Analyzing the Effects of Financial Crises Experienced In Turkey on the Fiscal Performance of Companies Traded In Borsa Istanbul

Jale Yalınpala Çokgezen
Assistant Professor
Department of Economics
Faculty of Economics
Marmara University
Göztepe Campus, 34722, Kadıköy
Istanbul, Turkey

Serhat Kuşkonmaz
MBA Student
Graduate School of Business
Koç University
Rumelifeneri Yolu, 34450, Sarıyer
Istanbul, Turkey

Abstract

Liberalization in the financial markets and the accelerated capital movement after the 1980s are significant factors which caused Turkey to become sensitive to external shocks. Turkey has confronted four different crises since 1990 and both financial and real sectors of the economy have been affected to a considerable degree. The requirement of a proper crisis and risk management has become unavoidable in order to sustain operations efficiently for the companies operating in countries such as Turkey, which face crises within every decennium. The companies which can manage this process successfully, especially during times of crisis, will not only be able to increase the efficiency with the recovery in the economy but will also decrease the duration of the crisis by minimizing its negative effects. In this article, the effects of financial crises on the fiscal performance (efficiency) of companies traded on Borsa Istanbul were determined using Data Envelopment Analysis and some solutions were offered to the companies with the aim of helping them to improve their efficiency.

Keywords: Financial Crisis, Borsa Istanbul, Turkish Economy, Data Envelopment Analysis

Introduction

Financial crises occur due to various reasons and affect economies significantly. There are many studies on the reasons of such outbreaks which affect the economic sectors in a negative way, and its effects upon other economies. As a consequence of globalisation a crisis that breaks out in one country can have an impact on other countries too. Turkey's economy has become vulnerable against exogenous shocks after 1980 by the reason of liberalisation in financial markets and its weak economic structure. The 1994, 1997-1998, 2000-2001 and 2008 crises experienced since 1990 had a huge impact on Turkish economy. The purpose of this study is to define the effects of those financial crises on financial performance of the companies dealt at Turkish stock market "Borsa Istanbul". With this purpose, firstly, the financial crisis fact has been investigated, it's been dealt with development and types of crises, than, the development of financial crises in Turkey and their effects on macroeconomic variables have been included and finally, the measures taken against negative reflections have been stated. The crisis period performance of 90 companies traded on Borsa Istanbul has been measured by data envelopment analysis method and by this way, the worst affected companies and sectors have been detected.

1. Types of Financial Crises

While financial crises are described as strong and continuous fluctuations of cost and quantity in product, service and foreign exchange markets, we can categorise them as 'real crises' and 'financial crises'.

Real crisis stands for a quantitative shrinking and dullness at critical level, and financial crisis expresses a big financial collapse in markets. Debt problems of banks and nonbank public, plus, no-repayment of loans cause financial difficulties. Types of crisis found in literature are: money/monetary crisis, banking crisis, financial crisis, currency crisis, and foreign debt crisis. The classification may differ from article to article. If we start with crises under the name of financial crises and categorise them then, we can form a category, like, banking crisis, currency crisis, and foreign debt crisis. Banking crisis is then, when banks in the banking system can't cover the depositors' demand for money, when they defer their liabilities, go bankrupt, and when the government prepares bailout packages and nationalisation programs in order to prevent the panic. Currency crisis, on the other hand, is about losing foreign investors' trust because of economic imbalances and pressure on foreign currency, and hence, a flight from the national currency and domestic currency's fall in value. When foreign investor becomes worried about the situation, it leaves the country, which means a depletion of international reserves exposing the country to a crisis. Currency crises may cause depletion at central bank reserves, a huge devaluation and high hike of bank rates. Weakness of financial infrastructure and macroeconomic indicators, moral hazard and asymmetric information, wrong decisions of international finance houses and credit institutions, and contingencies can be seen as determinants of a currency crisis. In case at least one of these determinants emerges, a speculative attack on national currency may trigger a crisis. Flight from domestic currency results in a hike of exchange rates. It's usual for currency crises to cause depletion at central bank reserves, a huge devaluation and high hike of bank rates (Kibritçioğlu, 2001, p. 175-176). If a speculative attack on exchange rates causes devaluation (an intense depreciation), or urges authorities to make use of too much of national reserves in order to stabilise exchange rates and gives rise to high interest rate hike, then it's called foreign exchange crises.

According to a series of theoretic studies, foreign exchange crises and banking crises are involved in an interaction and have devastating effects on economy. There are studies showing that these two crises outbreak together, as well as other researches claiming that the two have different grounds. To an alternative opinion, financial crises are a result of balance of payments problems. Instability of the financial sector creates really big real shocks. Depleted international reserves cause a credit crunch and hence, bank failures and financial crises come to surface. If it's then not possible to sanitise the depletion of reserves, it ends in speculative attacks on foreign currency, bank failures and high interest rates, and at the end, the central bank responds with an intervention in order to preserve the parity. If the banks have debts in foreign currency, under these circumstances that weakens the banking sector. Currency crises are usually resolved by means of devaluating the domestic currency and the fluctuating exchange rates; the central bank fights the speculative attacks with monetary tightening and foreign exchange market intervention. This situation reflects itself with fluctuation at cash market, with rise and discrimination at national interest rates and with depletion at foreign exchange reserves. On the other hand, some arguments put an inverse relation forward, which is that, a problem at the financial sector might produce a balance of payment crisis. The central bank finances the troubled financial institutions and loses its ability to keep the effective exchange guarantee. If it does that financing by issuing money, markets would be in expectation of monetisation in the next term and the crisis would repeat itself. Foreign exchange attacks happen and they put the already idle financial system in an even more difficult position (Kaminsky et al., 1996, p. 1-4).
Foreign debt crisis, on the other hand, is described as the situation of a country where the private sector as well as the public sector can't pay back their foreign borrowings. Due to the short-term borrowing pattern and inability of covering debts with available reserves because of the financial imbalance, this type of crisis happens.

