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THE IMPACT OF RECENT GLOBAL FINANCIAL CRISIS (2008) ON TURKISH ECONOMY

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by

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To My Dear Fiance, Aişe

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1. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

2. The program of advanced study of which this thesis is part has consisted of:

i) Research Methods course during the undergraduate study

ii) Examination of several thesis guides of particular universities both in Turkey and abroad as well as a professional book on this subject.

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June, 2011

ABSTRACT

İlhan KILIÇ **June 2011**

THE IMPACT OF RECENT GLOBAL FINANCIAL CRISIS (2008) ON TURKISH ECONOMY

The purpose of this study is to determine in which areas the last global financial crisis that erupted in America in 2008 affected Turkey and to do an econometric study on this issue. This econometric study has been tried to be carried out by means of artificial neural networks method through an empirical modeling. When selecting the dependent variable, the most suitable one was chosen by reviewing the studies in the literature on the subject. A sample was created by benefitting firstly from the study of Kaminsky in 1999 titled "The Twin Crises: The Causes of Banking and Balance of Payments Problems", secondly from the published study called Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra in 2007, thirdly from Gujarati's book titled Basic Econometrics published in 1995, and from the indices in these three studies. As a result of all these, a dependent variable was created which is composed of "0"s and "1"s. On the contrary, when selecting the independent variables, the economic and financial variables which are meaningful and important for Turkey were tried to be used as much as possible. These variables are, in order of importance, total exports, consumer price index, gross domestic product ratio of total deposits, the exchange rate (U.S. $), total imports, the net international reserves, industrial production index, M2 money supply, banking sector domestic loan on private sector/domestic credit amount,

government bonds, treasury bills and the Istanbul stock exchange index 100. Other chapters of the study, in summary, deal with an overview of the financial crises and the effects of various crises that occurred between 1990 and 2010 and the recent global financial crisis in 2008 on Turkish economy.

Key words: The Recent Global Financial Crisis, Turkish Economy, Variables

KISA ÖZET

İlhan KILIÇ **Haziran 2011**

SON KÜRESEL FİNANSAL KRİZİN (2008) TÜRKİYE EKONOMİSİNE ETKİSİ

Bu çalışmanın amacı 2008 yılında Amerika'da patlak veren son global finansal krizin Türkiye'yi hangi alanlarda etkilediğini saptayarak bunun üzerinde bir ekonometrik çalışma yapmaktır. Bu ekonometrik çalışma ampirik bir modelleme ile yapay sinir ağları yöntemi aracılığı ile yapılmaya çalışılmıştır. Bağımlı değişken seçilirken literatürde konu ile ilgili çalışmalara bakılarak en uygunu seçilmiştir. İlk olarak, Kaminsky'nin 1999 yılında ki " The Twin Crises: The Causes of Banking and Balance of Payments Problems" konu başlıklı çalışmasından, ikinci olarak da 2007 de Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra adlı yayınlanmış bir çalışma ve son olarak da Damodar N. Gujarati 1995 yılında ki Basic Econometrics isimli kitabından faydalanılarak ve bu üç çalışmada geçen endekslerden bir örnek oluşturulmuştur. Bunların hepsinin sonucunda "0" ve "1" lerden oluşan bir bağımlı değişken meydana getirildi. Diğer taraftan da, bağımsız değişkenlerin seçiminde mümkün olduğunca Türkiye açısından anlam ve önem taşıyan ekonomik ve finansal değişkenler kullanılmaya dikkat edilmiştir. Bu değişkenler önem sırasına gore, toplam ihracat, tüketici fiyatları endeksi, toplam mevduatların gayri safi yurt içi hasılaya oranı, döviz kuru (Amerikan Doları), toplam ithalat, net uluslararası rezervler, sanayi üretimi endeksi, M2 para arzı, özel sektöre verilen bankacılık sektörü iç kredilerin iç krediler toplamına oranı, devlet tahvili, hazine bonosu ve İstanbul menkul kıymetler borsası 100 endeksinden oluşmaktadır. Çalışmanın diğer bölümleri özetle, finansal krizlere genel bakış, 1990-2010 yılları arasında meydana

gelen değişik krizlerin ve 2008 yılında ki son global finansal krizin Türkiye Ekonomisine etkisi olarak ele alınmıştır.

Anahtar Kelimeler: Son küresel finansal kriz, Türkiye ekonomisi, değişkenler

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LIST OF ABBREVIATIONS

EMP	Foreign Exchange Market Pressure Index
ISE 100	Istanbul Stock Exchange 100 Index
CPI	Consumer Price Index
CBTR	Central Bank of the Turkish Republic
IMF	International Monetary Found
WDI	World Development Indicator
GDP	Gross Domestic Product
SPI	Speculative Pressure Index
ANN	Artificial Neural Network
FPI	Financial Pressure Index
MSE	Mean Squared Error
RMSE	Root Mean Squared Error
IBID	ibidem-in the same book

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INTRODUCTION

The recent global financial and economic crisis is the worst economic failure since the Great Depression of 1929-32. For this reason, 2008 recent global financial crisis is different from other crisis. The crisis brings with a risk for Turkey to lose years 2008 and 2009 in terms of growth potential unless necessary measures are taken immediately. For instance, growth rate negatively affected from this crisis. In 2008, growth rate was 0.66 percent and after a year, it was down to zero likes -4.69 percent. Finally, in 2010, it fortunately was 8.9 percent. As seen, the growth rate was being affected positively. On the contrary, foreign currency in dollar was affected that reached to the levels of 1.70TL during this period. I examined that the impact of crises on growth rate, inflation, unemployment, export, public finance, monetary policy, foreign currency in dollar, interest rate.

Kaminsky indicated that (1998) the exchange rate market pressure index is a broader definition of crisis, which includes not only devaluations, but also episodes of unsuccessful speculative attacks. When a currency is under attack, the central bank can intervene by either an increase in domestic interest rates or a substantial loss of foreign reserves to avert the attack. "Kaminsky and Reinhard (1999) analyzed the links between banking and currency crises. They find that problems in the banking sector typically precede a currency crisis. The currency Crisis deepens the banking crisis, activating a vicious spiral; financial liberalization often precedes banking crises. The anatomy of these episodes suggests that crises occur as the economy enters a recession, following a prolonged boom in economic activity

that was fueled by credit, capital inflows, and accompanied by an overvalued currency."[1]

"Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007) indicated that they aim a measure of the probability of crises associated with an aggregate indicator, where the percentage of false alarms and the proportion of missed signals can be combined to give an appreciation of the vulnerability of an economy. In this perspective, the important issue is not only to determine whether a system produces true predictions of a crisis, but also whether there are forewarning signs of a forthcoming crisis prior to its actual occurrence. To this end, we adopt the approach initiated by Kaminsky, Lizondo and Reinhart (1998), analyzing each indicator and calculating each threshold separately. We depart from this approach in that each country is also analyzed separately, permitting the creation of a more "custom-made" early warning system for each one."[2]

In the light of this information, we arrived to make that an empirical research has been done with various variables that how to the affect in Turkish economy. In order to estimate the model, monthly data is employed for the time period from January 1990 until December 2010. The total number of observations is 252. The dependent variable is a pressure index is created. This index is named as Foreign Exchange Market Pressure Index (EMP) which is taken from central bank of the Turkish Republic. On the contrary, independent variable consists of 12 indicators that boadly expessed in empirical approach stage.

[1] Kaminsky, G.L., Reinhart, C.M. (1999), "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *The American Economic Review*, 89(3), p. 473.
[2] Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007), "A Forewarning Indicator System for Financial Crises: The Case of Six Central and Eastern European Countries", William Davidson Institute Working Paper Number 901, p.1.

The recent global financial crisis began a mortgage crisis in USA in 2007. With the crash of the US mortgage market in the beginning of 2007, high amount of financial companies declared their bankruptcy and many financial market leaders have experienced considerable decreases in their stock prices which have also affected global stock markets. Mortgage crisis has not only affected financial firms with poor lending standards but also created serious consequences for the whole US economy.

In this thesis, the USA financial crisis is analyzed and to study an empirical analysis about Turkish economy. Besides, I analyzed that regression between dependent variable that consists of "0" and "1" likes an index and other independent variables such as foreign currency in dollar, total export, net international reserves, banking sector domestic loan on public sector/ domestic credit amount, total deposits in deposit money banks/gdp, consumer price index (CPI), treasury bills, government bonds, M2 money supply, total import, industry production index and Istanbul stock exchange 100 index (ISE 100).

The purpose of this thesis is to give an overall account of the Turkish Economy during the 1990-2010 periods. Growth performance of the economy is exhibited in Table 1 and Figure 1. Inflation figures are comment in Table 2, Figure 2 and 3. In addition to this, employment and unemployment figures are shown in Figure 4 and Table 4. Besides, impact on export, public finance, monetary policy, foreign currencies and interest rate of recent financial crisis is seriously to investigate in detail. Moreover, in the period of 1990-2010, an empirical research is done and told at a great length in chapter 3.

CHAPTER I

LITERATURE REVIEW ON FINANCIAL CRISIS

1.1. What is the Crisis?

"The Crisis word is based on Greek, and the crisis means decision in general meaning. 'Financial Crisis comprises four main types such as monetary crisis, banking crisis, systemic crisis and final one is foreign debt crisis.'"[3]

1.2. Types of the Financial Crisis

1.2.1 Monetary Crisis

Fixed exchange rate systems, the demands of the market participants suddenly redirects the local currency denominated assets to assets as a result of foreign money, the central bank's foreign exchange reserves could not bear these demands in the form of depletion of the resulting crisis.

1.2.2 Banking Crisis

Banking crises, the maturity of debt to commercial banks could not extend or not to cover in demand deposits a sudden withdrawal demand as a result of liquidity distress and after this situation expresses to the status of falling bankruptcy. Credit used by the Bank and other institutions operating in areas where problems that occur as a result, these individuals and institutions received loans from banks can no longer pay back and attach to

[3] IMF: World Economic Outlook

bank for depositors withdraw their deposits, as a result of banking crises are the basic reasons.

1.2.3 Systemic Crisis

Systemic crisis, laws, institutions, monetary and fiscal policies within the framework of the existing economic structure, changing the layout, the conditions can no longer relate crises that occur as a result.

1.2.4 Foreign Debt Crisis

External debt crisis, the government or private sector or whether a country's external debt cases can no longer pay is emerging.

1.3. Financial Crisis Models

Some models and theories have been developed to explain the nature of the financial crises. Each model or theory clarifies one or more aspects of the nature of interest. "Classification of financial crisis models as First Generation Financial Crisis Models and Second Generation Financial Crisis Models has been widely accepted."[4] Final group models are called Third Generation Financial Crisis Models or the Models Explaining Asian Crisis. This chapter is aimed to lay the general view of financial crisis and to give information on financial crisis models.

1.3.1. First Generation Financial Crisis Models

"First Generation Financial Crisis Models indicated that Traditional Crisis Models, Canonical Crisis Models or Speculative Attack Models as well.

[4] Bastı, ibid, p 1.

Main starting point of these models is the foreign currency can exhaust and its supply can not be raised easily.

First financial crisis modeling revealed by Paul Krugman in 1979 has been considerably developed, and at the moment it is named as "First Generation Financial Crisis Models" According to the first generation models which try to model monetary crises, main reasons behind monetary crises are macroeconomic structural imbalances and unsustainable policies. "High and increasing budget deficits, high inflation, high domestic interest rates, and high rates of money supply increase, huge current deficits, extremely valuable exchange rate, and decreases in international reserves can be given as examples of macroeconomic structural imbalances."[5]

"Issuing money to finance budget deficits in a country where fixed exchange rate system is implemented can be given as an example for unsustainable and unstable policy. According to these models, covering of financial deficits while applying a fixed exchange rate policy or increasing money supply drastically to balance a weak banking system brought about financial crises. In other words, incompliance of economy policies, which are divided into two groups such as monetary policy and fiscal policy, is with foreign currency aim result in financial crises."[6]

"According to First Generation Models, financial crises (monetary crises) break out as follows: Assume that fixed exchange rate policy is implemented in an economy, that the budget of the economy has a deficit, and that the units implementing macroeconomic policies prefer issuing money to finance the budget deficit and the only tool they have to fix the

[5] Kuran, İ. (2006). Türkiye'de Ekonomik Krizler ve İstikrar Programları (1980-2005), Unpublished M.A Thesis, Harran University, p.9.
[6] Krugman, Paul (1979), "A Model of Balance of Payment Crises". Journal of Money, Credit, Banking, 11: p.311-325

deficit is to intervene in the foreign exchange market. For instance, interest rates drop down one hand and inflation increases on the other hand due to increase in money supply.

The fall in interest rates and the rise in inflation brought about reduction of economic reserves that result in crises. First of all, foreign investors demand foreign currency (as the interest rates fall) and then export foreign currency.

Furthermore, shadow price[7] of the foreign currency exceeds the official foreign exchange rate due to increasing foreign currency demand. Secondly, national currency is valued due to fixed exchange rate policy. This has a decreasing effect on export and increasing effect on import. Rise of inflation has negative impacts on export as well. As a result, foreign trade deficit gradually increases. The increase in the foreign trade deficit means a reduction in economic reserves. Moreover, these two developments bring along another development that reduces reserves more: in an economy where foreign trade deficit increases, speculators foresee that fixed exchange rate policy will be abandoned and, thus, foreign currency rate will increase. Therefore, speculators who want to maximize their profits sell their reserves in national currency and buy foreign currency. Together with the above-mentioned factors, this situation plays a role in the depletion of the reserves as well. Speculative attack plays an important role in the First Generation Models.

The most important characteristic of Speculative attack is that investors decrease the relative share of the national currency and increase the share of the foreign currencies and foreign assets in their portfolios.

Speculators sell their reserves in national currency as the value of the foreign currency starts to increase and then buy foreign currency.

Central Bank, which tries to maintain fixed exchange rate, puts its foreign currency reserves on the foreign currency market. Central Bank, the reserves of which decreases to a critical level, has to abandon fixed exchange rate regime.

As a consequence of this process, a financial crisis (monetary crisis) erupts. To summarize according to Krugman's approach, variables such as financial and monetary expansion result in reserve losses when there is no parity to prevent the loss of foreign currency reserves. This situation creates an increasing pressure on the foreign exchange rate."[8]

First Generation Models indicate that public sector as the source of the crises and suggest that crises break out because of the inconsistency between excessive public sector deficits and foreign exchange rate system. These models propose that the increase in money supply decreases interest rates and increases inflation and that these two developments trigger the crisis by reducing the reserves in many ways. Besides, they also claim that high interest rates turn into a structural problem and create a suitable environment for the financial crises.

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[7] Shadow price is the price determined by the supply-demand status of any good when the price is not fixed by the authorized institutions. Shadow price of any foreign currency is the price that is determined when the exchange rate is not fixed.

[8] Kaminsky, G.L., Lizondo, S. and Reinhart, Carmen M. (1998), "Leading Indicators of Currency Crises", International Monetary Fund Staff Papers, 45(1). http://www.imf.org/external/pubs/ft/staffp/1998/03-98/pdf/kaminsky.pdf

1.3.2. Second Generation Financial Crisis Models

General characteristic of the Second Generation Financial Crisis Models is that these models propose financial crises can break out even when there is no deterioration in the economic indicators.

"These models reveal how speculative attacks aiming national currency can result in crises even when the monetary and fiscal policies are consistent."[9]

"Second Generation Models stress that when there are inconsistencies between fixed exchange rate and some important economic figures, politicians may prefer to float the exchange rate and not respond to the speculative attacks even when there is sufficient amount of foreign currency reserve."[10]

According to the Second Generation Models leaded by Maurice Obtsfel, governments have grounds both to continue and to leave the fixed exchange rate policy. Governments make benefit-cost analysis when deciding on whether to continue or leave the fixed exchange rate policy. The advantage of the fixed exchange rate system is that it declines the inflation pressure and creates an economic environment that promotes trade and investment. On the contrary, the cost of the fixed exchange rate system is that it brings about an increase in the real interest rates. In case downward inertia is observed together with the high interest rates, unemployment rate increases and growth rate decreases.

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[9] Özer, Mustafa (1996), "Finansal Krizler, Piyasa Başarısızlıkları ve Finansal İstikrarı Sağlamaya Yönelik Politikalar", Eskişehir: Anadolu University Publications, No:1096, page 67.
[10] Bilgin, M.Hüseyin, Karabulut, Gökhan and Ongan, Hakan (2002), "Finansal Krizlerin İşletmelerin Finansal Yapıları Üzerindeki Etkileri", İstanbul: İstanbul Ticaret Odası Publications, Publication No:2002-41, page 14.

Increasing real interest rates may lead to failure to sustain the fixed exchange rate system and, in turn, to eruption of crises. Since it will not be rational to keep the exchange rate at its current level in case costs exceed benefits, the exchange rate is floated. To decrease unemployment and current transaction deficits and to promote growth, governments perceive to switch to the floating exchange rate system even though foreign currency reserves are adequate to preserve the exchange rate.

Velasco[11] indicated that "it is proposed that high interest rate has the possibility of weakening the banking system and that monetary authority prefer devaluation to possible bankruptcies to be caused by deposit guarantee."

Second Generation Models has two main characteristics: "Self-fulfillment of the expectations and multiple equilibria."[12]

Self-fulfillment of the expectations can be expressed the following example: Suppose that there is an economy where fixed exchange rate policy is implemented. This implementation will have costs as well as its benefits.

In case these costs exceed the benefits, private sector foresees that the government would abandon the fixed exchange rate policy. When this foresight grasps the whole market, speculators start to expect devaluation and make speculative attacks. Finally, devaluation occurs. This process is indicated self-fulfillment of the expectations.

[11] Velasco, Andres (1987), "Financial and Balance of Payment Crises: A Simple Model of the Southern Cone Experience". Journal of Development Economics, 27: page 263-283
[12] Bastı, ibid, page 12

In this case, interest rates (interest rates will increase since the government will try to raise foreign exchange flow from abroad to preserve the value of its national currency) and prices will appreciate in this process on account of devaluation expectations. As a result of these negative developments to be observed in the macroeconomic structure, the cost of pursuing the fixed exchange rate policy will rise. In turn, cost appreciation will increase the devaluation expectations.

"Self-fulfillment process to occur between expectations and the cost of sustaining fixed exchange rate regime will conclude with devaluation. A lot of Studies made via various economists specialized in financial crises can be given as illustrates for self-fulfillment process. For instance, according to Guillermo A. Calvo, the basic variable that results in multiple equilibria and self-fulfillment is the crises risk the banking system is exposed"[13]. Calvo proposes that any government which adjusts and implements its economic policies in an independent manner causes a term mismatch between the liabilities and assets of a bank in due course. Term mismatch brings about self-fulfillment expectations and, in turn, financial crises. Calvo expresses crises and self-fulfillment process as follows: it is not known for sure whether the government, which is authorized to plan and implement its economy policies independently, will strictly pursue these policies or not. There is an issue of uncertainty. This uncertainty turns this country into a risky area for the investors who want to make investment and foreign capital transfers. It is the government's duty to minimize or completely eliminate this risk. For instance, particularly in the countries where the central bank is not autonomous, the latter can guarantee fund provision to the problematic banks as the government policy requires so. In this case, it can act like the final loan authority. Therefore, depositors (particularly institutional and professional investors) do not take into consideration the match/mismatch

between their deposits in the banks and the terms of the loans granted by the banks. Term mismatch finally results in financial crisis. Multiple equilibria can be explained as follows:

There may be a single equilibrium point for any good in its related market, but there may be many equilibrium points for the same good in its related market as well. This is correct for the foreign currency market as well. On the contrary, expectations determine at which point the foreign currency will be equilibrated. Besides, multiple-equilibrium develops on the basis of the macroeconomic figures. "In general terms, in case of mid-level macroeconomic figures, foreign currency rates may be equilibrated at high levels on account of negative expectations or at low levels on account of positive expectations. Therefore, it is possible to conclude that multiple-equilibrium can be observed in case of midlevel macroeconomic figures."[14]

1.3.3. Third Generation Financial Crisis Models

These models indicated that "The Models Explaining Asian Crisis". Financial crises were widely believed to be caused by the public sector before the eruption of Asian Crisis. Reasonable inflation levels, low budget deficits and even budget surpluses recorded in the Southeast Asian countries eliminated the risk of financial crises. On the contrary, private sector started to sorrow from some economic problems. Valuation of the foreign currencies both decreased the export and increased the foreign trade deficit and current deficit as well as private sector foreign borrowing. But, since these were not public-oriented but private-oriented problems, no financial crisis expectation raised. On the contrary, Asian Crisis broke out when the national currency of

[13] Bastı, ibid, page 15
[14] Bastı, ibid., page 13

Thailand was devaluated. Two main proposals have been made to express the reasons of Asian Crisis.

First proposal is that Asian Crisis can be expressed on the basis of the Second Generation Crisis Models. According to this proposal, concerned with countries were exposed to a self-fulfilling pessimism by the international investors.

