Sectoral Non-Performing Loans Cycle in Turkey: An Empirical Analysis

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Türkiye'de Sektörel Batık Krediler Döngüsü: Ampirik Bir Analiz

Abstract

This study examines how much of the total loans are in follow-up and which sectors have difficulties repaying these loans, using the monthly data from the post-2000 period using the Event Study method. Undoubtedly, banks' loans to the sectors are the most basic investment element. It is a significant problem on which sectors these loans are concentrated on and the contribution of these sectors to the country's economy, and their effects on the economy. Another critical problem is the recycling problem in the payment of loans extended by banks. This situation, called non-performing loans in short, is of great importance in terms of being the leading indicator of crises. The research findings showed significant increases in almost all selected sectors in the pre-crisis, crisis, and post-crisis periods. From this point of view, the rate of growth in non-performing loans of banks provides some predictions about the general course of the economy.

Keywords : Non-Performing Loans, Default Credit, Banking System, Event Study.

JEL Classification Codes : C32, E32, E44, E5.

Öz

Bu çalışmanın amacı toplam kredilerin ne kadarının takibe düştüğü ve hangi sektörlerin bu kredileri geri ödeme konusunda sıkıntı yaşadığı, 2000 sonrası dönem aylık veriler kullanılarak Olay Çalışması yöntemi ile incelemektir. Yatırımların en temel unsuru şüphesiz bankalar tarafından sektörlere kullandırılan kredilerdir. Kullandırılan bu kredilerin hangi sektörler üzerinde yoğunlaştığı ve bu sektörlerin ülke ekonomisine katkıları, ekonomi üzerindeki etkilerinin neler olacağı önemli bir sorun teşkil etmektedir. Bir diğer önemli sorun ise bankalarca kullandırılan kredilerin ödenmesindeki geri dönüşüm sorunudur. Kısaca sorunlu krediler olarak adlandırılan bu durum krizlerin öncü göstergesi olması bakımından büyük önem taşımaktadır. Araştırma bulgularında, hemen hemen seçilen bütün sektörlerde kriz öncesi, kriz dönemi ve kriz sonrası dönemlerde belirgin artışların yaşandığı sonucuna ulaşılmıştır. Bu açıdan değerlendirildiğinde, bankaların batık kredilerindeki artış oranları ekonominin genel gidişatı ile ilgili bir takım öngörüler sunmaktadır.

Anahtar Sözcükler : Takibe Düşen Krediler, Batık Kredi, Bankacılık Sistemi, Olay Çalışması.

1. Introduction

There is always a risk that the company or individual will not repay the loans made by banks within the agreed period. Non-performing loans occur when both principal and loan interest is not paid for a long time, contrary to the terms and conditions of the loan agreement. A loan becomes problematic when there are indications that the borrower will not be able to repay the loan or if more than 90 days have passed before the borrower has paid the agreed instalments (FED, 2018; ECB, 2020).

Reducing the non-performing loan rates of banks to reach the economically desired profit figures will ensure that they are protected against the risk of any financial difficulties in the future. One of the critical factors that cause banks to face especially non-performing loans, is the maturity mismatch problem. This problem arises from the maturity problem between the bank's assets and liabilities. The main problem here is that the deposits they collect are generally short-term, as well as the banks' desire to give long-term loans. In this case, banks will be faced with the possibility of selling their assets to meet their short-term liquidity needs or even the risk of being sold at a price lower than their value (OECD, 2010). It can be said that another factor that may cause non-performing loans is the inability of individuals to pay their obligations as a result of the ineffective functioning of financial markets in developing countries because the ratio of non-performing loans in the banking sector is an important factor in the emergence of banking or financial crises (Greenidge et al., 2010). In general, Mileris (2014) listed the factors that may cause non-performing loans in banks, such as deterioration in the basic building blocks of the country's economy, ineffective credit risk measurement management in banks, and unconscious use of credit. In addition, the decrease in the market power and profit margins of banks may cause a reduction in the concession value of the bank in cases where competition conditions increase. Improving incentives with capital increases will lead banks to risk more losses to make more risky decisions. Banks can choose riskier and lower-quality portfolios, take more credit risk, or take a path such as lowering their capital levels. Such risky behaviour may result in higher NPL rates or increase the risk of bankruptcy. This may make banks more fragile and unstable (OECD, 2010).

According to Stiglitz and Weiss (1981), high-interest rates increase the risk probability in loan portfolios due to adverse selection (incomplete information) and incentives. Therefore, those willing to pay high-interest rates are less likely to pay off the loans they use. In risk environments, banks may have difficulty determining the probability of repayment of loans. As a result, the higher the interest rates, the higher the average risk of borrowers, which results in lower profits for banks. In his study, Vos (1994) found that international credit markets went to overlending due to incomplete information and assessments to increase their market share. The loans given were distributed among specific borrowers and tended to cluster, leading to excessive risks.

The reasons such as the opening up policies implemented especially after 1980 in Turkey, the economic instability experienced in the post-1990 period, the increase in foreign

currency and interest rate risks in the period after the 2001 crisis, and the high costs of using loans were effective in the rise of non-performing loans. Non-performing loans in the Turkish banking system increased significantly with the financial crisis in 2001. After the 2001 crisis, the share of non-performing loans in total loans reached almost one-third (BDDK, 2009). However, the 2008 crisis, which had an impact worldwide, increased unemployment rates and the NPL loan ratio extended in all sectors, especially individual loans.

In the post-2001 period, there has been an increase in short-term capital inflows, especially from developed countries to developing countries with higher interest rates, such as Turkey[1]. The fact that the Turkish lira has become more valuable with the increase in foreign currency in the country has increased foreign dependency by fuelling imports. As a result, Turkey has been exposed to high current account deficit rates (TurkStat, 2022). With the expansion in consumer loans, domestic demand has revived, and high growth rates have made the current account deficit even higher. The revenues obtained are not used in productive sectors such as manufacturing but in non-productive ones (Akça, 2022a: 171). In the private sector, where foreign debt ratios are high, especially in the post-2010 period in Turkey, debt burdens have increased even more due to rising exchange rates. Because companies with cash problems could not pay their bank debts, non-performing loans started to grow.