In parallel with economic progress the integration of international financial markets has improved too and this situation has changed the character of recent crises. Spreading effects and interaction of crises have become very dramatic. Even in crises of various grades it's possible to observe similar effects. Currency crisis can outbreak at the same time with banking and debt crises (like in the most recent crisis in Asia and 1994-1995 crisis in Mexico). There is another example of crisis situation where the banking crisis appeared before currency crisis(especially in developing countries such as Turkey and Venezuela in mid-1990s). In addition to this, there is a case where the banking crisis appeared before debt crisis (in Argentina and Chile in 1981-1982), moreover, just as the opposite of that situation, the flight of external financing created a banking crisis (Columbia, Mexico, Peru and Uruguay). Lately, crises starting as currency crises in some eastern Asian countries brought banking and debt crises with it (Indonesia). A crisis, that takes form according to a not-fully-developed financial sector, a vulnerable banking sector, confidence loss in exchange rates and speculative attacks, worsens the problems of foreign debts and banking. (It was the most significant characteristic of crises in Eastern Asia.) (Aziz et al., 2000, p.6)

In order to take inflation under control, the developing economies tried to perform a stabilisation policy based on fixed exchange rate, but the short-term capital inflow occurred parallel to the developing of financial liberalisation caused domestic currency depreciation, and in the end it led to increased exports, problems at balance of payments and depletion of reserves. First of the models built to analyse these financial crises are the first generation models. The first generation models (traditional theory on monetary crisis) had been built by Krugman (1979), and Flood and Garber (1984) (speculative attack models). They underline the basic economic facts which lead to a crisis, and highlight the fact that the paradoxes at national economy policy are the source. Mentioned paradoxes appear in the form of financing deficits by means of continued monetising and keeping a fixed exchange rate. As long as the central bank has enough forex, the paradoxes can be ignored, but when the national reserves fall down to a critical level and are perceived by the markets as "short", then speculative attacks on foreign exchange get going and the tainting macro indicators begin to be interpreted as premises of a crises, such as: growing budget deficits, high rate increases of monetary growth, high inflation, excessive value of foreign exchange rates, high current account and trade deficits, sharp drops of international reserves and escalating national interest rates. Macroeconomic factors, in particular credit booms, had played a critical role in the opening of security gaps in financial sectors in many Latin American countries and in other emerging market economies (Aziz et al., 2000, p. 8-9). Crises of Mexico (1073-1982) and Argentina (1978-1981) led the drive for studies on crises.

Though it was not possible to explain the 1992-1993 European Monetary System and 1994-1995 Latin American crises with the first generation models, it became inevitable to establish new theories, and these theories have been called second generation models. According to Obstfeld's theory (1986 and 1994), there has to be contradictions between governments' alternative policies and purposes. Governments face with two choices: either quitting or supporting the fixed rate system. While the economic units keep the belief of being able to walk out on fixed rate system, despite of this uncertainty in the politics, supporting the fixed exchange rate system increases the costs and the foreign exchange market faces some self-feeding expectations. If the investors expect the fixed system to be left, they may apply pressure on the government. In the event that a considerable amount of investors withdraw their funds from the country, this forces the government to quit the fixed system, and, even if the investors put trust in the government, they may withdraw their funds because of risk losses resulted from devaluation (Aziz et al., 2000, p. 9). The probability that the expectations would cause devaluation is a ground for crisis. The difference between these two models lies behind that whether the crises are random or not. While the first generation models see the worsening macroeconomic indicators like foreign currency reserves as premises of a crisis, the reason of the crisis from the viewpoint of the second generation models is rather the influence of unexpected development over expectations (Yay et al., 2004, p.101). The second generation models emphasise the multiple equilibria generated by the multiple solutions which took form as a result of a non-linear behaviour of one or more economic units and especially the government – the interaction between the investors' expectations and results of the policies leads to self-feeding crises. According to the second generation models, crises arise as the herd behaviour becomes prevalent and fund directors without any reliable information similarize their portfolios in order to increase performance (Hacıhasanoğlu, 2005, p. 12-13). According to these models again, crises have a contagion effect – crisis in a country can trigger crises in other countries. A financial contagion takes place through trade and financial connections between countries and leads to similarities on macroeconomic basis.

When one of the countries which have any connection through trade devaluate, others will be forced to do the same in order to watch the price competition. In a similar way, when the markets are interdependent, liquidity insolvency forces the investors to liquidate their assets in other markets (Goldfajn et al., 1997, p. 10). Other studies on crises argue that reasons for crises especially in developing countries are external factors, and that the behaviour of terms of trade, interest rates and exchange rates is a fact which triggers a crises because of the integration of capital markets (monsoonal effect) (Yay et al., 2007, p. 347). Rising interest rates in developing countries do not only push the funding costs up for banks and companies but increase the adverse selection moral hazard issues and financial vulnerability at the same time (Aziz et al., 2000, p. 10-11). The third generation monetary crisis models have been developed after the Asian crisis in 1997, as it was not possible to analyse and explain them with the then-existing models. There where the economies allow capital flows freely, excessive borrowing happens through the government guarantee given to the banks and companies, but, because the government fails to control financial units moral hazard and asymmetric information issues come to surface and creates vulnerability.

Borrowed capital is put in non-profitable investments, on the other hand, an exogenous shock occurs, and then, as a consequence of these, growing loss, nonperforming loans, bank failures and capital flight would become facts (Erkekoğlu et al., 2005, p. 18).

2. Financial Crises in Turkey

2.1. Crisis in Latin American and Turkish Economies – 1994

Short-term international funds had played a significant role during the crises in Turkey, Mexico, Latin America and Asia. Latin American countries are vulnerable against crises and experience rough crises periodically. The Latin crisis seen in the first half of the 1980's was an external debt crisis – they were not able to discharge and so shook the international financial system up. The growth strategy of the countries in this group was actually based on huge amount of borrowings from foreign banks, and the constant rise of interest rates brought them to a point where it was not possible to pay the debts any more (Göktaş, 2000, p. 70-71). Specifically in Mexico the main reasons of the crisis were that the national currency (Pezo) was kept excessively valuable compared to foreign currencies, there was current accounts deficit, short-termed foreign capital inflows were growing, national savings ratio was low and efficiency of national investments were decreasing. The crisis rose in 1994 as government devaluated the Pezo, and since the foreign investors had trust in an excessively valuable domestic currency policy, under these circumstances they immediately steered from Pezo for foreign currencies. Even though the central bank sold Dollar to intervene, it brought no success because the reserves were depleted. In that period of time, Mexico was implementing the orthodox economy policies which were including the resolving of budget deficits, the liberating of trade at international level and carrying out a tight monetary policy. Neither in Mexico nor in Latin America the implemented fixed rate exchange system brought success. A strong monetary and fiscal policy was not possible. The contagion effect of Mexican crisis called "tequila effect" was hindered with the help of the credit channels of the USA and IMF (similar cases seen also in Brazil and Argentina) (Alp, 2000, p. 234-242).

