0.95	FIXASSETSTA	1159	0.34	0.36	0.16	0.00	0.88
	CAPEXTA	722	0.00	0.00	0.09	-1.87	0.49	CAPEXTA	1159	0.00	0.00	0.04	-0.74	0.46
	CashholdTA	721	0.05	0.02	0.07	0.00	0.41	CashholdTA	1159	0.10	0.07	0.10	0.00	0.61
	SHETA	721	0.27	0.41	0.82	-9.57	0.99	SHETA	1159	0.57	0.60	0.29	-3.50	0.99
	OPERPROFITMARG	713	-1.20	-0.05	14.68	-261.27	96.84	OPERPROFITMARG	1158	1.61	0.09	35.80	-2.21	951.77
	NETINCMARG	713	-2.14	-0.10	17.77	-262.59	0.00	NETINCMARG	1158	1.32	0.07	28.51	0.00	785.64
	ROA	722	-0.07	-0.03	0.17	-3.71	0.00	ROA	1159	0.05	0.04	0.07	0.00	0.98
	ROE	722	-0.19	-0.06	0.86	-15.03	5.14	ROE	1159	0.07	0.06	0.34	-6.44	5.18
	ROS	713	-2.14	-0.10	17.77	-262.59	0.00	ROS	1158	1.32	0.07	28.51	0.00	785.64
	TOTDEBTTA	721	0.73	0.59	0.82	0.01	10.57	TOTDEBTTA	1159	0.43	0.40	0.29	0.01	4.50
	stfideTA	721	0.22	0.16	0.27	0.00	2.23	stfideTA	1159	0.12	0.08	0.12	0.00	1.02
	ltfideTA	721	0.16	0.04	0.43	0.00	5.89	ltfideTA	1159	0.08	0.03	0.16	0.00	2.71
Tot debt burden	713	24.24	1.22	228.24	0.14	4759.46	Tot debt burden	1158	5.96	0.59	120.22	0.09	3029.46	
Int debt burden	713	1.87	0.13	20.31	0.00	473.08	Int debt burden	1158	0.60	0.06	12.02	0.00	301.85	
Int ExpTA	722	0.08	0.04	0.18	0.00	3.73	Int ExpTA	1159	0.05	0.03	0.06	0.00	0.77	

When liquidity ratios like NWCTA, CURRENTRATIO and CashholdTA are taken into account, it is obvious that the profitable companies are much more liquid than the unprofitable companies in the pre-crisis period due to significant difference in their cash

holding strategy. They use less short-term debt, thus they have to bear less interest expenditures. The comparison of mean values of the same liquidity ratios of the pre-crisis and crisis periods reveals that average NWCTA has a negative sign in the crisis period for unprofitable firms because short-term financial debt burden is higher than pre-crisis period whereas the cash holding behavior does not show much difference.

Pre-crisis and crisis average CURRENTRATIO and CashholdTA ratios look similar for firms recording losses in their balance sheets. In the crisis period, average NWCTA ratio of profitable firms which is 0.217 is close to the ratio in the pre-crisis period that is 0.233. The mean CURRENTRATIO variable of profitable firms decreased from 6.79 to 2.61 in the crisis period due to significant increase in current liabilities. For the same firms in crisis, CashholdTA ratio (0.101) is on average 100% larger compared to unprofitable firms (0.046). Crisis cash holding ratio (0.101) is also larger than pre-crisis cash holding ratio (0.083) for profitable firms. When the comparisons are made from the perspective of internal resources usage (equity), profitable firms financed around 60% of their assets by their equity on average. Unprofitable firms' stfideTA and ltideTA ratios are on average two fold of those of profitable firms. The average TOTDEBTTA ratio is around 70% for unprofitable firms, thus only 30% of assets are financed by equity on average.

To summarize, profitable firms are more liquid, hold more cash, use more equity thus less debt than unprofitable firms. As firms record profits, they tend to hold more cash and also to reserve more cash as they face economic downturns. The financial indicators underline the fact that the essentials to operate a business profitably do not change much whether there is a crisis or not. The optimal usage of internal and external resources of a firm is the distinctive mark to record profits.

### 3.5.2 Panel Data Analysis for Financial Performance

To obtain more detailed results, the relationship between financial performance and firm financial indicators is analyzed depending on the results obtained with GLS between 2006Q1 and 2011Q3. The output tables obtained from STATA and their interpretations are provided below.

As shown in Table 8, for the whole sample period, the value of Wald chi2 test statistic is 10131.04 and the p value is 0,000 which means that the model is significant at 1% level. The p value of all independent variables is 0.00 which means that they are statistically significant at 1% level also apparent from their z-statistics.