In the global crisis originating from the USA in 2008, the insufficient total supply level caused the prices to increase. With the bursting of the credit-based bubble, the demand fell, and as a result, the prices started to decrease. In Turkey, unlike this situation, too many credit funds, especially in the banking sector, caused excessive credit expansion. The main factor that determines the crisis is investments. The source of investments is savings. Savings in Turkey are financed by external debt. Consumer loans and construction loans are the cheapest and easiest way to convert savings into loans. This situation may contribute to the country's economic growth in the short term. Still, this growth, which is not supported by the increase in production capacity, may cause high external debt and current account deficit problems in the long term.

In Graph 1, the percentage of the total loans extended by banks in Turkey is shown as a percentage. The ratio of non-performing loans to total loans showed a significant decrease after the 2001 crisis, and then it did not fluctuate much, except for 2009. The share of non-performing loans in total loans remained below 1% in the 2000s. Regarding non-performing loans, the construction sector ranks first with 9.29%, the wholesale trade and

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[1] *ECB interest rates:*
   <https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html>,
   28.02.2021; FED interest rates: <https://www.federalreserve.gov/releases/h15/>, 28.02.2021; Turkey interest
   rates: <https://tradingeconomics.com/turkey/interest-rate>, 28.02.2021.

brokerage sector ranks second with 5.72%, and the electricity, gas and water resources sector ranks third with 5.60%.

Graph: 1
Development of Total Loans by Year Inside Share of Nonperforming Loans in Turkey (%)
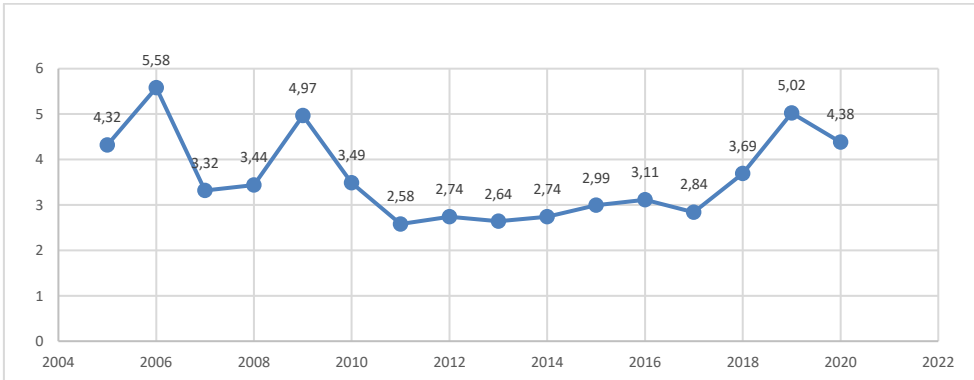
In this study, the loans to be liquidated, which show how much of the loans extended by the banks have fallen into liquidation, are examined as seven sectors. These sectors are; retail loans, wholesale retail, construction, metal, textile, food and transportation. In addition, total loans to be liquidated are also included in the analysis. 2000-2020 is considered time, and monthly data are used. The method we use to examine the loans to be liquidated by banks is the Event Study Method. With the Event Study method, the selected periods were divided into certain intervals, considering the effects of both the 2001 crisis and the 2008 USA Mortgage Crisis in Turkey. Thanks to these data intervals, the NPL analysis of the relevant sectors was made.

One of the study's contributions to the academic literature has been the analysis of the banks' NPL ratios, especially in the last twenty years. Previous literature studies on the subject have generally dealt with the relationship between non-performing loans and macro variables. This study discusses the rate of non-performing loans in critical sectors, which are the backbone of the economy. In this way, while it was revealed to which sectors the banks channel their deposits, the sectors that constitute a risk factor were determined. It is thought that the study can be a guide, especially for a country like Turkey with bad banking experiences. In addition, it has an original value as the method used. Because the Event Study method has never been used in previous studies on this subject, in this respect, the analysis technique provided by the Event Study method has provided an important framework for evaluating non-performing loans.

The first part of the study consists of the introduction part. In the second part, there are literature reviews on the subject. The third section contains information about the variables used and the method. In the fourth chapter, the results of the analysis are given.

2. Literature Review

There are many national and international studies on the subject of investigation. In the results obtained, the general opinion is that the negativities in macro variables trigger the increase in non-performing loans more.

In studies on Turkey, Akça (2022b) examined the relationship between problem loans and macro variables in the 2000-2020 period. In the analysis findings, it has been determined that unemployment, economic growth, inflation, exchange rate and interest rates cause non-performing loans in the short term. Baş et al. (2021) found that the increase in interest rates and total loan volume for 2008 and 2017 will increase non-performing loans. Koten (2021), in his analysis for the period of 2010-2020, concluded that the increase in the non-performing loan rates of banks decreases the profitability ratios over time. In his research for the 2002 and 2017 periods, Us (2020) found that non-performing loans were negatively affected by capital adequacy, profitability and economic growth while positively affected by inflation, unemployment, external debt stock, lending and bank size. Cifter et al. (2009) examined the relationship between industrial production and non-performing loans in the 2001 and 2007 periods. Their findings determined that the industrial production cycles affect the NPL cycles in different periods.

Alnabulsi et al. (2021), in their analysis of Jordan, examined the relationship between non-performing loans, financial instability and economic growth between 2002 and 2009. As a result of the examination, it was determined that non-performing loans were negatively related to GDP and unemployment and positively related to the money supply, interest rates, capital lending adequacy ratio and total deposits.