The pessimism of the creditors and investors created a pessimist atmosphere for the other investors as well. The resulting cycle caused the Asian Crisis. According to the researchers who made the second proposal, the weak economic structure produced by the wrong policies and structural depressions resulted in the Asian Crisis. These structural depressions can be summarized as follows:

The first depression was the presence of microeconomic problematic implementations such as implicit deposit insurances and confidential public guarantees. These implementations have been proposed to pave the way for the crisis on account of moral hazard and excessive borrowing. Governments could provide direct or indirect guarantee for the foreign borrowing of the banks or big businesses.

The second depression was the inadequate auditing of the financial sector and particularly the banks. When the system is not properly audited, banks can enable use of funds by their affiliated companies at such huge amounts to increase financial sensitivity. Besides, in inferior systems, huge amount of funds inflowing to the country result in not only high amount of domestic fund transfers with poorly-managed banks but also domestic demand explosion. The loans granted without any risk analysis can not be paid back in economic shrinkage times and result in crises.

"The third depression was the unreliable balance sheets of the banks and non-bank financial institutions. The problems in the balance sheets of the banks mainly result from mismatch. When the banks borrow money in foreign currency and lend in national currency and when they make short-term borrowing and make lending for long-term investments, it means that they encounter both monetary and term mismatch problems."[15] Wrongly-valued foreign currencies and unpaid debts are the other balance sheet problems. In other words, if the foreign exchange rate of a country is not equilibrated, if the financial institutions have term and monetary problems, and if the debts are not paid back, it means that the banks have structural problems. Such situations create the appropriate environment for the financial crisis.

In the light of these data, Third Generation Crisis Models stress that mainly structural depressions and wrong policies result in financial crises. In the First and Second Generation Crisis Models, however it is proposed that the interest plays role on the financial crises.

1.4 The Transmissions of the Crisis to the Turkish Economy

"The recent crisis will affect Turkey from four channels. The first and most important of these is the credit channel. The second channel is the portfolio investment channel. The third channel is the foreign trade channel. The fourth and last channel is the negative impact of the increased risk perception and decreased confidence on consumer and investor behavior."[16]

[15] Yay, Turan, Yay, G.Gürkan and Yılmaz, Ensar (2001), Küreselleşme Sürecinde Finansal Krizler ve Finansal Düzenlemeler, İstanbul: İstanbul Ticaret Odası Publications, page 26.
[16] Economic Policy Research Foundation, Policy Note, "2007-08 Global Financial Crisis and Turkey: Impacts and Recommendations.", page 4-5.

CHAPTER II

THE IMPACT OF RECENT GLOBAL FINANCIAL CRISIS AND THE OTHER VARIOUS CRISES ON TURKISH ECONOMY BETWEEN 1990 AND 2010

The financial crisis that began in the United States in 2007 sub-prime mortgage market then quickly spread to other countries and it has become a global crisis. This crisis affected both financial and economic activities. This global crisis seriously has affected, even though Turkish economy is the biggest seventeenth economy in the world economies. In a short time, Turkey passed significant two crises which 1994 and 2001 through financial market and affected fiscal market negatively. On the contrary, 2008 global crisis actually affected real sector. Due to the fact that Turkish real sector entered to global crisis with having very high foreign currency debt and export volume was affected negatively because of constriction of demand was in foreign markets. Real sector exporter which based on import will be the most affected because global crisis will constrict that opportunity of credit and increase foreign currency in dollar. I will deeply investigate in this chapter that the impact of recent global financial crisis in Turkish Economy such as impact to economic growth, inflation, unemployment, export, interest rate, investment, foreign exchange, public finance, monetary policy, fiscal policy and banking and finance. 2008 recent global financial crisis is different from other crisis. The crisis brings with a risk for Turkey to lose years 2008 and 2009 in terms of growth potential unless necessary measures are taken immediately. For instance, growth rate negatively affected from this crisis. In 2008, growth rate was 0.66 percent and after a year, it was down to zero likes -4.69 percent. Finally, in 2010, it fortunately was 8.9 percent. As seen, the growth rate was being affected positively at the end.

Even, first quarter in 2011, Turkish economy caught 11 percent growth and it placed that first economy in this period.

2.1 MACROECONOMIC OVERVIEW

2.1.1 Impact on Economic Growth

After the crisis of 1990s and 2000s, Turkish economy had been shortly recorded an economic constriction. In 2001 financial crisis, growth rate was rapidly declined to -5.7 percent. On the contrary, growth rate was 6.8 percent in 2000. After this economic shock, Turkish economy had been recorded stable growth since 2002 and 2007 as seen below in table 1.

Table 1: GDP Growth (Annual %) for Turkey

Date	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP growth (annual %)	-3,4	6,8	-5,7	6,2	5,3	9,4	8,4	6,9	4,67	0,66	-4,7	8.9*

*1998 based GDP (Consumption) TUIK figure

Source: World Bank

Due to spreading recent global financial crisis is from United States of America. GDP growth sharply started to decline in 2007. While an average GDP growth during 2002 and 2006 was 7.24 percent. However, global financial crisis have caused to this negative growth in the last quarter of 2008. Growth rate was down to 3.07 percent in 2008. That was 0.66 percent as seen above the table 1. Moreover, in 2009, growth rate was highly constricted to -4.69 percent. At the end, according to TUIK 1998 based GDP

(Consumption) figures show 8.9 percent that was in 2010 for growth rate. The Central Bank of Turkish Republic figures revealed that gross domestic product annually as shown below figure 1.

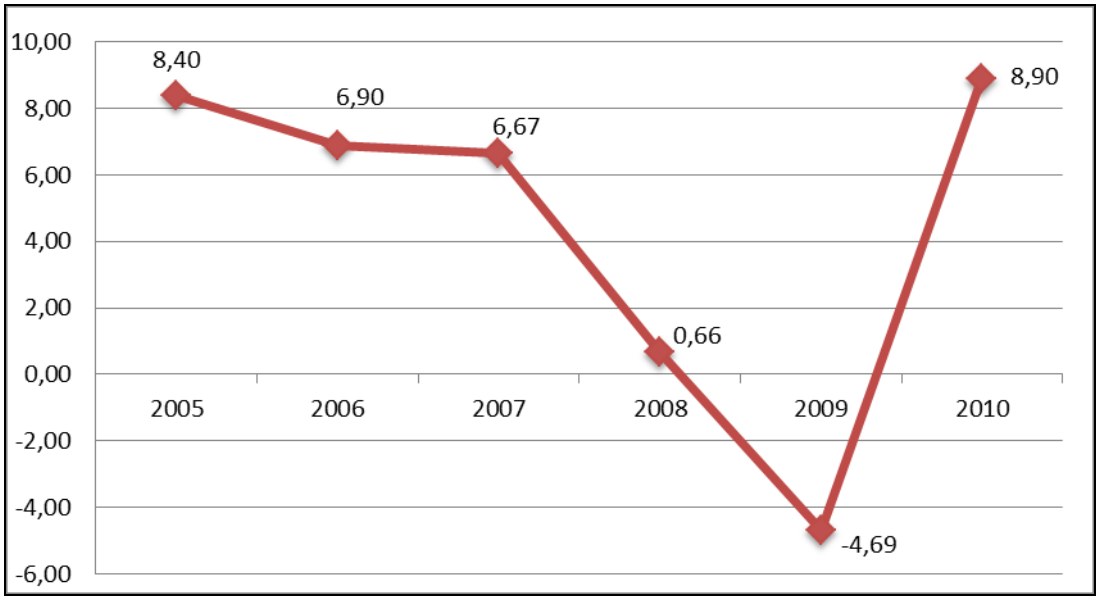

Figure 1: % Changes of Gross Domestic Product (Constant)
Sources: Central Bank of the Turkish Republic

As seen in the figure 1, GDP have been declined between 2005 and 2009. Especially, with 2008 financial crisis, growth rate has declined significantly. An average GDP growth 2005 and 2007 was 6.66 percent. On the contrary, in 2008, this average growth depreciated to 6 percent, that was 0.66 percent. Then, growth was down to -4.69 in 2009 and the last three decades the most declines was in 2009 as seen above graph 1. "The serious nature of this still-unfolding crisis is evident in the increasingly pessimistic picture painted by forecasts for economic growth. Since the beginning of the

crisis in 2007, forecasts for growth rates in 2008 and beyond have been repeatedly revised downward."[17]

2.1.2 Impact on Inflation

Economic indicator of inflation was very high during 1975s and 1980s. After 1980s Turkey has been a chronic high-inflation country since the 2000s as shown table 2. In 1980, inflation raised the highest value of all times due to petroleum crisis have been became by members OPEC member that increased secondly to 150 % petroleum prices in 1979 and 1980. During these years, there was a devaluation of Turkish Lira, which inflation rate was 58,692 percent in 1979 and 110,173 percent in 1980, in Turkey. Moreover, unemployment rate increased to 20 percent. On the contrary, an average of between 1975 and 1979 was 33.52 percent. The Government of Turkish Republic enacted a law of 24 January decisions in 1980 at the same time Turkish Lira was devalued to 48.6 %. Thus inflation was down to 36.58% in 1981. After that inflation decreased to approximately 6 point like 30.84% in 1982.

Table 2: Inflation (Annual %) Between 1975 and 1980 for Turkey

Date	1975	1976	1977	1978	1979	1980
Inflation, consumer prices	19,19	17,36	27,08	45,28	58,69	110,17

Source: World Bank

[17] Boorman, Jack, (2009) "The Impact of the Financial Crisis on Emerging Market Economies: The Transmission Mechanism, Policy Response and Lessons."

Inflation continued on chronic increasing again between 1983 and 1993. Between these years an average value of inflation was 54.33 percent. One of the biggest share of this dramatic economic condition was 1986, 1988-1989 and 1991 economical and financial crisis. Another significant share was military coup.

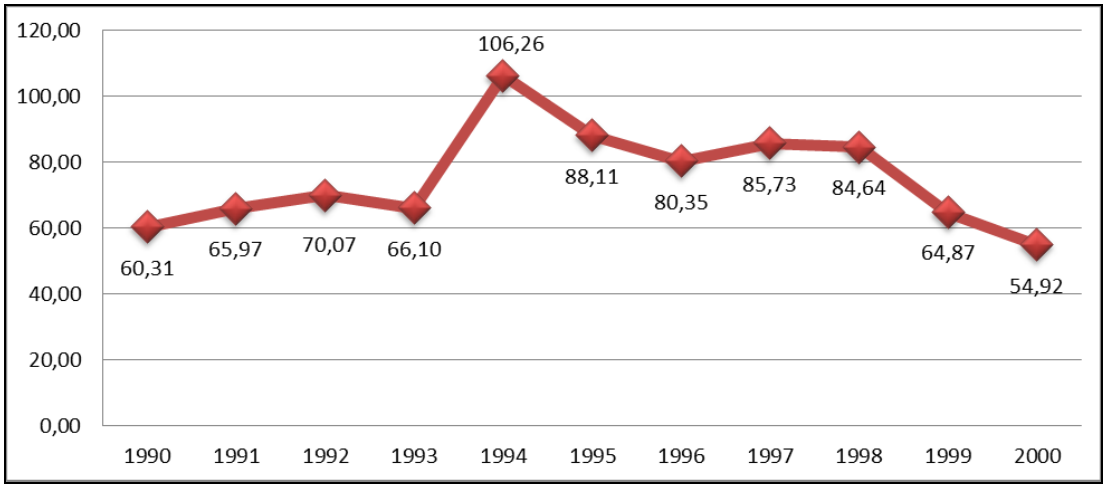

Figure 2: Inflation, Consumer Prices (Annual %)
Sources: Central Bank of the Turkish Republic

Due to the fact that financial crisis has broken out in 1994. Inflation rate, which based on consumer price, rose to levels of 106.26 percent. Although this financial crisis took a short time, it was felt with very sharply. Current deficit jumped from 1 million dollar to 6.4 million dollars. Besides, foreign debt stock indicated to increase of 12 million dollars. Short term debt jumped to up 18.5 million dollars and beating a historical record. Total net capital output reached to 4.2 billons dollars. Moreover, Treasury bill's interest rate exceeded 400%. Wholesale price jumped up 121%. Unemployment rate reached 20 percent and half million people was fired your occupation in 1994 financial crisis. Consequently, the year of 1994 was very bad for Turkish economy. As shown figure 2, inflation started to decline in 1995 and this decreasing continued to 2000s. After stand-by agreement stability plans,

which have been put to apply in 2000, was leader of great collapse. Money crisis rose in 2000 after that thirteen banks was bankruptcy. Interest rates reached to high levels. Before this crisis foreign exchange was 0,670 TL. In 2001 April, foreign exchange reached to 1,161 TL. Inflation rate relatively declined to 54.40 in 2001. With Turkish Lira considerably appreciated in 2002s. Until 2001 to 2005 inflation rate declined. As seen table 1, at the same period between 2001 and 2005 growth rate relatively increased. Inflation rate normally continued between 2005 and 2006.

The recent global financial crisis began in the United States in sub-prime mortgage market in 2007 and that spread quickly to Europe, Asia and other emerging countries so, it has become a global crisis that affected both financial and economic activities. Turkey also was affected from this global crisis. Until 2007, inflation rate normally continues to 8.76 percent levels. Immediately, global financial crisis has broken out in 2007s. With impact of global financial crisis, inflation was up to 10.44 percent in 2008. Turkish economy had relatively been affected less in other countries since between 2007 and 2010 due to the fact that monetary, fiscal and economy policy is both active and stable.

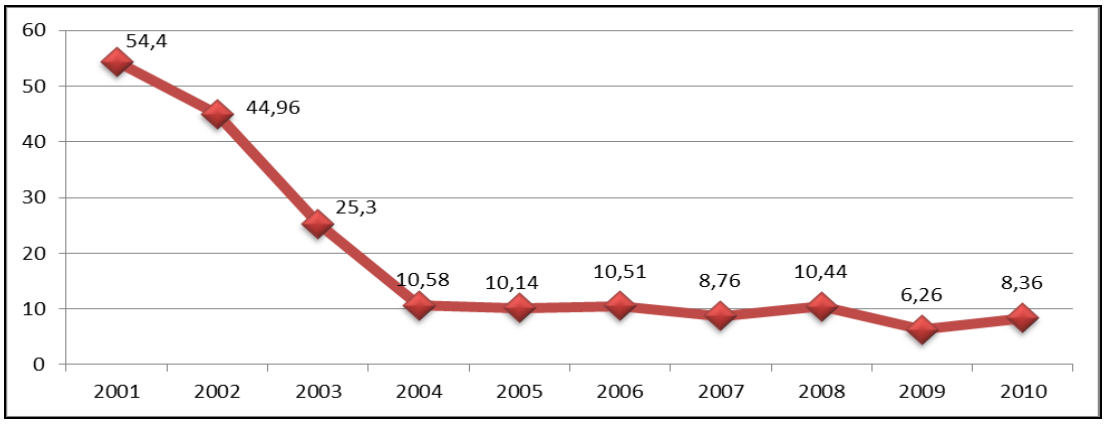

Figure 3: Inflation, Consumer Prices (Annual %)

Sources: Central Bank of the Turkish Republic

There are significant points that have to be emphasized here;

The bad impact of economic and financial crises is such as 1980, 1986, 1988-1989, 1991, 1994, 2001 and 2008 recent global financial crisis. As seen, Turkish economy had battled this crisis.

On the contrary, last year in 2010, Turkish Lira appreciated against to foreign currency and Turkish economy is both active and stable condition so it is seventeenth economy of world. Besides, it placed to first sequence in Europe Economies with 8.9 percent growth, also it placed to third sequence after China and Argentina in World Economies.

2.1.3 Impact on Unemployment

The third indicator of Turkish economy is unemployment. As seen below in table 3, the unemployment increased from 2000 until 2003. After it reached to 10.5% in 2003, unemployment rate slowly declined until 2007. Due to 2008 financial crisis, unemployment rate increased 1.4 points, impacted on Turkish economy negatively.[18]

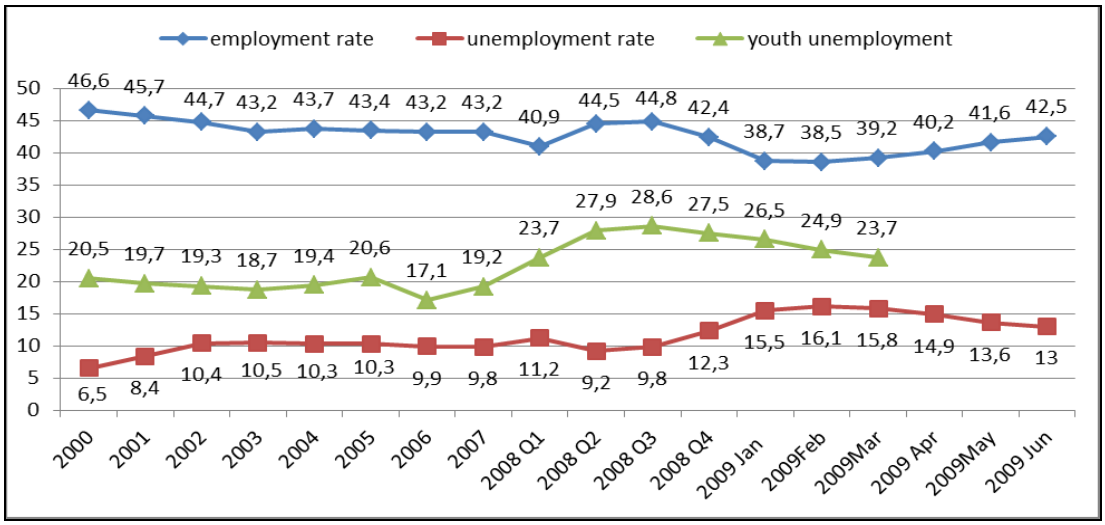

FIGURE 4: Employment and Unemployment Rates (%) Between 2000 and 2009

Sources: Turkstat

Unemployment rate increased to 12.3 percent in fourth quarter of 2008. It reached with recent global financial record rates which firstly 15.5% in January 2009, secondly 16.1% in February 2009, thirdly 15.8 in March 2009, as seen in above table 3.

On the contrary, employment rate did not relatively increase. From 2000 until Jun 2009 average of unemployment rate was 42.6 percent but impact of this financial crisis declined employment to 38.5 percent in February 2009.

Table 3: Unemployment Rates (Annual %) Between 2005 and 2010

Year	Unemployment rate	Rank	Percentage Changes
2005	10.30	84	-11.43
2006	9.90	106	9.68
2007	9.80	115	0.00
2008	9.90	123	-2.94
2009	10.70	127	8.08
2010	14.10	144	31.78

Source: CIA

As seen above in table 4, unemployment located to the rank of 84 in 2005. From 2005 until 2010, this ranking continuously rose, and finally it

[18] Uygur, Ercan, "The Global Crisis and Turkish Economy,", page 8-10, 2010.

placed in the rank of 144 in the world countries. The percentage change of unemployment reached the highest rate which was 31.78 percent in 2010. Likewise, with impact of recent crisis in 2008 unemployment raised again old values that increased to 10.70 percent in 2009 and 14.10 percent in 2010.

2.1.4 Impact on Export

Table 4: Monthly Total Export and % of Changes in Total Export between 1990 and 2010

Date	Total export million $	% of changes in total export	Date	total export million $	% of changes in total export
1990	12.959.289.00	11,48	2001	31.334.216.00	12,81
1991	13.593.463.00	4,89	2002	36.059.090.00	15,08
1992	14.714.628.00	8,25	2003	47.252.835.00	31,04
1993	15.345.067.00	4,28	2004	63.167.153.00	33,68
1994	18.105.873.00	17,99	2005	73.476.408.00	16,32
1995	21.637.043.00	19,5	2006	85.534.674.00	16,41
1996	23.224.466.00	7,34	2007	107.271.744.00	25,41
1997	26.261.072.00	13,08	2008	132.027.190.00	23,08
1998	26.973.951.00	2,71	2009	102.142.606.00	-22,64
1999	26.587.225.00	-1,43	2010	113.979.444.00	11,59
2000	27.774.905.00	4,47			

Source: CBTR

As seen above table 4, Turkish exports had achieved an upward trend since 2008 however a decreasing was in 1999 and 2009. According to

Central Bank of The Turkish Republic figures, the biggest monthly % change was 33.68 percent in 2004, also, total export increased from $36.059.090 to $ 47.252.835 in 2003. Second the biggest rate was 31.04 percent in 2003 and third the biggest rate was 25.41 percent in 2007.

On the contrary, the lowest monthly % change was -22.64 percent in 2009 and also, total export decreased from $132.027.190 to $102.142.606 in 2009. Second the lowest rate was -1.43 percent in 1999 and third lowest rate was 2.71 percent in 1998, also, total export was $26.973.951.

