THE EFFECT OF CREDITS ON ECONOMIC GROWTH

A THESIS SUBMITTED TO
THE INSTITUTE OF SOCIAL SCIENCES
OF
ANKARA YILDIRIM BEYAZIT UNIVERSITY

BY

NURULLAH GÜLEÇ

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE IN
THE DEPARTMENT OF ECONOMICS

JANUARY 2018

Approval of the Institute of Social Sciences

Assoc. Prof. Dr. Seyfullah Yıldırım
Manager of Institute

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Sciences.

Prof. Dr. Murat ASLAN
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Sciences.

Assoc. Prof. Dr. Abdulkadir DEVELİ
Supervisor

Examining Committee Members

Prof. Dr. Erdal Tanas KARAGÖL	(AYBU, Economics)
Prof. Dr. Murat ATAN	(Gazi Uni., Econometrics)
Assoc. Prof. Dr. Abdulkadir DEVELİ	(AYBU, Economics)

I hereby declare that all information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise, I accept all legal responsibility.

Name, Last Name: Nurullah GÜLEÇ

Signature :

ABSTRACT

THE EFFECTS OF CREDIT ON ECONIMIC GROWTH

Güleç, Nurullah

M.S., Department of Economics

Supervisor: Assoc. Prof. Dr. Abdulkadir Develi

January 2018, 144 pages

Economic growth has always been one of the leading working areas of economists. In many studies, different factors affecting economic growth were investigated. The relationship between credit growth and economic growth has been subject to many studies. In this study, the effects of lending on economic growth and inflation were investigated. Credits were dealt with in three groups as commercial credits, consumer credits, and credit cards. The effects on the real gross domestic product (rGDP) and on inflation of each group were investigated. Vector Autoregression Model (VAR), which is frequently used in the analysis of econometric data, was used in the study. By establishing eight different VAR models, it was tried to determine the relationship between rGDP and each credit group and the relationship between inflation and each credit group. Finally, using Granger causality analysis, the causality relation between credits and inflation and the causality relation between credits and rGDP was examined.

Key Words: Economic Growth, Credit Growth, Inflation

ÖZET

KREDİNİN EKONOMİK BÜYÜME ÜZERİDEKİ ETKİLERİ

Güleç, Nurullah

Yüksek Lisans., İktisat Bölümü

Tez Yöneticisi: Doç. Dr. Abdulkadir Develi

Ocak 2018, 144 Sayfa

Ekonomik büyüme ekonomistlerin her zaman önde gelen çalışma alanlarından biri olmuştur. Yapılan birçok çalışmada ekonomik büyümeyi etkileyen farklı unsurlar araştırılmıştır. Kredi büyümesi ve ekonomik büyüme arasındaki ilişki birçok araşıtırmaya konu edilmiştir. Bu çalışmada kredilerin ekonomik büyüme ve enflasyon üzerindeki etkileri araştırılmıştır. Krediler, ticari krediler, tüketici kredileri ve kredi kartları olarak üç grup şeklinde ele alınmıştır. Her grubun reel gayri safi yurt içi hâsıla (rGSYH) ve enflasyon üzerindeki etkileri araştırılmıştır. Araştırmada ekonometrik verilerin analizinde sıkça kullanılan Vektör Otoregresyon Modeli (VAR) kullanılmıştır. Sekiz farklı VAR model kurularak her kredi grubunun rGSYH ve enflasyonla ilişkisi tespit edilmeye çalışılmıştır. Son olarak Granger Nedensellik analizi kullanılarak krediler ile rGSYH ve enflasyon arasındaki nedensellik ilişkisi araştırılmıştır.

Anahtar Sözcükler: Ekonomik Büyüme, Kredi Büyümesi, Enflasyon

To My Wife and little Son

ACKNOWLEDGMENTS

First of all, I wish to present my most sincere gratitude to my thesis advisor Assoc. Prof. Dr. Abdulkadir Develi for his continuous support, encouragement and motivating me with sincere attitude. I have to faithfully express that without his wise consultancy and sincere attitude, this work could not have been completed successfully.

I would like to thank my parents for their financial and spiritual support throughout my education life. I know their prayers are always with me.

Finally, I give my greatest thanks to my wife Merve GÜLEÇ and my little son Mehmet Fatih GÜLEÇ for their unlimited support to me, although I had neglected them. Thank you endlessly.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
GDP	Gross Domestic Product
nGDP	Nominal Gross Domestic Product
PP	Phillips-Perron
rGDP	Real Gross Domestic Product
TURKSTAT	Turkish Statistical Institute
VAR	Vector Autoregressive

CHAPTER I

INTRODUCTION

The relationship between financial development and economic development has been the subject of many studies. Some economists argue that the financial development is the reason for the economic development, while some economists claim that the economic development is the reason for the financial development.

One of the most important indicators of financial development is credit volume. Credits are the basic tools for economic growth, especially in developing countries. Because both the production and consumption in the economy can be financed through credit. Whether supply-side growth or demand-side growth model is chosen, credits are either indispensable for both models. For this reason very serious work has been done on the credit volume and it continues to be done.

In the economy, the most important actors having effect on credits are banks. It is claimed that with the development of the banking sector, more efficient use of the funds in the economy is ensured. Banks collect funds and provide funding for those who need it. The banking sector has a crucial role in the efficient use of funds in limited quantities.

The banks also support the economic development from both sides. The banks can provide to increase in production in economy by supporting the

entrepreneurs who lack the capital, while banks can support the consumption by providing funds to those who want to consume however have not enough income.

In this study, the effects of credit volume on economic growth and inflation will be investigated. For this purpose, the total credit volume, inflation, trade credit volume, the consumer loans volume and credit cards series between 2003 and 2017 in Turkey based in quarters have been worked. The relationship between credit volume and banking sector is considered and the literature on banking will be searched and the banking in the current economic system will be examined.

Chapter 2 focuses on the concepts of money and banking. Brief information about the historical development of money, functions of money and types of money will be given. Then, information will be given on banking, central banking, functions and purposes of the central banking, reserve systems and commercial banking.

Chapter 3 deals with the relationship between money, credit and economic growth. The definition of credit will be considered first. The relationship between money and credit will be analyzed by comparing the functions of money and functions of the credit today. The relationship between economic growth and money will be addressed through the quantity theory of money. Brief information about the quantity theory of money will be given and a revised version of the theory taking into account the relationship between credit and money will be worked on. Inspired by this theory the effect of the sub-fractures of the credit on real growth and inflation will be analyzed.

In Chapter 4, the methodology of this work and the methods to be used are briefly explained. The structural characteristics of the data to be used will first be analyzed. The results of the analysis will prove the suitability of the VAR model. Once the implementation and structure of the VAR model is explained,

the model will be established using the data and the results obtained from these models will be interpreted. The Granger Causality test will be applied at the end of the analysis and the causal relationships between the series and the directions of the causality will be determined.

In Chapter 5, the results obtained will be interpreted and suggestions will be given.

CHAPTER II

MONEY AND BANKING

This section will focus on money and banking terminology, which are essential to this work. Firstly the information about the historical development, types and functions of the money will be given. Then, information will be given about the banking sector; central banking and commercial banking, respectively. In this frame, brief information about the role of banking in economy, working principles of central banking and commercial banking will be presented.

2.1. Money

Money is the most fundamental tool for the ease, continuity and security of economic activities. When we look at the most used expressions in economic life, we can see that almost all of them are related to money, such as earning or making money, spending money, saving money, borrowing or lending money, etc. Since money is such a fundamental component of the economy, many studies have been made on money, money theory and monetary policies and they are still being done.

What is Money and Its Historical Background?

Money, with the broadest definition, can be described as the means of payment and measure, which is accepted by all people in society and mediates all commercial activities. As it can be understood from the definition, the most basic feature that an object can be money is that it is accepted by the whole society.

Today, this is achieved by accepting the banknotes printed by the central banks as a means of payment and measurement by states.

Many objects in history have been used as money such as seashells, pearls, processed wood, rice, wheat, iron, copper, gold, silver, etc. People start trading at the beginning by exchanging goods which are needed with goods which are more in their hands. But this method did not always allow the desired trade to be done. For this trade to take place, both sides should have needed the goods that other ones had. The difficulties lived here led people to demand goods, that they could exchange again, in exchange for selling their goods. As a result, rare objects such as commodities or shells rarely found in nature have begun to be used as tools of exchange. Although the objects used in this phase were features of exchange, they still did not have the feature of being a unit of measure, because no standard was provided for the commodities or other means of exchange. In the next stage, the known first money is printed by Lydians in Anatolia in the B.C. 7th century. The main reason why the Lidyalians need the money to fulfill all the functions and use them is because they have a very high trade volume due to their geographical location and they need to make this trade faster, easier and safer. The use of gold coins has become widespread in the world after the discovery of the mien stone and the determination of the metal rates within the coins. However, even this money was not enough to make the trade truly comfortable and safe. Eventually, the states standardized the coins by processing various symbols on them and brought them in an acceptable manner in terms of the whole society.

Rapidly growing world trade as a result of making money more convenient for daily use and trade, technological developments and increasing economic activities in parallel with increasing needs makes difficult and risky for traders to carry much money on their long journeys. Then the traders started to use the bonds which were accepted as payment promises among themselves. These

bonds were used to keep the trade faster and more reliable until the paper money was used.

As a result of the developing trade, the enriched traders began to give their money to the bankers to keep and protect their fortunes and they started to take bonds for their given money. These bonds were accepted and used as a means of exchange for buying and selling goods in society. At the beginning, the bankers, who had printed bonds as much as precious metals they had, realize that the bonds are accepted like money, and so precious mine owners want to reclaim certain parts of the mine they lend. Then, by printing bonds as much as they want, the bankers began to give dept to people who want to take dept and this was the birth of the fractional reserve system.

At the latest in the development of money, the governments decided that the bonds issued by the bankers to the market would be put on under a single institutional framework. This means the birth of central banks. Today, banknotes issued by state-authorized central banks are used as money in economies.

Nowadays, the banknotes that are printed and marketed by the central bank through commercial banks carry inherent characteristics such as acceptability, portability, stability, and durability.

What are the Types of Money?

Looking at the historical development of the money, as mentioned above, it appeared that money had been used in various forms over time. After the period of barter, the money emerging from the use of precious metals was called commodity money. The values of commodity money depended on precious metal contained itself. These values written on the money according to the rate of the mine it contains represented purchasing power. The main difficulty in using commodity money was that it is difficult and risky to move. In addition to

this, the authority holder of printing this money made benefit by making changes in the rate of precious metal during the printing, and in this case, this unjust income was called seniorage (Şıklar, 2009). As a result of this implementation, the money with high rate precious metals was held in hand and the low ones were started to be used in trade. This situation was described by British Sir Edward Gresham and was called Gresham law (Şıklar, 2009).

Due to the increase in economic activity and the increase in trade volume, some difficulties were occurred, especially, transferring and maintaining of commodity money. Therefore period of representative money began. The representative monetary system works in the form of giving precious metals to the bankers and taking the bonds with money quality in the market.

The representative money has undergone a transformation over time and is guaranteed by the states through legal regulations. With this regulations central banks authorized by the states have the authority to issue money. Nowadays, money which is printed by central banks and cannot be converted into any precious metal called fiat money. The basic principle of accepting such objects as money is to be accepted by the state as a means of payment. Today, these money is issued by central banks to the market through commercial banks.

The last type of currency we will be referring to is the checks writen against the demand deposits or credit accounts in the bank, which is called commercial bank money. Here, besides giving money into the system by printing checks up to the deposits they collect, they also provide money to the system by lending deposits as credit and writing checks again against to these credits.

What are the Functions of Money?

The money has three basic functions. These can be sorted as medium of exchange, unit of account and store of value.

Money is used as a means of exchange in the purchase and sale of goods and services. Being the medium of exchange in trade is the basic reason why money is needed. This feature, which removes the difficulties of the first version of the trade, barter system, provides that economic units meet the needs easier and quicker.

The money has a function that allows the value of the goods to be expressed to a common extent for both the buyer and the seller. Through the unit of account function, money plays a fundamental role in the formation of economic activity by expressing the goods and services on the market in a common value unit.

Money keeps purchasing power in future periods as it is in the current period. In fact, this property is also present in all goods that express economic value, such as land, precious metals, houses etc. However, there is a liquidity feature, representing to obtain other goods and services at the desired time, on the money that is different from other commodities. This means that, as in the period of barter, by using other commodities people can act as a commercial activity among themselves, but doing this activity by using money is more easily and safely, without the need for any other intermediary means.

2.2. Banking

Banks are commercial institutions, which are one of the most important instruments of the economy, that enables money to exist in the economic system, to adjust its circulation and amount according to its needs. Since banks are the institutions that play the most active role in controlling the money in the economy, they also play a crucial role in economic development of an country and in increasing the level of prosperity.

Banks can be divided into several categories according to different criteria. Some of those; banks according to ownership structures: private banks, public banks,

mixed banks, foreign banks, banks according to organizational fields: local banks, regional banks, national banks, international banks, offshore banks, banks according to economic activities: agricultural banks , mine banks, commercial banks, public banks, investment banks, development banks, central bank. In spite of all these classifications, considering the functions of banks in the economy, it is possible to divide banks into two; central banks and commercial banks (Kaya, 2013, p.74-85).

The central banks are one of the most important institutions of the economy, called the bank of the banks, which create money by basing on the authority given by the states and which put these money into the economic system through commercial banks.

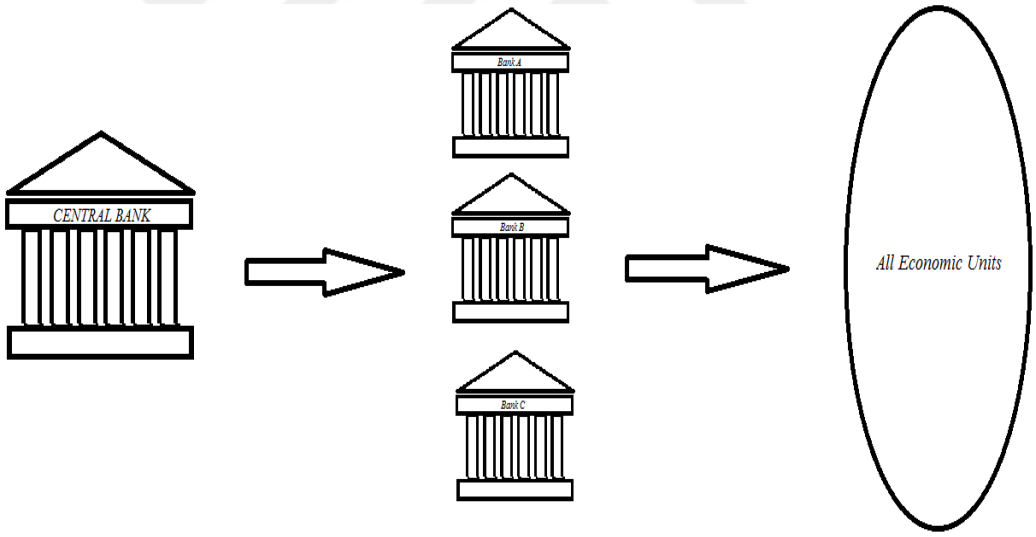


Figure 1.1: Money Supply

Commercial banks are an important financial institution that transfers the banknotes receiving from the central bank to the other units of the economy and make it possible to exist money, which is the basic means of making purchases with the simplest expression, in the system. At the state of nature (without any

money in the system), although the whole money required to finance the economy is provided by the central bank, after the economic system starts to work, the banks collect the deposits from the economic units and transfer these deposits to the other economic units that need funds and carry out the financial intermediation function, and they serve for continuity of economic system (Casu et al., 2015, p. 3-4).