Collaku et al. (2021) found that every 1% increase in non-performing loans decreased the profitability ratio by 0.19% in Kosovo from 2010-2019. On the other hand, Khan et al. (2020) found that non-performing loans had a negative impact on operating efficiency and profitability while positively impacting capital adequacy and income diversification for the period 2005-2017 in Pakistan. Akter et al. (2017) found a negative effect in their study on non-performing loans and profitability in Bangladesh during the 2008-2013 period, and Khan et al. (2020) found similar results.

Beck et al. (2015), in their study on 75 countries between 2000 and 2010, show that decreases in global economic activity and stock prices cause an increase in non-performing loans.

Budiarto (2021) found that job prospects in Central Java (Indonesia) are directly proportional to debtor performance and solvency, and banks' economic performance impacts non-performing loans.

Jordan et al. (2013) analysed Bahama in 2002 and 2011; real economic growth affects non-performing loans negatively. As economic growth increases, non-performing loans in the country decrease.

Klein (2013), in his analysis of Central, Eastern and South-eastern Europe (CESEE) during the 1998-2011 period, increased unemployment and inflation, and depreciation of the exchange rate, causing an increase in non-performing loans. On the other hand, increases in non-performing loans negatively affect economic growth.

According to Messai et al. (2013), in their study of 85 banks in Italy, Greece and Spain for the period 2004-2008, found that non-performing loans were negatively related to economic growth and banks' profitability ratios and positively to unemployment, interest rate and loan loss reserves.

Muhovic et al. (2019) found that non-performing loans were negatively related to unemployment, economic growth, inflation and banks' profitability rates in their study of Western Balkan countries between 2000 and 2015.

Sánchez Serrano (2021), in his analysis of 75 European Banks during the 2014-2018 period, found that banks with low NPL ratios tend to lend more to the real economy.

Singh et al. While non-performing loans are positively related to economic growth and inflation in Nepal in the period (2021), 2015 and 2019, it is negatively related to bank size, Capital Adequacy Ratio (CAR) and profitability ratios.

Ghosh et al. (2015), in their analysis of the USA for the 1984-2013 period, factors such as increases in total loans, liquidity risk, and low credit quality increase non-performing loans. On the other hand, increases in bank profitability have a reducing effect on non-performing loans.

Accornero et al. (2017), in their analysis of Italy between 2008 and 2015, concluded that the increase in non-performing loans negatively affected loan growth.

Balgova et al. (2017) analysed 190 countries by considering different periods between 1990 and 2014. As a result of the analysis, it has been determined that the decreases in non-performing loans contributed to economic growth and caused an increase.

Basten et al. (2019), in their study involving 32 banks in Europe, examined the impact of the 2008 Global Crisis on banks. The research findings determined that the high risks that were not priced in the banking sector in the pre-crisis period were high. In the post-crisis period, the banks reduced these risks with the reforms made, making themselves more resilient with the regulatory reforms.

Louzis et al. (2012), in their analysis of Greece in the 2003-2009 period, found that non-performing loans are in direct relationship with macro variables (GDP, unemployment, interest rates, public debt) and bank management quality.

Zeng (2012), in his analysis of China, increases or decreases in non-performing loans depend on micro and macro factors. They are strengthening the internal management efforts of banks, making property rights reforms, and reducing asymmetric faulty information to reduce non-performing loans.

Espinoza et al. (2010), in their study of 80 banks in the Gulf Cooperative Council Countries (GCC) between 1995 and 2008, found that risk aversion and interest rates decrease non-performing loans, while decreases in economic growth increase non-performing loans.

Academic literature has generally examined the link between non-performing loans and macro variables, emphasising that loans play a key role in the economy. According to the general view obtained in the studies, non-performing loan rates are at lower levels since the periods of the rapid growth of the economy are generally optimistic, credit standards are relaxed, and risk appetite is high, while non-performing loans increase in the opposite periods when the economy starts to slow down.

3. Data and Methodology

While the event study method was used in the first application times, especially in measuring market efficiency, it has become a method frequently used in all areas of the economy in the following years. It is generally used to measure the abnormal values of the reaction to the event resulting from an event. This method was first used by Dolley (1933). Dolley (1933), in his study, examined the effect of stock splits into price increases and decreases. In the following years, the Event Study method became the preferred method in many studies with different calculation methods (Myers et al., 1948; Baker, 1956; Ashley, 1962). In the first step of the event study analysis, the event and date range to be investigated are determined. In the following steps, critical values are selected, normal and abnormal values are determined, abnormal values are combined and tested, and the model is finalised by considering the experimental results (Campell et al., 1997; Mackinlay, 1997; Konchitchki et al., 2011; Corrado, 2011). In the event study, the timeline usually consists of two parts; the actual event period surrounding the event day and the second is the previous forecast period.

According to Fama et al. (1969), the Event Study method, used the market index model to calculate the normal and abnormal values in the data. The formula used to calculate normal and abnormal values.

$$e_{it} = R_{it} - E(R_{it})$$

e_{it} = Normal value,

R_{it} = Real value,

$E(R_{it})$ = Expected value
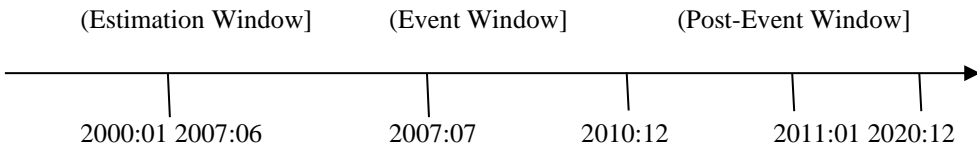
Calculation of cumulative abnormal values.

$$CAG_{it} = \sum_{i=1}^{N} AR_{it}$$

This study tried to determine the unexpected /excessive growth rates of the sectoral loans to be liquidated with the Event study analysis. In this way, the effect of the 2008 crisis on non-performing loans will be seen more clearly. To see the non-performing loan growth, the non-performing loan growth of each sector was compared with the total non-performing loan growth because total non-performing loans are a portfolio of sectoral non-performing loans and show the systemic relationship.