As shown above table 4, the recent global financial crisis based on US that negatively impacted economy that total export as -22,64 percent, however, before a year, total export was 23,08 percent in 2008.

An interesting point in the table 4 is attracted attentions, when the crisis of 1988-1989, 1991, 1999 and 2001 total export increased little by little that except of the 1999.

2.1.5 Impact on Public Finance

Although fiscal indiscipline and therefore high budget deficits were the most prominent features of Turkish economy till recent times, especially tight fiscal policy that applied last five years was one of the most important factors that kept the country's economy alive in this crisis. The most recent data on the realizations of the budget in December of 2008, according to figures from 2008, in 2008, even though as seen that year-end revenue target exceeded the 101.5% rate, for end of 2008 year that the targeted the surplus out of interest target was realized 88.4 percent. According to data from the previous month of November 2008 crisis in December at the serious amount

of income reduction and the increase in spending is taking place not just to see that the budget balance started to deteriorate.[19]

Basic economic figures for the years 2009-2011 are containing the medium-term financial plan, prepared by ministry of Finance decided by the board of auditors and the relevant time period for a high budget figures announced by determining goals. However, under pressure from the growing global financial crisis, covering the years 2009-2011 were made changes in 2009 budget. Growth rate was reduced to one point, in order to improve fiscal discipline, reduced the budget deficit and also primary surplus in 2009 increased. After following bilateral talks with the International Monetary Fund, growth target was reduced from 5 percent to 4 percent, increase in budget expense and revenue is envisaged.

As a result of arrangements, the budget expenses of central government is 262.110 million TL, the revenue of projected budget also is to increase 248.759 million TL. According to the initial objectives of the central government budget appropriation in the budget while increasing 17.7 percent, 21.2 percent of the enlarged budget revenue target.[20]

Turkish economy into the crisis of 2000-2001 with the high public deficits, tight monetary policy and fiscal discipline applied by the post-crisis period with the understanding of the need to reduce public deficits, an important measure also reduced the public debt, relative to it gradually decreased as the interest burden on the budget. Besides, in accordance with the code of 5018 public financial management and control law implementation, from the consolidated budget in line with international

[19] Kaya, Ünal, a.g.e., page 16.
[20] Bakkal, Susam, a.g.e., page 85.

standards and wider scope-related central government budget application has been applied since 2006.[21]

Two criteria are taken into account in performance appraisal of public finance. One of them is the ratio of budget deficit to gross domestic product and other is improving of the surplus out of interest.

Considering the effects in the course of the entire world and to Turkey, under the influence of all the countries of the global financial crisis will affect the budget of central government in 2009. In order to 2009 budget sizes and support other variables in the economy were revised to budget sizes. However, economic growth rate was became under 4 percent and the tight of real areas and related to decreasing of consumer tendency that tax revenues fall, the budget deficit will top forecasts.

The single positive appearing within the overall balance of the economy is to enter into this global financial crisis with low budget deficits that ensuring fewer problems in the economy.[22]

2.1.6 Impact on Monetary Policy

In the first half of 2008 for fight inflation to increase interest rates by 1.5 percentage points to the Central Bank of The Turkish Republic rose the level of 16.75 percent, falling commodity prices, declining domestic demand and reduced inflation expectations for the future with other countries central banks to fight crisis by following the same path, since November the reduction in interest rate has chosen to go to. Contrary to the expectations of the overall market in November, the central bank reduces interest rates by

[21] Bakkal, Susam, a.g.e., page 85.
[22] The Organization of Government Planning, Economic Developments, a.g.e., page 22.

0,50 points, in January 2008 and 2009 interest rates was reduced respectively 1,25 and 2 points that moved by the 13 percent level. Central Bank interest rate cuts in 2009, the monetary and exchange rate policy will continue in the year 2009 has been confirmed in the report.[23]

Central Bank of the Turkish Republic, also, 20 February 2009 with the purpose to increase fluidity of foreign currency liquidity, foreign exchange stores increased from one month to three months and Central Bank, in bilateral transactions, lending interest rate from 7 percent to 5,5 percent, for Euro from 9 percent decided to reduce to 6,4 percent. From the date of 10 March 2009, The Central Bank, foreign exchange market to prevent the unhealthy price formation and liquidity in foreign exchange to support the foreign exchange selling auctions began. In auctions that will be maked to sell total foreign currency determined 50 million US Dollars per day and indicated that this amount can be increased in necessary day.

In addition, despite auctions the foreign exchange market in result of speculative behaviors in case of excessively fluctuate as a result of speculative behavior that Central Bank will directly interfere to sell foreign exchange currency.[24]

Negative impact on foreign demand for Turkey and the shrinking possibility of direct investment share in finance of current deficit, the factors that create risk for the rest of 2009 at the forefront to take. But, some acquire the assets of national law with economy receipt of assets brought into the economy in our economy also aimed to record the income and corporation tax buyers at home and abroad, they have facilitated the setting to take assets enterprises a capital proceeds received from investors in the

[23] Kaya, Ünal, a.g.e., page 17.
[24] The Organization of Government Planning, Economic Developments, a.g.e., page 18.

domestic home encourage the trading of securities. In the buying and selling of share that received from domestic investor the rate of 10 percent tax is down to zero, some structural measures to take against the crisis were small and medium size business investment support plans and the incentives of research and development. In addition to this, the central bank has lowered foreign currency reserve requirement ratio in the two points and the limit of export rediscount credit and interests that paid for Turkish Lira reserve requirement increased. Consequently, as a result of new economic measures was applied that elimination of the liquidity tightness in markets and credit channels are expected to work better.[25]

2.1.7 Impact on Foreign Currencies

As seen below figure 5, foreign currency in dollar has dramatically increased since 2003, from January 1990 until April 2003. An average of between 2004 and 2006 was 1,435 TL. This value decreased to 1,325TL in 2007. With recent crisis in US foreign currency in dollar was increasing again in 2008 that the buying price of the US dollar was 1,566 TL, also, in April 2009, dollar reached to 1,688TL levels. Euro increased 2.5 percent to 2.200 TL from 2.146 since the beginning of 2009. In free market, U.S. dollar closed the year 2008 at 1.540 TL and on December 15, 2009 it weakened to 1.512 against Turkish lira. In contrast with U.S. dollar, Euro rose to 2.207 TL on December 15, 2009 up from 2.142 TL in 2008. Now, US dollar is proceeding to 1,550 levels.

[25] The Committee of Banking Preparation and Inspection, The Report of Financial Markets, a.g.e., page 17.

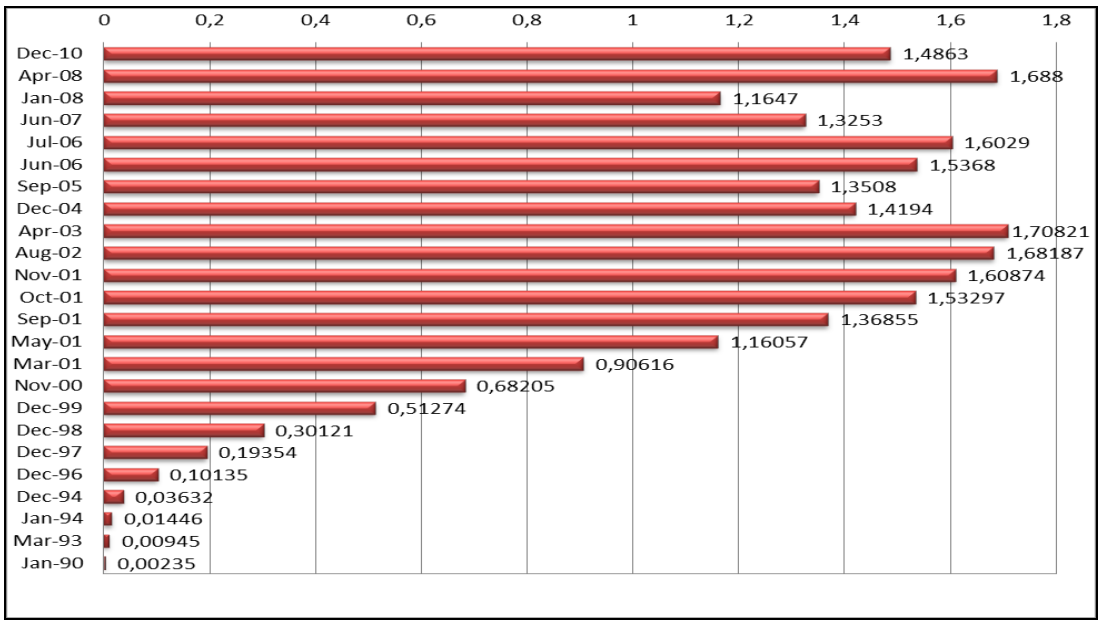

Figure 5: Foreign Exchange in Dollar

Sources: Central Bank of the Turkish Republic

2.1.8 Impact on Interest Rate

As seen in figure 6, interest rates have sharply percentages that interest rate has the change of 0.16 percent in February 1990. After this time, it was reached to 70.79 percent in March 1994. Moreover, with crisis in October 1994, sharply decreasing was seen to -28.82 percent in below figure 6. Interest rate placed into 87.59 percent change in February 1995. Dramatically decreasing continued in February 1998s and February 2000s. Interest rate reached to one of high levels as 120 percent in September 2002. Then, sharply decreasing was seen -34.28 percent in January 2004.

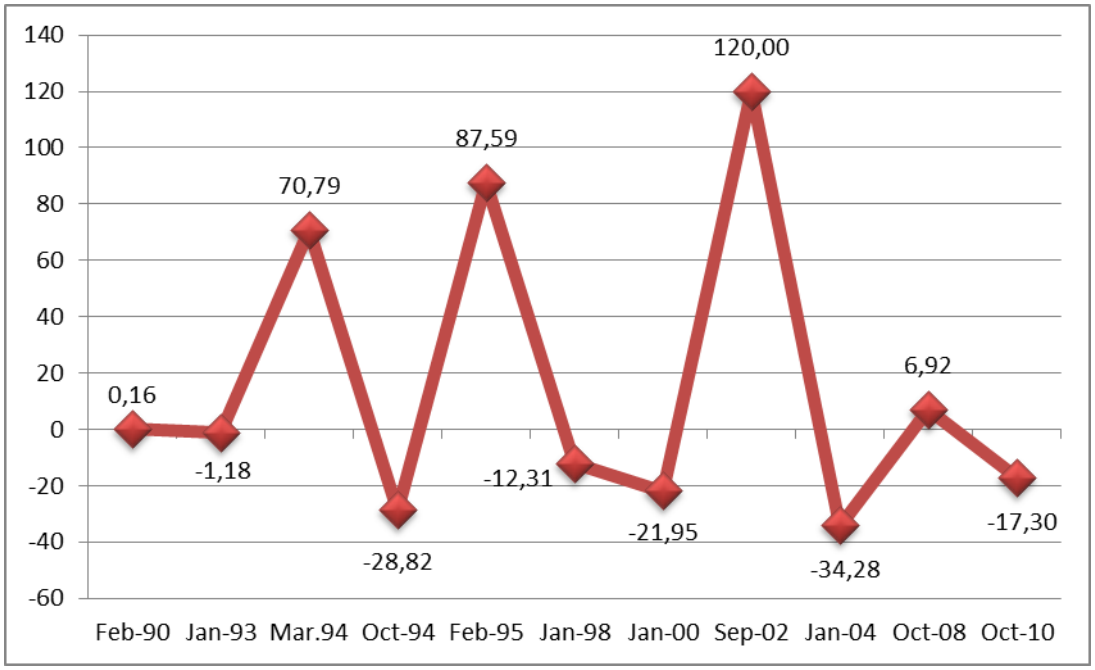

Figure 6: % Changes in Interest Rate

Sources: Central Bank of the Turkish Republic

In below figure 7, Central Bank of The Turkish Republic figures have indicated that interest rates since 2005. The beginning of 2005, interest rate placed in 4.71 percent. This rate gradually was increased until December 2008 with impact of global crisis. After this time, interest rate preceded normally levels.

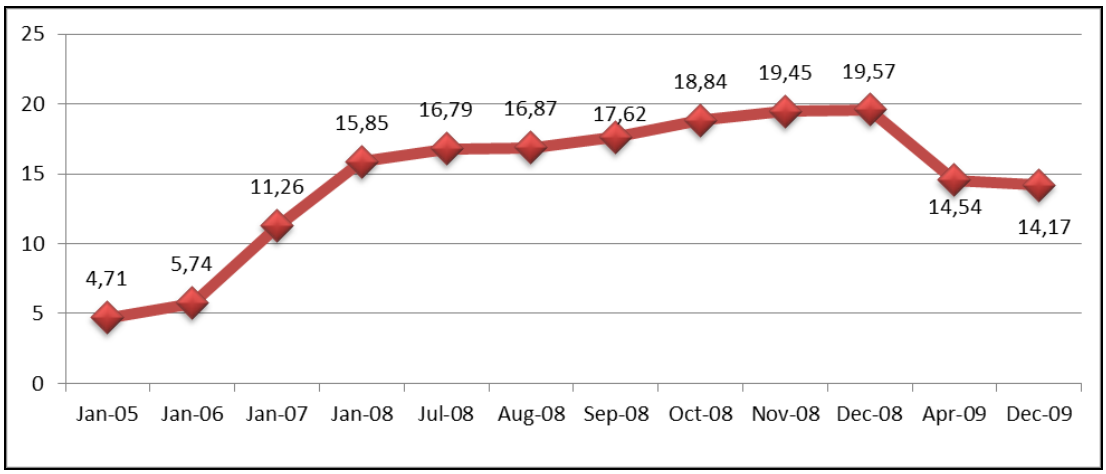

Figure 7: Interest Rate %

Sources: Central Bank of the Turkish Republic

An average of between January 2008 and December 2008 was 17.86 percent, but interest rate declined to 14.5 percent in April 2009. Exactly after a year in April 2010, interest rate again declined to 14.1 percent. While impact of the recent crisis slowly was passing in 2010s at the same time interest rate was declining, as seen in above graph 6. Interest rate, which gradually decreasing from 2005 until 2008, was declined to 2.5 point and placed to 11.6 percent in October 2010. Central Bank of The Turkish Republic continued to cut interest rate during whole the year of 2010.

Consequently, interest rate placed with 11.3 percent in December 2010, as a result of fluctuation.

CHAPTER III

AN EMPIRICAL APPROACH TO THE RECENT GLOBAL FINANCIAL CRISIS: THE CASE OF TURKISH ECONOMY

3.1. Introduction

Kaminsky indicated that (1998) the exchange rate market pressure is a broader definition of crisis, which includes not only devaluations, but also episodes of unsuccessful speculative attacks. When a currency is under attack, the central bank can intervene by either an increase in domestic interest rates or a substantial loss of foreign reserves to avert the attack. "Kaminsky and Reinhard (1999) emphasized that the indicators showed M2 multiplier, the ratio of domestic credit to nominal GDP, the real interest rate on deposits, and the ratio of lending-deposit interest rates, excess real M1 balances, real commercial-bank deposits, and the ratio of M2 divided by foreign-exchange reserves (in U.S. dollars). The indicators linked to the current account include the percent deviation of the real exchange rate from trend, as a measure of misalignment, the value of exports and imports (in U.S. dollars), and the terms of trade. The indicators associated with the capital account are foreign-exchange reserves (in U.S. dollars) and the domestic-foreign real interest-rate differential on deposits (monthly rates in percentage points). The indicators of the real sector are industrial production and an index of equity prices (in U.S. dollars). Lastly, the fiscal variable is the overall budget deficit as a percent of GDP. We analyzed that the evolution of 16 macroeconomic and financial variables around the time of the crises. The

variables used in the analysis were chosen in light of theoretical considernations and subject to data availability. Monthly data was used."[26]

"Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007) indicated that we aimed a measure of the probability of crises associated with an aggregate indicator, where the percentage of false alarms and the proportion of missed signals can be combined to give an appreciation of the vulnerability of an economy. In this perspective, the important issue is not only to determine whether a system produces true predictions of a crisis, but also whether there are forewarning signs of a forthcoming crisis prior to its actual occurrence. To this end, we adopt the approach initiated by Kaminsky, Lizondo and Reinhart (1998), analyzing each indicator and calculating each threshold separately. We depart from this approach in that each country is also analyzed separately, permitting the creation of a more "custom-made" early warning system for each one."[27]

In the lights of this information, we arrived to make that an empirical research has been done with various variables that how to the affect in Turkish economy and these variables, which inflation (consumer Price index), total export, total import, foreign exchange in dollar, treasury bills, banking sector domestic loan on private sector/domestic credit amount, net international reserves, government bonds, M2 money supply, Istanbul stock exchange (ISE 100 index), industry production index and total deposits of deposit money banks/gross domestic product are independent variables. On the contrary, the dependent variable is made up of 0 or 1 which is calculated

[26] Kaminsky, G.L., Reinhart, C.M. (1999), "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *The American Economic Review*, 89(3), page 480-481.
[27] Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007), "A Forewarning Indicator System for Financial Crises: The Case of Six Central and Eastern European Countries", William Davidson Institute Working Paper Number 901, page 1.

by Artificial Neural Network method. Besides, Foreign Exchange Market Pressure Index (EMP) used in this thesis and threshold value calculated. The dramatic increase in inflation from 1994s and 1995s upwards ceased this increase and also total export increases during this period that except for 1999. Economic growth has been declined since 2000, in addition to, taking the negative value -4.69 as 2009 in growth rate. As seen this opposite relationships that analyzed with an empirical method in this chapter.

3.2. Literature Review

Kaminsky, G.L., Reinhart, C.M. (1999) indicated that sixteen macroeconomic and financial variables used in this study. These are M2, Domestic credit/GDP, Real interest rate, Lending-deposit rate ratio, Excess M1 balances, M2/Reserves, Bank deposits, Exports, Imports, Terms of trade, Real exchange rate, Reserves, Real-interest rate differential, Output, Stock prices and Deficit/GDP. The variables used in the analysis were chosen in light of theoretical considerations and subject to data availability. Monthly data was used to get a clearer view (than would otherwise be revealed by lower frequency data) of developments as the crisis approaches and by the desire to evaluate to what extent these indicators.[28] The exchange rate market pressure is a broader definition of crisis, which includes not only devaluations, but also episodes of unsuccessful speculative attacks. When a currency is under attack, the central bank can intervene by either an increase in domestic interest rates or a substantial loss of foreign reserves to avert the attack (Kaminsky 1998).

Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain. and Zdzienicka-Durand, Aleksandra (2007) indicated that eight variables used in

[28] Kaminsky, G.L., Reinhart, C.M. (1999), "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *The American Economic Review*, 89(3), page 480-481.

this study that Real exchange rates, M2, Credit, Reserves, GDP, Commercial bank deposits, Imports and Exports. Our study covers the period starting from the first quarter of 1996 and ending at the last quarter of 2003. We use quarterly data for the following countries: Russia, Hungary, Poland, the Slovak Republic, the Czech Republic and Kazakhstan. Our series are taken from the IMF database (IFS statistics).[29]

Uygur, Ercan, (2001) showed that significant crisis indicators are emphasized. These are short-Term Foreign Debt/Foreign Exchange Reserves, Current Account Deficit/Foreign Exchange Reserves, Current Account Deficit/GDP, Total or Short-Term Foreign Debt/Export, Deficit Position of Banking Sector/ Foreign Exchange Reserves, The Credit of Banking/ Foreign Exchange Reserves, M2/ Foreign Exchange Reserves, Appreciating of Domestic Money, Capital Volatility, Increase, Volatility of Foreign Debt Interest and Risk Premium, Volatility of Short-Term Domestic Interest. There is no regression analysis only determined significant crisis indicators in this article as seen above.[30]

Şen, Ali (2005) showed that fourteen variables were used in this study. These are M2/Reserves, Domestic Credit, Total Commercial Bank Deposits, Real Interest, Gross Foreign Exchange Liabilities in Banking Sector, The credit of Central Bank to The Public Sector, Reserves, Export, Import, Real Foreign Exchange Rate, Budget Deficit, Real Output, Istanbul Stock Exchange Index and Inflation. In this model, covering the period is starting with January 1980 and ending with December 2003 were composed of totally 260-month data and were separately estimated via probit method.[31]

[29] Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007), "A Forewarning Indicator System for Financial Crises: The Case of Six Central and Eastern European Countries", William Davidson Institute Working Paper No: 901, page 1.
[30] Uygur, Ercan, (2001), "Krizden Krize Türkiye: 2000 Kasım ve 2001 Şubat Krizleri", page 18.