2.2.1. Central Bank

Central banks are the banks that are authorized by the state through law, have the authority to print money on behalf of the state, aim at monetary stability or price stability by directing the money market. The central banks manage the monetary policy in the country to maintain price stability, to prevent liquidity crises, money market failures and financial crises (Casu et al., 2015, p. 121). The reason for the need for central banks is the necessity of inspections and regulations that must be made in the financial system, after paper money begins to be used.

Looking at the history of central banks, the Bank of England, which was established in 1964 and served as the first emission bank, can be regarded as the first central bank. In addition, according to some economists, the first central bank was established in 1668, the Swedish state bank which gave its own banknotes as money representing the discounts of commercial bonds and exchanged these banknotes to precious metal money if requested. (Parasız, 2005, p275).

Central banks are designed as institutions with the right to print money as much as precious metals in their hands at the beginning of their establishment. In this framework, there are no inconveniences for the central banks being privately funded organizations. However, the rapid growth of the population of the countries and the related trade has created the need for the increase in the money

supply in the economy more than the precious metals, and thus the central banks have begun to print more money than the precious metals in their hands. In this way, it was possible that one of the most important qualities of the states, the power of printing money, can be abused by private institutions, therefore the central banks started to be nationalized. However, according to some economists, states that have permanently budget-deficits can close the budget deficits by using the central banks and this would harm the stability in the economy. Because of this theory, central banks have reached their present autonomous position.

The Purpose of Central Bank

The fundamental purpose of the central bank is to ensure that the country's economy continues as smoothly as possible. To realize this aim, the central bank intervenes to the economy at the points where it believes that it is necessary to use the instruments at its hand.

Recently, it take attention that the first goal of central banks is to fight against inflation. Actually, the central bank counteracts the long-term increase, inflasion, or decrease, deflation, at the general level of prices to fulfill the its fundamental purpose, price stability. Price stability implies that changes in the level of general prices are small enough that people do not need to take into account in decisions about investment, consumption and savings. The main reason why the central bank accepts price stability as its main objective is that price stability has a direct influence on people's investment, saving and consumption.

It is a topic that has been frequently spoken in recent times that financial stability is important for macroeconomic stability of the country besides price stability. Financial stability is a situation that financial functions such as the payment system, risk dissipation and efficient allocation of resources are effectively

implemented even during periods of temporary fluctuation, shock or structural change. In a narrow sense, financial stability is the absence of long-term volatility in asset prices (Darıcı, 2012)

The Functions of Central Bank

According to Ball (2011, p.47), the functions of central bank can be listed as clearing payments, monetary policy, emergency lending and financial regulation.

Function of clearing payments means that the banks carry out transactions between themselves through the central bank. As we have already mentioned, the central bank is also called the bank of the banks.

Other function of central bank is monetary policy which means that controlling money supply in the economy. The central bank fulfills this function by making arrangements affecting money and credit access and cost. In this way the central bank determines how much money the banks can create and put into the economic system.

Third function of central bank is used in extraordinary economic circumstances to protect depositors and prevent bigger economic crisis. This function, also called the lender of last resort, is applied in cases of economic crises where banks are in danger of sinking and money needs can not be provided from other sources.

Financial regulation is the last function of central bank which service to preclude banks from taking too much risk. By restricting the activities of the banks, the central bank aims to ensure monetary stability and to keep the economy safe.

In addition to these four functions, Casu at al. (2015, p.122) also stated that the central bank fulfills functions of holding the goverment's bank accounts and controlling the goverment's gold and foreign currency reserves.

Objective and Tools of Monetary Policy

Monetary policies, one of the most important tools of central bank, are used while central bank realizes its objectives. The central bank aims to regulate interest rates, price stability and available credit amounts by adjusting the amount of money in the economic system through monetary policy. We can list the primary aims of the monetary policy in the following way; high employment, price stability, stable economic growth, interest rate stability, financial market stability and stability in the foreign exchange market (Casu at al. 2015, p.128). However some of these aims contradict each other. One example of these conflicts can be expressed as follows. If the central bank reduces interest rates in order to stabilize interest rates, this policy may have a positive impact on economic growth and employment growth. However, such a policy also brings inflation. For this reason, central banks may have to make a choice between these objectives in order not to contradict objectives. In the world, the primary objective of central banks is generally to ensure price stability.

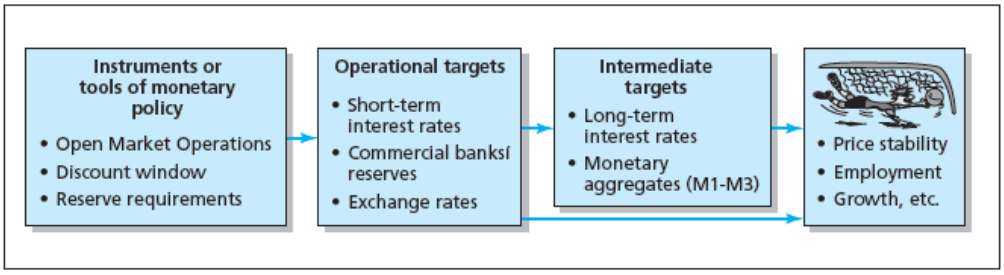


Figure. 1.2: Monetary Policy Instruments, Targets and Goals (Casu at al. 2015, p.129)

The central bank uses some instruments to achieve the above-mentioned objectives. As it can be seen at Figure 1.2, it is possible to classify these tools

into three categories; open market operations, discount windows, and reserve requirements.

The central bank carries out open market transactions by purchasing treasury securities from the non-bank or by selling treasury securities to the non-bank private sector. These operations are very important for adjusting the amount of money in the economy. The central bank has the ability to influence the liquidity in the economy and also the interest rates through these operations. If the central bank sells treasury securities, it will reduce the money supply in the system. As a result of this, short-term interest rates increase. On the contrary, if the central bank buys treasury securities, it increases the money supply in the system. This results in short-term interest rates falling.

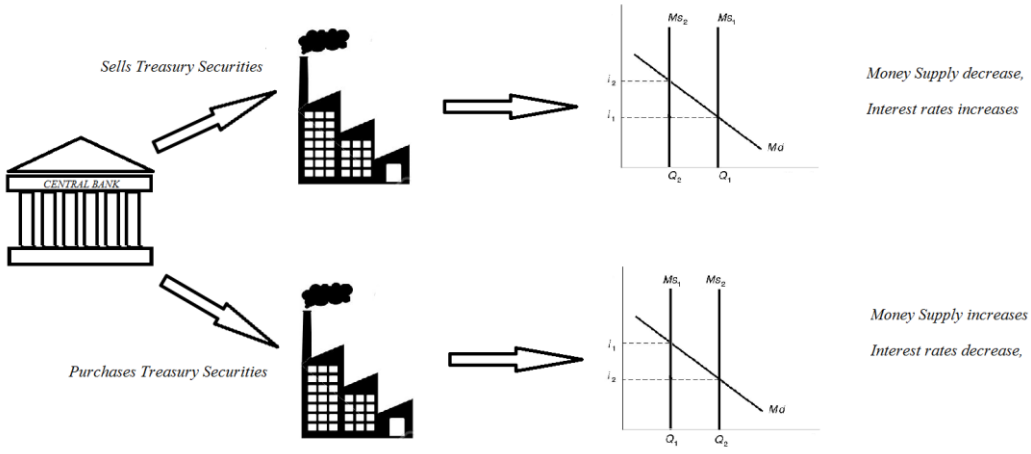


Figure. 1.3: Effects of Monetary Policies

Open market operations are the most frequently used instruments because of having some important advantages. First of all, open market operations have a quick impact on the economy. As well as the quick effects, the effects are fully measurable and controllable. It can be quickly and easily reversed when an

undesirable effect occurs. Since open market operations can be applied at the desired frequency and volume, minor or major arrangement can be realized.

Discount rate can be defined as the lending interest rate of the central bank. The central bank can increase or decrease the cost of finding money for banks by changing the discount rate. The central bank, which adjusts the amount of money in the economy through its borrowing costs, also affects short-term interest rates. By increasing discount rate, the central bank can increase the borrowing costs of banks and reduce the volume of money in the economy. On the contrary, by decreasing discount rate, the central bank reduces the borrowing costs of the banks and increases the volume of money in the economy. Banks often use funds from the central bank for a short term. This instrument is also used to fulfill the lender of last resort function of the central bank. So, this instrument is used to prevent the deepening of the crisis in times of economic crisis in which banks can not find alternative sources.

The banks holds a certain amount of reserve in accordance with the prudential principle in order to meet the cash needs of the customers. The central bank may change the amount of reserves that banks must hold. With this amendment, the central bank aims to adjust the amount of credit in the economy. The central bank, which increases the required reserve ratio, means that targeting the reducing supply of money in the economy. Vice versa, by reducing the required reserve ratios, the central bank allows the banks to create more fund to the economy. This instrument affects all banks at the same time. However the opposite of open market operations, required reserve ratios are not often used instruments, since the required reserve ratios have very serious effects on the money supply. So, it is not possible to make small adjustments to the money supply in the economy with this instrument. Further frequent changes in required reserve ratios can cause serious problems in the financial structure of banks.

Money Supply and Required Reserve Systems

In economy, Money supply is provided by central banks which is entrusted by governments. Instead of giving directly money to economic units, the central bank makes the money supply through the banks.

At the beginning, the bankers take charge of protecting the precious metal and money they collect. The bankers were only lending their own capital to money seekers. As the banking logic evolves, the banks realize that only a very small part of the deposits deposited to them are demanded back, and that a very large part is not. They started to keep some of the deposits in the banks as reserves and to lend the remainder to the money seekers. In this way, the bankers initially started to work with the full reserve system and then started to apply the fractional reserve system. Although the exact nature of the reserve system is better suited to banking, the banking sector began with the application of the fractional reserve system

Fractional Reserve System

The fractional reserve system is a banking reserve system in which only a part of the deposits collected by the banks are held in cash or in assets which have high liquidities and the rest of deposits are given to the clients as credit. Nevertheless, this system is not in line with the philosophy and functioning of deposit banking, the foundation of this system is based on the private Venetian bankers in the middle of the 14th century (Douglas et al., 1939). In the fractional reserve system, money is produced on the basis of debt (Askari & Krichene, 2016). Therefore, this type of Money creation method is also called a debt based monetary system (Gündoğan & Çetiner, 2014).

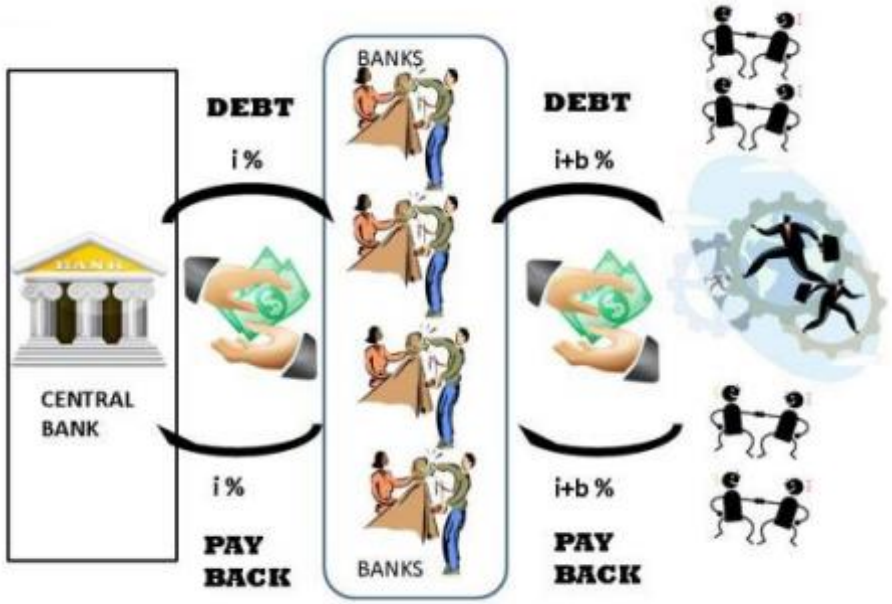


Figure 1.4: Debt Based Monetary System (Gündoğan & Çetiner, 2014).

In the fractional reserve system, money is created by the banks under central bank control. When banks give deposits collected to their customers as credit, they create as much money as credit they give.

The following table, Table 1.1, shows that a customer deposits 1000 TL to the bank.

Table 1.1: Deposits 1000 TL

Bank			
Assets		Liabilities	
Cash	1000	Deposits	1000

Now, assume that one customer want to credit from bank, and bank gives 500TL credits to this customer. In this case the bank's account record will be like Table1.2.

Table 1.2: Lending 500 TL

Bank			
Assets		Liabilities	
Cash	1000	Deposits	1000+500=1500
Loans	500		

As seen in Table 1.2, while the cash reserve of the bank did not change during this transaction, customer deposits increased by 500 TL. The money supply in the economy which is the sum of the deposits in the banks is considered, it is clear that the bank has created money as much as loans bank gave.

The amount of money that banks can create is restricted by the central bank through required reserves in the fractional reserve system. The reserve requirements were originally kept for the security of the customers, and later became a tool that the central bank used to determine the amount of money in the system. In the fractional reserve system, maximum money supply is directly related to the required reserve ratio determined by central bank. In the following table, table 1.3, how much money can be created from the starting cash deposits of 1000 TL by banks under 10% required reserve ratio (R) condition have shown.

Table 1.3: Transections in Banks

	Bank			
	Assets		Liabilities	
Transaction 1	Required Reserve	100	Previous Deposits	0
	Cash	900	Deposits A	1000
	Total Loan	0	Total Deposit	1000
Transaction 2	Required Reserve	190	Previous Deposits	1000
	Cash	810	Deposits B	900
	Total Loan	900	Total Deposit	1900
Transaction 3	Required Reserve	271	Previous Deposits	1900
	Cash	729	Deposits C	810
	Total Loan	1710	Total Deposit	2710
Transaction 4	Required Reserve	343.9	Previous Deposits	2710
	Cash	656.1	Deposits D	729
	Total Loan	2439	Total Deposit	3439
Transaction 5	Required Reserve	409.51	Previous Deposits	3439
	Cash	590.49	Deposits E	656.1
	Total Loan	3095.1	Total Deposit	4095.1
.	.		.	
.	.		.	
.	.		.	
Last Transaction	Required Reserve	1000	Previous Deposits	-
	Cash	0	Deposits -	-
	Total Loan	9000	Total Deposit	10000

In Table 1.3, first customer A deposits 1000 TL in cash to the bank. The bank has to keep a reauired reserve of 100 TL due to this deposit and the bank may give the remaining money, 900 TL, as a loan to new customers. In second transaction, The bank gives 900 TL to the new customer B as a loan and deposits it in the deposit account opened on behalf of the customer. The deposits laid on behalf of the bank customer B is accepted as new deposits and the bank holds 90 TL which is one-tenth of deposit of 900 TL is as required reserve for these deposits. These transactions are carried out until the first cash deposits are holded as reserves, in other words, until there is no cash, excluding reserves, remaining in the bank. Ultimately, the bank could create 10 times as much money supply as the initial deposit. This multiplier is called money multiplier and is calculated as 1 / R (required reserve ratio).