Using the least squares method, the analysis estimated the relationship between sectoral non-performing loan growth and total non-performing loan growth. Error terms of each sector were calculated, and Cumulative Abnormal Growth rates (CAG) were created for all windows from the error terms. The cumulative error terms are taken as six months.
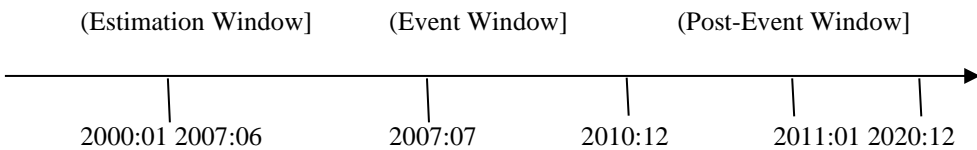
Figure: 1
Event Study Timeline for Wholesale, Retail and Sales, Construction, Metal, Textile, Food, and Transportation Sectors

(Estimation Window]   (Event Window]   (Post-Event Window]

2000:01 2007:06   2007:07   2010:12   2011:01 2020:12

Figure: 2
Event Study Timeline for Personal Credits

(Estimation Window]   (Event Window]   (Post-Event Window]

2000:01 2007:06   2007:07   2010:12   2011:01 2020:12

Two timelines were created to analyse the effects of the crisis. The first is the timetable of wholesale retail and sales, construction, metal, textile, food, and transportation sectors in Figure 1, and the second is the timeline of personal loans to be liquidated in figure 2. Figure 3.1 shows a 90-month dataset with a period of 2007:06 starting from 2000:01 in the estimation interval determined as the "Estimation Window". A 42-month dataset between 2007:07 and 2010:12 was used in the "Event Window" interval to represent the 2008 crisis. As the final stage, in the Post-Event Window part of the post-crisis period, there is a 120-month dataset between 2011:01 and 2020:12. Figure 2 shows a 36-month dataset with a time frame of 2007:06 starting from 2004:07 in the "Estimation Window" prediction

interval. A 42-month dataset between 2007:07 and 2010:12 was used in the "Event Window" interval. In the Post-Event Window, there is a 120-month dataset between 2011:01 and 2020:12. Since the date range covers the period before the 2001 crisis, 2000 was chosen as the starting year. Since only existing data on retail loans were published in 2004 and later, 2004 was included in the analysis as the starting year. In determining the event dates, the 2001 Turkish Banking Crisis and the 2008 USA Mortgage Crisis were taken as a basis.

In the Event Window, the error terms obtained for non-performing loans for seven different sectors are classified as a separate data group. The aim here is to consider the distribution of error terms in the pre-crisis period. For this purpose, specific statistical values were used. Cumulative excess returns are used here. Cumulative excess returns were calculated from these error terms, and both periods (Estimation Window and Post-Event Window) were compared.

H_0 = CAG = 0, Non-performing loans remained unchanged in the relevant sectors and insensitive to crises.

H_1 = CAG ≠ 0, Non-performing loans increased or decreased in the relevant sectors; it didn't remain insensitive to crises.

The hypothesis established is whether there is a difference between the error terms of the Event Window period and the Post-Event Window period. In the CAG calculations for each sector, it is determined whether all values are equal to 0. If the H_0 hypothesis is rejected, it is concluded that non-performing loans are affected during crisis periods.

Hypotheses for each sector's average overgrowth between periods;

Hypothesis of term 1 and period 2;

$H_0 = CAG_1 = CAG_2$

$H_1 = CAG_1 \neq CAG_2$

Hypothesis of term 2 and period 3;

$;H_0 = CAG_2 = CAG_3$

$H_1 = CAG_2 \neq CAG_3$

Hypothesis of term 1 and period 3;

$H_0 = CAG_1 = CAG_3$

$H_1 = CAG_1 \neq CAG_3$

As a result, the equality of means hypotheses for all sectors was rejected[2].

The "z" test was used to measure the difference between the mean values of the variables for all three selected periods. Therefore, the "z" value for each sector has been calculated. The formula used for the calculated "z" value is as follows;

$$Z_h = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$\bar{X}$ = The average value of the selected data for the relevant period

μ = Default average value

σ = Variance value

n = Number of observations

The hypotheses for comparing the z-values and averages calculated between the periods of the sectors are given below. The fact that the calculated "z" test statistic is more significant than zero indicates that overinvestment has occurred in the relevant variable[3].

The hypothesis of period 1 and period 2;

$H_{0=} z_{1,2} > 0$ ve $\mu_1 > \mu_2$ The non-performing loan growth rate in the crisis period is decreasing compared to the pre-crisis loan growth rate.

$H_{1=} z_{1,2} < 0$ and $\mu_1 < \mu_2$, The crisis period non-performing loan growth rate increases compared to the pre-crisis loan growth rate.

The hypothesis of term 2 and period 3;

$H_{0=} z_{2,3} > 0$ and $\mu_2 > \mu_3$, Post-crisis non-performing loan growth rate decreases according to crisis period loan growth rate.

$H_{1=} z_{2,3} < 0$ and $\mu_2 < \mu_3$, Post-crisis non-performing loan growth rate increases according to crisis period loan growth rate.

The hypothesis of term 1 and period 3;

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[2] *Abnormal values of each variable were not included in this study because of included a long data set. It can be provided by the author upon request.*

[3] *In all variables and parameters, "1" represents the pre-Event (Crisis), "2" represents the Event period, and "3" represents the post-Event.*

$H_{0=}\ z_{1,3} > 0$ and $\mu_1 > \mu_3$, Post-crisis non-performing loan growth rate decreases compared to pre-crisis loan growth rate.