Yılmaz, Mesut (2005) indicated that twenty variables, which Interest Rate in USA Money Market, Interest Rate in USA Money Market Growth Rate, Budget Deficit/GDP, ISE 100 Index, Banking Credits/GDP, Banking Credits Growth Rate, Current Account Deficit/GDP, Foreign Debts/Export, Total Foreign Debts/GDP, Export/Import, Export/Import Growth Rate, Export Growth Rate, Short-Term Foreign Debts/International Reserves, Short-Term Foreign Debts/Foreign Debts, M2/Reserves, Real GDP Growth, International Reserves Growth Rate, National Money Market Interest Growth rate, The Differential of USA-Turkey Money Market Interest Rates, The Differential of USA-Turkey Inflation, were used in this doctorate thesis. In addition, covering the period is starting with 1992 and ending with 2003 were compose of totally 132- month data which estimated via ML- Binary Probit method.[32]

Gerni, Cevat., Emsen, Ö. Selçuk., and Değer, M. Kemal (2005) have observed that the interest rate-exchange rate nexus in the Turkish economy appeared in the process of financial liberalization has formed a fragile structure and that situation has triggered the economic crises along with the rising of the country's risk premium. There is used LPM and Logit analysis method in this article. About covering period is starting with 1990 and ending with 2004 were compose of monthly data. In addition, independent variables are M2Y/M2, Real Foreign Exchange Rate, Public Income/ Public Expenditure, Reserves, Industry Production Index, Export/Import, The Differences of Turkey and USA Real Interest Rate, Inflation Rate, ISE Index and Variation Rate in Net Error.[33]

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[31] Şen, Ali, (2005), "The Preditability of Financial Crisis: The case of Turkey"
[32] Yılmaz, Mesut, (2005), "An Theoretical and Empirical Approach to the Crisis of Foreign Currency in Emerging Markets: The case of Turkey 1992-2003"
[33] Gerni, Cevat., Emsen, Ö. Selçuk., and Değer, M. Kemal, (2005), "Erken Uyarı Sistemi Yoluyla Türkiye'deki Ekonomik Krizlerin Analizi", Ekonometri ve İstatistik, 2:11-29.

Aydın, Üzeyir (2003) indicated that the independent variables were gathered under five different titles: current accounts balance, budget balance, foreign exchange rates, financial pressure index and foreign capital movements. These basic variables were used in order to gather various sub-variables under a common name. Furthermore, GNP growth rates, Wholesale Price Index and unemployment rates were utilized in order to set up a crisis index, which was used as a dependent variable. The results of this analysis covering the period of 1981-2002 are as follows: the current accounts deficit, budget deficit, foreign exchange movements, foreign capital movements, interest rates and the changes in central bank foreign exchange reserves were found influential on the crises after 1980. To the study, the Financial Pressure Index that consists of the public domestic borrowing interest, exchange rate and the central bank foreign exchange reserves is the most influential variable on the crises, followed by the public investment expenditures and current accounts deficit.[34]

Saraçoğlu, Bedriye., Yiğidim, Arslan., Demir, Ahmet., Duman, Sibel and Açıköz, Senay (2005) analyzed the financial crisis that had emerged in Turkey in the years of 1994, 2000 and 2001 by using signal acquisition, logit and probit models separately. Speculative Pressure Index (SPI) was constituted through the monthly percentage changes in the foreign exchange rate, interest rate and international reserves. This index was used as a dependent variable. The data between the years of 1992 and 2004 were used. Current deficit/net international reserves, export/import coverage ratio on annual basis, hot money/international reserves and expansion of the real

[34] Aydın, Üzeyir, (2003), "Türkiye'de 1980 Sonrası Dönemde Yaşanan Ekonomik Krizlerin Analizi, Unpublished M:A: Thesis, Dokuz Eylül University.

credit volume on annual basis again were considered as the final leading indicators.[35]

Karataş, Bilge titled "Real Estate and Mortgage Crisis A Study on The United States". In this thesis is examined two time periods in order to capture structural break in the end of 1999. The first period is starting with January 1990 until December 1999 and the second period is starting with January 2000 until December 2006. This study's dependent variable is house price index. On the contrary, independent variables are Consumer Price Index, Personal Income, Population, Mortgage Rate, Housing Starts, and Unemployment Rate. In order to estimate this model, monthly data is employed for the time period from January 1990 until December 2006. Total number of observations is 2004.[36]

Bastı, Eyüp (2009) indicated that in this article the most crucial point is effects of mortgage crisis to Turkish economy for my thesis. These effects are negatively in Turkish economy. ISE 100 index is decreased by %52.6 in 2008. Interest rate, foreign exchange rate, treasury bill's interest rate, export, investment and internal demand. There is not any regression analysis in article.[37]

Aydoğmuş, Özgür (2006) purposed for this study is to examine the aspect of relationship between financial markets and economic growth. M1/GDP, M2/GDP, M2-M1/GDP, L/GDP, L-M1/GDP, The Assets of Commercial Banks/GDP, The Credit of Private Sector/GDP, The Credit of Private

[35] Saraçoğlu, B., Yiğidim, Arslan., Demir, Ahmet., Duman, Sibel and Açıkgöz, Şenay, (2005), "Finansal Kriz Öncü Göstergeleri ve Türkiye Finansal Kriz İndeksi", The latest advances in Monetary Theory and Policy II, Symposium conducted at Muğla University, page 427-460.
[36] Karataş, Bilge, (2009), "Real Estate and Mortgage Crisis : A Study on the United States" A Master Thesis at Bilkent University, page 26-27-28.
[37] Bastı, Eyüp, (2009), "2008 Global Fınancial Crisis and The Turkish Financial System" Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, page 89-103.

Sector/The Volume of Total Credit, ISE 100 Index and ISE Total Operation Volume are used the indicator of representation of financial growth in this study and between 1996-2005 years is used three months period times series. These variables are estimated via Dickey Fuller Test, Engle-Granger Cointegration Test and Causality test.[38]

Görmez, Birol (2009) showed that the subject of the thesis is to analyze the Turkish financial crises in the early 2000s. In this thesis, empirical analysis consists of dependent and independent variables such as M2(Money Supply)/Gross International Reserves of Central Bank, Total Deposits of Commercial Banks, Domestic Credit Amount, Consolidated Budget Income/Consolidated Budget Expenditure, Real Exchange Rate, Deposit Rate, Consumer Price Index, Current Account Balance/Gross Domestic Product, Export Coverage Import Ratio. Artificial Neural Network method is used in this master's thesis. 96-monthly data covering the period between January 1996 and December 2003 is used.[39]

3.3 The Data and Methodology

In order to estimate the model, monthly data is employed for the time period from January 1990 until December 2010. The total number of observations is 252. The dependent variable is a pressure index is created. This index is named as Foreign Exchange Market Pressure Index (EMP). which are taken from central bank of the Turkish Republic.

On the contrary, first independent variable is the total export which indicates foreign trade of a country, for instance import and export which both of

[38] Aydoğmuş, Özgür, (2006), "Financial Markets and Economic Growth: An Econometric Analysis"

them are foreign trade figures. Also this figures is monthly obtained from CBRT. Second one is the Consumer Price Index (CPI) which is gather from Central Bank of The Turkish Republic. The data not only indicates specific data, but also reflects total data in CPI. Another indicator is the total deposits/gross domestic product. Third indicator is the government bonds. Fourth one is the foreign currency in dollar. Fifth indicator is the total import. Sixth indicator is the the net international reserves. Seventh indicator is the industry production index. Eightth indicator is the M2 money supply which is calculated to M1 plus personal money in deposit accounts and also, is a measure of money supply, including coins and notes and personal money in current and deposit accounts. Nineth indicator is the banking sector domestic loan on private sector/domestic credit amount. Tenth indicator is treasury bills which is measured in millions of Turkish Lira. Eleventh is the government bonds. Twentieth is the Istanbul stock exchange 100 (ISE 100) which is calculated to an average of 100 firms in stock market. All of them obtained from Central Bank of The Turkish Republic (CBTR).

3.4 Model

Some modifications and changes have been made and inspired these above models. Consequently, new model has been constituted in this thesis. Between 1990 and 2010 years, monthly data had been used in this thesis. The model is analyzed that resulted in equation:

$$Y_i = \beta_0 + \beta 1\, T\_Exp + \beta_2 CPI + \beta_3 \text{TOD/GDP} + \beta_4 For\_Exchng + \beta_5 \text{T\_IMP} + \beta_6 \text{NIR} + \beta_7 \text{IPI} + \beta_8 \text{M2} + \beta_9 BSDL\_P/DCA + \beta_{10} \text{Trea\_Bills} + \beta_{11} \text{Gov\_Bonds} + \beta_{12} ISE100 + e_t$$

Where;

[39] Görmez, Birol, (2009), "An Empirical Approach to Financial Crises: The Case of Turkish Financial Crises in the Early 2000s". A master Thesis at Fatih University, page 73-125.

T_Exp: Total Export
CPI: Consumer Price Index
TOD/GDP: Total Deposits/Gross Domestic Product
For_Exc: Foreign Exchange Rate in Dollars
T_IMP: Total Import
NIR: Net International Reserves
IPI: Industry Production Index
M2: Money Supply
BSDL_P/DCA: Banking Sector Domestic Loan on Private Sector/Domestic Credit Amount
Trea_Bills: Treasury Bill's
Gov_Bonds: Government Bonds
ISE100: Istanbul Stock Exchange 100 Index

As seen above in equation, I researched into the relationship between dependent variable which consists of "0" and "1" and twelve independent variables that are shown in equation. Also, the Artificial Neural Network (ANN) Method has been used during the empiric operation. As a result of this operation reached to significant values that R-squared is 0.954334 of the change in dependent variable be explained by the changes in total export, inflation (consumer Price index), total deposits of deposit money banks/GDP, foreign exchange in dollar, total import, net international reserves, industry production index, M2 money supply, banking sector domestic loan on private sector/domestic credit amount, treasury bills, government bond, Istanbul stock exchange (ISE 100 index).

3.5 Dependent Variable

A pressure index is created in order to determine the dependent variable. These indexes are named as Speculative Pressure Index (SPI),

Financial Pressure Index (FPI) and Foreign Exchange Market Pressure Index (EMP). In creating index, different formulations are applied. For instance, in a study, the value of FPI is defined as the weighted average of foreign exchange changes, foreign reserves[40]. In another study, market pressure index is defined and formed an equation that consists of the real exchange rate and the country's foreign reserves. Besides, the threshold parameter is defined that consists of the empirical mean of EMP, the standard deviation and the coefficient of standard deviations of EMP[41].

In our study, a different method is applied to determine the dependent variable and it is shown the below graph.

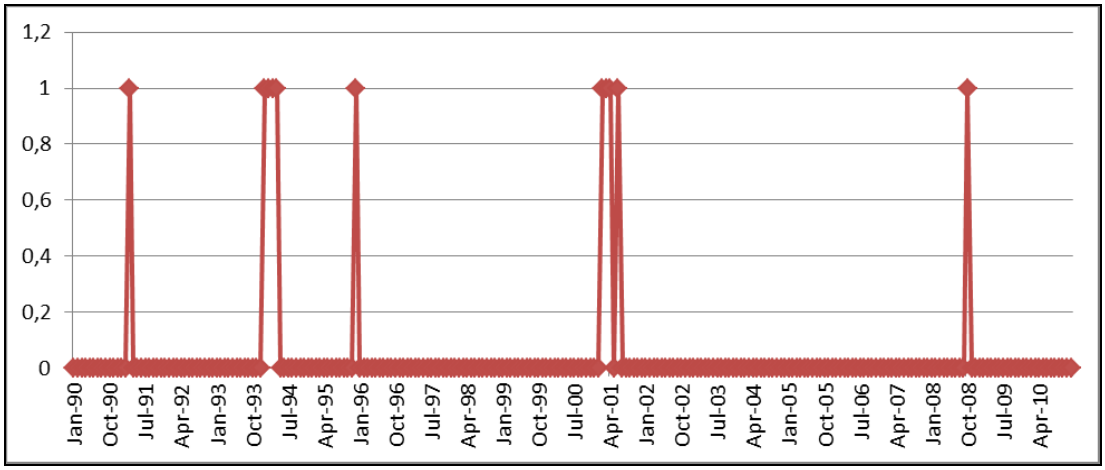


Figure 8: Dependent Variable

In the analysis applied via Artificial Neural Network method, the values that belong to the foreign exchange market pressure index, instead of

[40] Kaminsky, G.L., Reinhart, C.M. (1999), "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *The American Economic Review*, 89(3), page 476.
[41] Andreou, Irène., Dufrénot, Gilles., Sand-Zantman, Alain., Zdzienicka-Durand, Aleksandra (2007), "A Forewarning Indicator System for Financial Crises: The Case of Six Central and Eastern European Countries", William Davidson Institute Working Paper No: 901, page 6-7.

the values '0' and '1', are used as dependent variables. As the number of months in which the pressure index value is higher than the threshold value is limited. For this reason, the value of the pressure index, instead of the dependent variable consisted of '0' and '1', was taken as the dependent variable. In the months in which the actual value of the pressure index is estimated successfully and exceeds the estimated threshold value, it is expressed that the financial crisis is estimated successfully. The term 'Foreign Exchange Market Pressure Index' used as a dependent variable in our analysis and the term 'Threshold Value' used in the determination of the months with crisis can be explained as follows.

"Foreign Exchange Market Pressure Index is calculated as a weighted average of the monthly percentage change in gross foreign exchange reserves of the Central Bank of Turkey and of the monthly percentage change in the nominal devaluation of Turkish Lira against USD."[42]

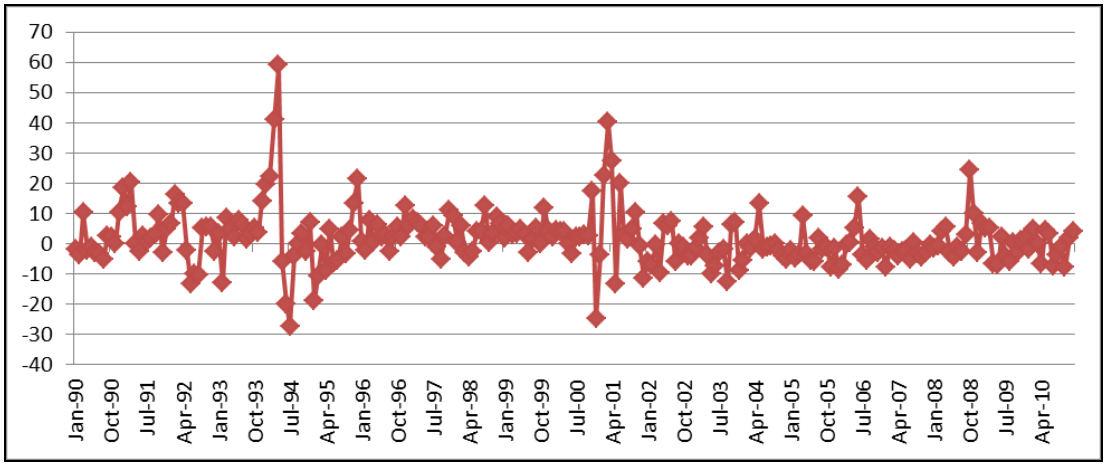


Figure 9: Foreign Exchange Market Pressure Index

Sources: Central Bank of the Turkish Republic

[42] Şen, ibid, page 135.

$$EMP_T = \%\Delta e_t - \alpha_1 \%\Delta r_t$$

This equation gives the foreign exchange pressure index.

Where

e_t refers to nominal foreign exchange buying rate of TL/USD at time t.

r_t refers to gross foreign exchange reserves of Central Bank of Turkey

$\%\ \Delta\ e_t$ refers to the percentage change of nominal foreign exchange buying rate of TL/USD at time t with respect to time (t-1) (With respect to the previous month).

$\%\Delta r_t$ refers to the percentage change of the amount of CB gross foreign exchange reserves at time t with respect to time (t-1) (With respect to the previous month).

α_1 refers to the ratio of the standard deviation of the serial that is comprised of the monthly change of the foreign exchange rate to the standard deviation of the serial that is comprised of the monthly change of the CB gross foreign exchange reserves (σ_e / σ_r).

According to this equation, the increase in the nominal foreign exchange rate affects the pressure index positively whereas the increase in the reserves affects negatively. In other words, devaluation of TL vs. USD and decrease in the CB gross foreign exchange reserves increase the pressure on the foreign exchange market, and thus, financial crisis risk.

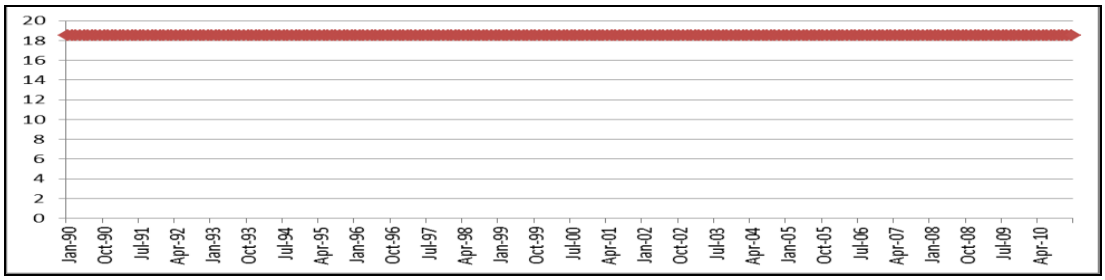


Figure 10: Threshold Value

The threshold value is calculated as follows:

Threshold Value: $\beta\sigma_{emp} + \mu_{emp}$

Where

β refers to the coefficient of standard deviation of EMP.

σ refers to standard deviation of EMP serial.

μ refers to average of EMP serial.

Crisis equation;

Crisis= 1, *if EMP*>threshold value

0, *otherwise*

As seen above in equation, there is a financial crisis. Thus the dependent variable takes the value of 1 in first condition. On the contrary, there is not a financial crisis and the dependent variable takes the value of 0 in second condition.

In this thesis, the threshold value has been calculated as 18.488, the standard deviation of the pressure index as 9.08, the average as 1.69, the value of (σ_e / σ_r) as 0.74. "β" coefficient has been assigned the value of 1.85. Naturally, the value of the pressure index has received different values each month. In the light of this information, in March 1991, January, February, March, April 1994, December 1995, January, February, April, June 2001 and October 2008, the pressure index receives higher values than the threshold value. That is, given this information, it is concluded that there was

a financial crisis in these months. The fact that a financial crisis existed in in March 1991, January, February, March, April 1994, December 1995, January, February, April, June 2001 and October 2008 fit with the facts and the results of other empirical studies.

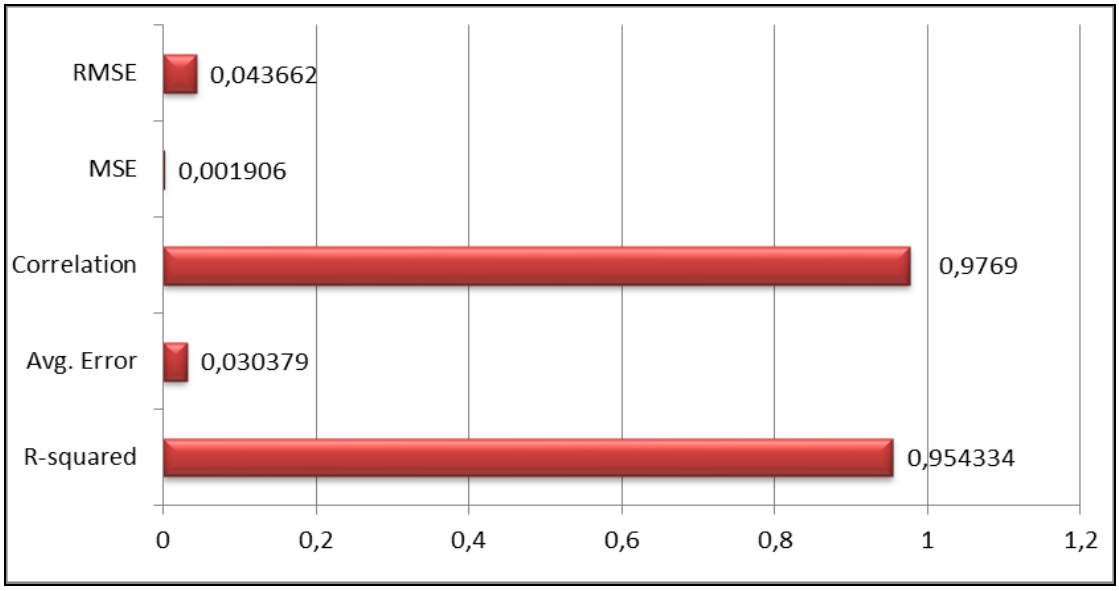


Figure 11: Best Net Statistics of Artificial Neural Network
Sources: Neuro Shell Predictor

The network performance statistic is better known as R-Squared or the coefficient of multiple determinations, a statistical indicator usually applied to multiple regression analysis. It compares the accuracy of the model to the accuracy of a trivial benchmark model wherein the prediction is just the average of all of the example output values. A perfect fit would result in an R-Squared value of 1, a very good fit near 1, and a poor fit near 0. In this thesis R-Squared is calculated to 0,954334, which is a powerful indicator of the ability of the model to make well predictions, in above figure 11. If your neural model predictions are worse than you could predict by just using the average of the output values in the training data, the R-Squared value will be 0. Network performance may also be measured in negative

numbers, indicating that the network is unable to make good predictions for the data used to train the network. There are some exceptions, however, and you should not use R-Squared as an absolute test of how good the network is performing.