The 1994-crisis of Turkey was a fiscal crisis and affected the stock market as well as the currency markets. Main reasons of it were the keeping of interest high in order to support capital inflow and its negative effect on current account deficit, constant intervention of the central bank in exchanges causing the Turkish Lira to over valuate, the rising wages, public debts' rise due to domestic borrowing and pricing strategy for the sake of elections, abusing the central bank for short term financing of treasury, giving weight to domestic borrowing in order to finance the rising foreign trade public debts (isolating the private sector) and as a result of that hiking overnight interest rates and increase in foreign exchange liabilities of banks (worsening foreign exchange short position) in consequence of foreign borrowing. Seeing banks and stockbrokers inside the financial system under the threat of bankruptcy showed that these institutions were not able to function efficiently. The 1994-crisis, shortly after its outbreak, affected the reel sector too and due to devaluation, companies with foreign exchange liabilities went bankrupt. With the help of economic measures taken on 5th of April 1994, Turkey tried to provide stability again. In accordance with this package, exchange rate adjustment was left to market conditions and short term advance rates given to the treasury were decreased. It was aimed to bring the inflation rates down, to revalorise the TL and to re-equilibrate the balance in public sector.

2.2. Crises of 1997 in Southeast Asia and 1998 in Russia and Turkey

The crisis breaking out in Thailand at the end of 1997 and influencing Indonesia, Malaysia, The Philippines and South Korea affected then also Japan. It began in fiscal sector but then turned into a crisis with effects on other sectors too. With the increasing exchange rates depreciation occurred in related economies. Similarly, a serious reduction of value came to existence in the stock market. It wouldn't be wrong to assert that the Asian crisis broke out because of internal as well as external reasons. The inefficiency of aforementioned countries' financial markets in a free market and lack of full and exact information in markets were given internal reasons, while external reason was indicated as the continued funds transferring made by international finance institutions despite the fact that they were conscious of the general economic situation in the region. In previous years, the funds being transferred to these countries had transformed from long term and direct investments to short term funds (hot money). As long as the fixed rate system was being implemented there had been an over valuated domestic currency, but then, the start of speculative behaviours set a sharp depreciation in motion. In aforementioned countries the banks were predominant in the financial system, and the states banks were predominant between the banks.

Because it was restricted to access the financial system, it led the banks to operate ineffectively; while account owners could save their funds in the banks in lower interest rates, investors began to acquire their funds for higher costs. Banking sector canalised the funds that it received from abroad to fields with long terms and low value of returns such as consumption and real estate instead of investment, and (as a result of the fact that the banks were moving away from risk management and efficiency) non-performing loans became an issue. In the end, all the banks in short position lost their capital (Alp, 2000, p. 242-247). Then, Southeast Asian crisis began to affect Russia negatively. As the crisis in Asia turned into a recession and demand for oil decreased, it caused the prices to decline. Russia with significant oil revenues began to lose an important source of finance and therefore had to go deeper into debt. At the point where it started to have difficulty in repayment, Russia announced that it was not able to support Ruble anymore and declared moratorium. Afterwards came recession, depletion of reserves and hyperinflation. These crises affected the economy of Turkey in a negative way too. They firstly had an influence on stock exchange and led the shares to lose value in exchange.

The government decreased the interest rates of domestic government bonds to resist. During the crisis in Russia, Turkey had capital outflows and reserve depletions. Parallel to the deceleration of the growth rate, also fixed capital investments declined (items of demand out of public current expenditure and hike of production rate in industry sector were reduced). As a consequence of financing government deficits by means of capital market, volume of capital market grew. As the demand for public fund followed a high course in comparison with the extent of financial markets, real interest rates increased considerably (approximately 50%) and terms shortened. The effects of the crisis were strong because of being obliged to use almost only domestic sources in need of borrowing due to lack of external credit facilities, being unable to perform structural and financial reforms and growing uncertainty/insecurity. After deepening of crisis Turkey made tax reform, signed a new stand-by agreement with IMF and brought a program into force to fight inflation in 2000. Here's the main frame of this program:

- Decreasing the rate of inflation since it takes its source from structural reasons (inflation shook the confidence in TL and caused high real interest, and this, in turn, hindered the public finance policy with a negative budget balance).
- Reforming the foreign exchange rate and monetary policies (during the program following two different exchange rate policies, then upon a gradually widening band switching to a more flexible policy).
- Having a surplus in primary balance, quickly privatising in order to reduce the public debt.
- Making structural reforms on social security, tax and agriculture.

2.3. Crisis in Turkey: November 2000 – February 2001

The defects of the plan which was made in 2000 to suppress the problems caused by the crises in prior period were these: the plan was based on a predetermined exchange rate and inflation and was open to speculative influences. The profit formed by the difference between the rises in exchange value and the interest rate offered for TL under the influence of high real interest rates, offers an arbitrage profit to those who were there for a speculative profit. TL, being over valuated as a result of the fixed exchange rate system, caused current deficits in November, and due to the flash request of foreign investors for foreign currency, the interest rates rose. Parallel to the speculative behaviour banks' urge to cover the shorts stimulated the demand for TL - it hiked the domestic interest rates and increased the risk for banks which possessed treasury stocks.