$H_{1=}\ z_{1,3} < 0$ and $\mu_1 < \mu_3$, Post-crisis non-performing loan growth rate increases compared to pre-crisis loan growth rate.

Hypotheses created for "F" values calculated between periods for each sector;

The hypothesis of term 1 and period 2;

$H_{0=}\ F_{1,2} < F_{Critical\ value}$, Crisis period variance value and pre-crisis variance value are similar.

$H_{1=}\ F_{1,2} > F_{Critical\ value}$, Crisis period variance value and pre-crisis variance value are different from each other.

The hypothesis of term 2 and period 3;

$H_{0=}\ F_{2,3} < F_{Critical\ value}$, Post-crisis variance value is similar to crisis period variance value.

$H_{1=}\ F_{2,3} > F_{Critical\ value}$, Post-crisis variance value crisis period variance value is different from each other.

The hypothesis of term 1 and period 3;

$H_{0=}\ F_{1,3} < F_{Critical\ value}$, Post-crisis variance value and pre-crisis variance value are similar.

$H_{1=}\ F_{1,3} > F_{Critical\ value}$, Post-crisis variance value and pre-crisis variance value are different from each other.

4. Findings

As a result of the CAG values calculated for the analysis, all values were different from zero. As a result, the H_0 hypotheses was rejected and the H_1 hypotheses was accepted. In selected sectors, non-performing loans were affected by the crises during the crisis periods. Afterwards, graphs were created according to the CAG values for each sector. The cumulative overgrowth values of retail loans are shown in Graph 2. According to the results obtained according to the "z" calculated and "F" test statistical values of individual loans, the growth in non-performing loans during the crisis period increased compared to the pre-crisis period, the loan growth rate increased compared to the crisis period after the crisis and increased in the post-crisis period compared to the pre-crisis period. In other words, the results show that the NPL ratio in individual loans has increased continuously before and after each crisis. In wavelengths, while the pre-crisis-post-crisis and crisis-period

wavelengths differ, the pre-crisis and post-crisis wavelengths are similar. In short, the dimension of instability in retail loans is most visible in the crisis period.
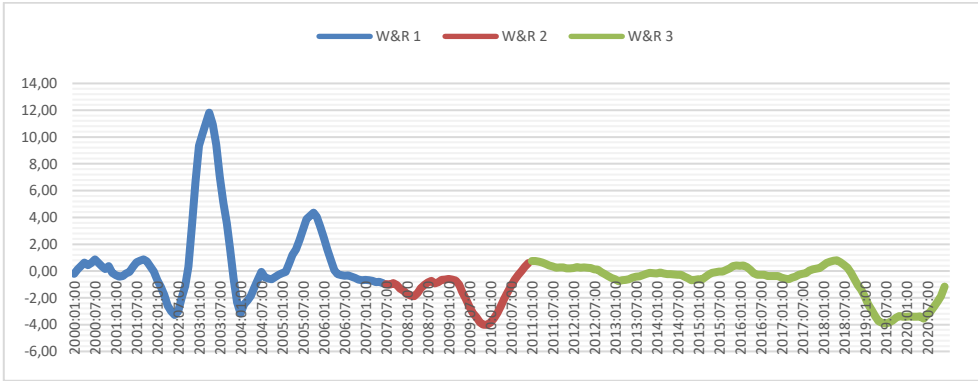
Graph: 2
Cumulative Abnormal Growth Data for Personal Credits (CAG)[4]
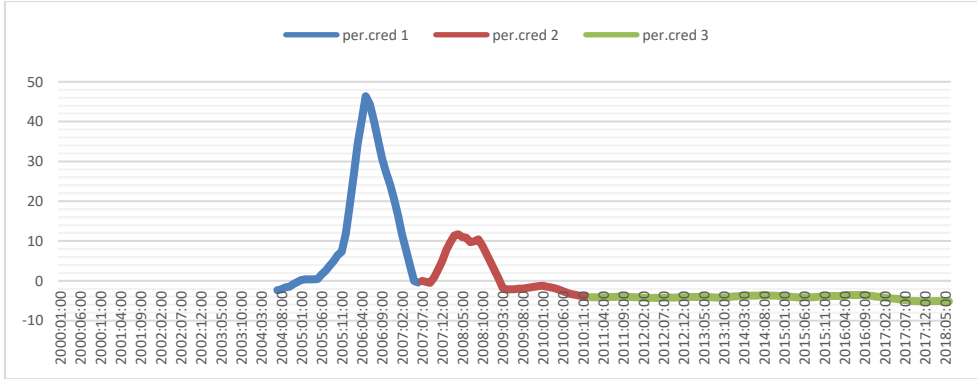
Graph 3 represents non-performing loan growth rates for the wholesale retail industry. When the "z" and "F" test results of the variable are evaluated, non-performing loan growth rates increased during the crisis periods compared to the pre-crisis period. After the crisis (event), the growth rate of non-performing loans decreased compared to the crisis period. While non-performing loan rates are similar in the crisis period and the post-crisis period, the pre-crisis and crisis-period non-performing loan rates differ. In short, non-performing loans increased during and after the crisis compared to pre-crisis.

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[4]   *The blue striped line in all charts; pre-crisis (event), red line; the crisis (event) period, and the green striped line represents the post-crisis (event) period.*

Graph: 3
**CAG for the Wholesale Retail Industry**

When non-performing loan growth values of the construction sector are evaluated in Graph 4, according to the "z" and "F" test results, non-performing loans remained the same in the pre-crisis and post-crisis periods but increased in the post-crisis period. The crisis period and pre-crisis differed in wave dimensions, but the crisis period and the post-crisis period were similar. In short, non-performing loans in the construction sector experience constant fluctuation and are unstable. Especially in the post-2001 period, significant decreases were experienced in non-performing loans in the construction sector, and significant increases were experienced in the post-crisis period in 2008 USA. Another remarkable point in the construction sector was in 2012. It is thought that problems such as economic problems (deceleration of growth, increase in unemployment rates, etc.), especially in the Euro Region in 2012, and the slowdown in growth in Turkey may cause this result.