A caution about R-Squared, the coefficient of multiple determinations, with r squared, and the coefficient of determination. These values are the same when using regression analysis, but not when using neural networks or other modeling techniques. The latter is usually the one that is found in spreadsheets. See any statistics book for more details. Also note that sometimes the coefficient of multiple determinations is called the multiple coefficient of determination, but in any case it refers to a multiple regression fit as opposed to a simple regression fit. Also, do not confuse it with r, the correlation coefficient.

R-Squared is not the ultimate measure of whether or not your net is producing good results. You might decide the net is OK by the number of answers within a certain percentage of the actual answer, the mean squared error between the actual answers and the predicted answers, your analysis of the actual versus predicted graph, etc. The success of the net depends more upon the problem and the field you are working in rather than a single statistical measure.

There are times when R-Squared is misleading, if the range of the output value is very large, then the R-Squared may be close to 1 yet the results may not be close enough for your purpose. Conversely, if the range of the output is very small, the mean will be a fairly good predictor. In that case, R-Squared may be somewhat low in spite of the fact that the

predictions are fairly good. Also, note that when predicting with new data, R-Squared is computed using the mean of the new data, not the mean of the training data.[43]

Average Error is the absolute value of the actual values minus the predicted values divided by the number of patterns.[44] This value in this thesis is 0,030379 in figure 11.

Correlation is a measure of how the actual and predicted correlate to each other in terms of direction (ie, when the actual value increases, does the predicted value increase and vice versa). This is not a measure of magnitude. The values for r range from 0 to 1. The closer the correlation value is to 1, the more correlated the actual and predicted values are. Correlation is 0.9769, which is again a powerful indicator of the accuracy of the model, in figure 11.[45]

Mean square error (MSE) is a statistical measure of the differences between the values of the outputs in the training set and the output values the network is predicting. This is the mean over all patterns in the file of the square of the actual value minus the predicted value, the mean of (actual - predicted)^2. The errors are squared to penalize the larger errors and to cancel the effect of the positive and negative values of the differences.[46] MSE is calculated to 0,001906 in figure 11.

Root mean square error (RMSE) is the square root of the MSE. In this thesis, it is 0,043662 in figure 11.[47]

[43] NeuroShell® Predictor
[44] NeuroShell® Predictor
[45] NeuroShell® Predictor
[46] NeuroShell® Predictor
[47] NeuroShell® Predictor

3.6 Independent Variables

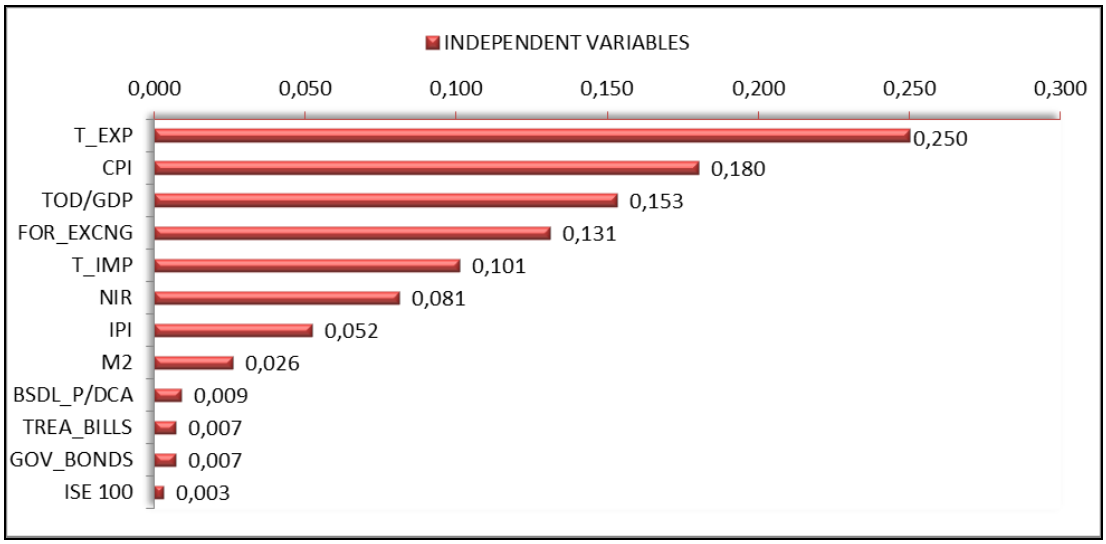


Figure 12: Independent Variables

Sources: Central Bank of the Turkish Republic

As seen from the figure 12 and the table 6, the most important input in predicting the output is the input of T_ EXP (Total Export). Because of its value of importance is the greatest. On the other hand, the input which is the least important in predicting the output is the input of ISE 100 (Istanbul Stock Exchange). Because of its value of importance is the smallest of all.

3.6.1 The Indicator of Total Export

"The indicator of export is that when you commerce for something out of the country. In economics, an export is any good or commodity, in other words transported from one country to another country in a legitimate fashion."[48]

[48] www.wikipedia.com

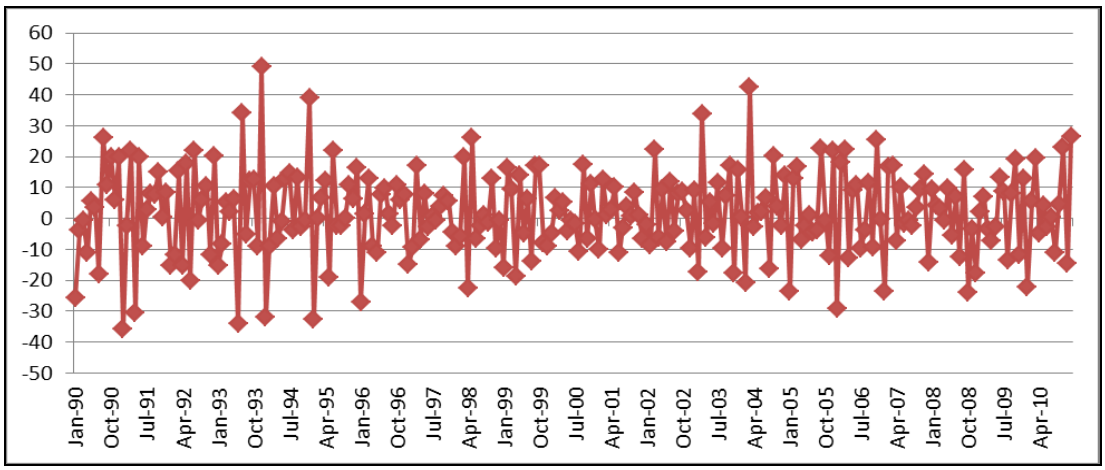


Figure 13: % Changes of Total Export

Sources: Central Bank of the Turkish Republic

"The indicator export is derived from the conceptual meaning as to ship the goods and services out of the port of a country. The seller of such goods and services is indicated that an "exporter" who is based in the country of export however the overseas based buyer is referred to as an "importer". In International Commerce, "exports" indicated that selling produced goods and services from home country to other markets or countries."[49]

3.6.2 The Indicator of Consumer Price Index (CPI)

"The consumer price index shows that changes over time in the general level of prices of goods and services that a reference population acquires, uses or pay for consumption."[50]

[49] Joshi, Rakesh Mohan, (2005) International Marketing, Oxford University Press, New Delhi and New York ISBN 0195671236

[50] http://stats.oecd.org/glossary/detail.as...

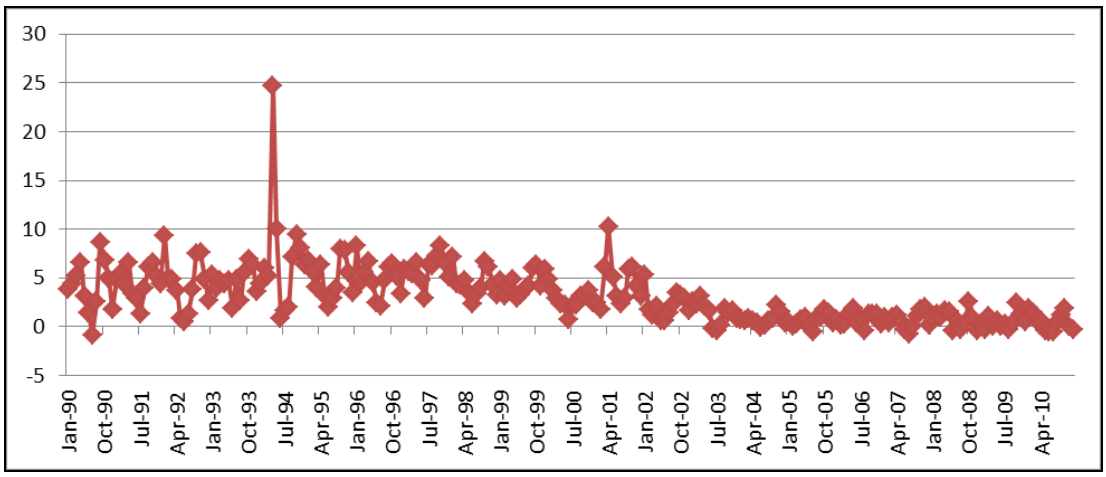


Figure 14: % Changes of Consumer Price Index (CPI)

Sources: Central Bank of the Turkish Republic

"A consumer price index is forecasted that a series of summary measures of the period-to-period proportional change in the prices of a fixed set of consumer goods and services of fixed quantity and characteristics, acquired, used or paid for by the reference population. Every summary measure is built that a weighted average of a large number of elementary aggregate indices."[51]

3.6.3 The Indıcator of Total Deposits in Deposit Money Banks/Gross Domestic Product

This indicator made up of deposits that the total deposits of each deposit money banks which is over gross domestic product.

[51] http://stats.oecd.org/glossary/detail.as...

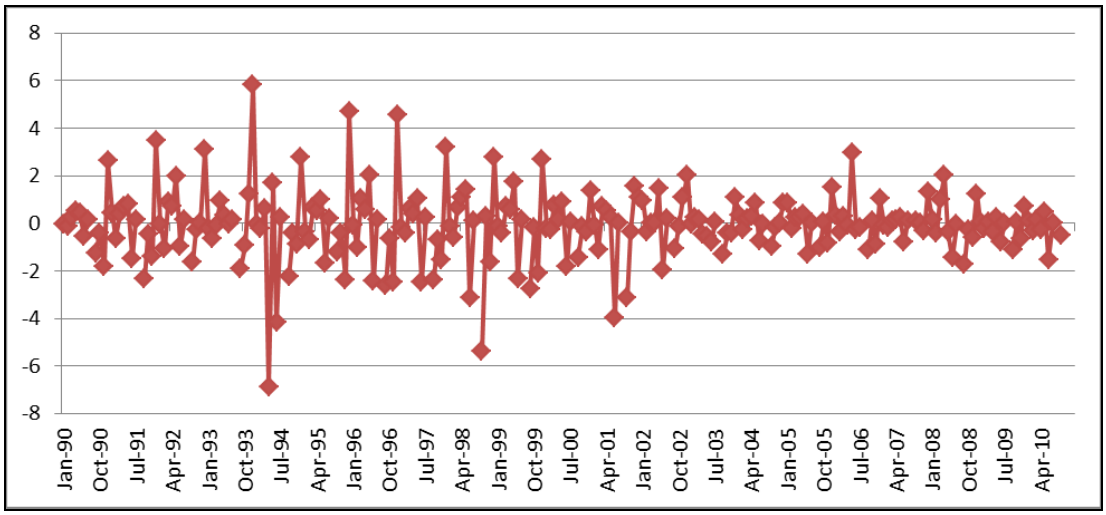


Figure 15: % Changes of Total Deposits in Deposits Money Banking/Gross Domestic Product (GDP)

Sources: Central Bank of the Turkish Republic

3.6.4 The Indıcator of Foreign Currency in Dollar

"The price of one country's currency expressed in another country's currency. In other words, the rate at which one currency can be exchanged for another. For example, the higher the exchange rate for one euro in terms of one yen, the lower the relative value of the yen."[52]

[52] http://www.investopedia.com/terms/e/exchangerate.asp

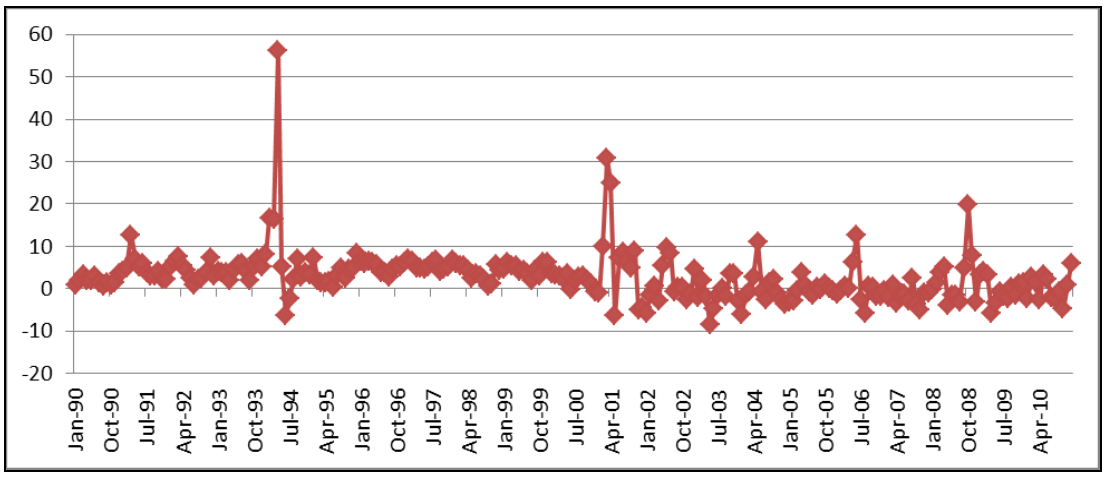


Figure 16: % Changes of Foreign Currency in Dollar

Sources: Central Bank of the Turkish Republic

3.6.5 The Indicator of Total Import

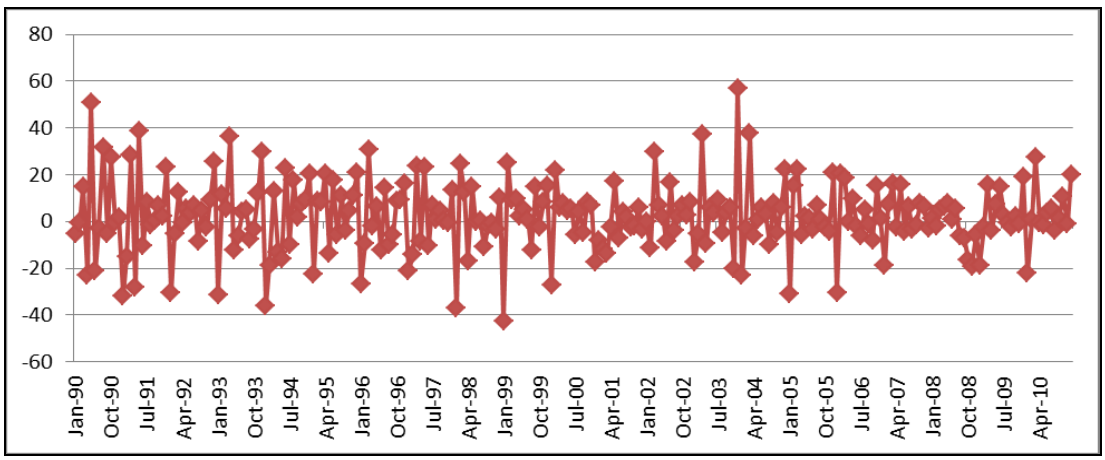


Figure 17: % Changes of Total Import

Sources: Central Bank of the Turkish Republic

3.6.6 The Indıcator of Net International Reserves

"Any kind of reserve funds can be passed between the central banks of different countries. International reserves, which are an acceptable form of payment between these banks, the reserves themselves can either be gold or else a specific currency that is the dollar or euro."[53]

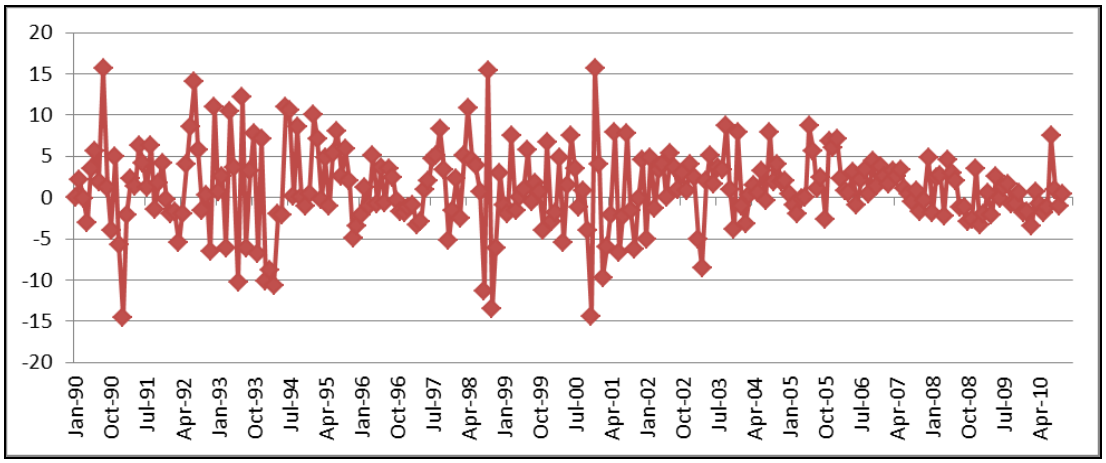
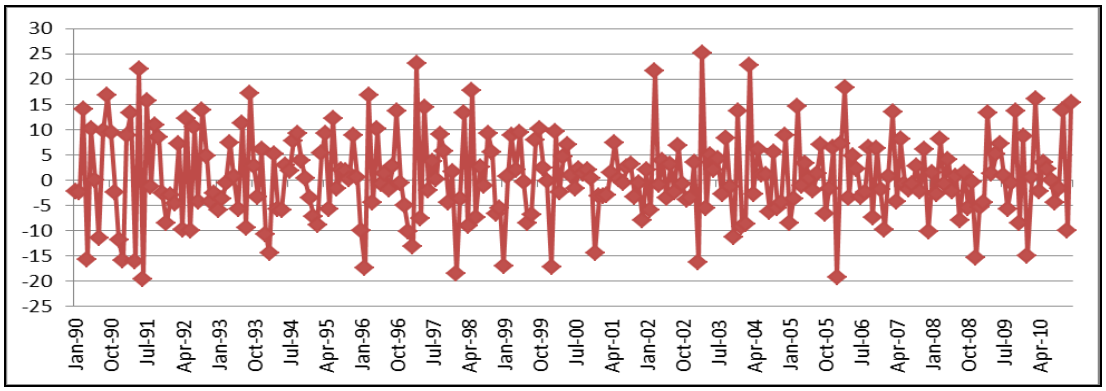


Figure 18: % Changes of Net International Reserves (NIR)

Sources: Central Bank of the Turkish Republic

3.6.7 Industry Production Index



[53] http://www.investopedia.com/terms/i/international-reserves.asp

Figure 19: % Changes of Industry Production Index (IPI)

Sources: Central Bank of the Turkish Republic

3.6.8 The Indicator of M2 Money Supply

M2 is a measure of money supply, including coins and notes and personal money in current and deposit accounts.