At the end of those developments a huge capital outflow occurred in November and the current accounts deficit grew large in no small measure. And during the crisis of February 2001 the banks which had been already having difficulty in competing before the crisis, had serious problems due to bad management – weak financial structure, maturity period, domestic loan costs and distributions, banks' short positions, these all deepened the vulnerability of their financial structure. Besides, transferring the debts of public banks to the public caused a pressure on markets. On the other hand, because the central bank was offering its TL liquidity facilities under control in order to keep its foreign exchange reserves, the banks demanding forex had to back down due to lack of liquidity. In the meantime, as a result of being unable to establish trust in the markets the central bank had to sell foreign exchange. Then it was obvious that it was impossible to keep the actual exchange system under those circumstances and was time to change over to forex fixing in/by market.

Reasons of November and February Crises:

- Big government deficits and closing of them with vicious circle of borrowing – short termed and high rated borrowings.
- Banks financing the public hence leading external borrowing to escalate and ineffective operating modes.
- Overvaluation of real foreign exchange rate and growing of current account deficit as a consequence of fixed exchange rate system, a huge amount of capital outflow due to expectation of devaluation, being unable to pay debts in foreign currency because of hiking foreign currency.

2.4. Financial Crisis of 2007-2008 and Turkey

The crisis which had started to develop in 2007 and made itself evident first in the USA and then in the others in 2008, became a global crisis with snowballing effects. The first effects of the crisis that began because of unregulated housing credits came to the surface in February of 2007 and gained power by the August of the same year. When the share prices started to be at premium rapidly together with the internet and technology boom in 1999, the American central bank FED hiked the interest rates in 2000 considering the inflationary effects of that. As a consequence, the stock market crashed and an effect that led the economy to a recession appeared. What FED should do was to reduce the interest rates and build a new mechanism which would lend wings to consumption expenditure with a wealth effect, immediately. What should be done was to invigorate the US economy by generous and cheap housing credit facilities. With the help of some other facilities like tax incentive, housing demand was hiked, house prices rose, people, whose houses gained value, began to use more credit. The mechanism to be used to transform these credit pools and make them ready to be sold to other investors was not a new mechanism and called "securitisation" (Özel, 2008, p. 28-35). Banks crediting the clients with a high ability to pay (prime mortgage), in the course of time, began to provide loan for persons with a lower ability to pay (sub-prime).

The US banks transformed these credits given to persons without an ability to pay into bonds and sold them to either each other or European banks. But as soon as the real estate prices in the USA went down, value of those papers became a question of debate. For the collateral surety of those housing loans sold as bonds was the houses mortgaged against credit, and as the house prices fell, it was not enough to pay the real estate and the papers lost in value. As the commodity prices fell too, because of the facts like the wealth built on that and futures positions, deficiencies began to happen. The crux of the problem was, on the one hand, the acceleration of the consumption flow due to exaggerated house prices, on the other hand, the rising of collateralised and mortgaged sums between the years 1995-2006. When the housing bubble was over, it left all economies, in the first the US American economy upside down behind (Gürsoy, 2009, p. 191-195). The credit rating of the investment instruments based on risky housing loans and of the financial institutions investing on them was lowered, and that meant a loss in value for investments as well as the companies, so it became harder to turn the product into cash and markets happened to have a liquidity problem. The crisis which affected the whole credit market took effect firs in the investment banks – some went bankrupt some were saved by bailout (Ünal et al., 2009, p. 5-6). On the USA-born crisis the burst of the housing bubble played a significant role. Financial system collapsed and this affected the real economy negatively. In general, the factor that punctures the systemic risk increasing bubbles is the rise in the internal and external interest rates.

When the interest rates rise, banks try to reflect that to its clients, housing bubble blows out, disinvestment begins, growth rate decelerates, and in addition to those, growth at asymmetric information and adverse selection problems appears to be an aggravating element. Generally speaking, sign for a systematic risk is a financial system crisis through a downtick at asset prices and economic activities. Sudden loss of liquidity due to fluctuating money behaviours comes along with that. As a result of these shocks markets' risk-return expectations change. Because of recessions, that caused diminish in economic growth, and debt restructuring led to new costs. Countries took measures and tried to prevent the crisis from affecting their whole economies, for effect-level of the crisis is directly proportionate to its cost. When we take a brief look at the measures being taken, we see that liquidity support was given and that it was aimed to relieve the markets with the help of interest rate cut. However, thinking that these types of measures wouldn't help much to solve recession, policies recommending the intervention on the economy by fiscal policy were emphasized (Sönmezler et al., 2009, p. 130-135). Since the global crisis made itself evident first in the USA and First World, those have been the countries which took steps against it.

And those steps in general were (Sönmezler, 2009, p. 92): providing markets with liquidity, reducing interest rates according to the imputed short-term interest rates, supporting monetary policy with fiscal policies like tax concession and subsidising financial sector or real economy institutions in a difficult situation. Global crisis had a bad influence on Turkish economy too. Because of liquidity excess, private sector had taken a high amount of loan in foreign currency –with the crisis, high risk became a main topic. Private sector was caught in a very disadvantaged position with high external debts as well as short term payment obligations. Thanks to structural adjustments of 2001 the banks had gained a stronger financial structure (a strong capital structure, high quality assets, high profitability y ratios etc.), but the crisis affected the process negatively by making it almost impossible to get cheap credit from abroad and difficult to borrow at home (Sönmezler et al., 2009, p. 137-140). Thanks to the fact that the banks were without risky investments and in a strong position at capital adequacy ratio, the banking sector's strength against crisis had reinforcement. Turkish economy began to see the effects of the global crisis from the second half of 2008.

Decrease in foreign demand had an impact upon decrease in growth rate. Industrial production experienced critical decreases and in 2009 recession burst. Likewise, also the capacity utilisation ratio of manufacturing industry was on the decrease. Shrinkage at industrial production had a negative influence on the growth. The real sector and consumer confidence indexes which show how the crisis affected the expectations and the environment of trust declined too. The global crisis also influenced the Turkish labour market, and the unemployment rate increased. Unemployment being constantly in rise demonstrates that the unemployment is a chronic and structural issue in Turkey, and the crisis made it only worse. Decrease in demand in the world pulled the export down as well, and caused a current account deficit problem. Recessions in the EU countries had a greater impact upon Turkey's foreign trade rather than the USA, because their share in the foreign trade of Turkey is larger. Decrease in foreign demand also caused an import reduction at intermediate goods used in manufacturing and so an overall import reduction. The inflation rate became higher due to increasing merchandise and oil prices. Later, as the oil prices went down, inflation rate reduced too.