There is a lot of criticism on the fractional reserve system. Especially after the great depression of the 1930s, these criticisms were intensified and began to gain interest. This system has often been criticized both in terms of operation and ethics. In the Angel (2016) study, the ethical criticisms of the fractional reserve system are summarized under 11 headings. In his work Fisher (1935) stated that monetary authorities could not control the money supply in this system and said that the supply of money in the control of the banks was the cause of chronic inflation and deflation.

The economic power of the banks in the fractional reserve system provides that the banks have the direct influence of the developments of the economies. Banks may act as risk averse, so the necessary money supply may not provided in the economy, and this attitude may cause economic growth and welfare levels to fall below what is targeted. On the contrary, banks can act as risk seeking, and they can give credit to very risky projects. In this case, the amount of non-repayable loans in the economy may increase so that the banks may go bankrupt. Thus the whole economy and the people of the country would be adversely affected by banks' wrong transactions.

The banking sector, the central bank and the government must work in full harmony in order to achieve economic success in the fractional reserve system. Banks need to provide loans in line with government policies, the central bank to provide the necessary monetary base for the bank, and the government have to avoid policies and practices that would risk the banking sector.

Full or 100% Reserve System

Full or 100% reserve system is a banking reserve system in which all of the demand deposits and checkable deposits are held in the banks or the in the central bank in cash. In this system, the banks can only give to the demanders in the amount of money in equity or in time deposits.

Although the full reserve system is the true form of deposit banking, the fractional reserve system has been used by private bankers in Venice since the middle of the 14th century (Douglas et al., 1939).

The first study on the full reserve system was carried out by David Ricardo in 1823. In his work, Ricardo argued that lending money should be differentiated from money creation and that the money-creating department should keep 100% gold reserves. In Ricardo's 100% reserve system, only gold have been recommended as reserve (Lainà, 2015).

The great depression experienced in the 1930s caused the banking system and monetary policies to be questioned again. In 1933, as a result of the studies, the Chicago Plan was proposed to get rid of the great depression.

Fisher (1935), one of the economists working on this issue, stated that the most basic reason for not being stable in the economy is the fractional reserve system. He also said that despite the fact that the government raised the money supply from 4 billion dollars to 5 billion dollars from 1929 to 1933, in same period the banks recalled the loans and reduced the money in the economy from 27 billion dollars to 20 billion dollars. In this way, despite the changes in the monetary base, banks causes deflation and inflation by decreasing or increasing the amount of money in the system by means of credits.

"What makes the trouble is the fact that the bank lends not Money but merely a promise to furnish money on demand-money it does not possess (Fisher, 1935, p. 7)."

Determining the amount of money in the economy by means of credit by banks causes inflation and deflation. According to Fisher (1935), the main purpose of using a full reserve system instead of a fractional reserve system is to end chronic inflation and deflation and prevent depression. Fisher (1935) claimed that the

full reserve system would make banking and monetary system more simpler as well as reducing bank failures, interest-bearing government debt, major inflation and deflation.

The chicago plan and Fisher's recommendations were attracted by many academics in the 1940's and were tried to be developed. Academics supported these studies with different reasons, such as Higgins (1941) stated that the full reserve system would automatically control investments that exceed the savings cause inflation, while Hart (1935) argued that the fundamental gain of this reform would be monetary control (Lainà, 2015),

Friedman (1959) supported the full reserve banking idea of the Chicago plan and the Fisher's suggestions by writing the book, A Program for Monetary Stability, with making an addition.

> *"I shall follow them also in recommending that the present system be replaced by one in which 100% reserves are required. I shall depart from the original Chicago Plan of Banking Reform" in only one respect, though one that I think is of great importance. I shall urge that interest be paid on the 100% reserves. This step will both improve the economic results yielded by the 100% reserve system , and also, as a necessary consequence, render the system less subject to the difficulties of avoidance that were the bug-a-boo of the earlier proposals (Friedman, 1959, pp. 65-66)."*

Friedman stated in his work that there is no problem in transitioning to the full reserve system from the existing system and he argued that the interest payment to the reserves would facilitate the acceptance of the system by the banks. Interest payments on reserves would provide a fairer incentive between the holders of money and government bondholders (Lainà, 2015).

The narrow banking system proposed by Litan (1987) is almost identical to the full reserve banking system. In the full reserve system, cash, central bank reserves, and government securities are accepted as reserves must be held by banks, in the narrow banking system, in addition to the reserves of the full reserves system, "safe assets" are also considered as reserves.

2.2.2. Commercial Banks

The basics of commercial banking extend to the periods when money begins to be used in economic life. The most fundamental function of commercial banks is to collect the funds of those with funds in hand and to fund those who need funds.

Goddard&Wilson(2016) defined the commercial banking as a main institution of existing financial system that collects deposits from savers, provides loans to borrowers and performing other financial operations. In addition to collecting and lending funds, commercial banks also have different functions in the financial system. Some of these functions are financial intermediation function, foreign trade funding and export promotion function, risk management function in international financial markets, the effective use of resources function, income and wealth distribution function, money creation function and assisting the execution of money and finance policies function (Altan, 2001).

There are many theories about the fundamentals of banking. In Werner (2016), three basic theories about banking have been mentioned; the financial intermediation theory of banking, the fractional reserve theory of banking and the credit creation theory of banking. The main reason for the introducing of different theories about banking is the question of the source of the money that the banks give as loans.

The financial intermediation theory is now the most accepted theory among researchers. In this theory, banks collect deposits from savers and lend it as a loan to borrowers. In Dewatripont, Rochet, and Tirole (2010), researchers have indicated that banks lend long-term loans by short-term borrowing. Von Mises (1912) defined banking as a mediator between fund holders and fund needers. In the General Theory of Keynes (1936), he argues that funds must be collected through intermediary institutions for investment. Sealey and Lindley (1977) argued that banks also made production, and this production was recognized as the collection of funds from fund owners and lending of these funds to fund needers. According to them, the bank fulfills only the intermediary function with this production process.

There are many famous economists advocating this theory. Some of those are Gurley and Shaw (1955);Tobin (1963, 1969); Diamond and Dybvig (1983); Baltensperger (1980); Diamond (1984, 1991, 1997); Eatwell, Milgate, and Newman (1989); Gorton and Pennacchi (1990); Bencivenga and Smith (1991); Bernanke and Gertler (1995), Rajan (1998), Myers and Rajan (1998), Allen and Gale (2004a, 2004b); Allen and Santomero (2001); Diamond and Rajan (2001); Kashyap, Rajan, and Stein (2002); Matthews and Thompson (2005); Casu and Girardone (2006); Dewatripont et al. (2010); Gertler and Kiyotaki (2011) and Stein (2014) (Werner, 2016).

As a results, according to financial intermediation theory of banking, banks can not create money collectively or on their own and it was said that banks have no difference from other financial institutions.

The second theory, the fractional reserve theory argues that banks are financial intermediaries, similar to the financial intermediation theory. However in addition to the financial intermediation theory, this theory claims that banks, however not alone, can create money together in financial system. Phillips

(1920) claimed that what is right for banking system is not right for the individual bank. Similarly, Crick (1927) notes that banks are merely financial intermediary institutions, but that the entire banking system can create money. Keynes (1930) was one of the economists supporting the fractional reserve system. However, Keynes (1930) preferred to use the "creating deposit" instead of "creating money". In addition, Keynes (1930) stated that banks do not need to collect funds from the fund owners to create deposits. Another supporter of this theory is Stiglitz (1997). It can be supposed that money is created from nothing by deposits multiplier. However, in fact, this process is the creation of money during registration when the deposit comes to a bank within the framework of the rules of the fractional reserve theory (Stiglitz, 1997).

Many economists also supported the fractional reserve theory. Some of those are Hayek (1929), Whittlesey (1944), Samuelson (1948), Gurley and Shaw (1955), Culbertson (1958), Aschheim (1959), Warren Smith (1959), Solomon (1959), Paul Smith (1966) and Guttentag & Lindsay (1968) (Werner, 2016).

As a consequently, fractional reserve theory argues that banks can not create money alone, they can create money collectively. According to this theory, each bank alone is only a financial intermediary institution.

The thirth of these theories is the theory of banks create credits. This theory contradicts the other two theories in terms of basic concept. This theory does not accept banks as financial intermediaries and argues that banks create money out of nothing when they give credit. Macleod (1906) claimed that banks do not need to collect money to give credit, banking is not a lending process but a money creating process, credits are equivalent to cash in the economic system. Withers, (1916) stated that in past the banks gave the paper money in their hands to the borrowers but in the current system they gave account book as credit and they registered this credit as a liability side of balance sheet. Davenport (1913),

similarly, said that banks lent to the credit they created rather than to lend money collected in the hands. Werner (1997) supported this theory, claiming that the banks created loans by increasing current debts. Gündoğan&Çetiner (2014) expression of the current monetary system as a debt based monetary system supports this theory. An interesting fact about this theory is that this theory is not included in any lecture book except Ryan-Collins et al. (2011) (Werner, 2016).

Some other economists who support this theory can be listed as Macleod (1856), Wicksell (1898), Withers (1909, 1916), Schumpeter (1912), Howe, (1915), Cassel (1918), Hawtrey (1919), Hahn (1920), Cassel (1923) and James (1930) (Werner, 2016).

To sum up, according to this theory, each bank creates money through some financial operations and lends this money to the borrower. That is, when bank gives credit, it creates money at the same time.

It would be a far from reality to say that banks are only financial intermediary given the current banking system. Considering Turkey, the injection of money by the Central Bank about 134 Billion TL, while total credit volume in the economy is around 2 Trillion TL. If the banks are only financial intermediaries, what could be the difference between 134 Billion TL and 2 Trillion TL? Some economists claim that money and the credit are different concepts. However, both money and credit actually represent only purchasing power. From this point of view there is no difference between money and credit. In addition, the current banking system promises that credit will be able to deliver it in cash to all customers who receive, although this is not possible. In existing financial system, banks make a decision which idea can become real by giving credit. This is unbelievable power.

CHAPTER III

MONEY, CREDIT AND ECONOMIC GROWTH

In this section the terms used in this study and the contents of the theories will be explained. For better understanding of this work, explanations will be made as clearly as possible. Firstly, the description of the credit and the types of credits that form the basis for the study will be mentioned. Then, as mentioned in the previous section, the relationship between money and credit will be discussed. The quantity theory of money and credit will be explained based on the relationship between the money-credit, which is the basis of the study, and the definition of economic growth will be given. Finally, the relationship between economic growth and credit growth will be addressed.

3.1. What is Credit?

The most basic statement of credit is that moving of saving from fund holders to fund needers. In other words, the unused purchasing power is made available to another economic unit with the need through credit. Uzunoğlu (1996) defined credit as transferring a certain purchasing power to another person for a certain period of time. As it can be understood from this description, credit is actually the use of the unearned purchasing power and will be reimbursed in the future together with the interest.

Credit, when dealt with in terms of banking, can be defined as giving money or bank guarantee to a person with or without collateral within the legal arrangements (Balkas, 2004).

There are 4 basic components of the credit. These are time elements, trust elements, risk elements and income elements. Time component expresses the credit period and it can be changed according to credit type, borrowers etc. Trust component refers to the belief in the repayment of the credit in the determined period. The risk component implies a possible loss to the lender if the borrower fails to fulfill the obligation. Finally, the income component is the obligation that must be borne by the borrower to give up using the purchasing power now.

There are many important functions that credit undertakes in the economy. These functions serve very important economic activities such as the the desired progress of the economy, the arrangement of supply and demand. Some of these functions;

- to prevent the savings from being idle
- to stimulate the economy,
- to provide balance between supply and demand of goods
- to transfer the capital and the savings in the idle situation to the business areas,

As a result of the credit process, there exists a creditor or lender and a debtor or borrower in the system. If this process takes into account when money enters the economy, we can easily say that central bank is lender and banks are the borrower. This means that money is borrowed by the central bank to the system over the banks. In the second stage of the process, the banks are lender and economic units which take credit are borrowers. As mentioned earlier, banks are subject to a fractional reserve system when lending credits. This means that

banks can give more credit than they receive from the central bank. In short, money is the credit and credit is the debt in the existing system.

There are many kinds of credit such as according to their qualities, period, their sectors, etc. In this study, consumer credit and commercial credit will be analyzed. Consumer credit are credit provided by banks for consumer needs. With this credit, consumers become in long-term borrowed and increase their purchasing power in short term. Commercial credits are credits for investment purposes, not expenditures.

3.2. Relationship Between Money and Credit

There is no common definition for money in the literature and textbooks. In textbooks, expressions such as M1, M2, M3 and M4, which generally express deposit aggregates, are used to mean money supply. Even the Federal Reserve Bank has not made a clear definition of money.

"There is still no definitive answer in terms of all its final uses to the question: What is money?"

A common definition of credit can be made, although there is no common definition of money. In summary, it can be considered to be the transaction that gives lending and debt relationship. The relationship between money and debt has also been the subject of different studies such as Tarshis(1962), Yorgov (2012), Rodriguez (1993), Offick& Wohltmann (2014), Arestis& Eichner (1988).

The power to print money in economies has been transferred to central banks by states. In existing system, money enters the economy through giving to banks as credit / dept by central bank. Banks give this money / credit getting from the central bank to the other economic units by multiplying through the money multiplier. All of these transactions are debt relationship.

Today, there is no difference between the printed money by the central bank and the credit by the banks in terms of economic life. This has been mentioned in some of the major financial institutions' reports as follows (Werner, 2012).

> *"The actual process of money creation takes place primarily in banks."*
>
> (Federal Reserve Bank of Chicago, 1961, p. 3);

> *"By far the largest role in creating broad money is played by the banking sector... When banks make loans they create additional deposits for those that have borrowed."*
>
> Bank of England (2007)

> *"Over time… Banknotes and commercial bank money became fully interchangeable payment media that customers could use according to their needs"*
>
> (ECB, 2000).

> *"Contemporary monetary systems are based on the mutually reinforcing roles of central bank money and commercial bank monies."*
>
> (BIS, 2003).

> *"The commercial banks can also create money themselves… in the eurosystem, money is primarily created by the extension of credit… …."*
>
> (Bundesbank, 2009)

As these institutions, which have an important role in the financial sector, also admit that money is being created by the banks in the current economic system. Banks' ability to create money is also due to their ability to make credit. The banks can give credit without any need for deposits. The only thing banks need

to do is to write the credit in the asset side of the balance sheet and to increase the customer deposit in liability side of balance sheet. Werner (2016) explained this situation clearly through an example and presented it as an example of the invalidity of the fractional reserve theory.