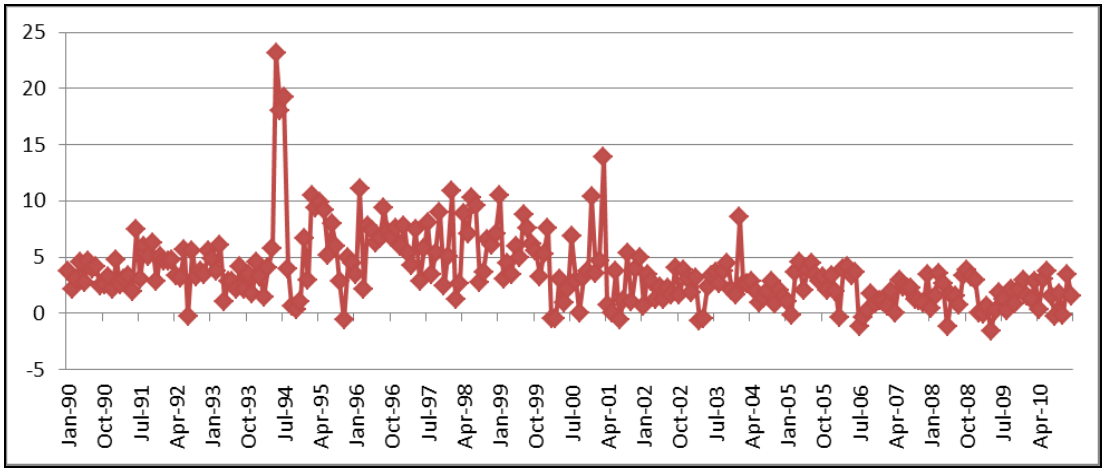


Figure 20: % Changes of M2 Money Supply

Sources: Central Bank of the Turkish Republic

"The money supply is the total amount of money in circulation in a country or group of countries in a monetary union. There are several ways in which this can be calculated: M1 is a measure of money supply including all coins and notes plus personal money in current accounts; M2 is M1 plus

personal money in deposit accounts; M3 is M2 plus government and other deposits."[54]

3.6.9 Banking Sector Domestic Loan on Private Sector/Domestic Credit Amount

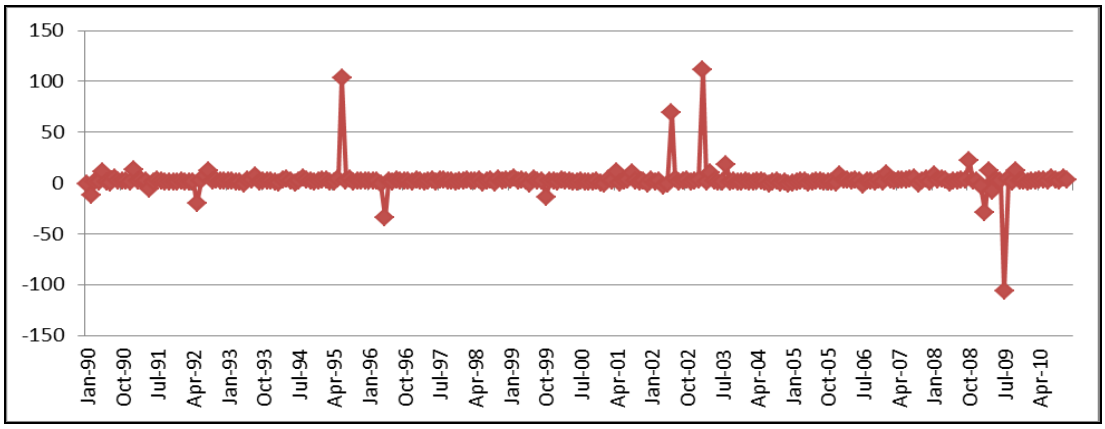


Figure 21: % Changes of Banking Sector Domestic Loan on Private Sector/Domestic Credit Amount (DCA)

Sources: Central Bank of the Turkish Republic

3.6.10 The Indicator of Treasury Bills

"Treasury bills are a common form of sovereign short-term debt, Treasury Bills are issued by many governments of the world. Typically issued through the central bank with maturities ranging from four weeks to two years, they bear no interest, are issued at a discount to face value and redeemed at par."[55]

[54] http://stats.oecd.org/glossary/search.asp
[55] (Financial Terminology Database, Bank of England)

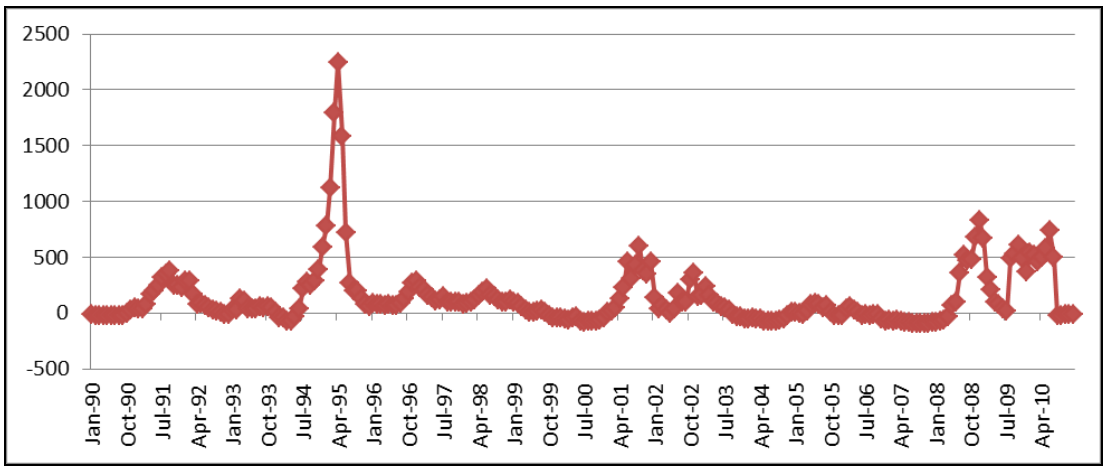


Figure 22: % Changes of Treasury Bill's

Sources: Central Bank of the Turkish Republic

3.6.11 The Indicator of Government Bonds

"A government bond is a kind of bond that is issued by a national government denominated in the country's own currency. Bonds issued by national governments in foreign currencies are normally referred to as sovereign bonds. The first ever government bond was issued by the English government in 1693 to raise money to fund a war against France. It was in the form of a tontine."[56]

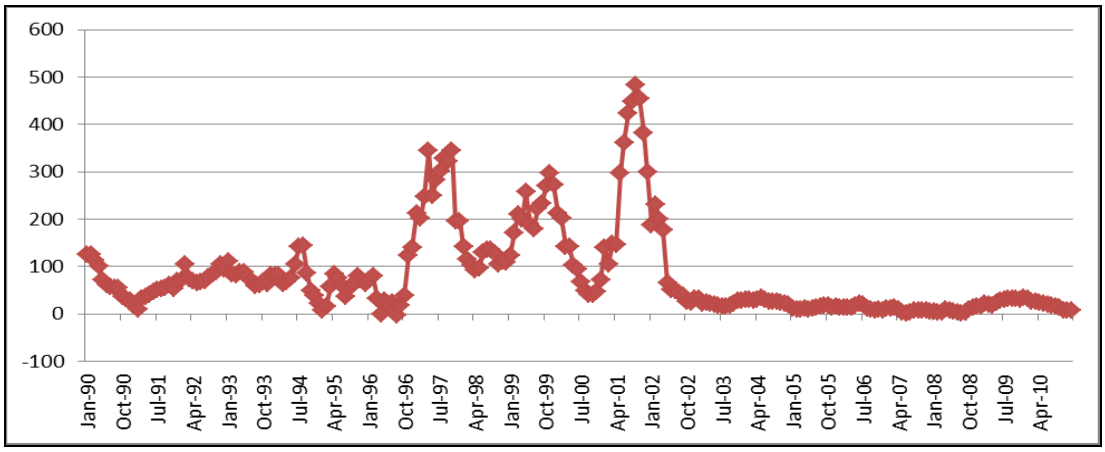


Figure 23: % Changes of Government Bonds
Sources: Central Bank of the Turkish Republic

"A government, which is its own currency with which to pay debt in its own currency, is always able to print more. It means that there is no risk that a government will be unable to meet payment on government bonds, and the yield on government bonds is used to determine the risk free rate of return. While there may be some sovereign risk that a government may choose to default, this is so unlikely that it can safely be disregarded under normal circumstances. Government short term zero coupon bonds are called treasury bills."[57]

3.6.12 The Indicator of Istanbul Stock Exchange 100 (ISE)

"40 Number of company stock over time, starting in 1986 with 100 companies limited by shares Composite Index in the sequel. Traded on the National Market, excluding investment trusts in the ability to represent the pre-set conditions, taking into account the next sector is composed of stocks selected automatically includes the ISE 30 stocks. Shares of stock prices and each, except for those the same custody, Money in custody rates in the number of total shares of stock, mainly on the basis of market value is calculated and an indication of the overall stock market."[58]

[56] www.wikipedia.com
[57] www.moneyterms.co.uk
[58] "Glossary of Terms Stock Market", Koç University Exchange Club Web site

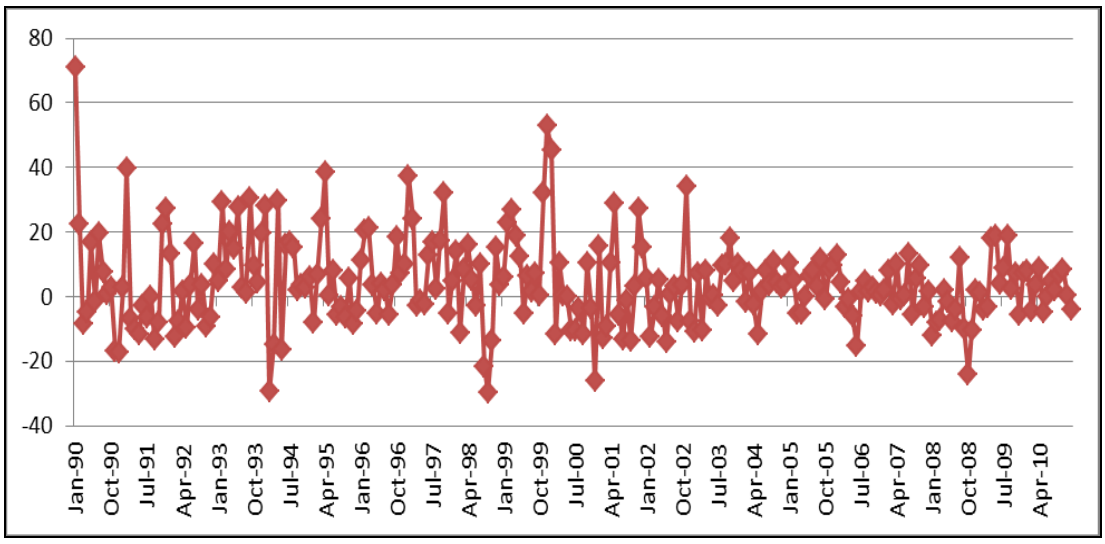


Figure 24: % Changes of Istanbul Stock Exchange 100 Index (ISE 100 Index)

Sources: Central Bank of the Turkish Republic

3.7 Importance of Independent Variables

The Relative Importance of Inputs values signify the importance of the variables. The weight values range from 0 to 1. Weights near 0 signify the least important variables, while weights near 1 signify the most important. As seen below the table 6, ISE 100 ındex is near 0 that is the least important variable. On the contrary, Total Export is near 1 that is the most important variable. Besides, Treasury Bill's, Government Bonds and BSDL_P/DCA are other lower important variables, however, CPI, TOD/GDP and FOR_EXCNG are other higher important variables. Except of above counting variables, T_IMP, NIR, IPI and M2 are other variables that the middle-level importance in table 6.

Table 5: Importance of Independent Variables

	INDEPENDENT VARIABLES	IMPORTANCE LEVEL
1	T_EXP	0,250
2	CPI	0,180
3	TOD/GDP	0,153
4	FOR_EXCNG	0,131
5	T_IMP	0,101
6	NIR	0,081
7	IPI	0,052
8	M2	0,026
9	BSDL_P/DCA	0,009
10	TREA_BILLS	0,007
11	GOV_BONDS	0,007
12	ISE 100	0,003
	TOTAL	1,000

Sources: NeuroShell® Predictor

One caution is that this technique becomes less and less accurate the more inputs that you have in the network. When you have 10 or less they are usually pretty good. When you have over 100 or so they will be pretty poor. Therefore, the best way to decide among a couple of hundred possible inputs is probably to train with no more than 20 at a time, recording the best of each lot. Then take the "winners" of each set of 20 and combine them in the final network. A possible disadvantage with this approach is that if there are relationships between two inputs in different lots that give the two a

powerful effect together that they do not have alone, then that relationship may not be discovered.

The limitations of determining are the importance (contribution) of an input variable. NeuroShell builds non-linear models, and the concept of the contribution of a variable in a non-linear model is a very vague and imprecise concept. That is because the effect of a variable on a model depends heavily on the settings of all other variables. (For the mathematically minded, consider z=x4+y. When x is close to zero, y has a great effect on the model. When x is large, y has very little effect.) The importance factors should by no means be considered highly accurate; they are a rough estimate at best, and we know of no algorithms that are highly accurate, if for no other reason than it is impossible to measure accuracy in any but the most elementary models. The genetic method gives more reliable importance factors than the neural method does. Often the two techniques will give different factors for the same problem. Sometimes this difference can be explained by the difference in the accuracy of predictions. Sometimes it can be explained by the fact that there are many ways to use the variables to arrive at predictions (this is most often the case when the number of training rows is small and/or the number of variables is large). Sometimes it can't be explained at all; in these cases, you should believe the genetic method's contributions.[59]

3.8 The Regression Results

In this thesis, 1994 financial crisis, November 2000, February 2001 financial crisis and recent global financial crisis based on USA in 2008 that quickly spread to other countries and finally also erupted in Turkey. These

crisis were analyzed by making use of the method of Artificial Neural Network. Before the analysis, the studies, which analyzed the financial crises in question including the 1994, 2000, 2001, 2008 financial crisis were deal with in literature review part.

Artificial Neural Network (ANN) is a method of artificial intelligence models. It mimics the way in which the biological brains function. It is composed of interconnected processing elements, which are called neurons. These elements are work in unison to solve problems. ANN learns by example. The ability of modeling a non-linear structure, making generalization by learning a sample, and forecasting are the important features of ANN. Marketing, credit evaluation, price estimation, estimation of exchange rate path are a few of the fields wherein ANN has been used. The number of studies using ANN has been increasing day by day although its usability has been continuing to be discussed.[60]

I used twelve inputs that are independent variables in the analysis. Comparing the importance of all variables is in the model. As seen from the figure 12, the most important input in predicting the output is the input of T_ EXP (Total Export). Because of its value of importance is the greatest. On the other hand, the input which is the least important in predicting the output is the input of ISE 100 (Istanbul Stock Exchange). Because of its value of importance is the smallest of all.

The weight values range from 0 to 1. Weights near 0 signify the least important variables, while weights near 1 signify the most important. As seen the table 6, ISE 100 ındex is near 0 that is the least important variable. On

[59] NeuroShell® Predictor

the contrary, Total Export is near 1 that is the most important variable. Besides, Treasury Bill's, Government Bonds and BSDL_P/DCA are other lower important variables, however, CPI, TOD/GDP and FOR_EXCNG are other higher important variables. Except of above counting variables, T_IMP, NIR, IPI and M2 are other variables that the middle-level importance in table 6.

[60] GÖRMEZ, Birol, "An Empirical Approach to Financial Crisis: The Case of Turkish Financial Crises in the Early 2000s", Page 128, 2009

CONCLUSION

This thesis has examined various dimensions of the impact of the recent global financial crisis (2008) on Turkish Economy. First chapter, I defined to the crisis and then examined financial crises models. After that, second chapter, the impact of recent global financial crisis (2008) and other various crises on Turkish economy was reviewed. For instance, the impact on growth rate, inflation, unemployment, public finance, monetary policy, interest rate, foreign currency in dollar and export of recent crisis. Third chapter is empiric study on recent crisis based on mortgage crisis in USA.

In this thesis, the USA financial crisis is analyzed and to study an empirical analysis about Turkish economy. Furthermore, I analyzed that regression between dependent variable that consists of "0" and "1" likes an index (EMP). On the contrary, independent variables such as foreign currency in dollar, total export, net international reserves, banking sector domestic loan on public sector/ domestic credit amount, total deposits in deposit money banks/gdp, consumer price index (CPI), treasury bills, government bonds, M2 money supply, total import, industry production index and Istanbul stock exchange 100 index (ISE 100).

We used twelve inputs that are independent variables in the analysis. Comparing the importance of all variables is in the model. As seen from the figure 12, the most important input in predicting the output is the input of T_ EXP (Total Export). Because of its value of importance is the greatest. On the other hand, the input which is the least important in predicting the output is the input of ISE 100 (Istanbul Stock Exchange). Because of its value of importance is the smallest of all.

Some of the causes of the current crisis are clear. These include the failure to correct the global imbalances that ballooned in the years leading up to the crisis; the absence of the needed degree of transparency in financial markets; the failures of national regulatory and supervisory systems and the absence of sufficient mechanisms for international regulatory coordination; the failures to prevent the emergence of perverse incentives in the financial system, especially in mortgage markets in the United States; the willingness of senior people in the banks and other financial institutions to accept financial innovations and instruments that even they now admit they did not understand. And there are many others.

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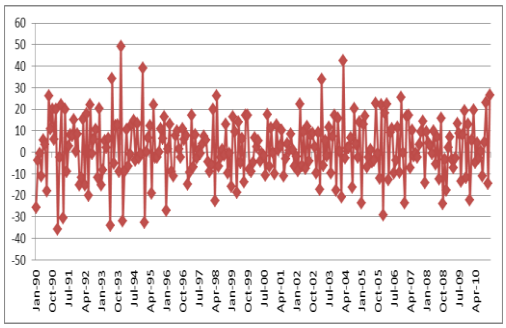
APPENDIX I: Data Sources (1990:01 to 2010:12)

	Indicators	Source
1	*T_Exp*: Total Export	CBTR
2	*CPI*: Consumer Price Index	CBTR
3	*TOD/GDP:* Total Deposits/Gross Domestic Product	CBTR
4	*For_Exc:* Foreign Exchange Rate in Dollars	CBTR
5	*T_IMP:* Total Import	CBTR
6	*NIR:* Net International Reserves	CBTR
7	*IPI:* Industry Production Index	CBTR
8	*M2:* Money Supply	CBTR
9	*BSDL_P/DCA:* Banking Sector Domestic Loan on Private Sector/Domestic Credit Amount	CBTR
10	*Trea_Bills*: Treasury Bill's	CBTR
11	*Gov_Bonds:* Government Bonds	CBTR
12	*ISE100:* Istanbul Stock Exchange 100 Index	CBTR

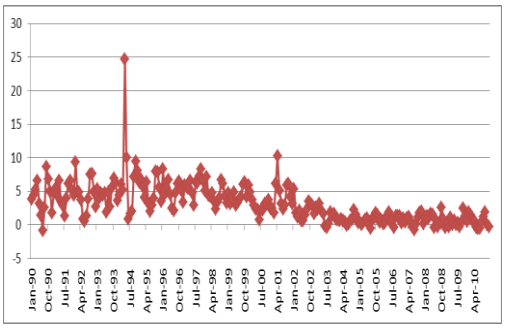
CBTR: Central Bank of the Turkish Republic

APPENDIX II: Independent Variables

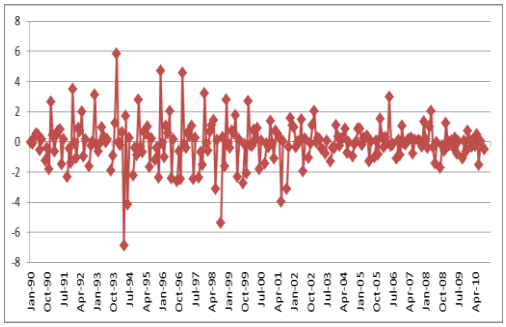
Total Export



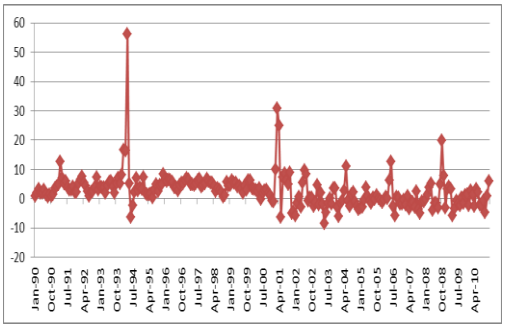
Consumer Price Index



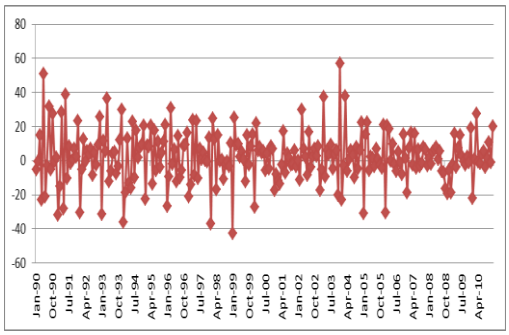
TOD\GDP



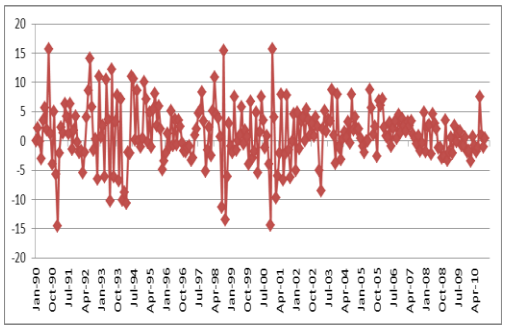
Foreign Currency in Dollar



Total Import

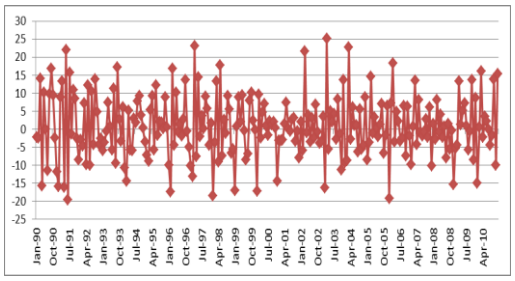


Net International Reserves

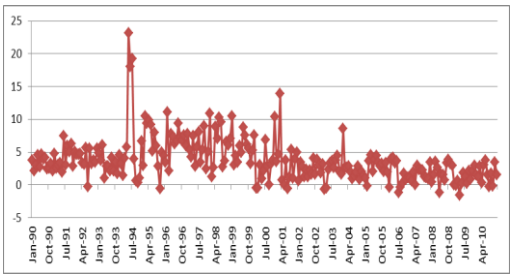


APPENDIX II: Independent Indicators (Continues)