Effects of financial crises on financial deepening indicators are shown in Table 1:

Table 1: Financial Deepening Indicators

Years	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
M2/GDP[1]	27,8	25,2	31,6	32,2	36,6	37,1	28,8	39,1	34,5	45,5
Domestic Credits/GDP[1]	24,9	26,4	25,6	27,8	34,1	34,6	27,5	36,8	37,9	52,9
Bank Deposit/GDP[1]	19,4	17,9	19,8	21,5	24,4	25,5	20,5	26,5	28,2	32,1
Growth[1]	5,0	7,7	-4,7	7,9	7,4	7,6	2,3	-3,4	6,8	-5,7
Real Interest Rates[1]	3,8	9,5	10,8	-11,2	12,5	15,9	4,8	-23,8	-17,4	14,1
US$ Foreign Exchange Rates[2]	0,001	0,011	0,029	0,045	0,081	0,152	0,262	0,422	0,626	1,231
Portfolio Investments[3]	2,4	3,9	1,2	0,2	0,6	1,6	-6,7	3,4	1,0	-4,5
PSBR/GDP[1]	8,0	8,0	5,0	4,0	7,0	6,0	7,0	12,0	9,0	12,0
ReserveAssets[3]	-1,5	-0,3	-0,2	-4,7	-4,5	-3,3	-0,4	-5,2	3,0	12,9
Years	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
M2/GDP[1]	39,9	35,2	34,6	40,5	42,3	43,8	48,6	54,6	56,1	54,9
Domestic Credits/GDP[1]	47,5	42,8	41,4	45,6	45,8	49,3	52,5	63,0	69,6	69,4
Bank Deposit/GDP[1]	33,7	31,8	29,4	32,5	35,6	37,9	41,2	42,1	45,4	44,7
Growth[1]	6,2	5,3	9,4	8,4	6,9	4,7	0,7	-4,8	9,2	8,8
Real Interest Rates[1]	-8,4	-3,1	5,6	11,9	15,1	11,4	16,5	7,1	5,5	5,4
US$ Foreign Exchange Rates[2]	1,513	1,500	1,429	1,347	1,438	1,307	1,299	1,554	1,507	1,678
Portfolio Investmenst[3]	-0,6	2,5	8,0	13,4	7,4	0,8	-5,0	0,2	16,1	22,0
PSBR/GDP[1]	10,0	7,0	4,0	0,0	-2,0	0,0	2,0	5,0	2,0	0,0
Reserve Assets[3]	0,2	-4,1	-4,3	-23,2	-10,6	-12,0	2,8	-0,8	-15,0	-1,0

Source: GönülYüce, MerterAkıncı, Ömer Yılmaz, "Before and After 2002 in the Economy of Turkey within the Context of Main Economic and Financial Indicators", Ministry of Finance, Fiscal Administration Magazine, January – June, 2013, vol: 164, p.183-207. Numbers on growth: The World Bank

1 stands for: percent values, 2: TL values, 3: billion Dollar values.

3. *Data Envelopment Analysis and an Implementation on the Companies Traded on Borsa Istanbul*

3.1 Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a non-parametric method developed due to the inefficiency of parametric methods such as ratio analysis and regression analysis in multi-dimensional analysis where there are multiple inputs and outputs. As a mathematical programming-based technique, DEA follows the way defined below while measuring the efficiency (Baysal et al., 2004, p.438):

i) Within the observation set, "the best" observation generating the maximum output with the minimum input combination is determined.

ii) This frontier is accepted as the "reference" and the distance of inefficient Decision Making Units (DMUs) to that frontier is measured "radially".

In parametric methods, production functions of the decision making units measured for efficiency are said to have an analytic structure; whereas in non-parametric methods, production function is not foreseen to have any analytic structure. Therefore, these methods provide the opportunity to have a highly flexible structure compared to other methods (Akan et al., 2011. p.14). DEA, which measures efficiency by means of rating mathematically weighted total outputs to still mathematically weighted total inputs, is preferred in situations when inputs and outputs of the decision making units with multiple input and multiple output sets cannot be combined in an objective efficiency index (Altan: 2010, ps.190). In the logic of Data Envelopment Analysis, the units with 100% (or 1) efficiency level are assessed as efficient units, the units ranking below 100% (or 1), on the other hand are evaluated as inefficient units. In the analysis, basic efficiency criterion is the ratio of weighted total outputs to weighted total inputs. Efficiency criterion of any decision point (j. decision point) is defined as in the formula given below (Yavuz et al., 2013, p.159):

$$\frac{u_1y_1 + u_2y_2 + \cdots + u_ny_n}{v_1x_1 + v_2x_2 + \cdots + v_mx_m}$$

In the formula above, there are n number of outputs and m number of inputs for j. decision point.

u_n : n. weight of output y_n : n. amount of output

v_m : m. weight of input x_m : m. amount of input

While performing an analysis through the model in point, it is required to select the most suitable one for the analysis among input oriented or output oriented models. If the purpose is to minimize the input amount at a particular output level, it would be the right decision to choose input oriented models; if the object is to maximize the output amount at a particular input level, then output oriented models should be chosen. The constraint in DEA resolution is the requirement that all Decision Making Units included in the analysis have to be above the predetermined efficient frontier or below that frontier. Accordingly, efficient units take the value of "1" while inefficient units take a value smaller than 1. The difference between 1 and efficiency value (1- Efficiency Value), shows that same output level can be obtained with less input amount at the rate of calculated difference (Seyrek et al., 2010, p.70). After the efficiency values of all decision making units are calculated, potential optimization values are found in order to enhance the performance of inefficient units. At the next stage, an overall evaluation is held considering all input and output levels for each decision unit and suggestions are offered so as to reach the efficient frontier (Altan, 2010, p.193). Data Envelopment Analysis can be applied to numerous different fields from public sector to private sector, from finance to real sector. First implementations of the analysis were performed on the non-profit organizations and further to its successful results and popularity its utilization became prevalent and it came into use on the profit-oriented corporations as well. Among the usage areas of the analysis, municipalities, local administrations, military units, hospitals, education institutions, hotels, banks, and airports can be cited (İlkay et al., 2009, p.195-196). The method provides an opportunity to conduct strategic analysis for decision making units and ability to compare (benchmarking) with other units, besides it contributes to supporting continuous improvement (Soba et al., 2012, p.261).