**Table 8. Results of panel data analysis for all Periods, Pre-Crisis & Crisis**

		Dependent Variable : ROA			
	Independent Variables	Coefficient	Standard Error	z Statistics	Probability
2006Q1-2011Q3	C	-0,0075	0,002	-3,24***	0,001
	NWCTA	0,0428	0,043	8,75***	0,000
	InvTA	-0,0285	0,010	-2,82***	0,005
	EBITTA	0,7912	0,010	77,19***	0,000
	stfideTA	-0,1286	0,009	-13,59***	0,000
	ltfideTA	-0,1653	0,005	-35,95***	0,000
	Number of observations	3607			
	Number of groups	157			
	Wald chi2(5)	10.131,04***			
	Prob > chi2	0,000			
Log likelihood	4.691,32				
PRE-CRISIS	C	-0,0248	0,002	-10,17***	0,000
	NWCTA	0,0419	0,006	7,41***	0,000
	InvTA	-0,0293	0,010	-2,83***	0,005
	EBITTA	0,9239	0,010	93,93***	0,000
	stfideTA	-0,0737	0,010	-7,16***	0,000
	ltfideTA	-0,1135	0,006	-19,38***	0,000
	Number of observations	1570			
	Number of groups	157			
	Wald chi2(5)	12.050,7***			
	Prob > chi2	0,000			
Log likelihood	2655,378				
CRISIS	C	0,0009	0,004	0,23	0,816
	NWCTA	0,0515	0,008	6,8***	0,000
	InvTA	-0,0532	0,017	-3,18***	0,001
	EBITTA	0,6644	0,017	38,17***	0,000
	stfideTA	-0,1127	0,016	-7,24***	0,000
	ltfideTA	-0,1913	0,007	-28,92***	0,000
	Number of observations	1880			
	Number of groups	157			
	Wald chi2(5)	3.617,78***			
	Prob > chi2	0,000			
Log likelihood	2161,499				

\* p<0,10; \*\* p<0,05; \*\*\* p<0,01;

ROA is positively and significantly affected by NWCTA increase ( $z=8.75$   $p<0.01$ ). The coefficient means that one unit increase in NWCTA will explain 0.0428 units change in ROA when the other independent variables are hold constant. This empirical result is not surprising as the adequate management of firm liquidity is an important factor of financial performance of a firm. For the chosen period, financial ratios indicate that firms increase their cash holdings to such a level that they can repay all their debts by their cash holdings. This attribute gained importance especially for the crisis period as the firms become more vulnerable to market frictions. For this reason also, increase in current assets helped Turkish firms to be more profitable not only in crisis period but in pre-crisis period also.

InvTA increase also affects ROA significantly, but negatively ( $z=-2.82$   $p<0.01$ ). One unit increase in InvTA explains -0.0285 units change in ROA when the other independent variables are hold constant. It means that an increase in inventories can be a signal that the inventories cannot be depleted as usually and the keeping too much inventory harms firm profitability.

The most significant independent variable in the model is EBITTA and is positively affects ROA ( $z=77.19$   $p<0.01$ ). Its coefficient (0.7912) indicates a very powerful relationship. It is not surprising that a firm financial performance is highly related to its capability to increase its cash flows from its operations. It is the primary component of firm profitability.

Increases in *stfideTA* and *ltfideTA* also affect ROA significantly but negatively ( $z=-13.59$   $p<0.01$  and  $z=-35.95$  and  $p<0.01$  respectively). The coefficients are -0,1286 ( $p<0.01$ ) for *stfideTA* and -0.1653 ( $p<0.01$ ) for *ltfideTA* respectively. The effect is magnified for the *ltfideTA*. The *ltfideTA* coefficient means that one unit increase in *ltfideTA* will explain 0.1653 units decrease in ROA. These findings are in line with the previous literature. When the amount of debt rises, the cost of it also increases causing deterioration of financial performance of a firm.

When the same analyses are conducted for the pre-crisis and crisis periods, the findings are also illustrated in Table 9. For both periods, the values of Wald test statistic are 12050.7 and 3617.78 respectively and their p values are 0 which means that both models are statistically significant at 1% significance level. The independent variables of both periods are also significant at 1% level except the constant term that is not significant in the crisis period.

Before crisis, *NWCTA* is again significant and affects ROA positively. However, this coefficient became larger during crisis. This can probably be attributed to changing corporate behaviors. Firms that preferred to benefit from the precautionary role of cash holdings on average are among the profitable firms for the crisis period.