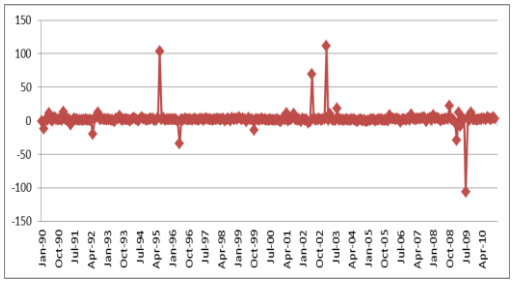
Industry Production Index



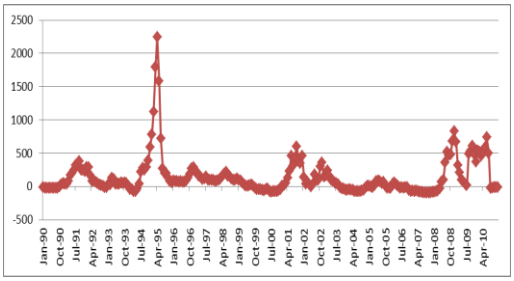
M2 Money Supply



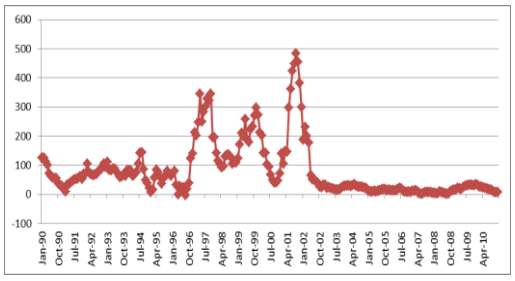
Banking Sector Domestic Loan on Private Sector/DCA



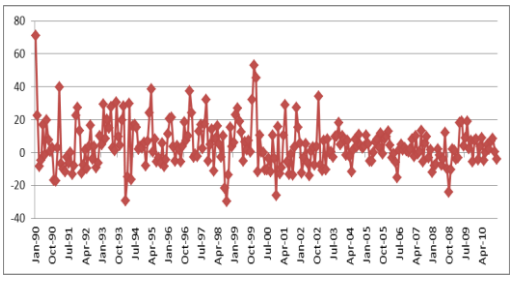
Treasury Bills



Government Bonds



Istanbul Stock Exchange 100



As seen in Appendix I and II, we can clearly see indicators that emhasizes 1994 crisis, 2001 crisis and 2008 recent global financial crisis. Espesially, total export, Consumer Price Index, TOD\GDP, Foreign Currency

in Dollar, M2 money supply, Banking Sector Domestic Loan on Private Sector/DCA, Treasury Bills, Government Bonds and Istanbul Stock Exchange 100 indicated these crises. For instance, Consumer Price Index, Foreign Currency in Dollar, M2 Money Supply and Treasury Bills sharply increased in this period, on the contrary, Total Export, TOD\GDP, Total Import, Net International Reserves, Industry Production Index, Banking Sector Domestic Loan on Private Sector/DCA, Government Bonds and Istanbul Stock Exchange 100 are both increased and decreased in this period.

APPENDIX III: Data Set for Independent Variables

EXP	ISE	FOREX	CPI	IMP	TOD/GDP	M2	NIR	TREA	GOVR	IPI	BSDL_P/DCA
-25,677	71,0635	0,80912	3,8	-5,1499	-0,02303	3,7842	-0,0345	-10,1219	124,712	-2,2676	-0,96287896
-3,625	22,3664	2,06885	4,42	-0,6862	-0,11167	2,12353	2,11207	-20,5152	125,108	-2,4362	-12,06066131
-0,5995	-8,3596	3,18938	5,19	14,9636	0,257475	3,02043	-0,1108	-24,103	113,933	14,0309	1,049958886
-11,161	-4,9681	1,90768	6,64	-23,141	0,514112	4,58194	-3,031	-23,3907	100,739	-15,641	1,337743388
5,5331	16,8365	1,92764	3,14	51,0687	0,430425	2,72918	3,51034	-23,7384	72,3613	10,136	11,59213841
3,51126	-1,6882	3,10085	1,44	-21,248	-0,5593	4,70049	5,65847	-25,2343	60,8431	0	1,193196638
-17,935	19,6015	1,40868	-0,9	-2,7803	0,158704	3,92665	1,92162	-26,1183	57,7563	-11,448	-0,213085155
26,0006	7,44073	0,49497	2,55	31,7284		4,1144	15,6461	-22,4398	55,9523	9,75919	4,926758833
10,7992	0,83529	1,45803	8,7	-5,176	-1,25813	2,4345	1,22041	-23,3648	54,8449	16,7437	1,81363778
19,9935	2,85512	0,85308	6,84	27,3368	-0,39006	2,57721	-3,9669	1,81467	37,2562	9,39664	1,94014178
5,96595	-16,848	1,28863	5,01	-0,5936	-1,79477	3,2951	4,98896	29,596	31,6163	-2,3508	2,527407813
19,8093	-17,202	3,49589	1,75	1,7838	2,626158	2,18432	-5,6985	49,39529	28,4393	-11,852	1,470443333
-35,773	2,79799	4,15552	4,86	-31,678	0,450704	4,78424	-14,607	40,64539	18,4349	-15,966	12,69262897
-2,5024	39,6871	4,89736	5,42	-15,281	-0,62411	2,5854	-2,1699	39,30516	10,1129	8,875	2,320408909
21,8888	-6,905	12,7194	4,37	28,2798	0,397459	3,01564	2,24645	74,9701	33,4295	13,318	2,845937099
-30,378	-10,042	7,10639	6,56	-28,176	0,697489	3,31183	1,36945	170,1757	36,3627	-16,109	2,272232019
19,7907	-11,627	5,02186	3,33	38,6964	0,82117	1,92313	6,34401	202,8262	40,041	21,9807	-6,196797609
-9,0609	-2,7075	5,9204	2,96	-10,476	-1,48566	7,47148	4,12677	247,4827	47,0593	-19,604	1,320950384
2,78333	-6,3519	3,80803	1,31	8,45432	0,139744	3,00709	1,17147	314,2328	51,7067	15,7636	3,606489516
7,93063	0,09776	2,97759	3,98	-1,3197		5,98152	6,33725	345,119	54,1192	-1,2766	2,451397169
7,81029	-13,114	3,08034	6,09	0,39829	-2,33834	5,09362	-1,4388	375,7242	56,2542	10,8836	1,07451936
15,0911	-8,2382	4,18381	6,59	7,13169	-0,44705	6,25864	1,79065	252,9272	60,7534	8,55199	1,229519859
0,52442	22,3186	2,19828	5,25	2,38384	-1,39177	2,84091	4,19294	251,5303	52,9042	-2,5962	1,434179815
8,40919	27,3497	2,16718	4,36	23,2248	3,500986	5,05954	-0,2289	226,8624	69,4472	-8,5478	1,347096108
-15,314	13,048	5,18952	9,37	-30,577	-0,01476	4,61049	-2,0098	289,7139	71,1728	-2,9146	2,014733651
-11,599	-12,464	6,61067	5,03	-5,1128	-1,07105	4,70029	-1,692	285,3033	105,343	-4,5549	1,204693905
15,254	-7,787	7,50025	4,87	12,7333	0,882459	4,74671	-5,4962	166,1488	74,6216	7,26682	1,069702727
-15,097	1,64976	5,40168	3,76	-0,5059	0,715567	3,37693	-1,9422	75,89068	70,8473	-9,7068	1,075056034
17,9128	-9,6252	4,45283	0,88	5,49244	1,969478	3,184	3,99338	89,05066	66,5837	12,206	-20,10552757
-19,98	3,49729	2,58717	0,49	3,5931	-0,95387	5,63389	8,55676	69,16556	67,0687	-9,98	1,941137921
21,7962	16,48	0,91076	1,32	6,94199	0,171194	-0,2932	14,006	47,79805	68,7977	10,5322	7,55200482
-0,7541	-4,244	2,14776	3,82	-8,3058		5,58755	5,8304	27,10758	77,2069	-4,3129	11,68416988
6,01767	3,56317	2,51881	7,45	4,57679	-1,64538	3,2955	-1,5717	16,31236	85,3181	13,9413	2,187714275
10,3895	-9,3685	3,94108	7,56	-2,451	-0,28644	3,72438	0,34991	6,80481	89,0968	4,78381	2,821431156
-11,689	-6,3592	7,34408	4,88	9,06661	0,028864	3,49679	-6,5517	-10,6879	105,125	-4,302	2,56076108
20,3773	9,85326	2,91412	2,74	25,388	3,120684	5,53043	10,938	-9,67594	95,3598	-2,6606	1,88297695
-15,132	4,8264	4,20868	5,29	-31,179	-0,23197	4,83514	0,74547	31,97365	112,151	-5,8435	1,741921674
-8,2978	29,0707	3,87865	3,98	11,7948	-0,62289	3,79839	2,51531	32,76803	84,3034	-3,7037	2,081880798

5,38801	8,4715	3,72331	4,77	5,31974	-0,09673	6,04439	-6,074	129,0252	81,4572	-0,5198	1,356212569
2,14028	19,9857	1,8275	4,39	36,41	0,953333	1,05147	10,4024	106,9247	87,5666	7,31453	1,233251131
6,43388	14,6799	4,41987	4,72	-12,327	0,355176	2,88386	3,57644	36,22042	87,4883	0,6816	-0,522549598
-34,147	27,5843	5,8114	1,83	-5,9565	-0,05822	2,82319	-10,264	36,18297	78,7546	-5,8027	2,741617361
34,0858	2,88835	5,92737	4,88	4,01042	0,172365	2,12589	12,1391	36,71453	70,3933	11,2936	2,69460243
-5,1649	1,04202	4,11021	2,67	5,14409		4,14073	-6,1044	56,00242	59,4195	-9,4096	7,213334738
12,3699	30,5312	2,02542	5,59	-7,5613	-1,91068	2,16528	3,26348	44,6274	61,016	17,2098	1,454995306
12,483	9,76652	5,26985	6,89	-3,4538	-0,92721	3,40044	7,78364	59,17413	67,0848	2,86708	1,752021375
-8,8431	4,40562	6,94691	6,39	12,0028	1,250191	1,74923	-6,8337	45,93228	62,8077	-3,2939	2,091668418
49,0361	19,5594	5,11815	3,62	29,6095	5,821791	4,53177	7,14678	12,81174	81,4329	6,0262	2,386916517
-31,791	28,1892	8,05347	4,41	-35,973	-0,05389	3,26937	-10,148	-40,9195	83,2076	-10,708	1,603477349
-9,0797	-29,381	16,7545	6,01	-18,658	-0,21861	1,40168	-8,8502	-41,5523	82,4143	-14,483	0,364424477
10,6014	-15,03	16,2775	5,18	13,105	0,638755	4,09484	-10,66	-68,0697	63,8977	5,178	3,226047486
-6,6117	29,8269	56,2081	24,7	-12,955	-6,86628	5,72502	-1,9976	-67,5263	66,9197	-5,641	4,439350191
-1,0746	-16,398	5,26687	10	-16,027	1,696763	23,1298	-2,0838	-33,2245	76,8516	-5,9783	1,728222476
13,0283	15,877	-6,4088	0,9	22,9529	-4,17783	18,0308	10,9527	37,84979	105,796	3,00578	-0,12594143
14,4954	16,6607	-2,2497	1,7	-9,7934	0,245015	19,1968	10,5248	217,006	142,51	1,79573	1,769900079
-3,8797	15,3207	2,24155	2	17,6581		3,93588	0,13862	275,4706	144,948	7,82801	4,72535462
13,3763	1,80233	7,11386	7,2	1,57849	-2,24601	0,65102	8,54691	250,5938	87,0268	9,20245	3,294664566
-2,8922	3,61843	2,84709	9,5	7,27488	-0,40879	0,29252	0,01684	286,1592	48,7572	3,93258	2,043309188
-0,7281	2,6936	3,94576	8,1	9,16173	-0,87859	1,03183	-1,1061	385,683	39,1109	0,36036	1,345364235
39,0398	5,99657	3,15577	6,3	20,3172	2,789352	6,66378	0,43912	588,2031	21,5146	-3,5907	1,847403276
-32,777	-8,2029	7,36353	6,8	-22,473	-0,34768	2,9792	10,044	783,7854	8,06764	-7,1695	3,261680934
0,06124	6,98288	1,9601	5,7	8,84835	-0,68755	10,4658	7,1133	1117,767	16,819	-8,9268	3,513476544
6,79253	24,0948	1,53876	4,1	8,38167	0,653334	9,38365	-0,2707	1796,172	57,0113	5,39647	1,476270253
12,3645	38,3491	1,30151	6,4	20,6479	0,508085	9,83878	4,80915	2247,513	84,0611	9,19541	0,891935863
-19,194	0,47233	1,79688	3,2	-13,428	1,009252	9,20294	-1,0631	1587,685	76,7322	-5,7416	4,430019234
22,0259	7,90628	0,2772	2	17,8971	-1,66394	5,12718	5,38889	721,3171	59,6045	12,2843	103,2446242
-2,442	-5,6975	2,95029	2,9	-5,5834	0,211912	7,9534	8,0174	270,3402	36,379	-1,7179	2,518381103
-2,3381	-3,4249	4,85605	3,9	10,9733		5,9105	2,56458	198,3816	55,6923	2,11592	3,969265104
0,10915	-6,4829	2,47668	8	-3,9365	-1,186	2,83545	5,94672	197,791	63,932	1,89189	1,230677693
10,6701	5,52399	4,66118	7,8	4,76733	-0,39428	-0,5767	1,97378	129,6869	80,1868	0,26525	2,270985144
6,31606	-8,2996	4,7731	5,5	11,251	-2,38449	4,92087	-4,9494	81,58564	72,9051	8,90652	2,014545476
16,4392	-4,6373	8,29132	3,5	20,8334	4,690319	4,44034	-3,3945	57,04703	63,2551	0,64778	1,691779756
-26,908	11,0427	6,5451	8,3	-26,955	-0,0784	3,48673	-2,1045	90,39579	71,8587	-9,8954	2,264350918
1,56456	20,3815	5,97442	4,5	-9,3202	-1,01651	11,0951	1,26128	74,34364	79,2042	-17,411	1,974545584
12,8808	21,2395	6,59213	5,6	30,8411	1,038193	2,10755	-1,082	76,44237	32,805	16,7568	1,648144471
-9,039	3,76453	6,24942	6,7	-2,1135	0,5949	7,77192	5,13167	71,18152	-0,15204	-4,4445	-0,987315815
-11,166	-5,4348	5,76761	4,5	6,44436	2,011715	7,36298	-0,8158	80,03037	28,1882	10,0775	-34,00748942
7,58396	4,05994	3,84591	2,5	-12,252	-2,43094	6,23252	3,58708	68,31206	20,0756	-0,7042	1,840636402
9,62324	1,93406	3,79668	2,1	14,3604	0,134191	6,69914	-0,6965	68,14063	24,4107	1,32979	1,462378082
1,43958	-5,6003	2,66613	4,8	-10,016		9,36066	3,55036	83,65037	-3,15942	-1,7498	2,874891554

-2,3296	3,70752	4,63923	6,1	-5,7264	-2,62224	7,24958	2,3733	125,4097	18,0478	2,76046	2,454120315
10,8269	18,4215	5,48653	6,5	8,57492	-0,64014	6,7471	-0,425	187,656	39,5578	13,6049	2,404024373
6,05475	7,0562	5,07718	5,2	9,41351	-2,48083	7,60669	-1,7843	263,9443	122,747	-0,4577	1,892121762
7,62661	9,96356	6,32149	3,4	16,1612	4,580354	5,94228	-1,8069	290,0867	139,778	-4,9042	1,30501354
-14,805	37,1178	7,11226	5,9	-21,119	-0,16177	7,78154	-1,2245	225,8812	211,596	-10,234	2,692233358
-9,1627	23,9711	6,47484	5,7	-14,21	-0,42128	5,38536	-0,9144	207,7324	202,443	-13,016	2,123063696
17,1879	-2,9913	4,75865	5,4	23,5918	0,623914	4,2669	-3,3461	162,7344	247,843	23,0134	1,386416732
-6,8905	-1,3767	4,84176	6,6	-8,559	0,363523	7,49843	-2,9623	136,9533	345,493	-7,5503	2,055227365
8,14167	-2,5685	4,73095	4,7	23,2784	1,022743	2,84745	0,94164	109,159	249,797	14,4283	3,22949694
-2,724	12,6682	5,09365	2,9	-10,336	-2,47405	5,78626	2,00447	120,8046	282,431	-1,9826	1,085617366
0,86381	16,8388	6,32564	6,3	6,742	0,248169	8,04878	4,67178	149,2761	302,184	3,64078	2,906524999
-0,5435	2,32713	6,64968	6,2	0,60519		3,46379	5,1645	101,1793	329,141	0,23418	3,018177831
3,98285	17,0396	4,14546	7,3	4,78091	-2,3784	5,36341	8,29066	93,37758	323,018	9,11216	1,803289518
7,47908	32,2237	4,55534	8,3	0,37491	-0,68994	8,9922	3,32687	100,9244	344,159	5,78158	1,734348343
5,5779	-5,2095	5,12395	6,6	-0,4717	-1,51699	2,46403	-5,1703	95,50081	195,108	-4,386	1,30188732
-4,5134	4,82285	6,68917	5,1	13,5043	3,217665	5,07737	-1,5366	77,93784	196,184	1,62315	1,900467761
-8,9392	14,1518	6,07317	7,2	-37,148	-0,14297	10,8724	2,31962	87,02527	143,206	-18,403	1,800875706
-5,9262	-11,357	5,47244	4,4	24,775	-0,58578	1,22212	-2,4651	95,03606	115,185	-3,6596	2,717349153
20,0411	8,57548	5,43374	4,3	12,6112	0,685887	2,66716	5,0958	118,5078	102,336	13,2509	2,574723866
-22,611	15,8472	4,34838	4,7	-16,729	1,099387	8,87493	10,8336	156,2204	92,2848	-9,0484	2,448194368
26,1115	5,2506	2,57317	3,5	14,8903	1,428802	7,07672	4,56972	184,6068	96,3998	17,753	3,0736574
-6,4593	-2,8537	3,47968	2,4	-0,1748	-3,14175	10,2942	3,85499	213,8411	130,094	-7,429	0,145106583
-2,3153	9,87891	2,91221	3,4	0,59991	0,119793	9,6249	0,7049	162,5407	136,645	2,51771	2,048342189
1,26824	-21,91	2,10358	4	-11,045		2,73134	-11,346	149,0039	136,635	-1,0745	2,652634984
-1,3124	-29,72	0,5003	6,7	-1,8662	-5,38331	3,67983	15,4189	115,2282	128,227	9,30954	0,576953894
13,0139	-13,651	1,21133	6,1	-0,6051	0,29587	6,52177	-13,51	93,78636	104,17	5,46488	4,308436656
-9,7289	15,24	5,60895	4,3	-3,4633	-1,65024	6,02818	-6,1158	100,5114	111,704	-6,5949	2,442487898
-0,6005	3,60866	4,30249	3,3	10,2073	2,790174	7,0747	2,90233	117,4075	108,934	-5,4755	3,249031825
-15,889	5,82522	4,73556	4,8	-42,469	-0,13791	10,4511	-0,9763	94,43702	123,66	-17,073	3,410139439
16,5219	22,6796	6,18569	3,2	25,223	-0,39488	3,03126	-1,9972	86,52408	172,121	0,73529	5,635582405
9,46778	26,925	5,52181	4,1	9,21943	0,698096	4,47901	7,57392	58,24028	211,277	8,85037	2,284213449
-18,701	19,0035	5,37986	4,9	9,48844	0,568657	3,49325	-1,5986	26,98606	199,199	2,09556	2,746561281
13,9576	12,414	4,13336	2,9	2,25612	1,762064	5,98457	-0,0152	7,67962	257,331	9,44171	1,797911798
-4,6402	-5,2048	4,41916	3,3	5,19783	-2,32489	4,95344	0,94427	6,94729	189,917	-0,3001	-0,95438604
6,2498	6,52551	3,41641	3,8	0,87968	0,158946	8,73985	5,7457	20,97823	178,756	-8,5026	4,310717359
-13,975	1,50526	1,97491	4,2	-12,154		7,56705	-0,4687	26,16618	222,862	-6,9079	2,484689177
17,2144	7,08929	4,22727	6	14,643	-2,74845	6,13317	1,73965	12,89906	234,107	7,86219	2,59361138
16,9235	0,16996	2,92888	6,3	-2,3243	-0,19421	5,51946	0,71053	-22,6809	269,463	10,1556	-13,4391735
-7,9298	32,0141	6,21589	4,2	8,124	-2,08349	3,29295	-4,0451	-40,8025	297,407	2,45353	2,346040155
-8,8397	52,8982	6,33682	5,9	15,2291	2,68806	5,26874	6,64322	-38,3669	271,908	-0,2177	2,242549662
-4,8526	45,503	3,43094	4,9	-27,179	-0,23963	7,55699	-2,8606	-40,3938	212,496	-17,091	0,693592874
6,60921	-11,874	3,4048	3,7	21,7533	-0,27942	-0,4738	-1,8206	-48,1576	202,397	9,56141	2,699588195