DEA can be used successfully in the fields stated below (Yoluk, 2010, p.44-45):

i) Construction of equal groups for inefficient units using efficient units

ii) Assignment of efficient working applications

iii) Setting the targets for input and output levels

iv) Formulating efficient strategies for units

v) Monitoring the variations of activities over time

vi) Determination of the direction where the resources should be transferred to

3.2 Data Envelopment Analysis Models

As Charnes-Cooper-Rhodes (CCR) Model and Banker-Charnes-Cooper (BCC) Model are two basic models of Data Envelopment Analysis method, there are two other models that take place in literature, which are Additive and Multiplicative models. CCR and BCC models come up in two different groups as "input oriented" and "output oriented". Input oriented DEA models study for determining the most suitable input combination in order to ensure the most effective production of a particular output combination. On the other hand, output oriented DEA models investigate the maximum number of output combinations that can be derived by using a particular input combination (Altan, 2010, p.190). Obtaining results without input and/or output orientation is the most important difference that differentiates the Additive Model based on the hypothesis of variable returns to scale, from other models. Estimated resolution area created by Decision Making Units generates a convex form and this form surrounds the datum points more tightly than the conical shaped envelop made under the hypothesis of constant returns to scale (Yavuz et al., 2013, p.162). Multiplicative Model is obtained through taking inverse logarithm of the Additive Model. Although this model is not used very frequently in practice, it might provide an advantage toward the extension of potential usage areas of Data Envelopment Analysis (Banker et al., 2004, p.357). The model does not restrain the efficient frontier into concaveness; on the contrary, it allows them to exist both in concave and non-concave areas (LaPlante, 2012, p.30).

4. Measuring Efficiency of the Companies Traded on Borsa Istanbul During Financial Crisis Periods

4.1 Model Setup

For the measurement of company efficiency levels in crisis periods, an output oriented CCR Model was used under the hypothesis of constant returns to scale. Mathematical formula of the model is described as follows (Yavuz et al., 2013, p.159):

$$Enkg_j = \sum_{i=1}^{m} v_i x_i$$

$$\sum_{r=1}^{n} u_r y_r = 1$$

$$-\sum_{r=1}^{n} u_r y_r + \sum_{i=1}^{m} v_i x_i \geq 0$$

$$u_r, v_i \geq 0$$

Established for the calculation of efficiency values of Decision Making Units, the model was resolved with the assistance of the EMS software version 1.3 (Efficiency Measurement System) that is frequently used in the implementations of Data Envelopment Analysis. Data Envelopment Analysis was used for the efficiency measurement on 90 industrial corporations and 16 sectors listed on Borsa Istanbul and operating in Turkey where 4 financial crises occurred in a 23 years period covering between 1991 and 2013. Number of the companies included in the analysis and respective activity sectors are presented in Table 1:

Table 2: Sectors and Number of Companies Included in the Analysis

Sectors*	**Number of Companies**
Information Technology	2
Textile, Wearing Apparel and Leather	7
Real Estate Activities	1
Food, Beverage and Tobacco	8
Holdings and Investment Companies	1
Construction and Public Works	1
Paper and Paper Products, Printing and Publishing	7
Chemicals, Petroleum Rubber and Plastic Products	15
Restaurants and Hotels	4
Basic Metal Industries	8
Fabricated Metal Products, Machinery and Equipment	12
Wood Products Including Furniture	1
Consumer Trade	2
Non-Metallic Mineral Products	18
Wholesale Trade	1
Transportation	2
Total	**90**

*Depends on Borsa Istanbul sector classification.

4.2 Selection of Decision Making Units

Since the analysis was performed based upon the annual data for the period covering the years between 1991 – 2013, and in order that the data is continuous, Decision Making Units were selected from the companies listed on Borsa Istanbul for all the years covering 1991 – 2013 period, and the companies which started to be traded in the stock market after 1991 were not included in the study. At the stage of composing the input and output sets, the companies with a data set that might have affected the significance of the analysis result in a negative way were excluded from the study.

4.3 Identification of Input and Output Sets

The data set composing the input set describes the resources that companies apply for with the purpose of performing their production activities, while the data set composing the output set focuses on the surplus value, in other words profitability, which companies create as the result of their production activities. In this regard, the data set used for the input and output variables is presented in Table 2.

Table 3: Input and Output Variables Used in the Analysis

Input Variables	**Output Variables**
I1: Current Ratio (Current Assets / Short Term Liabilities)	O1: Net Profit Margin (Net Profit / Net Sales)
I2: Financial Leverage Ratio (Total Liabilities / Total Assets)	O2: Asset Turnover (Net Sales / Total Assets)
I3: Ratio of Shareholder's Equity to Net Assets (Shareholder's Equity / Net Assets)	

In Data Envelopment Analysis, usage of multiple input and output variables makes it difficult for efficient and inefficient units to dissociate from each other. For this reason, the number of input variables is limited to 3; the number of output variables is limited to 2. It is seen that the relationship between the DMU number of the implementation and the numbers of input and output variables provide the conditions of $(n + 1) > (m + s)$ (n: the number of Decision Making Units, m: the number of input variables, s: the number of output variables), $n \geq 2\ (m + s)$ and $(n \div 3) > (m + s)$, which are thought to be the most suitable in order for DEA to give a significant result:

n: 90 m: 3 s: 2

- ✓ For $(n + 1) > (m + s)$ condition, $90 + 1 > 3 + 2$
- ✓ For $n \geq 2\ (m + s)$ condition, $90 \geq 2\ (3 + 2)$
- ✓ For $(n \div 3) > (m + s)$ condition, $90 \div 3 > (3 + 2)$