The effect of variable *InvTA* on ROA is magnified in the crisis period compared to the pre-crisis period. The crisis coefficient is used to be -0.0532 which was -0.0293 in the pre-crisis period. Good management of inventories has more effect on firm profitability during an economic crisis. The macro data reveals that the consumption decreased in the crisis period and accumulation of excess inventories gives harm to business profitability.

The most significant independent variable in the model continues to be EBITTA in both periods. It positively affects ROA ( $z=93.93$   $p<0.01$ ) and its coefficient (0.9239) indicates a very powerful relationship before crisis. This attribute changed and its coefficient decreased to 0.6644 ( $z=38.17$   $p<0.01$ ) in crisis.

The variables *stfideTA* and *ltfideTA* continue to be negative and significant for both periods. During crisis, the coefficients of *stfideTA* and *ltfideTA* become -0.1127 and -0.1913, respectively. They are used to be -0.0737 and -0.1135 respectively before crisis. It

is obvious that the explanatory power of financial debts in changes of financial performance increased during crisis. Firms highly indebted to banks are probably the ones that suffered most from this economic turmoil. Their interest expenditures are higher, their operating margins are thinner thus they could not save excess cash which has the power to ease the difficulties faced due to crisis.

In summary, liquidity management gains importance in the following periods for the firms that have to bear higher debt costs and having scarce cash resources at first sight. Second, bearing too much inventories also harms profitability if the firm has scarce financial resources in the preceding periods. As the weight of debt becomes smaller in corporate finance, the impact of cash flows is magnified for the financial performance of a firm and vice versa. And, the cash holdings play a precautionary role for the risks caused by debt.

#### **4. Conclusion**

Several researches have been conducted to find out the effects of crises on economy and the real sector. This study focuses on the real effects of the 2008 global economic crisis on Turkish manufacturing sector firms listed in Borsa Istanbul.

When the crisis literature about firms is scrutinized, many articles about Asian crisis can be found. They provide a good reference as they examine firms' financial performance in the pre-crisis, crisis and post-crisis periods. The findings show that the firms with high leverage ratio and high ratio of short-term debt over total debt tend to suffer most in crisis times thus these two ratios are the indicators of financial vulnerability in a sense. The firms with higher cash savings perform better in crisis period than ones with less cash reserves. Whereas the impact of leverage is more pronounced than the cash holding ratio for the post-crisis financial performance. In the Asia, the firms reacted to crisis by decreasing their leverage levels and becoming more conservative in terms of investment. In addition, the analyses provide evidence that the micro story has the power to reveal the macro effects as the decreases in sales and inventories signal GDP contraction for a country.

When the research about the recent 2008 global crisis is examined, the main findings are as follows; CFOs in many countries state that at a higher cash holding level, firms are able to raise more credits thus increase their investment plans by diminishing negative effects of crisis on real-side decisions like capital expenditures, technology and employment spending. This crisis motivates financially constrained firms to hold more cash and to reject to undertake profitable investments due to external finance difficulties. As a result, they prefer to use internal funds as credits became costly and harder to obtain.

In addition to crisis literature, other studies conducted on only debt and cash holding levels of firms underline that cash holdings seem to be a cushion against cash flow fluctuations and leveraged firms invest less and their employment grows slowly thus net debt matters.

In the light of these researches, the financial data of 157 manufacturing firms listed on Borsa Istanbul is analyzed. First, on an aggregate basis, the numbers say that the firms diminished their investments and their inventories eroded significantly. There was a significant increase in short-term financial debt. Their equity was melting down by 1/3 in the first quarter of 2009 due to losses. These financial figures do not catch the pre-crisis levels even in 2011Q3. The total cash holdings by firms doubled on average in crisis period compared to pre-crisis period to feel safer. Only total sales recovered and returned to 2007 level in 2010.

Second, panel data analysis is conducted with GLS technique with same firms to see effects of selected financial variables on firm financial performance. The results underline that working capital and inventory management become important when the firms have high leverage levels and scarce cash reserves. When the weight of internal resources thus cash flows is higher compared to debt, their impact is magnified on ROA and vice versa. Thus, it is obvious that the cash reserves play a precautionary role against the risks of debt.

Today, it can be concluded that profitable firms in the pre-crisis period succeeded to stay again constant during crisis period. Firms with a conservative leverage policy, good liquidity management and high cash reserves performed better in financial terms compared to other firms during this global crisis.

Although the summarized literature gives reference for many study areas to suggest for Turkish firms as the further research, the analysis of the post-crisis period should be at the first place as it will complete this study. Second, the crisis effects can be analyzed for manufacturing sub-sectors that do not have any data constraints.

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