**Graph: 4**
CAG for the Construction Industry
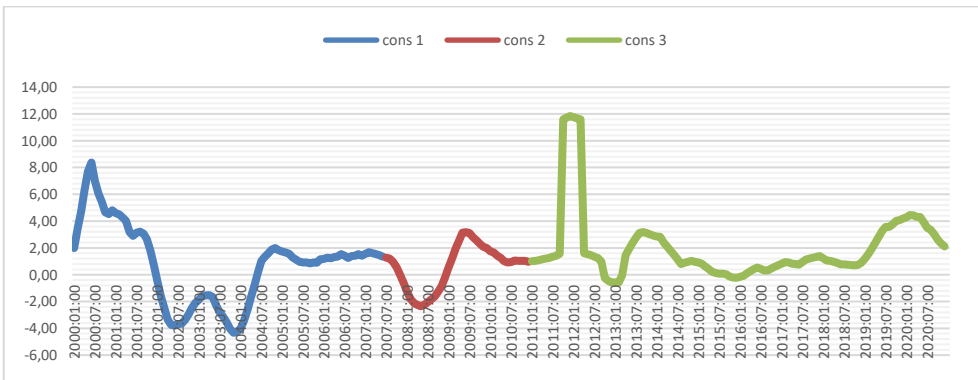
Graph 5 shows the non-performing loan growth rates of the main metal industry sector. When the "Z" and "F" test results were evaluated, the non-performing loan ratios, which started to increase in the pre-crisis period, increased both in the crisis and post-crisis periods. However, the fluctuations in the crisis period are parallel to the post-crisis fluctuations, and the instability's severity is higher than in the pre-crisis period. When evaluated in general, the metal main industry's non-performing loan rates increased during and after the economic crisis.

Graph: 5
**CAG for the Metal Main Industry Sector**
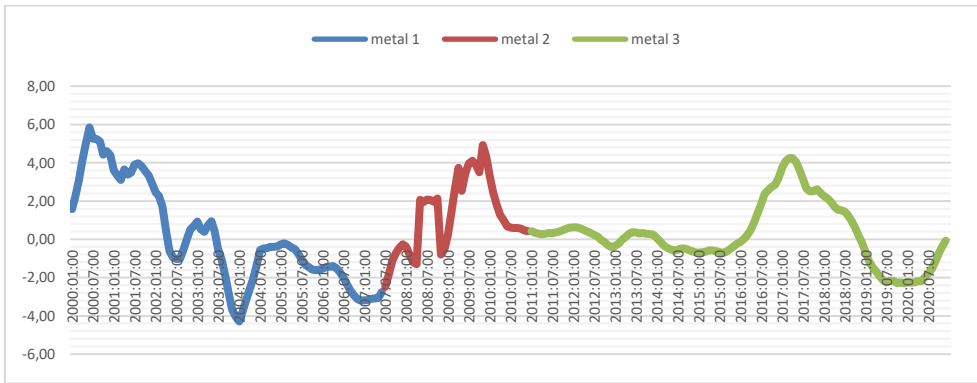
Graph 6 When the non-performing loans of the textile sector are evaluated according to the "z" and "F" test results, non-performing loans increase in crisis periods and post-crisis periods compared to the pre-crisis period. In addition, pre-crisis instability and fluctuations are similar to post-crisis instability and fluctuations. It is seen that the textile sector was particularly affected by the 2001 Turkish Crisis.
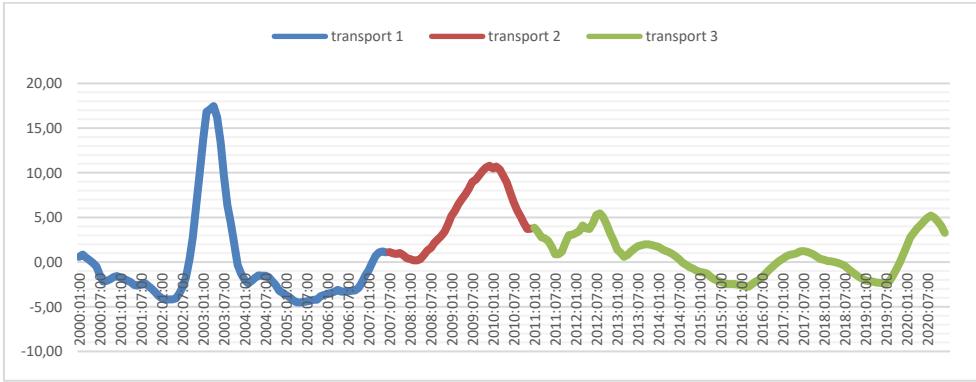
Graph: 6
CAG for the Textile Industry
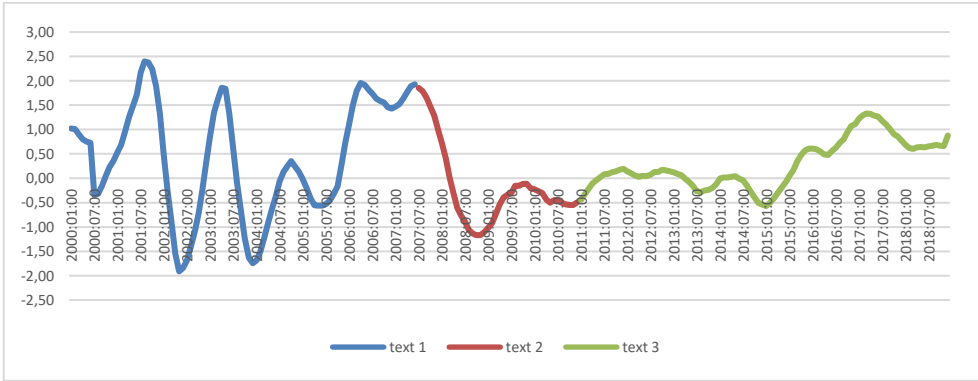
When the "z" and "F" test results of the food sector non-performing loans are evaluated, the non-performing loan rates increased continuously during and after the crisis. Regarding fluctuation, the periods before and after the crisis show similarities. The food sector has been growing, especially during the 2001 Crisis period, the 2008 Crisis period and after 2017.