4.4 Findings

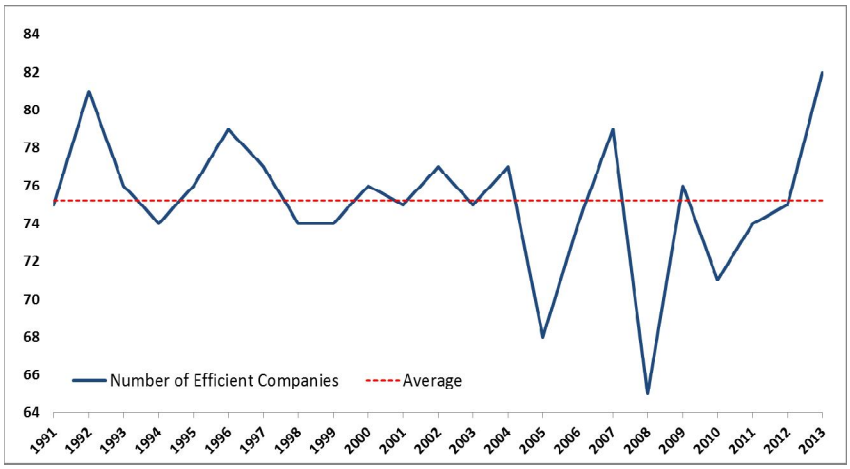
When efficient company counts given in Table 4 are examined for the crisis encountered in Turkey after 1990, it is seen that 82% of the companies in total operated effectively in 1994 and 1998 crises, as for 2008 crisis that rate retreated down to the level of 72%. It is understood that, within the analyzed period of 23 years, 2008 global crisis was the one which had the maximum negative impact on the efficiency of the companies operating in Turkey.

Table 4: Number of Efficient and Inefficient Companies by Years

	Number of Efficient Companies	Number of Inefficient Companies
1991	75	15
1992	81	9
1993	76	14
1994	74	16
1995	76	14
1996	79	11
1997	77	13
1998	74	16
1999	74	16
2000	76	14
2001	75	15
2002	77	13
2003	75	15
2004	77	13
2005	68	22
2006	74	16
2007	79	11
2008	65	25
2009	76	14
2010	71	19
2011	74	16
2012	75	15
2013	82	8

Reviewing the analysis results of 90 companies for 23 years, the average of the efficient company numbers occurs as 75.2. Looking especially at the efficient company counts in 1994, 1998, 2001 and 2008 during times of crisis in Diagram 1, it appears that as a common thread the number of efficient companies in these years were below the average; on the other hand, in post-crisis years efficient companies increased in number upon the recovery companies had.

Diagram 1: Number of Efficient Companies by Years



4.5 Conclusion, Evaluation and Recommendations

In Turkey which has became a more crisis sensitive country in conjunction with the financial liberalization, the Mortgage crisis which arose initially in the USA in 2008 and later on spread to the whole world in a short time was the crisis that cost the companies the largest loss of efficiency among 4 different crises experienced after 1990. In this period, 25 of 90 analyzed companies could not conduct their activities effectively and 12 of 16 sectors experienced loss of efficiency. Since the European Union, the biggest trade partner of Turkey, was affected by the crisis dramatically, it led to the situation that the export sent to that region by the export firms in Turkey decreased significantly. In addition to the shrinking foreign demand, global uncertainty and precautionary attitude negatively affected the domestic demand as well. While companies were having difficulties both in outsourcing and in domestic funding, they also began to face sales and collection problems. As the number of efficient companies declined to 65 and the percentage of efficient companies drew back to 72% in the crisis year 2008, it shows that the companies could not succeed in crisis management and they need to develop new strategies for the possible crises which might occur in the future. Looking at the sectors most affected by 1994 crisis, it is seen that restaurant and hotel services took place on the top, which was followed by transportation ranking number two.

Among the most affected sectors, chemicals, petroleum rubber and plastic products ranked number three. Fabricated metal products, machinery and equipment sector was the most negatively affected sector in 1998 crisis, and it was followed by chemicals, petroleum, rubber and plastic products sector, and restaurant and hotel services, respectively. Sorting the sectors most negatively affected by 2001 crisis, restaurant and hotel services ranked first again, while chemicals, petroleum, rubber and plastic products sector ranked number two, and real estate activities ranked number three. In the global crisis encountered in 2008, construction and public works was the most affected area of activity, while consumer trade and wholesale trade ranked number two and number three, respectively. Taking into account the respective internal dynamics, progresses and affects of crises, it appears that the most affected sectors in negative sense differ from crisis to crisis. However, it was confirmed that, in 3 out of 4 crises encountered, the most affected sectors common in three crises were “Chemicals, Petroleum, Rubber and Plastic Products” and “Restaurants and Hotels”. It was observed that, following these two sectors, the most affected sectors common in 2 out of the 4 crises were “Transportation”, “Consumer Trade” and “Wholesale Trade”. The companies which borrowed money at a low interest rate and wanted to take advantage of the financial leverage in order to expand in times when economy was steady, had losses of their profitability thus of their efficiency under the heavy burden brought by credit costs and financial expenses that increase during times of crisis. Moreover, the companies which took a loan in foreign currency and the companies in import-export business were exposed to high level of exchange risk as the result of open foreign currency positions in their balance sheets.

It is an inevitable necessity for the companies operating in countries like Turkey which face a crisis every decennium, to perform crisis and risk management successfully in order to be able to maintain their efficiency. That requirement emerging both in operational and in financial areas urge companies to monitor and analyze general economic conjuncture and sector dynamics, and develop new strategies so that they can position themselves correctly in the industry in comparison to their competitors. The companies which can manage this process especially during crisis periods will be able to maximize their productivity levels with the recovery of economic activity as they get over the period by minimizing the negative effects of the crisis. It is recommended to companies to take precautions in the matters given below in order to be able to carry out their activities in a more efficient manner, when considering financial risk and exchange risk as well as sales-collection problems caused by demand weakness in shrinking market conditions during crisis periods:

- ✓ Developing new strategies in the fields of crisis and risk management
- ✓ Hedging* the company against currency risk through alternative investment instruments

* In finance, known as a protection method against risks in futures market, the definition of a hedging transaction is that a buyer or a seller ensures protection by means of having position in advance against price fluctuations in future. This method is employed especially by the companies that engage in foreign trade. Due to the creation of an exchange rate risk on the date of export and import deals, future price fluctuations are hedged from that day forth by means of using some instruments on the same day, such as forward exchange (forward), foreign exchange futures (futures), foreign exchange purchase-sale options or foreign exchange swap.