3.3. The Quantity Theory of Money and Credit

The quantitative theory of money as the today form was presented by Fisher (1911). The theory of quantity is basically based on the idea that the increase in the volume of money in an economy which is at full employment level will cause an increase in the general level of prices and, this increase in the volume of money will not affect the reql economic variables (Humprey, 1997). This idea is acknowledged and supported by many classical economists. Bullard (1994) argued that long-run fixed-rate money supply growth would lead to a constant inflation rate. The equation of the quantity theory of money presented by Fisher (1911) is also called the change equation at the same time.

$$M * V = P * Q \qquad (2.1)$$

In this equation, M is the money supply, V is the circulation rate of the Money, velocity, P is the general level of prices, and Q is the total goods and services in the economy. This equilibrium implies that the monetary value of total goods and services in the economy must equal the circulating total volume of money in the economy (Stewart, 1960).

Until Fisher's (1911) study, the significance of quantity theory was not fully understood. In fact, the theory has already been dealt with and developed by many economists.

Locke (1691 and 1696) stated in his work that there is a definite relationship between commercial activity and money supply. Decrease or increase in the volume of money affect directly to trade volume. Locke (1691 and 1696) is the first economist to describe the concept of circulationof money, velocity, and argues that less money with high velocity are better for the economy (Çiçek 2011).

Cantillon (1755) is another economist who argues that money supply and circulation rate together are influential on the overall level of prices. In this study, Cantillon (1755) stated that the increase in money supply and the decline in the money circulation rate may not change the overall level of prices if they are in the same level(Stewart, 1960).

Classical economists have regarded the quantity theory as a proportionality relation between the general level of prices and money supply. Graff (2008) stated that the quantity theory is basically considered as an inflation theory. According to some classical economists, the velocity of money and the number of goods and services in the economy are stable in the long run, and therefore the increase in money supply directly affects the general level of prices. That is, the rate of increase in money supply equals the rate of increase in the general level of prices (Fisher, 1911).

Some economists have stated that the relationship between money supply and the general level of prices is proportional. Because of this, the increase in the money supply will also affect the velocity of money, and thus this increases will have a lower effect on the general level of price. Richardo (1817) noted that the increase in the rate of money circulation under fixed money supply would lead to inflation. Humphrey (1997) stated that the money supply has a partial effect on prices. The conclusion that can be drawn from these studies is that both the

money supply and the velocity of the money together have an effect on the general level of prices.

Five basic proposals have been made for the version of the quantity theory proposed by Fisher (1911). Although these proposals were used by earlier economists, Fisher (1911) explicitly emphasized these proposals (Çiçek, 2011).

- Money and prices are equally proportional,
- There is a causality from the money to the prices,
- Money is neutral in the short and long term,
- Money supply and demand are independent,
- Relative price / absolute price doctrine.

There are some difficulties in applying quantity theory. One of these is the lack of a clear means of calculating the amount of goods and services in the economy. Q in the equation contains both semi-finishing and final products in the economy. However, it is very difficult to do such a calculation. Because of these difficulties, the Q in the equation is replaced by Y_r, which represents the real gross domestic product. With this change, the change equation is arranged as follows in equation (2.2).

$$M * V_Y = P * Y_r \tag{2.2}$$

In this equation, meanings of variables other than M and P have changed. V_Y expresses the rate of money circulation for the final goods and services in the system, while the previous V shows the number of transactions for all goods and services. In the equation, Y_r represents the monetary value of the final goods and services in the economy, real GDP.

When this equation is expressed in the following format;

$$M \times V_Y = P \times Y_r \Rightarrow P = \left(\frac{V_Y}{Y_r}\right) \times M \quad (2.3)$$

$$P = f(M) \quad (2.4)$$

it is shown that there is a proportional relationship between money supply and general level of prices.

The quantity theory of classics by the expression in Eq. (2.4) is actually a general level of price theory. In addition, under the assumption that the velocity of money, V_Y, and real GDP Y_r are exogenous and constant, the quantity theory of classics can be expressed as follows.

$$\alpha = \frac{V_Y}{Y_r} \quad \Rightarrow \quad P = \alpha \times M \quad (2.5)$$

sSme assumptions need to be made, to convert the quantity theory into the equation of general level of price of the classic economists. These assumptions;

- P, Y_r and V_Y have no effect on M, this means M is an external variable,
- V_Y is an external variable, especially it is not affected by P, M and Y_r,
- Money is neutral, so it is dependent from Y_r,

With these assumptions, the classical quantity theory guarantees a meaningful causality, a meaningful relationship between money and prices, and a situation where the increase in money supply can not affect real GDP.

In sum, the classical quantity theory assumes that the rate of money circulation is independent of the amount of money and is constant over time, and that the increase in money supply will not affect real GDP. Under these assumptions, it claims that the amount of money and the general level of prices have a proportional relationship.

A different interpretation of the equation of variation expressed in Eq. (2.1) is the money demand function known as the "Cambridge Equation". In this equation, *"k"* expresses how much cash units in the economy want to keep in the hands and is calculated as shown in equation (2.6). In addition, in Cambridge Equation, Y representing nominal GDP is used instead of Y_r representing real GDP, and is presented in Equation (2.7).

$$k \equiv \frac{1}{V_Y} \tag{2.6}$$

$$Y \equiv P \times Y_r \tag{2.7}$$

The change equation (2.1) re-formulated using these new variables, and the new version is shown in equation (2.8).

$$M = k \times Y \;\Rightarrow\; M = f(Y) \tag{2.8}$$

In this equation M is interpreted as money demand. The right part of the equation refers to the amount of money economic units want to keep in the hands, that is, money demand.

Marshall's (1871) study affirmed five suggestions by Fisher (1911). According to the Cambridge equation, these proposals were explained and improved within the framework of money supply and demand. In addition, Marshall (1923) mentioned the existence of eight factors affecting the *"k"* parameter, which expresses the cash rate that economic units wish to hold in the hands (Çiçek, 2011).

1. The marginal utility of keeping money in terms of comfort and confidence provided by the money,
2. The marginal utility of holding resources in the form of commodity rather than money (direct utility),
3. Expected rate of return from holding assets such as stocks,
4. Inflation expectations,
5. Banknotes and bank loan instruments in the form of deposits,
6. Institutional factors such as work habits, professional practices, bank regulations, transportation methods and production techniques,
7. The confidence level of the economy and the comfort of payment commitments,
8. Unforeseen shocks such as war, war rumors, crop failures.

The cases 1 and 8 raise the *"k"* parameter, while the other cases decrease the value of the *"k"* parameter.

Another comment on quantity theory was made by Friedman (1956). This theory, which is called the Monetarist Liquidity Preference Theory, has gained importance in the 1970s when both the inflationary and the unemployment cycles coexist in the world economy. With the collapse of the Bretton Woods

system, the blank in idea of the money supply was filled by the Monetarist Liquidity Preference Theory. Friedman's (1956) study treated money demand as a demand for other goods and services and ranked the factors affecting money demand as follows (Çiçek, 2011).

1. The price of the related goods (*P*),
2. Prices of substitute goods (r_b= bond yield, r_e= stock return)
3. Budget constraint (*Y*),
4. The liquidity level of the total assets of the individual (*w*),
5. Preferences (*u*),

According to these variables, the Friedman Money Demand function is as shown in equation (2.9).

$$M^d = f(P, r_b, r_e, (1/P), (dP/dt), Y, w, u) \quad (2.9)$$

$$M^d = f(P/Y, r_b, r_e, (1/P), (dP/dt), w, u) \times Y \quad (2.10)$$

Equation (2.10) is Friedman's (1956) money demand function. Compared this expression with equation (2.8), it is seen that only the Cambridge constant *"k"* is expressed in more detail.

There is no clear statement about the content of M which expresses the money supply in the quantity theory and the derivatives introduced. Before the banking system developed, the amount of valuable coins in the market was used as M. However, with the development of the banking sector, in different instruments that enter economic life, they represent a purchasing power such as money and are used in transactions instead of money. Today there are different definitions

of money, such as M1, M2 and M3, but there is no consensus as to which one expresses the M in the quantity theory.

Werner (1992) argued that part of the money created by the banks was used for financial transactions while the other part used to increase production of the goods and services. In this framework, total money is divided into two as the money used to increase the production and used for financial transactions

$$M = M_R + M_F \tag{2.11}$$

In equation (2.11), $M_R$expresses the amount of money in total money supply used for transactions that increase GDP, while M_F expresses the amount of money used for transactions that do not affect GDP. If we look from this framework, the part of quantity theory that relates to money supply can be expressed as shown in Equation (2.12). On the other hand, the economic transaction which is the left part of the quantity theory equation can also be divided into two parts as shown in Equation (2.13) (Werner, 2005).

$$M \times V = M_R \times V_R + M_F \times V_F \tag{2.12}$$

$$P \times Q = P_R \times Q_R + P_F \times Q_F \tag{2.13}$$

These two equations also hold equations (2.14) and (2.15).

$$M_R \times V_R = P_R \times Q_R \tag{2.14}$$

$$M_F \times V_F = P_F \times Q_F \quad (2.15)$$

Quantity Theory of Credit was proposed by Werner (1992). Werner has stated that money can be created by banks without any restrictions in many of his work and proved this with different examples.

As mentioned in previous chapters, money in the current economic system is actually created by every loan given by the banks and is given as a debt to the economic units. In this work, therefore, the money supply M in the quantity theory is replaced by C, which represents the total credit volume in the economy. In this framework, the equations (2.11), (2.14) and (2.15) can be revised as follows.

$$C = C_R + C_F \quad (2.16)$$

$$C_R \times V_R = P_R \times Q_R \quad (2.17)$$

$$C_F \times V_F = P_F \times Q_F \quad (2.18)$$

In this study, individual and corporate credit will be handled separately and the amount credit used for financing transactions and serving for the production of goods and services in these two type of credit will be tried to be determined.

3.4. Economic Growth

Economic growth can be defined as an increase in welfare levels of people living in the country. Citizens of country can be considered to have a high standard of prosperity if the per capita real income or production amount is high. The most basic indicator of economic growth is used as GDP. GDP expresses the monetary value of goods and services produced in the economy in a certain period.

GDP can be expressed in two different ways as real GDP and nominal GDP. Nominal GDP is the total monetary aggregate of the goods and services produced in a given period calculating with the current prices. Real GDP refers to the monetary aggregate of goods and services produced in a given period calculating with prices in a base period. In this way, real GDP represents the amount of increase in goods and services produced in a given period, nominal GDP includes both the increase in goods and services produced and the increase in general level of prices.

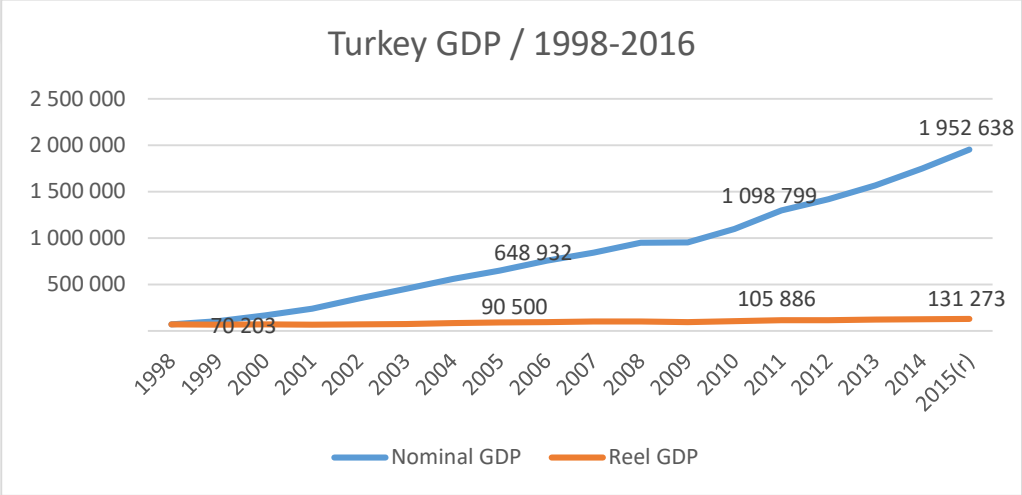


Figure 2.1: GDP in perion 1999-2015

The graph shows the nominal GDP and real GDP calculated based on 1998 prices. Due to the constantly rising prices over the years, this graph is not fully compatible for real GDP and nominal GDP benchmarking. Instead of this, the% change in GDP given in the chart below is more meaningful.

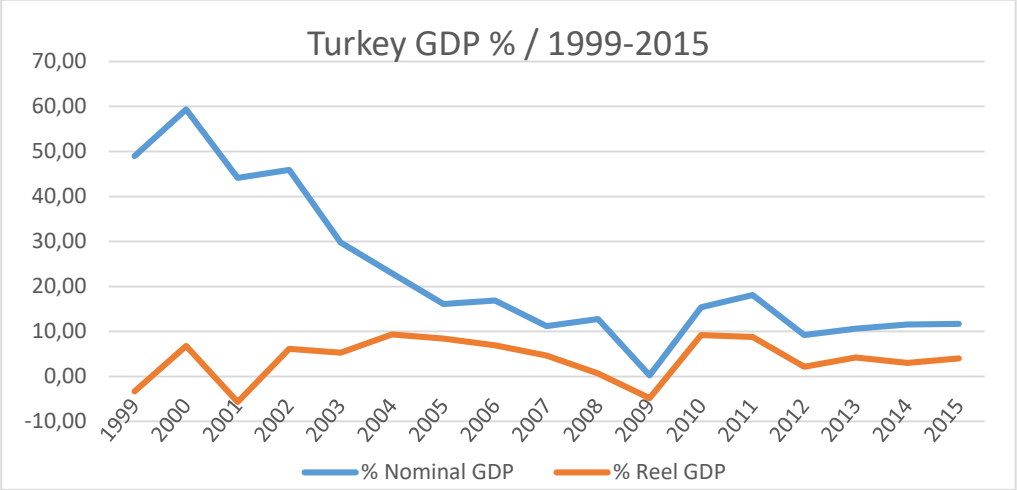


Figure 2.2: GDP % changes in period 1999-2015

As shown in Figure 2.2, the real GDP has always risen lower than the nominal GDP due to inflation. However, the gap between the increases has decreased every year until 2010. This means that the rate of inflation until 2009 is generally decreasing every year compared to the previous year.

3.5. The Relation Between Credit Growth and Economic Growth

The relationship between credit growth and economic growth has been revealed many times in the literature by studies conducted by different economists on different countries. In the studies done, the severity of the relationship varies from country to country. In addition, researchers have not been able to reach a consensus on the direction of causation. While some researchers have argued that causality is from credit growth to economic growth, some researchers argue that causality is from economic growth to credit growth (Arslan & Küçükaksoy, 2006).