Graph: 7
CAG for the Food Industry
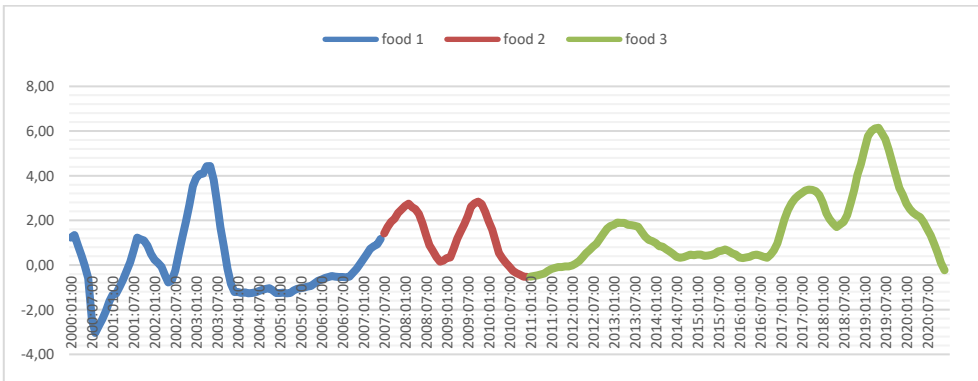
When the non-performing loan abnormal value graph of the transportation sector is evaluated according to the "z" and "F" test results, non-performing loan rates have consistently increased both in the crisis periods and in the pre-crisis and post-crisis periods. While the fluctuations between the pre-crisis and crisis periods were similar, the post-crisis period differed. In general, it can be said that the transportation sector has been dramatically affected by the economic crisis environment.

Graph: 8
CAG for the Transportation Sector

Graph 9 shows the NPL ratio of loans extended by banks to all sectors. According to the findings, non-performing loan rates increase continuously in the pre-crisis, crisis and post-crisis periods. The instability in non-performing loans, which started in the pre-crisis period, continues during and after the crisis. The size of the fluctuations is similar. Although it decreased partially in 2018, non-performing loan rates have increased continuously in recent years.

Graph: 9
CAG for the Total Loans
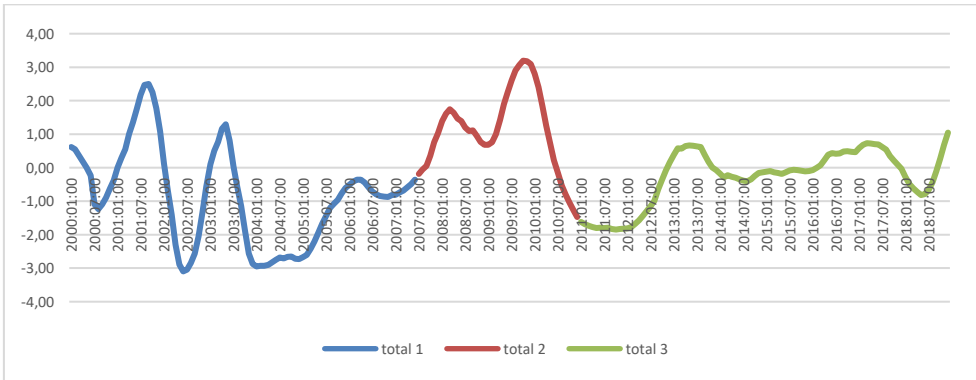
When the results of the analysis of the amount of non-performing loans extended by banks on a sectoral basis are evaluated in general, it is observed that there is an increasing trend in retail loans both before and after 2008. While the level of uncertainty and instability increases during the crisis period, it decreases in the post-crisis period. In the wholesale and retail sales sector, non-performing loans peaked, especially in the 2001 crisis and were less

affected by the 2008 crisis. In the post-2008 period, an increase is observed in non-performing loans. Compared to the 2001 crisis, the construction sector's non-performing loans increased significantly after the 2008 crisis. Especially in recent years, the construction sector has been the sector most affected by the economic conditions of non-performing loans. When the basic metal industry sector is examined, the effects of the 2001 and 2008 crises seem much clearer. Non-performing loans, which were at their peak in the 2001 crisis, declined to their lowest levels in the post-2001 period. The effect reflected on the credits in the 2008 crisis is at high levels, although not as much as the 2001 crisis. Even though non-performing loans decreased slightly in the post-2008 period, they entered an upward trend again after 2015. Like the metal sector, the textile sector was most affected by the 2001 crisis. Due to the fragile nature of the sector, there have been many fluctuations in the textile sector, especially over the years. The increase in the non-performing loan ratios of the textile sector in recent years is remarkable. Non-performing loans in the food sector are fluctuating and become unstable over the years, as in the textile sector. During the 2001 and 2008 crises, the bad debt ratios of the food sector increased, and this increase saw peaks, especially after 2016. In the 2001 and 2008 crises in the transportation sector, non-performing loans were at very high levels. While it has been observed that it has been dramatically affected by the crises, it has entered an upward trend again, especially in recent years. If we take a general evaluation based on non-performing loans, there were many increases during the 2001 Turkish crisis and the 2008 US crisis. While an improvement was observed in non-performing loans after 2009, it entered an upward trend again after 2011.