- ✓ Funding the company via alternative ways such as bond issuance, issuance of shares or equity financing (public offering) in addition to bank credit
- ✓ Keeping up-to-date with general economic conjuncture on global and national basis and developing alternative scenarios about their potential impacts on the company
- ✓ Positioning the company in its sector correctly by consistently following and analyzing the competitors in the industry the company operates
- ✓ Following up Key Performance Indicators (KPI) of the company and the sector periodically and generating suggestions for improvement in case of receiving negative signals
- ✓ Maximizing the productivity by constant improvement of services and goods within the scope of "Total Quality Management" in order to gain an advantage over their competitors

References

Akan, Y. and Çalmaşur G. (2011). A Comparison of Data Envelopment Analysis and Stochastic Frontier Approach Methods for the Measurement of Efficiency (An Implementation on the Tra1 Sub Region). Atatürk University of Economics and Administrative Sciences Magazine, 10. Econometrics and Statistics Symposium, Special Issue, p.14.

Alp, A. (2000). Internationalization of Finance. Yapı Kredi Publications, Istanbul.

Altan, M. S. (2010). Efficiency in Turkish Insurance Sector: An Implementation Using Data Envelopment Analysis Method. Gazi University, Faculty of Economics and Administrative Sciences Magazine, 12/1, p.190.

Aziz, J., Francesco, C. and Ranil S. (2000). Currency Crises: In Search of Common Elements, IMF Working Paper. WP/00/67, March, Working Paper African, Asia and Pacific and Research Departments, pp.1-56.

Banker, R. D., Cooper, W. W., Seiford, L. M., Thrall, R. M. and Zhu, J. (2004). Returns to Scale in Different DEA Models. European Journal of Operational Research, 154, p.357.

Baysal, M., Uygur, E. M. and Toklu, B. (2004). A Study of Efficiency Measurement in Turkish State Railways Using Data Envelopment Analysis. Gazi University Faculty of Engineering and Architecture Magazine, Volume: 19, No: 4, p.438.

Erkekoğlu, H., Bilgili, E. (2005). Estimation of Financial Crises: Theory and Practice. Erciyes University, Economics and Administrative Sciences Magazine, Issue: 24, pp.15-36.

Göktaş, A. (2000). Global Crisis and Turkey. Özen Publishing, Ankara.

Gürsoy, M. (2009). Economic and Financial Crises From Past to Today. MG Publications, Istanbul.

Hacıhasanoğlu, B. (2005). Importance of Mexico 1994 and Argentina 2001-2002 Crises for Developing Countries and Turkey. Central Bank of the Republic of Turkey (CBRT), Dissertation, Ankara, pp.1-19.

İlkay, M. S. and Doğan, N. Ö. (2009). The Efficiency Measurement of the Municipalities in Cappadocia Region Using Data Envelopment Analysis: A Comparison Concerning Years 2004 and 2008. Erciyes University, Faculty of Economics and Administrative Sciences Magazine, Issue: 32, pp.195-196.

Kaminsky, G. L. and Reinhart, C. M. (1996). The Twin Crises: The Causes of Banking and Balance-of-Payments Problems, Board of Governors of the Federal Reserve System, International Finance Discussion Papers. Number 544, March, http://www.federalreserve.gov/pubs/ifdp/1996/544/ifdp544.pdf.

Kibritçioğlu, A. (2001). Economic Crises and Governments in Turkey 1969-2001. The New Turkey, Year: 7, Issue: 41, pp.174-182.

L., A. E (2012). Evaluation of Bank Branch Growth Potential Using Data Envelopment Analysis. Faculty of Applied Science and Engineering University of Toronto, p.30.

Seyrek, İ. H. and Ata, H.A. (2010). Efficiency Measurement in Deposit Banks Using Data Envelopment Analysis and Data Mining. BRSA Banking Regulation and Supervision Agency Banking and Financial Markets, Volume: 4, Issue: 2, p.70.

Soba, M. and Akcanlı, F. (2012). Efficiency Rating of Companies Trading in the Field of Food, Beverage and Tobacco in Istanbul Stock Exchange Using Data Envelopment Analysis Method. Afyon Kocatepe University, Economics and Administrative Sciences Magazine, Volume: 14, Issue: 2, p.261.

Sönmez, C. (2009). The Origins of the Global Crisis: Mortgage Credits. Current Economic Problems: Global Crisis, Ed: Sadi Uzunoğlu, Istanbul, pp.79-96.

Sönmezler, G., Gündüz, O. (2009), Sector Impacts of the Global Crisis. Current Economic Problems: Global Crisis, Ed: Sadi Uzunoğlu, Istanbul, pp.129-146.

Yavuz, S. and İşçi, Ö. (2013). Efficiency Measurement of the Food Production Companies in Turkey Using Data Envelopment Analysis. Dumlupınar University, Social Sciences Magazine, Issue: 36, p.159.

Yay, T. and Yay, G. G. (2007). Financial Crisis in 1990s and Turkish Crisis. Economic Reviews, Nobel Publication, Ankara, pp.337-357.

Yay, T., Yay, G. G. and Yılmaz, E. (2004). Financial Crises, Financial Regulation and Turkey. Istanbul University, Faculty of Political Sciences Magazine, March, Issue: 30, pp.101-130.

Yoluk, M. (2010). Performance Evaluation of a Hospital Using Data Envelopment Analysis Method (DEA). Atılım University, Institute of Social Sciences, Post Graduate Thesis, pp.44-45.

Yüce, G., Akıncı, M. and Yılmaz, Ö. (2013). Before and After 2002 in the Context of Main Economic and Financial Indicators in Turkish Economy. Ministry of Finance, Finance Magazine, January-June, Issue: 164, pp.183-207.