The relationship between financial institutions and economic growth has long been a subject of research. The first study in this area was carried out by Bagehot (1873). In this study, the development of the UK was linked to the development of the finance sector. The first study on the relationship between credit and

economic growth in the present sense was made by Gurley & Shaw (1967). In their work, Gurley & Shaw (1967) emphasized that the financial sector has provided a flow from fund holders to fund needers through credits. King & Levine (1993) investigated the relationship between financial development and economic growth in their work. One of the subparameters related to financial development was credit growth and they claimed that there was a strong relationship between economic growth and credit growth in their work. Jayanatre&Strahan (1996) found that there was a strong relationship between bank lending sensitivities and economic growth in America. Artan (2007) argued in study on 79 countries that, especially in developing countries, the credit growth has an important contribution to economic growth. Lu& Shen (2012) distinguished credit as domestic and foreign according to their sources, and concluded that there is a strong relationship between foreign-originated credit and economic growth. Qin&Ndiege (2013) showed that there is a strong relationship between loan growth and economic growth in study using Tanzania's economic data (Tunç, 2013).

Backe&Zumer (2005) stated that credit growth has a positive influence on both growth of production and economic growth. In addition, they noted that the rapid increase in credit volume is a leading indicator of the economic crisis. From this study, it can be concluded that the increase in credit volume alone does not yield exactly the desired results, but that directing loans to the right areas would allow for an increase in production, that is, an increase in real GDP.

Many studies have been conducted on the relationship between economic growth with credit growth in Turkey. Ceylan&Durkaya (2010) investigated the causality between credit growth in 1998-2008 and economic growth in Turkey and claim a causality from economic growth to credit growth. Yılmaz (2014) claimed that, in Turkey, the rapidly increasing volume of credits in recent years did not enough support economic growth because of use of these credits for the consumption of

imported goods instead of production. Mercan (2013) investigated the relationship between credit growth and economic growth between 1992 and 2011, and found a meaningful relationship. However, as a result, he expressed that the credit should lead to production instead of consumption. Tutar& Ünlüleblebici (2014) emphasized that the credits given to medium-sized enterprises have significant influence on economic growth. It can be concluded from this work that the important thing is increasing credit volume in the beneficial sector, not increasing just credit volume.

As can be seen from these studies, growth in credit volume is an important variable that triggers economic growth. In this sense, the increase in credit volume is becoming an important data for the economy. However, in almost all of the work being done in other countries and Turkey, the increase in the volume of credit supporting the production was also highlighted as important in economic growth.

Economic growth can be defined as the proportional difference between the output obtained in the current period and the output obtained in the previous period. Using the quantity theory equation, the economic growth is shown in equation (2.19). The equations (2.12 - 2.15) were revised and the following sets of equations were obtained.

$$\Delta M \times V = \Delta(P \times Q) \tag{2.19}$$

$$\Delta M_R \times V_R = \Delta(P_R \times Q_R) = \Delta(P_R \times Y) \tag{2.20}$$

$$\Delta M_F \times V_F = \Delta(P_F \times Q_F) \tag{2.21}$$

In these equations, C expressing the total credit volume is used instead of money supply M, and if the equations are revised, the following equations are obtained.

$$\Delta C \times V = \Delta(P \times Q) \tag{2.19}$$

$$\Delta C_R \times V_R = \Delta(P_R \times Q_R) = \Delta(P_R \times Y) \tag{2.20}$$

$$\Delta C_F \times V_F = \Delta(P_F \times Q_F) \tag{2.21}$$

In this study, the credits will be examined in two subdivisions as commercial credits and consumer credits. In the work to be done, the relationship between total credit volume and economic growth (Equation (2.20)) and causality will be investigated. Then the same examination will be performed for the customer and commercial credits. As a result, effects of commercial and consumer credits on real growth and inflation will be analyzed.

CHAPTER IV

METHODOLOGY AND NUMERIC STUDY

The relationship between credit growth and economic growth which are theoretically set forth in the previous chapters will be analized in this chapter of the study. In this framework, firstly the data will be edited according to econometric analysis, econometric analyzes that show the relationship between the data will be applied. After data sets, used in this work, are introduced and the methodology is mentioned, brief information about the econometric analyzes to be applied will be give. Finally, the econometric analyzes described will be applied to the data and the results will be discussed.

4.1. Data and Methodology

In this study, some economic data in Turkey in the year from 2003 to 2017 has been studied. The data we are working on are real growth, inflation, total credit volume, commercial credit volume and credit card volume. The data are handled as quarterly periods. In the established models, to determine the effect of increase in credits volume on real growth and inflation have been worked.

The credit data have been obtained from the website of the Banks Association of Turkey. Nominal gross domestic product (nGDP) and inflation data have been taken from the website of TURKSTAT. Since real GDP data have been not published on a quarterly basis, these data have been generated using nominal GDP data and inflation data. In the Q1/2003 - Q3/2017 period, there are 59 data

in each series. When the Q1 / 2003 data is accepted as index for each data, the series showing the data used are presented in Figure 4.1.

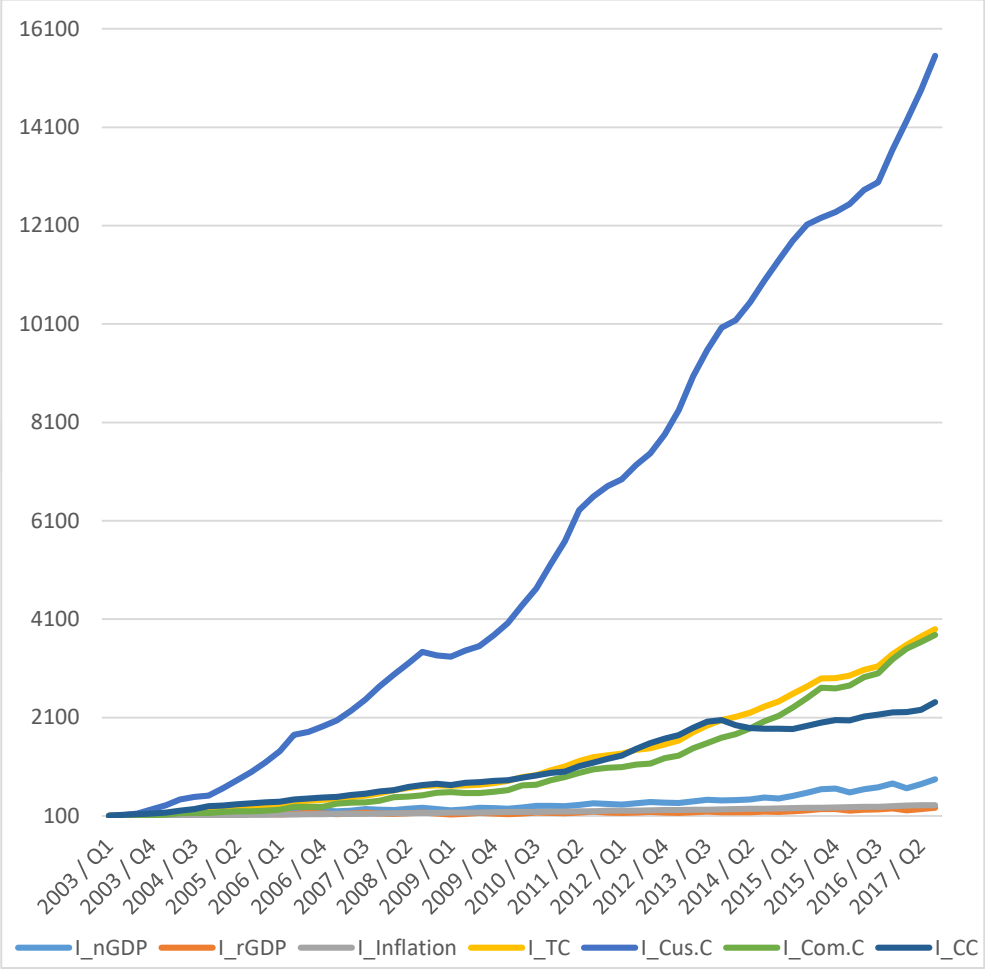


Figure 4.1: Indexed Series (Q1/2003=100 for each series)

In the Figure 4.1, I_nGDP represents that the form of nominal GDP series is indexed based on the year 2003 value and I_rGDP, I_Inflation, I_TC, I_Cus.C, I_Com.C and I_CC the represent indexed form of real GDP series, the indexed form of inflation series, the indexed form of total credit, the indexed form of customer credit, the indexed form of commercial credit and the indexed form of credit card, respectively.

The increase in consumer credits from 2003 to 2017 is noteworthy, when the graph is examined and consumer credits have increased by about 150 times. In addition, the increase in total credit volume and commercial credits is noteworthy even though it is as much as consumer credits. From 2003 to 2017, the volume of total credit volume and commercial credit increased by about 40 times. Whereas in the same period, the real GDP increased by 1,5 times the nominal GDP by 7,5 times.

As can be seen in Figure 4.1, all the series are on the increase, but the increment amounts are different. This gives us clues about the possible relationship between the data. However, in the time series analysis, the first process that needs to be done before starting the analysis is the preparation of data for an econometric analysis.

The first thing to do at this stage is to check whether the data are stationary or not. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used to test the stability of the data in this study. As will be presented later in the study, it is determined that the data except commercial loans are stationary when the logarithm is applied.

After the stability of the data was determined, it was decided to establish the Vector Autoregressed Models (VAR). In the VAR models, each variables are evaluated with past values. Relations between variables and past values are analyzed simultaneously using the least squares method. In this study, real GDP and inflation data are handled in combination with all credit data. As a result, the effect of the loans on the real GDP and inflation have been tried to be determined.

The relationship between the data does not mean that they are the cause of each other. In this framework, the relationships between all the data on which the VAR model was constructed were sought by the Granger Causality test. The

Granger Causality test investigates the existence of a time-dependent lagged relationship between two variables.

4.2. Unit Root Test

In econometric analyzes, the series studied must be stationary. The stationary series means that series have the same mean and the same variance over time. That is, if the series is moving around the same average and with constant variance over time, then that series is named as stationary. If the series is not stationary, the analysis is only valid for the current period and can not provide information about the future of series (Bozkurt, 2013). There is a high probability of obtaining false regression in analyzes made with non-stationary series. In this case, the t and F statistics will be invalid, so the resulting model will be invalid (Gujarati, 1999).

The time charts of the series can give an idea of stationarity. For this reason, the analysis is started by examining the charts of the series first.

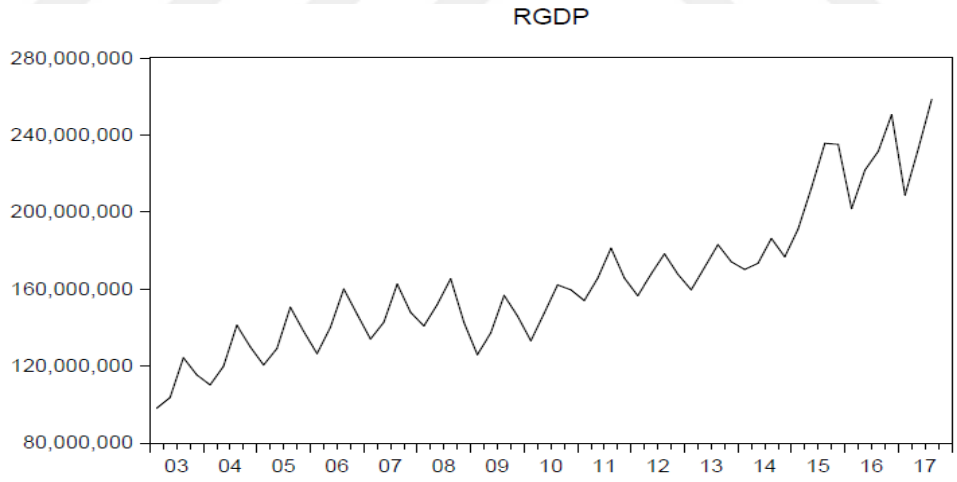


Figure 4.2: Chart of rGDP Series

The rGDP series is an increasing series, as shown in the graph, by drawing zigzags. As it can be understood from the chart, it can be foreseen that it is not a stationary series which moves around a fixed average.

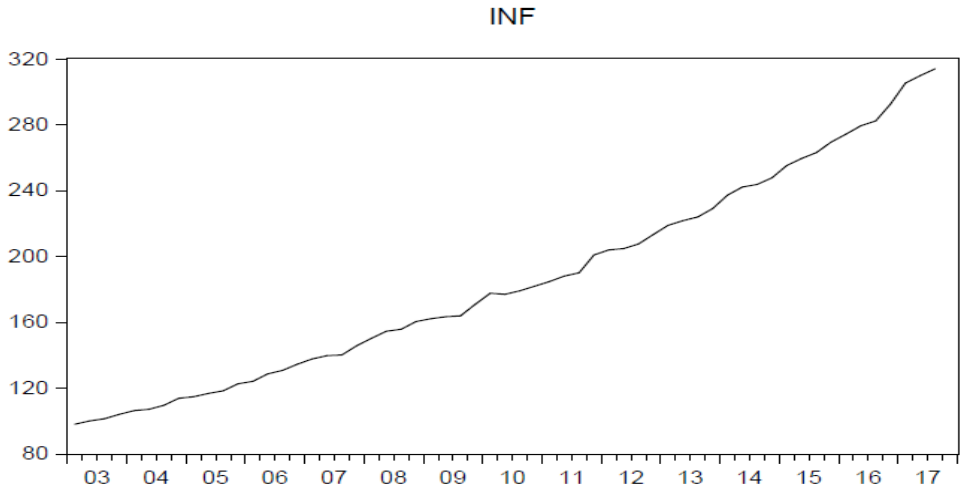


Figure 4.3: Chart of Inflation Series

The inflation series is also an increasing series over time. It is almost linear. As it can be understood from chart, it does not have a constant average. So it can be said that it is not stationary.

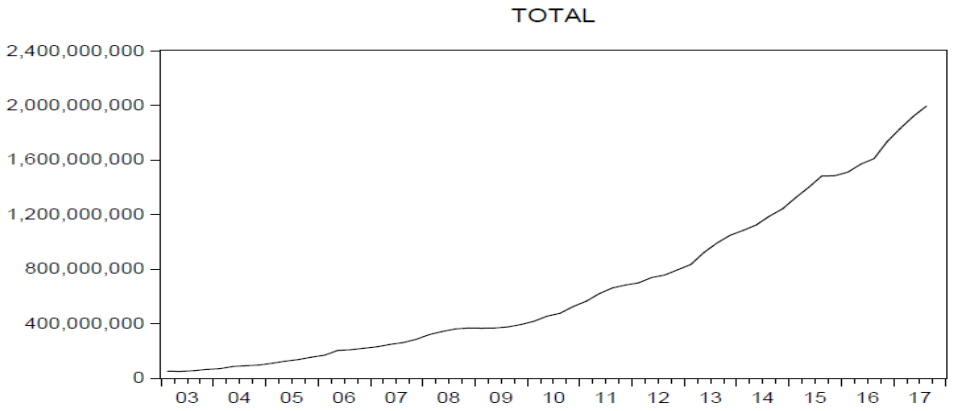


Figure 4.4: Chart of Total Credit Series

The total credit volume series is following an increasing course over time as in the previous series. However, unlike the inflation series, this course is moving exponentially. From the graph, it can be said that this series is not stationary either.