2,36364	10,4935	3,01906	2,9	5,91526	0,771574	-0,5181	4,77711	-57,7493	142,138	-2,482	2,20434802
5,25198	0,32981	2,59534	2,3	7,86352	0,16494	3,03732	-5,4103	-43,5748	141,87	4,6798	1,82668021
-4,1177	-0,1417	3,64683	2,2	4,59847	0,889192	0,91017	1,52593	-36,1166	102,132	6,96517	1,450430467
-0,5297	-10,363	-0,1598	0,7	5,67205	-1,81387	2,09674	7,45291	-69,1765	95,1658	0,93023	1,136864092
-1,6112	-10,385	1,84019	2,2	-5,781	0,074214	6,8302	3,55606	-78,5093	68,1488	-1,659	2,018921194
-10,674	-3,8382	2,85277	2,2	4,30825		2,88428	-1,1953	-75,8844	48,8734	2,2493	1,394453908
17,5734	-11,488	2,91979	3,1	-4,827	-1,42127	0,05766	0,88544	-75,6562	40,7655	1,37489	0,844704038
-6,5957	10,2928	1,90624	3,1	8,19674	-0,13932	3,11125	-3,9639	-69,4777	40,7151	1,98915	1,40583548
11,3409	-3,6638	1,06159	3,7	6,73437	-0,38575	3,71132	-14,388	-62,2061	47,0593	0,35461	2,205327081
-0,4136	-26,229	-0,7625	2,5	-17,249	1,388365	10,4049	15,6511	-46,6693	71,665	-14,399	0,537490039
-10,15	15,8059	-1,0461	2,5	-8,246	-0,0834	3,54114	4,0876	6,54318	140,558	-3,1992	-1,139120974
12,4919	-12,834	10,0631	1,8	-11,718	-1,11139	4,67165	-9,7259	19,72175	104,073	-3,1983	4,404938163
1,20559	-9,2373	30,8708	6,1	-13,507	0,713628	13,8824	-5,9637	51,36008	149,121	-2,9736	2,377222663
2,74726	10,4285	24,9475	10,3	-2,2833	0,540552	0,78085	-2,1134	128,3037	146,161	1,4756	11,38567227
10,2686	28,9623	-6,3937	5,1	17,1436	0,260745	-0,0093	7,88716	232,5331	297,227	7,38255	0,478562872
-11,199	-5,54	7,33725	3,1	-7,3021	-3,9811	3,78979	-6,6982	457,4881	361,578	0,10417	2,412907148
-3,0392	-13,163	8,62949	2,4	4,17182	-0,0014	-0,5698	-2,2935	311,2877	422,426	-0,5203	2,740058885
3,85218	-1,2406	6,09166	2,9	1,90821		1,15389	7,7798	434,156	448,252	2,51046	9,826321526
0,63067	-13,737	4,91893	5,9	-2,2034	-3,15103	5,34385	-1,5265	598,7553	483,553	3,06122	2,519068558
8,35259	3,05907	8,86476	6,1	-1,7664	-0,3642	1,02425	-6,2501	383,3472	454,296	-3,2673	0,903654346
1,03771	27,0817	-4,9339	4,2	5,79463	1,559909	3,98924	-0,1352	351,3838	383,041	-0,5118	1,86900386
-6,3845	15,0409	-4,5365	3,2	-3,3356	1,104223	4,91099	4,56181	458,014	299,24	-8,0247	-0,844609162
-1,9916	5,63828	-5,7166	5,3	-0,2476	0,947332	0,65509	-5,0001	134,0429	187,629	2,01342	2,674997488
-8,5738	-12,305	-1,4028	1,8	-11,48	-0,38568	3,40858	4,87586	43,07634	231,222	-5,9211	1,363325642
22,4506	-3,3776	0,51988	1,2	29,6404	-0,00096	2,86128	-1,2709	67,3592	200,838	21,6783	2,289504676
-6,0325	5,10754	-2,8928	2,1	6,95344	0,030017	1,21573	3,41871	29,49499	176,537	-0,8621	-2,517908699
9,38681	-5,9327	5,44998	0,6	2,18195	1,468762	2,34361	4,09493	-1,92127	64,9568	3,96135	-0,485465138
-7,6535	-14,24	9,67106	0,6	-8,5436	-1,94027	1,24162	0,01063	34,32462	50,4774	-3,4387	69,46691676
12,0244	0,68288	8,47532	1,4	16,8464	0,203442	2,26413	5,38864	178,8116	49,0895	3,07988	4,010832587
-4,1227	3,36165	-0,8262	2,2	-3,9373		1,65454	3,56582	95,00642	45,2789	-2,3343	1,568469059
8,14271	-7,6525	0,45924	3,5	2,06098	-1,08629	4,03673	0,99601	94,43747	39,4921	6,78776	1,646555838
8,79126	3,59296	0,23673	3,3	7,10031	-0,1456	1,59708	2,94182	300,767	26,9149	-0,8057	3,233793392
2,64135	33,9321	-2,6112	2,9	2,73702	1,081787	3,81033	0,78244	355,8813	24,1899	-3,7906	1,378720174
-9,7704	-7,7948	-1,2644	1,6	8,21409	2,039861	3,0441	4,05686	147,1884	32,5815	-3,4709	2,001553649
8,98108	-10,792	4,56054	2,6	-17,586	-0,02404	1,79487	2,37128	155,8705	32,1069	3,59572	2,692343632
-17,269	7,3595	-1,9691	2,3	-5,4125	0,239055	3,13013	-5,0103	241,9316	21,5993	-16,229	111,4426471
33,686	-10,65	1,98098	3,1	37,4944	0,159443	-0,6442	-8,542	161,8834	24,1028	25,084	1,446634973
-6,2962	8,10834	-1,7029	2,1	-9,4595	-0,47053	-0,4545	1,96802	93,5025	22,3184	-5,5506	10,01840801
5,41448	-0,3875	-8,4083	1,6	6,15519	-0,53847	2,34448	5,0662	89,09761	20,4949	5,0237	2,195232742
-1,6671	0,47664	-4,7825	-0,2	3,53207	-0,76911	3,36417	1,68031	59,30771	18,4951	2,07581	0,884487793
11,5908	-3,0019	-1,5497	-0,4	9,43192	0,04589	3,62979	3,57444	43,63681	16,9344	4,33245	1,412802946
-9,617	9,59629	-0,0004	0,2	-4,6696		2,68252	3,30625	31,63871	16,6409	-2,7966	18,10587376

7,46859	9,85517	-1,772	1,9	3,86226	-1,32467	3,75368	8,76901	-7,97997	17,2185	8,28248	1,53606817
17,2483	17,9191	3,56512	1,4	5,96017	-0,39685	4,48646	0,99875	-33,1935	22,0834	-1,3688	2,062288627
-17,716	4,81589	3,60122	1,6	-20,233	-0,40828	1,99175	-3,7988	-37,0365	29,3847	-11,347	0,975014004
15,753	9,87582	-2,9432	0,9	56,9941	1,070908	1,65795	7,84678	-51,2735	28,0385	13,7201	0,920900881
0,53577	8,04277	-5,9964	0,7	-23,127	0,331913	8,57177	-1,1004	-49,2716	29,9399	-9,1498	2,19913517
-20,676	-1,61	-1,4583	0,6	-3,0097	-0,29298	2,66109	-3,1991	-46,6523	31,4404	-8,7344	0,958871989
42,3943	7,14991	-0,6022	0,9	37,6654	0,188565	2,61028	0,29926	-47,2907	28,6508	22,6563	0,807641102
-2,7899	-2,4404	2,69842	0,6	-6,1507	0,286664	2,85304	1,44156	-56,6644	30,7698	-2,707	1,908655337
1,92409	-11,491	11,0982	0,4	0,73776	0,859195	1,88948	0,488	-71,701	35,4555	6,05565	1,935391821
2,21121	1,45497	-0,8391	-0,1	5,9722	-0,74622	0,9803	3,27875	-73,5426	29,7379	1,08025	1,00705526
6,58083	8,02428	-2,7208	0,2	3,07875	-0,05557	1,30759	-0,3512	-77,0765	25,4942	1,0687	-0,998318268
-16,417	3,54626	1,32078	0,6	-9,6822		1,92139	7,89705	-69,7868	26,6162	-6,3444	1,61841005
20,155	10,6485	2,11102	0,9	7,65143	-0,9596	2,86073	1,82833	-66,0381	26,8632	5,48387	1,835998982
3,73139	4,34255	-0,9052	2,2	-4,7011	-0,16913	0,84132	4,02732	-53,8549	24,1778	-5,581	0,440320984
-2,2742	2,70291	-2,6507	1,5	5,94179	0,010903	2,04232	1,86123	-19,0931	22,7769	-4,3725	0,870273127
14,0736	3,43764	-3,6037	0,4	22,2438	0,852172	1,42325	2,01138	8,62939	20,5552	8,89077	-0,686325263
-23,599	10,5706	-3,1061	0,55	-31,071	0,862502	1,02753	0,42781	5,46791	12,5615	-8,3981	0,153286264
13,0963	5,34014	-2,9542	0,02	15,2923	-0,2191	-0,1943	-0,9832	-1,61265	8,87952	-3,7351	1,177307264
16,6341	-5,3348	-0,3984	0,26	22,4973	0,25452	3,67291	-2,0539	-7,78566	10,0786	14,5503	1,703791127
-7,0348	-5,3393	3,72242	0,71	-5,8928	0,241512	4,51621	-0,0767	21,72967	12,1974	-1,1547	2,098601562
-2,4625	-0,1259	0,85023	0,92	2,25231	0,378675	2,06838	0,01337	76,94981	10,1316	3,34891	0,60385016
1,02569	6,2095	-0,7577	0,1	1,38488	-1,28145	3,8707	8,70671	87,27142	12,8897	0,45215	1,268062674
-4,5552	8,17958	-1,619	-0,6	-3,5323	0,024683	4,44482	5,69364	78,72454	14,9061	-2,0255	2,062508353
-3,654	3,14818	0,29069	0,85	7,04512		3,46109	1,14728	43,78843	16,5525	1,37825	1,687001376
22,7162	11,7939	-0,179	1,02	0,91274	-1,03972	2,85261	2,45902	69,14898	17,9585	6,94864	0,701851544
-0,6177	-0,8529	1,2722	1,79	-2,6638	0,05572	3,27194	-2,703	12,16243	17,1654	-6,6384	1,133157009
-12,25	8,21057	0,18393	1,4	-4,1297	-0,82941	2,00453	6,87953	-17,1129	13,7171	-1,7398	1,117740986
21,9384	9,5097	-0,5874	0,42	20,7735	1,498381	3,32071	6,04551	-19,4133	15,167	6,38953	0,484702764
-29,163	12,8647	-1,3218	0,75	-30,276	0,355034	1,92822	7,04672	-24,4655	13,1293	-19,175	7,848709597
18,0244	4,43175	-0,5858	0,22	20,2649	-0,379	-0,3927	2,27007	34,08407	14,1998	7,25157	2,724289765
22,3307	-3,0727	0,64931	0,27	18,4643	0,301728	3,99242	0,80482	58,3051	14,1488	18,2805	3,009172899
-12,886	-0,7076	0,16523	1,34	-0,1545	-0,06111	4,11835	0,602	26,83888	14,4124	-3,458	1,946656725
9,06823	-6,1552	6,22909	1,88	9,55459	2,946504	3,38724	3,15561	5,23058	17,6153	4,89766	2,755625157
10,9904	-15,146	12,6603	0,34	-1,7999	-0,26875	3,59871	-0,9408	-19,255	21,9717	2,22997	2,200235686
-9,5711	1,5242	-2,6418	0,85	-6,0674	-0,18858	-1,1482	2,1948	-16,1461	20,0043	-3,272	-1,925947457
-3,6252	4,65502	-5,7108	-0,4	4,83973		-0,3614	3,31303	-24,1414	12,9479	-2,4665	2,434884351
11,6771	1,4516	0,68011	1,29	-1,0028	-1,1255	0,2747	0,4536	-15,5656	10,5851	6,50289	2,62521184
-9,4358	2,69552	0,2789	1,27	-7,8452	0,082545	1,78655	4,37154	-16,4574	7,17655	-7,4627	0,812746134
25,4422	1,14817	-1,7088	1,29	15,1526	-0,87658	0,83857	1,35815	-48,1335	8,8828	6,30499	3,350352705
-0,4365	0,20945	-1,6981	0,23	1,17247	1,02109	1,10272	3,79565	-74,2942	8,22977	-1,8621	1,556412624
-23,701	1,87038	-0,463	1	-18,822	-0,08073	1,01899	2,512	-61,0713	11,9005	-9,6978	8,867324873
16,6408	7,87412	-2,0831	0,43	7,47074	-0,16238	0,67378	1,63427	-72,9255	12,7402	0,77821	3,123627333

16,9898	-2,3782	0,90864	0,92	16,261	0,106798	1,95286	3,1976	-64,6125	14,4342	13,4363	2,613350315
-7,1952	9,95788	-3,3918	1,21	-2,3795	0,168505	0,0511	2,5609	-70,1057	9,65349	-4,2886	3,618641616
10,0358	-0,9564	-1,7258	0,5	15,6036	0,233229	2,91604	3,41155	-86,5702	3,84407	8,10811	3,242227084
-1,8297	0,19608	-1,2512	-0,2	-4,4808	-0,80694	2,32143	1,14492	-84,9468	1,90166	-0,6579	2,985721475
-0,4733	13,0875	-2,9843	-0,7	6,64581	0,098824	2,19591	0,41057	-90,2915	3,53369	-1,7881	3,947676456
-2,2495	-5,7216	2,53283	0,02	-3,4992		2,26254	-0,5242	-90,9389	8,80805	-0,8092	5,021673748
3,45731	5,45809	-3,5918	1,03	-1,5161	0,093139	1,24578	0,78119	-91,0626	8,48743	2,71924	-0,687959684
9,47558	9,57341	-5,1276	1,81	8,07415	0,000906	1,14276	-1,779	-91,4396	8,61185	-2,184	2,29015954
14,3866	-3,4144	-0,9898	1,95	6,43361	-0,3096	0,93746	-0,3272	-91,391	7,28323	6,02165	3,825583934
-14,09	1,76018	-0,9952	0,22	-3,0785	1,30864	3,40974	4,86315	-82,0809	5,36528	-10,083	1,464904852
9,33966	-11,999	-0,216	0,8	1,3568	0,136674	0,46606	-1,8376	-84,8515	5,27334	1,56139	8,598616045
4,1919	-8,1826	1,51628	1,29	-1,91	-0,41136	1,54994	2,40889	-69,9172	4,3889	-2,7254	3,290334474
3,16565	-7,2293	3,71691	0,96	4,90168	0,994006	3,58638	2,68568	-60,8754	4,67998	8,11782	3,846351964
-0,5655	1,84918	5,22243	1,68	6,40837	2,017094	2,63976	-2,2416	-29,3211	9,04327	-0,7309	3,197906682
9,80296	-1,611	-3,8369	1,49	7,91898	-0,37438	-1,1908	4,61918	64,35772	8,79525	4,14993	-0,308807564
-5,6687	-7,7651	-1,5397	-0,4	0,8828	-1,44474	1,58922	2,91059	96,29109	4,91709	-2,1851	2,031552047
7,0072	-3,9473	-1,4505	0,58	5,54954	-0,05116	1,53732	2,01344	360,6712	4,60139	0,78844	1,810762404
-12,295	11,8754	-3,0805	-0,2	-6,3534		0,76964	-1,139	515,1297	1,95682	-8,0183	3,345298824
15,8083	-9,8756	4,85509	0,45	-7,0996	-1,70973	3,29903	-1,2429	474,3162	3,77872	1,48831	3,196368477
-24,001	-24,215	19,8137	2,6	-16,451	-0,26608	3,84109	-2,8952	482,2023	9,58178	-5,5168	22,17298399
-3,3616	-10,292	7,77802	0,83	-19,2	-0,60094	3,26203	-2,7006	683,8283	13,1672	-0,4513	1,836276523
-17,816	1,92572	-3,0893	-0,4	-5,5376	1,230871	2,97566	3,54833	833,3139	15,8946	-15,231	2,222989619
2,10497	1,19122	3,26603	0,29	-18,622	0,073319	-0,0008	-3,2812	668,1595	16,8675	-5,3476	-2,436901827
6,98361	-4,0502	3,98453	-0,3	-2,2247	-0,22509	-0,0284	-1,9752	320,0676	23,295	-4,4068	-29,16984905
-3,3151	-3,4019	3,15658	1,1	15,9496	0,058863	0,60567	0,49061	204,6671	20,3707	13,357	12,24148148
-7,2809	18,1519	-5,8881	0,02	-3,8179	-0,34588	-1,5587	-2,1325	103,2656	18,975	1,2513	-7,522087208
-2,8471	18,8196	-3,2672	0,64	7,38494	0,233376	0,25045	2,58569	78,01084	24,0829	5,14933	3,250799103
13,3846	4,1099	-0,7727	0,11	15,0252	-0,79124	1,84925	-0,1498	38,35106	28,6406	7,2478	1,925013973
8,7163	8,71523	-1,6937	0,25	2,84543	0,022631	1,18538	1,17281	19,42906	30,1543	0,91324	-106,592905
-13,426	18,6936	-2,2744	-0,3	-0,351		0,25663	1,63028	488,4548	33,2654	-5,7014	4,054915447
8,17357	2,31979	0,40596	0,39	-2,5459	-1,09628	2,15414	-0,8021	531,5748	33,0661	-0,4799	1,617085287
19,0439	7,12916	-1,5552	2,41	2,30278	0,052653	0,83695	-0,8374	606,5728	33,5596	13,6934	12,52977434
-11,814	-5,6885	1,22355	1,27	-1,2133	-0,62944	2,14371	0,50661	484,8519	31,1729	-8,5666	1,996818066
12,9347	7,08808	1,31444	0,53	19,0365	0,728728	2,90337	-1,8557	368,8915	34,0817	8,71985	2,324831506
-22,116	8,18176	-2,2114	1,85	-22,163	0,082804	1,58647	-1,7099	538,1069	32,3227	-14,932	1,326951948
5,52136	-4,6513	2,67314	1,45	0,75922	-0,33687	1,27234	-3,4188	524,2662	26,9868	0,5015	1,918471387
19,6492	3,43649	1,51035	0,58	27,5114	0,146413	2,83636	0,63719	464,5594	27,0418	16,0679	2,389143107
-4,9695	8,96812	-2,6431	0,6	-0,5268	-0,27087	0,3407	-0,8182	503,2638	23,7969	-2,1496	2,956994394
4,24923	-5,0289	3,15247	-0,4	-1,45	0,469992	3,04655	-1,7986	581,1865	21,6231	3,60281	2,933812154
-2,6459	-0,0137	2,31244	-0,6	3,42574	-1,52657	3,75188	-1,2055	740,0648	19,2132	2,29008	1,686666437
0,36725	4,62684	-2,165	-0,5	5,47519	0,025907	1,55931	7,46333	501,7357	18,1649	0,08292	5,189697458
-10,982	1,82626	-2,2562	0,4	-3,9303		-0,3011	0,99122	-25,8878	17,0852	-4,4739	3,205823643

4,55166	6,69048	-0,8454	1,23	1,3542	-0,48199	1,70741	-1,0653	-17,7788	14,0908	-1,6479	1,647550266
23,1011	8,21296	-4,7336	1,83	10,5724		-0,1397	0,38999	-10,1047	7,3948	13,933	5,395189879
-14,393	0,33564	0,78082	0,03	-0,968		3,42624		-8,14943	7,77334	-9,9845	3,386567198
26,4783	-4,0615	5,84993	-0,3	20,0124		1,54805		-14,5205	7,37962	15,3053	