5. Conclusion

In the study, the loans extended by banks in Turkey in the period of 2000 and 2020 were analysed by the Event Study method by considering the sector. Sectors covered; personal loans (vehicle, housing, consumer goods, etc.), wholesale retail, construction, main metal industry, textile, food, and transportation sector. In addition, total non-performing loans covering all sectors are included in the study.

Banks are the most important institutions that mediate the flow of funds in the financial system. One of the tools banks use most when intermediating the flow of funds is the loans they have made available. In the 2000s, interest rates in developed countries were low, and short-term fund inflows to developing countries such as Turkey, where interest rates were higher, increased. On the other hand, for Turkey, the 2000s covered a period in which privatisations were experienced a lot. The existence of too many credit funds in the banking sector in Turkey has caused excessive credit expansion. During this period, the rate of lending to the markets by banks increased rapidly. In this period, loans were generally extended to sectors with low added value and no long-term return to the economy[5]. The rapid growth of loans and the use of these loans by non-productive sectors negatively affect the

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[5] *For relevant data: TBB, (2021),
<https://www.tbb.org.tr/Content/Upload/Dokuman/7769/Sektorel_Kredi_Dagilimi_Mart_2021.pdf>,
28.02.2021.*

economy and increase the fragility of banks. Therefore, after determining the causes of non-performing loans, the effects of these loans on the banking sector and the economy should be taken into account, and necessary measures should be taken to ensure that loans do not become problematic loans.

In this study, the course of non-performing loans in domestic or worldwide economic disruptions is examined based on important sectors that are the backbone of the economy. Especially in the pre-crisis and post-crisis periods, it is thought that how non-performing loan rates changed according to the sector and making a sectoral analysis is an important feature for Turkey. As a result of the findings obtained from the study, solution suggestions for policymakers and economic actors are listed below.

- A supervisory mechanism can be established for banks to use their deposits.
- Loan interest rates may vary according to the sector or the efficiency of the sector. For example, sectors related to technological products (automobiles, mobile phones, etc.) or important sectors such as the main metal industry can be supported with low-interest rates.
- Since Turkey has an inflationary economic structure, expenditures made by individuals can be controlled through loans.
- In addition to the supervisory activities of banks, a well-designed asset management system can be established.
- By taking into account the imbalances and strategic errors between the sectors and taking these errors and omissions into account in future economic programs, a stable economic structure can be created in the longer term.

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Appendix

Table: 1
Statistical Values of the Variables

Variables	Var	stdev	Average	Obs.
Per.Cred. 1	242,59	2.99	12.82	36
Per.Cred. 2	28,06	1.94	1.75	42
Per.Cred. 3	0.80	0.96	-4.61	120
Wholesale Retail 1	10.37	1.59	0.96	90
Wholesale Retail 2	1.45	1.07	1.12	42
Wholesale Retail 3	1.75	1.12	-0.69	120
Cons. 1	8.74	2.79	6.60	90
Cons. 2	2.79	1.22	0.60	42
Cons. 3	6.60	1.45	1.98	120
Metal 1	7.11	3.52	2.48	90
Metal 2	3.52	1.28	1.19	42
Metal 3	2.48	1.19	0.25	120
Textile 1	1.37	0.65	0.21	90
Textile 2	1.06	0.56	0.73	42
Textile 3	0.21	1.03	0.73	120
Food 1	2.57	1.20	2.62	90
Food 2	1.20	1.23	1.21	42
Food 3	2.62	1.21	1.58	120
Trans. 1	27.08	1.93	-0.47	90
Trans. 2	13.93	13.89	13.79	42
Trans. 3	5.12	5.38	0.72	120
Total Loans 1	2.14	1.16	-0.87	90
Total Loans 2	1.50	1.49	1.49	42
Total Loans 3	1.68	1.11	0.21	120

Table: 2
Z Table for the Variables

	z1_2	z2_3	z1_3
Per.Cred.	4.07 (0.99)	33.19 (0.33)	6.71 (0.99)
Wholesale Retail	6.57 (0.49)	-1.30 (0.49)	4.57 (0.32)
Cons.	0.54 (0.99)*	-10.92 (0.99)	-3.0 (0.99)
Metal	-2. 78 (0.99)	3.19 (0.15)	-0.35 (0.48)*
Textile	-0.23 (0.99)*	3.44 (0.99)	-1.86 (0.99)
Food	-5.36 (0.99)	-6.34 (0.13)	-7.13 (0.99)
Trans.	-17.93 0.43	14.09 0.49	-2.03 0.31
Total Loans	-9.67 (0.30)	3.84 (0.27)	-5.55 (0.16)

Notes: *Ho Red, a=0,05, critical z value 0,12 or 0,13, If Z Value > 0, H_0 Red.

Tablo: 3
F Table for the Variables

	F1_2	F2_3	F1_3
Per.Cred.	8.64 (1.84)	0.02 (1.53)*	304.2 (1.53)
Wholesale retail	7.12 (1.65)	0.83 (1.74)*	5.94 (1.53)
Cons.	3.13 (1.65)	0.42 (1.65)*	1.32 (1.53)*
Metal	2.02 (1.65)	0.70 (1.74)*	2.86 (1.53)
Textile	2.08 (1.74)	1.84 (1.74)	0.88 (1.53)*
Food	2.14 (1.74)	2.19 (1.74)	0.98 (1.53)*
Trans.	0.51 (1.65)*	2.72 (1.65)	5.28 (1.53)
Total Loans	1.42 (1.74)	0.88 (1.65)*	1.26 (1.53)*

Notes: *Ho Red, If F Value > F Critical value, H_0 Red.