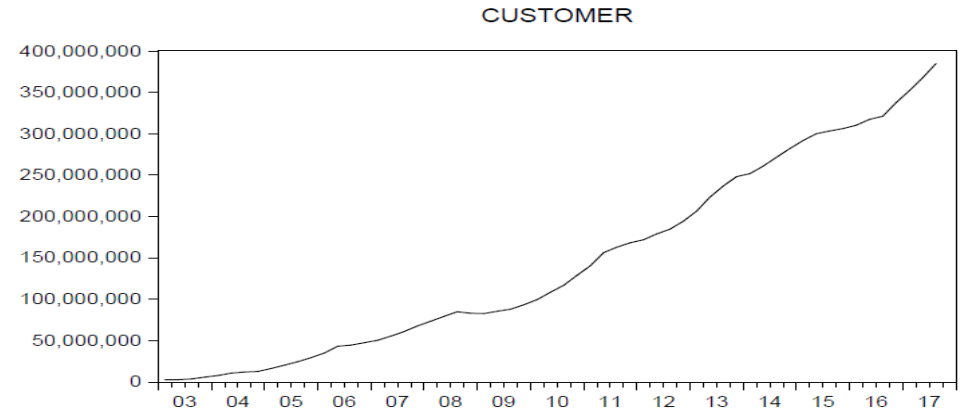


Figure 4.5: Chart of Customer Credit Series

The volume of consumer credit volume has continuously increased in the 2003-2017 period. Although there have been occasional fluctuations, the increase is continuous. Looking at the graph, it can not be said that this series is stationary.

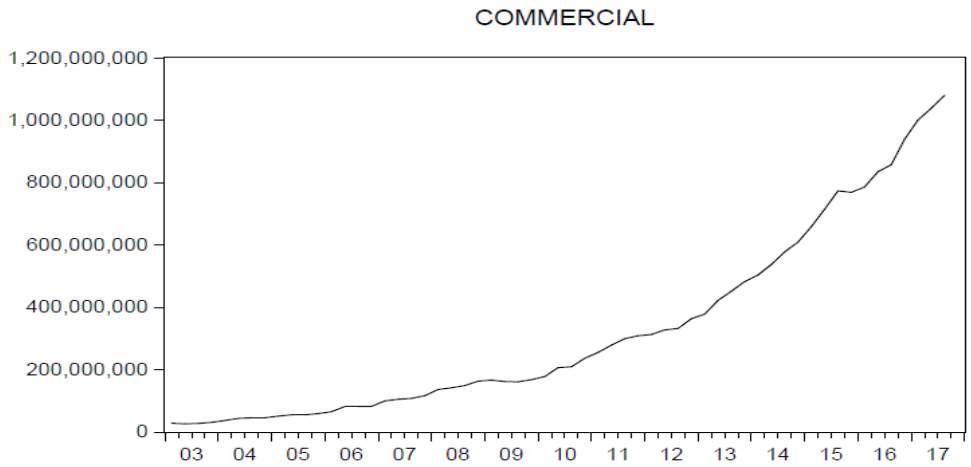


Figure 4.6: Chart of Commercial Credit Series

The series of commercial credit is an exponential series as the total credit series. But, this series has followed a much faster trend than the total credit volume series. This situation can be interpreted as the fact that this series is farther away to be stationary series than the total credit volume series.

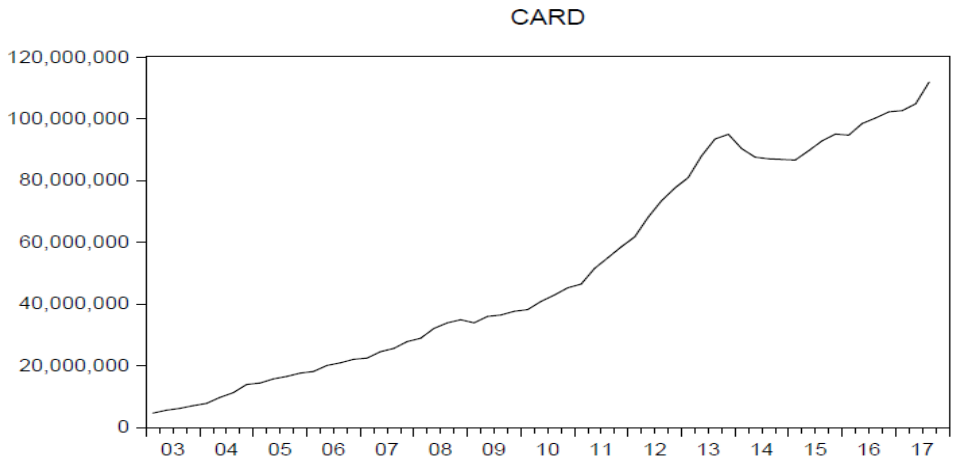


Figure 4.7: Chart of Credit Card Series

The last series, the credit card series, it is possible to say that the series has risen in a certain trend frame. From time to time, even if the course of series is broken, the general trend of the series can be interpreted as a linear function. However, we can not say that it is stationary for this series.

The most commonly used methods in literature to control the stationary of the series are unit root tests. In these tests, it is tested whether the series has a unit root. If the series has a root, it is not stationary, otherwise, it is stationary.

One of the most commonly used unit root tests in the literature is the ADF test. This test was developed in 1979 by David A. DICKEY and Wayne A. FULLER. In this test, the null hypothesis is that the series has root and the series is not stable. The ADF test is implemented through three regression. First regression has no intercept and no trend. In Second regression, there is an intercept, however, no trend and, third regression includes both intercept and trend.

$No\ intercept\ and\ no\ trend:$

$$\Delta Y_t = \alpha_1 \times Y_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + u_t \quad (4.1)$$

$Intercept\ and\ no\ trend:$

$$\Delta Y_t = \alpha_0 + \alpha_1 \times Y_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + u_t \quad (4.2)$$

$Intercept\ and\ Trend:$

$$\Delta Y_t = \alpha_0 + \alpha_1 \times Y_{t-1} + \alpha_2 \times t + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + u_t \quad (4.3)$$

The following hypothesis is tested in all three models

H_0: $\alpha_1 = 0$ $(There\ is\ a\ root\ /\ not\ stationary)$

H_1: $\alpha_1 < 0$ $(There\ is\ not\ a\ root\ /\ stationary)$

In the above models, Y is the series subject to stationarity analysis, a and b are the coefficients of the model, z difference operation and u are random error terms. As seen in the hypothesis test, the relationship of data with the previous data is being tested.

Another unit root test is the Phillips-Perron test. This test is claimed to be more successful than the ADF test in series with trend. The Phillips-Perron unit root test allows the error term to be weakly dependent and heterogeneously distributed. There is no autocorrelation problem in this respect (Torun, 2015). Both tests have been frequently used in the literature. Generally, the PP test can be considered as a verification test of the ADF test.

In this study, ADF and PP tests were applied to the series together. The series were tested with both ADF and PP with according to all three models: no intercept and no trend, intercept and no trend, both intrecept and trend. The results of the first tests applied to the series are given in Table 4.1. As it can be seen, no series is stationary.

Table 4.1: ADF and PP test results of series at Level (0)

	No Intercept & No Trend				Intercept & No Trend				Intercept & Trend			
	ADF		PP		ADF		PP		ADF		PP	
	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.
rGDP	1.95	0.99	2.81	1.00	1.02	1.00	-0.65	0.85	-0.80	0.96	-3.92	0.20
Inflation	7.89	1.00	33.83	1.00	5.15	1.00	10.83	1.00	2.43	1.00	1.76	1.00
Total Credit	4.72	1.00	13.83	1.00	8.82	1.00	7.66	1.00	1.76	1.00	1.38	1.00
Com. Credit	14.79	1.00	14.57	1.00	8.86	1.00	10.00	1.00	2.20	1.00	2.56	1.00
Cust. Credit	2.85	1.00	7.04	1.00	2.19	1.00	3.66	1.00	-0.88	0.95	-1.05	0.93
Credit Card	2.56	1.00	3.67	1.00	0.99	1.00	0.62	0.99	-1.88	0.65	-1.96	0.61

When Table 4.1 is examinated, no series appears to be stationary at either 1% or 5% or 10% significance level. When the studies done are examined, it is seen that econometric analyzes are usually done by taking logarithms of the series.

The logarithm of all series is taken according to applications in literature. The chart of the logarithm series have been presented in Figure 4.8. As can be seen clearly in Figure 4.8, the logarithm series are much more horizontal than their initial state. They all move almost parallel. It can be said that the logarithm series are stationary when we interpret them through the graph.

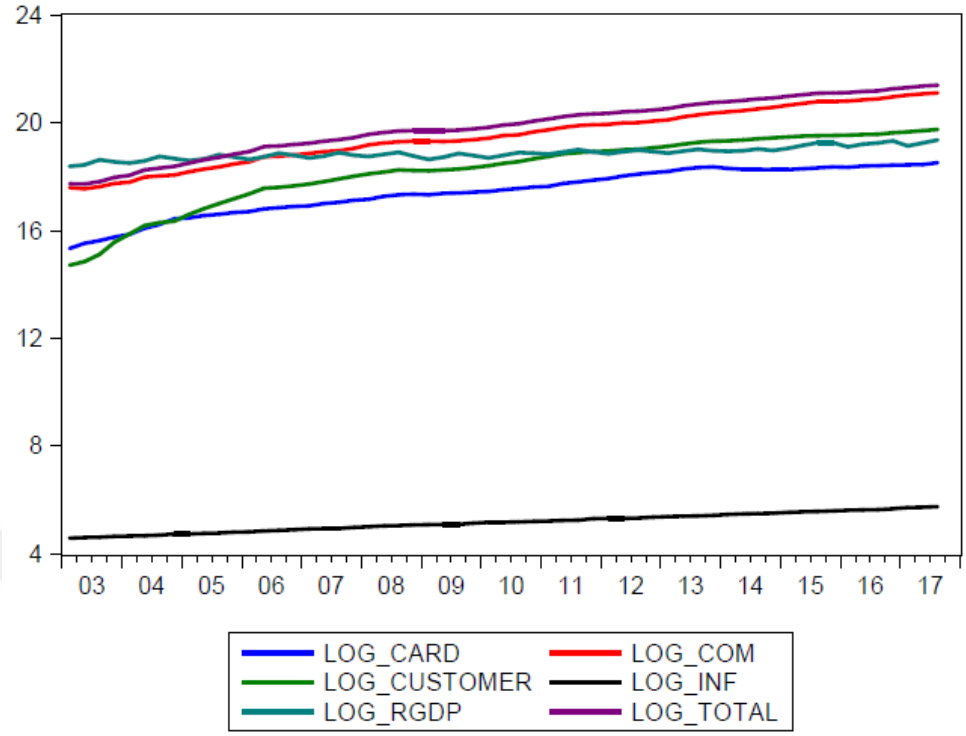


Figure 4.8: Charts of All Logarithm Series

The stationarity test results of the logarithm series are given in Table 4.2. As seen in Table 4.2, all the series caught stationary in different models at 5% significance level. This indicates that the logarithms of the series are ready for econometric analysis.

Table 4.2: ADF and PP test results of Logarithm Series Level (0)

	No Intercept & No Trend				Intercept & No Trend				Intercept & Trend			
	ADF		PP		ADF		PP		ADF		PP	
	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.
log(rGDP)	1.83	0.98	2.71	1.00	0.43	0.98	-1.51	0.52	-1.62	0.77	-4.79	**0.00***
log(Inflation)	6.81	1.00	20.65	1.00	-0.05	0.95	-0.06	0.95	-3.75	**0.03***	-3.73	**0.03***
log(Total Credit)	4.20	1.00	6.98	1.00	-4.08	**0.00***	-3.50	**0.01***	-3.19	0.10	-1.82	0.68
log(Com. Credit)	10.68	1.00	8.73	1.00	-3.88	**0.02***	-1.89	0.34	-3.00	0.14	-1.68	0.75
log(Cust. Credit)	1.47	0.96	3.30	1.00	-5.09	**0.00***	-8.24	**0.00***	-5.84	**0.00***	-6.67	**0.00***
log(Credit Card)	2.07	0.99	4.02	1.00	-2.20	0.21	-5.48	**0.00***	-1.55	0.80	-3.20	0.09

* indicates significant p-values at 0.05 significance level

4.3. Vector Autoregressive Models (VAR)

The series used in econometric analyzes are generally affected by multiple factors and at the same time affect many factors. This situation causes the loss of the capability of single equation models made up of one or more independent variables. In such cases, single equation models can not adequately explain the relationship between variables. In such cases, multi-equation models should be solved so that the analyzes can be performed more successfully. The structure of the relations system is determined by solving these equations. Equations are solved simultaneously in multi-equation models.

VAR model was first put forward by Sims in 1980 to solve simultaneous equations (Sims 1980). In this model, the problems of determining the internal and external variables during the solution of the simultaneous equations were solved. Variables in the VAR model cannot be separated as an endogenous variable and an exogenous variable. For VAR model, the existence of economic theories does not mean anything. The model does not allow the model to be shaped according to these theories. Thus, VAR model prevents the assumptions made by economists and distancing the models from reality. VAR models are used primarily to examine the relationship between macroeconomic variables and to examine the dynamic effect of random shocks on the system.

In the case of models, each variable is expressed as a regression of its past data and past data of other variables in the system. For this reason, it is very important how much delay time is chosen for VAR Models. Sample VAR models with two variables are presented in the following equations.

The left sides of the equations are the same except the coefficients, as shown in equations 4.4 and 4.5. The only difference in the equations is that the endogen variable is changed and all the variables entering the model are assigned as endogen variables in order.

$$Y_t = \alpha + \sum_{i=1}^{m} \beta_i \times Y_{t-i} + \sum_{i=1}^{m} \delta_i \times X_{t-i} + u_i \quad (4.4)$$

$$X_t = \theta + \sum_{i=1}^{m} \gamma_i \times Y_{t-i} + \sum_{i=1}^{m} \rho_i \times X_{t-i} + u_i \quad (4.5)$$

The steps to be used in implementing the VAR model are summarized briefly below.

1. The data made suitable for VAR Models. (Series are made stationary.)
2. The appropriate delay time for the VAR model is determined.
3. The VAR model is established,
4. It is tested with shocks.

The purpose of this study is to determine the effect of the credits on real growth and inflation. For this reason, VAR models with two variable which are rGDP & Total Credit, rGDP & Commercial Credit, rGDP & Customer Credit, rGDP & Credit Card, inflation & Total Credit, inflation & Commercial Credit, inflation & Customer Credit, inflation & Credit Card have been established.

4.3.1. VAR Model 1: rGDP & Total Credit

Before the VAR model is established, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the real GDP and the total credit volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Table 4.3.

Table 4.3: Lag order Selection Criteria for VAR Model 1

VAR Lag Order Selection Criteria
Endogenous variables: LOG RGDP LOG TOTAL
Exogenous variables: C
Date: 01/12/18 Time: 12:21
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-11.92341	NA	0.005918	0.546016	0.621774	0.574966
1	162.5202	328.3645	7.40e-06	-6.138048	-5.910774	-6.051200
2	169.6138	12.79631	6.56e-06	-6.259366	-5.880576	-6.114619
3	184.2951	25.33244	4.33e-06	-6.678240	-6.147935	-6.475595
4	194.4024	16.64724	3.42e-06	-6.917740	-6.235919	-6.657196
5	205.1852	16.91416	2.64e-06	-7.183731	-6.350395*	-6.865289*
6	206.6757	2.221215	2.94e-06	-7.085322	-6.100469	-6.708981
7	211.2523	6.461144	2.91e-06	-7.107935	-5.971567	-6.673695
8	219.7390	11.31560*	2.48e-06*	-7.283884*	-5.996000	-6.791746

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

There are two important issues in selecting the delay time. Selected Lag length must be small enough not to reduce the degree of freedom, but must be large enough to destroy the autocorrelation of the error terms. In this study, lag lengths were chosen among the results obtained from different tests.

Table 4.4: Test results of the VAR (5) for rGDP & Total Credit

R-squared	0.956006	0.999016
Adj. R-squared	0.945775	0.998787
Sum sq. resids	0.088104	0.042005
S.E. equation	0.045265	0.031255
F-statistic	93.44122	4363.965
Log likelihood	96.66922	116.6691
Akaike AIC	-3.172934	-3.913670
Schwarz SC	-2.767771	-3.508506
Mean dependent	18.92016	20.05907
S.D. dependent	0.194386	0.897289

Determinant resid covariance (dof adj.)	1.78E-06
Determinant resid covariance	1.13E-06
Log likelihood	216.5652
Akaike information criterion	-7.206118
Schwarz criterion	-6.395791

When examined in Table 4.3, the test results indicate that the lag length should be between 5 and 8. For this model, the lag length was assumed to be 5 in this study. The VAR (5) model based on lag length 5 is presented in Table 4.4 and Table 4.5 below.

Table 4.5: VAR(5) Model for rGDP & Total Credit

	LOG_RGDP	LOG_TOTAL
LOG_RGDP(-1)	0.708218	-0.043250
	(0.13234)	(0.09138)
	[5.35165]	[-0.47332]
LOG_RGDP(-2)	-0.096171	0.051582
	(0.13033)	(0.08999)
	[-0.73791]	[0.57320]
LOG_RGDP(-3)	0.087871	0.149170
	(0.12981)	(0.08963)
	[0.67690]	[1.66420]
LOG_RGDP(-4)	0.748691	-0.146079
	(0.13095)	(0.09042)
	[5.71755]	[-1.61564]
LOG_RGDP(-5)	-0.562594	0.024327
	(0.13698)	(0.09458)
	[-4.10727]	[0.25721]
LOG_TOTAL(-1)	0.417869	1.160040
	(0.20880)	(0.14417)
	[2.00131]	[8.04631]
LOG_TOTAL(-2)	-0.229603	0.098452
	(0.28962)	(0.19998)
	[-0.79278]	[0.49232]
LOG_TOTAL(-3)	-0.235140	-0.460916
	(0.28260)	(0.19513)
	[-0.83205]	[-2.36208]
LOG_TOTAL(-4)	-0.287857	-0.136163
	(0.27626)	(0.19075)
	[-1.04199]	[-0.71383]
LOG_TOTAL(-5)	0.361255	0.309771
	(0.16974)	(0.11720)
	[2.12828]	[2.64305]
C	1.632032	-0.037168
	(1.64629)	(1.13673)
	[0.99134]	[-0.03270]

Table 4.4 shows the model success criteria and test results. The model is shown in Table 4.5. When table 4.5 is examined, it is seen that the VAR model has two different equations, and in one of them log (rGDP) and in the other log (Total Credit) is dependent variable. Table 4.6 presents t test results and p-value values for the independent variables.

Table 4.6: Test Results of Coefficienct of Independent Variables

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.708218	0.132336	5.351652	0.0000*
C(2)	-0.096171	0.130328	-0.737915	0.4626
C(3)	0.087871	0.129815	0.676899	0.5003
C(4)	0.748691	0.130946	5.717555	0.0000*
C(5)	-0.562594	0.136975	-4.107275	0.0001*
C(6)	0.417869	0.208797	2.001315	0.0485*
C(7)	-0.229603	0.289617	-0.792780	0.4301
C(8)	-0.235140	0.282603	-0.832050	0.4077
C(9)	-0.287857	0.276255	-1.041995	0.3003
C(10)	0.361255	0.169740	2.128282	0.0362*
C(11)	1.632032	1.646286	0.991341	0.3243
C(12)	-0.043250	0.091376	-0.473324	0.6372
C(13)	0.051582	0.089989	0.573197	0.5680
C(14)	0.149170	0.089635	1.664203	0.0997
C(15)	-0.146079	0.090416	-1.615641	0.1098
C(16)	0.024327	0.094579	0.257212	0.7976
C(17)	1.160040	0.144170	8.046308	0.0000*
C(18)	0.098452	0.199975	0.492320	0.6237
C(19)	-0.460916	0.195131	-2.362081	0.0204*
C(20)	-0.136163	0.190749	-0.713833	0.4773
C(21)	0.309771	0.117202	2.643051	0.0098*
C(22)	-0.037168	1.136728	-0.032697	0.9740
Determinant residual covariance		1.13E-06		

* indicates significant p-values at 0.05 significance level

Coefficients C (1) – C(11) in Table 4.6 represent the coefficients of equation 1 in which rGDP is the dependent variable. Other coefficients, C(12) – C(22), represents coefficients of equation 2, in which total credit is the dependent variable. When the significance level is assumed to be 0,05, some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test

which results are presented in Appendix C is require. Although the coefficients of rGDP are not significant individually in the VAR Model, it is seen that all coefficients of rGDP together are jointly significant on total loans. The two equations obtained are given in Equation (4.6) and Equation (4.7).

Log(rGDP)= (4.6)

0,708*Log (rGDP)(-1) + 0,748* Log (rGDP)(-4) -0,562 *Log (rGDP)(-5) + 0,417*Log(Total)(-1) + 0,361*Log(Total)(-5)

Log(Total)= (4.7)

1,16*Log (Total)(-1) - 0,46*Log(Total)(-3) + 0,309*Log(Total)(-5) – 0,043*Log(rGDP)(-1) + 0,051*Log(rGDP)(-2) + 0,149*Log(rGDP)(-3) – 0,146*Log(rGDP)(-4) + 0,024*Log(rGDP)(-5)

VAR(5) Model for rGDP & Total Credit has been established. Now let's test the model effect-response graphs.

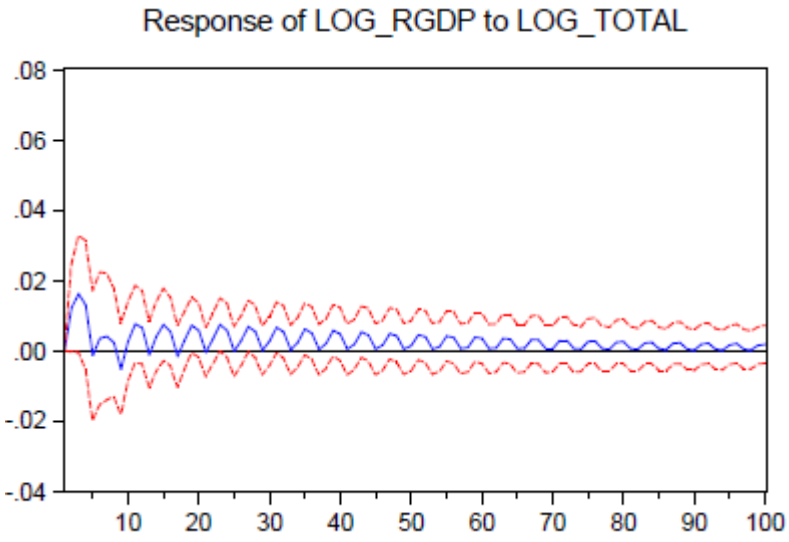


Figure 4.9: Response Chart of Log(rGDP)

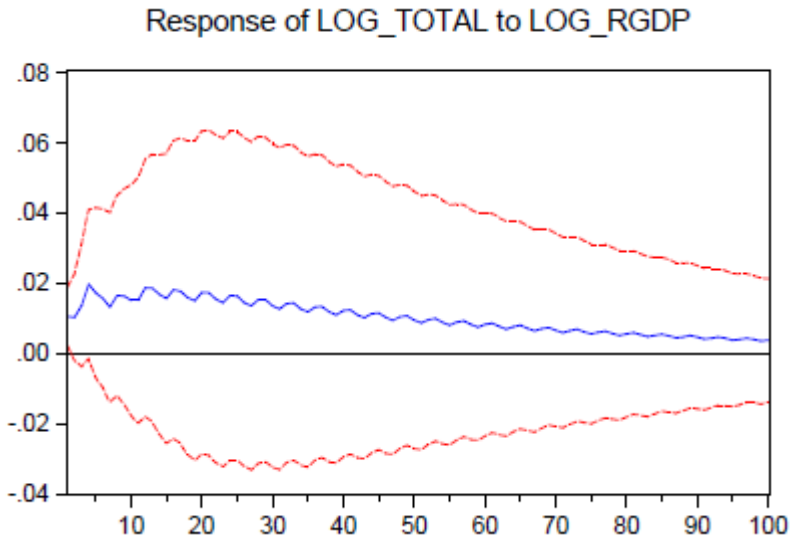


Figure 4.10: Response Graph of Log(Total Credit)

Figure 4.9 and Figure 4.10 show the rGDP and total credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in figures, both dependent variables approach the zero line over time. This means that the shock applied to the independent variable has temporary effect.

Table 4.7: Variance Decomposition Results for VAR Model 1 of Log(rGDP)

Variance Decomposition of LOG_RGDP:			
Period	S.E.	LOG_RGDP	LOG_TOTAL
1	0.045265	100.0000	0.000000
2	0.059399	95.71009	4.289906
3	0.065841	90.43589	9.564105
4	0.069467	87.85892	12.14108
5	0.083967	91.66625	8.333746
6	0.091378	92.81223	7.187768
7	0.093058	92.87647	7.123530
8	0.093645	92.90078	7.099222
9	0.100568	93.58345	6.416545
10	0.104490	93.98504	6.014959

Finally, the results of the variance decomposition analysis for rGDP are presented in Table 4.7. At the end of 10 periods, only 6,01% of the variance in the log (rGDP) appears to be from Log (Total).

Table 4.8: Variance Decomposition Results for VAR Model 1 of Log(Total)

Variance Decomposition of LOG_TOTAL:			
Period	S.E.	LOG_RGDP	LOG_TOTAL
1	0.031255	11.26488	88.73512
2	0.047409	9.535095	90.46490
3	0.064779	9.538580	90.46142
4	0.077833	12.95736	87.04264
5	0.085555	14.77187	85.22813
6	0.090856	16.05029	83.94971
7	0.094030	16.92528	83.07472
8	0.097135	18.72829	81.27171
9	0.100407	20.14625	79.85375
10	0.103784	20.96102	79.03898

Looking at Table 4.8, it can be seen that only 20,96% of the variance in Log (total) at the end of 10 periods is derived from Log (rGDP)

4.3.2. VAR Model 2: rGDP & Commercial Credit

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the real GDP and the commercial credit volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 5 according to the tests. This means that we will model VAR (5) for rGDP & Commercial Credit. The coefficients of the VAR (5) models established and the test results are presented in Table 4.9. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. Although the some coefficients of Commercial Credit in first equation are not

significant individually in the VAR Model, it is seen that these coefficients together are jointly significant on rGDP. The same situation is valid for the second equation.

Table 4.9: Coefficients and test results of VAR (5) for rGDP & Commercial Credit

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.715733	0.129353	5.533185	0.0000*
C(2)	-0.100614	0.128080	-0.785556	0.4343
C(3)	0.064212	0.129096	0.497402	0.6202
C(4)	0.752345	0.129521	5.808653	0.0000*
C(5)	-0.580137	0.134328	-4.318810	0.0000*
C(6)	0.363593	0.181390	2.004476	0.0482*
C(7)	-0.218816	0.246102	-0.889128	0.3764
C(8)	-0.166091	0.245566	-0.676359	0.5006
C(9)	-0.311317	0.234685	-1.326531	0.1882
C(10)	0.364272	0.152372	2.390666	0.0190*
C(11)	2.196835	1.778988	1.234879	0.2202
C(12)	-0.044997	0.102598	-0.438577	0.6621
C(13)	0.078113	0.101588	0.768915	0.4441
C(14)	0.115102	0.102394	1.124111	0.2641
C(15)	-0.152744	0.102732	-1.486825	0.1407
C(16)	0.023853	0.106544	0.223877	0.8234
C(17)	1.113063	0.143872	7.736470	0.0000*
C(18)	0.077657	0.195199	0.397835	0.6917
C(19)	-0.334741	0.194774	-1.718607	0.0893
C(20)	-0.206200	0.186144	-1.107745	0.2711
C(21)	0.330755	0.120856	2.736761	0.0075*
C(22)	0.083771	1.411029	0.059369	0.9528
Determinant residual covariance		1.43E-06		

* indicates significant p-values at 0.05 significance level

The equations obtained at %5 significance level are given below.

Log(rGDP) = (4.8)

0,715*Log(rGDP)(-1) + 0,752*Log(rGDP)(-4) - 0,580*Log(rGDP)(-5) + 0,363*Log(Com)(-1) – 0,218*Log(Com)(-2) – 0,166*Log(Com)(-3) - 0,311*Log(Com)(-4) + 0,364*Log(Com)(-5)

Log(Com) = (4.9)

1,113*Log (Com)(-1) + 0,077*Log(Com)(-2) – 0,334*Log(Com)(-3) – 0,206*Log(Com)(-4) + 0,33*Log(Com)(-5)

VAR(5) Model for rGDP & Commercial Credit has been established. Now let's test the model effect-response graphs.

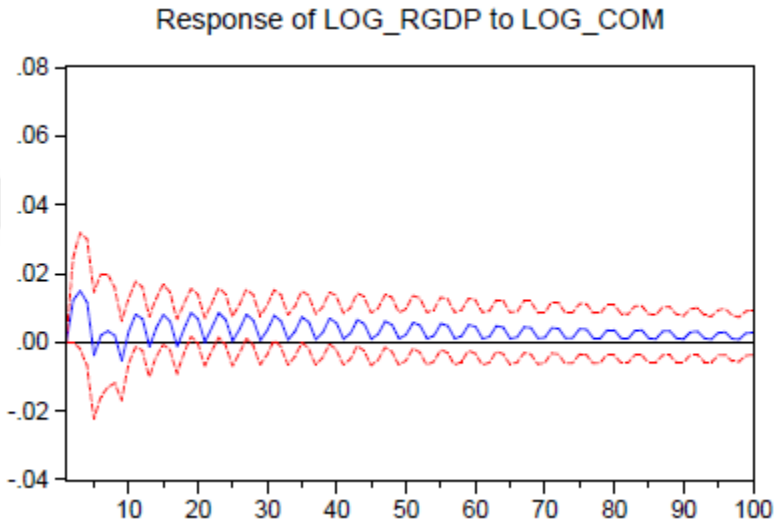


Figure 4.11: Response Graph of Log(rGDP) for VAR Model 2

Figure 4.11 and Figure 4.12 show the rGDP and total credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.11, Log(rGDP) approaches the zero line over time. This means that the shock applied to the Log(Com) has temporary effect.

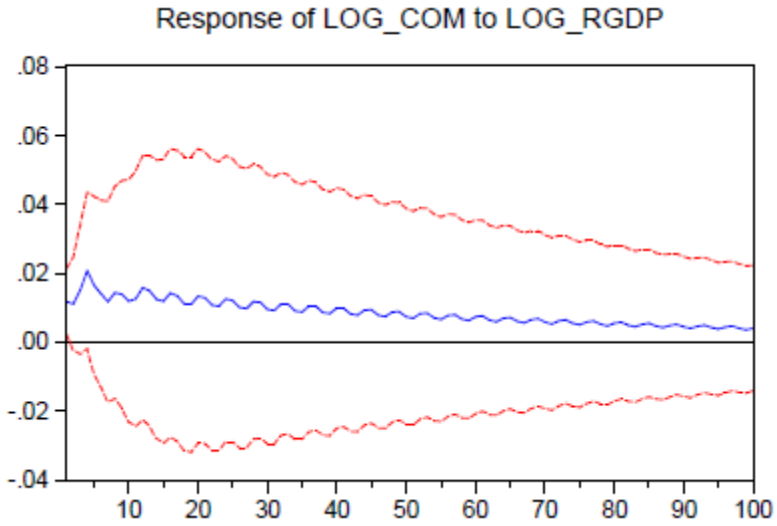


Figure 4.12: Response Graph of Log(Commercial Credit) for VAR Model 2

As it can be seen in Figure 4.12, Log(Com) approaches the zero line over time. This means that the shock applied to the Log(rGDP) has temporary effect.

Table 4.10: Variance Decomposition Results for VAR Model 2 of Log(rGDP)

Variance Decomposition of LOG_RGDP:			
Period	S.E.	LOG_RGDP	LOG_COM
1	0.044799	100.0000	0.000000
2	0.058978	95.73569	4.264305
3	0.065044	91.21557	8.784430
4	0.068169	89.11516	10.88484
5	0.081466	92.15176	7.848236
6	0.087821	93.19540	6.804596
7	0.088925	93.23179	6.768213
8	0.089156	93.22044	6.779556
9	0.094735	93.67191	6.328088
10	0.097612	93.94073	6.059268

Finally, the results of the variance decomposition analysis for rGDP are presented in Table 4.10. At the end of 10 periods, only 6,06% of the variance in the log (rGDP) appears to be from Log (Com).

Table 4.11: Variance Decomposition Results for VAR Model 2 of Log(Com)

Variance Decomposition of LOG_COM:			
Period	S.E.	LOG_RGDP	LOG_COM
1	0.035533	11.13353	88.86647
2	0.052704	9.561357	90.43864
3	0.070046	10.13959	89.86041
4	0.083516	13.34307	86.65693
5	0.090625	14.66493	85.33507
6	0.095726	15.28988	84.71012
7	0.098866	15.75169	84.24831
8	0.101926	16.82736	83.17264
9	0.105448	17.46807	82.53193
10	0.109038	17.53836	82.46164

Looking at Table 4.11, it can be seen that only 17,54% of the variance in Log (Com) at the end of 10 periods is derived from Log (rGDP).

4.3.3. VAR Model 3: rGDP & Customer Credit

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the real GDP and the customer credit volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 5 according to the tests. This means that we will model VAR (5) for rGDP & Customer Credit. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. Although the some coefficients of Customer Credits are not significant individually for second equation, it is seen that all coefficients of Customer Credit together are jointly significant on itself. The coefficients of the VAR (5) models established and the test results are presented in Table 4.12.

The equations obtained are given below.

Log(rGDP) = (4.10)

0,725*Log(rGDP)(-1) + 0,782*Log(rGDP)(-4) - 0,540*Log(rGDP)(-5)

Log(Customer) = (4.11)

1,272*Log (Customer)(-1) – 0,285*Log (Customer)(-2) – 0,166*Log (Customer)(-3) – 0,044*Log (Customer)(-4) + 0,164*Log (Customer)(-5)

It can be said that there is no relation between Log(rGDP) and Log (Customer) when Equation (4.10) and Equation (4.11) are examined.

Table 4.12: Coefficients and test results of VAR (5) for rGDP & Customer Credit

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.724629	0.133471	5.429129	0.0000*
C(2)	-0.094558	0.136385	-0.693316	0.4900
C(3)	0.055045	0.137613	0.399998	0.6902
C(4)	0.782208	0.137369	5.694202	0.0000*
C(5)	-0.540252	0.141551	-3.816655	0.0003*
C(6)	0.298540	0.181975	1.640555	0.1045
C(7)	-0.173695	0.271403	-0.639988	0.5239
C(8)	-0.079826	0.248410	-0.321349	0.7487
C(9)	-0.025947	0.237360	-0.109313	0.9132
C(10)	0.013590	0.132845	0.102301	0.9188
C(11)	0.764611	1.450741	0.527049	0.5995
C(12)	-0.011872	0.111103	-0.106853	0.9152
C(13)	0.098931	0.113529	0.871417	0.3860
C(14)	0.129217	0.114552	1.128023	0.2624
C(15)	-0.134046	0.114349	-1.172253	0.2443
C(16)	-0.003058	0.117830	-0.025956	0.9794
C(17)	1.272551	0.151479	8.400819	0.0000*
C(18)	-0.285228	0.225921	-1.262515	0.2102
C(19)	-0.166209	0.206781	-0.803794	0.4237
C(20)	-0.044485	0.197583	-0.225148	0.8224
C(21)	0.164977	0.110583	1.491889	0.1394
C(22)	-0.352366	1.207624	-0.291785	0.7712
Determinant residual covariance		2.19E-06		

* indicates significant p-values at 0.05 significance level

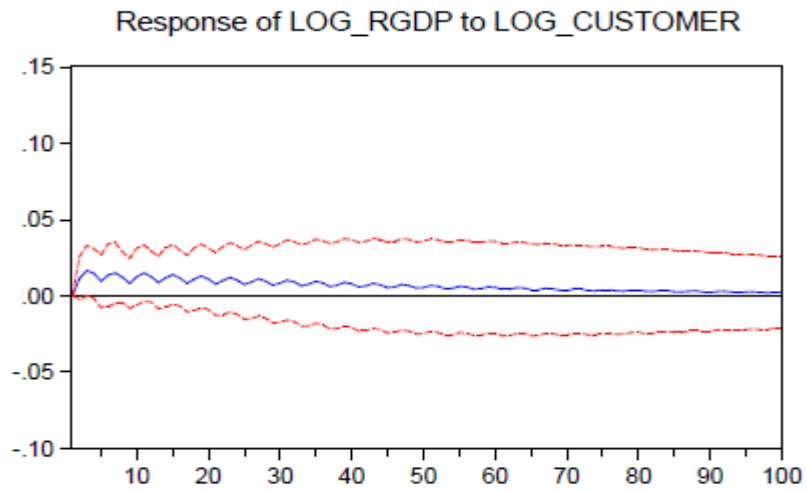


Figure 4.13: Response Graph of Log(rGDP) for VAR Model 3

Figure 4.13 and Figure 4.14 show the rGDP and customer credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.13, Log(rGDP) approaches the zero line over time. This means that the shock applied to the Log(Customer) has temporary effect.

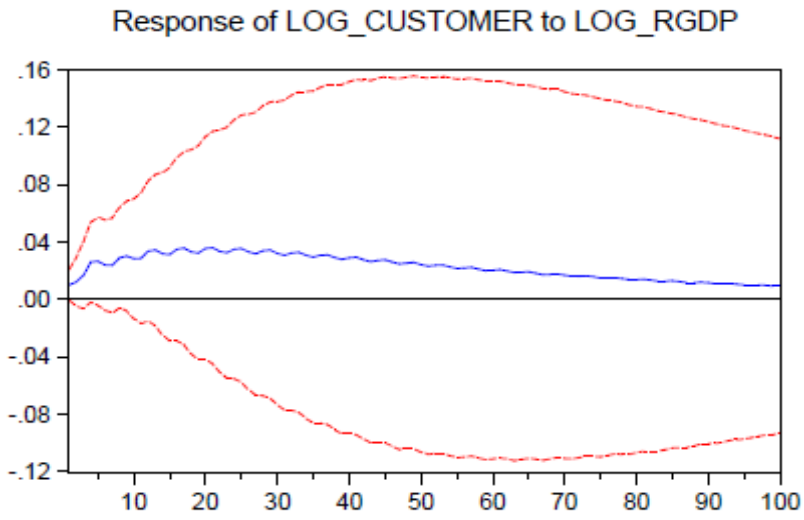


Figure 4.14: Response Graph of Log(Customer) for VAR Model 3

As it can be seen in Figure 4.14, Log(Customer) approaches the zero line over time. This means that the shock applied to the Log(rGDP) has temporary effect.

Table 4.13: Variance Decomposition Results for VAR Model 3 of Log(rGDP)

Variance Decomposition of LOG_RGDP:			
Period	S.E.	LOG_RGDP	LOG_CUSTO...
1	0.048018	100.0000	0.000000
2	0.062173	96.54441	3.455593
3	0.068873	91.54286	8.457140
4	0.072930	88.50896	11.49104
5	0.091687	91.66889	8.331114
6	0.102901	91.64641	8.353591
7	0.107510	90.42686	9.573142
8	0.110113	89.68699	10.31301
9	0.121039	91.02063	8.979374
10	0.128961	91.14871	8.851294

Finally, the results of the variance decomposition analysis for rGDP are presented in Table 4.13. At the end of 10 periods, only 8,85% of the variance in the Log (rGDP) appears to be from Log (Customer).

Table 4.14: Variance Decomposition Results for VAR Model 3 of Log(Customer)

Variance Decomposition of LOG_CUSTOMER:			
Period	S.E.	LOG_RGDP	LOG_CUSTO...
1	0.039971	6.193849	93.80615
2	0.064582	5.876551	94.12345
3	0.084310	7.441723	92.55828
4	0.099504	12.16332	87.83668
5	0.109375	15.92495	84.07505
6	0.116240	18.29241	81.70759
7	0.121863	20.39165	79.60835
8	0.128219	23.53377	76.46623
9	0.134951	26.23892	73.76108
10	0.141281	27.95721	72.04279

Looking at Table 4.14, it can be seen that only 27,96% of the variance in Log (Customer) at the end of 10 periods is derived from Log (rGDP).

4.3.4. VAR Model 4: rGDP & Credit Card

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the real GDP and the credit card volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 6 according to the tests. This means that we will model VAR (6) for rGDP & Credit Card.

Table 4.15: Coefficients and test results of VAR (6) for rGDP & Credit Card

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.792301	0.165770	4.779510	0.0000*
C(2)	-0.134006	0.182862	-0.732826	0.4658
C(3)	0.035170	0.174063	0.202052	0.8404
C(4)	0.834894	0.192075	4.346719	0.0000*
C(5)	-0.659466	0.224476	-2.937802	0.0043*
C(6)	0.064772	0.188141	0.344271	0.7315
C(7)	0.223478	0.273806	0.816190	0.4168
C(8)	-0.381280	0.473431	-0.805356	0.4230
C(9)	-0.032982	0.429178	-0.076849	0.9389
C(10)	0.200146	0.419038	0.477632	0.6342
C(11)	-0.204565	0.443286	-0.461473	0.6457
C(12)	0.200462	0.251471	0.797156	0.4277
C(13)	1.195886	1.623526	0.736598	0.4635
C(14)	-0.011949	0.091945	-0.129961	0.8969
C(15)	-0.138395	0.101425	-1.364503	0.1762
C(16)	0.241099	0.096545	2.497266	0.0146*
C(17)	-0.030863	0.106535	-0.289694	0.7728
C(18)	-0.035773	0.124507	-0.287317	0.7746
C(19)	-0.029040	0.104354	-0.278283	0.7815
C(20)	1.413076	0.151868	9.304627	0.0000*
C(21)	0.005271	0.262591	0.020074	0.9840
C(22)	-0.842698	0.238046	-3.540069	0.0007*
C(23)	0.493696	0.232421	2.124143	0.0367*
C(24)	-0.177495	0.245871	-0.721902	0.4725
C(25)	0.093272	0.139480	0.668710	0.5056
C(26)	0.379588	0.900497	0.421532	0.6745
Determinant residual covariance		9.55E-07		

* indicates significant p-values at 0.05 significance level

The coefficients of the VAR (6) models established and the test results are presented in Table 4.15. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. Although the some coefficients of Credit Card are not significant individually for second equation, it is seen that all coefficients of credit card together are jointly significant on credit card. The equations obtained are given below.

Log(rGDP) = (4.12)

0,792*Log(rGDP)(-1) + 0,834*Log(rGDP)(-4) - 0,659*Log(rGDP)(-5)

Log(Card) = (4.13)

0,241*Log(rGDP)(-4) + 1,413*Log (Card)(-1) + 0,005*Log(Card)(-2) – 0,842*Log(Card)(-3) + 0,493*Log (Card)(-4) – 0,177*Log(Card)(-5) + 0,093*Log(Card)(-6)

VAR(5) Model for rGDP & Credit Card has been established. Now let's test the model effect-response graphs.

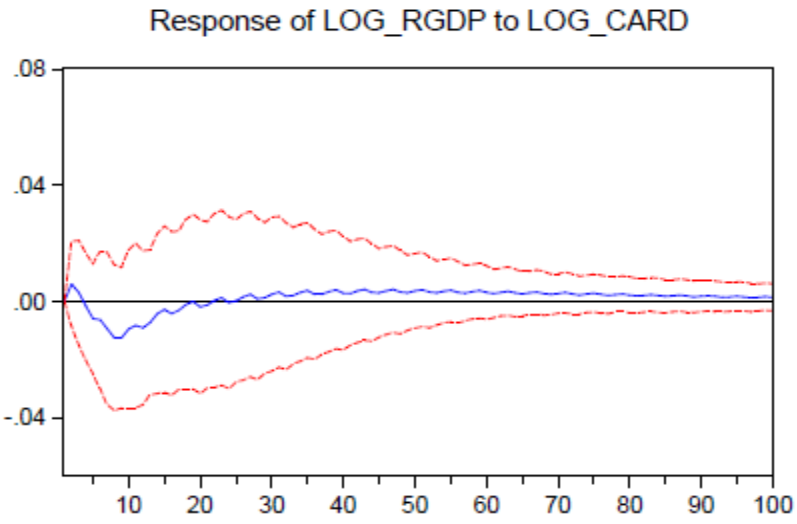


Figure 4.15: Response Graph of Log(rGDP) for VAR Model 4

Figure 4.15 and Figure 4.16 show the rGDP and credit card models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.15, Log(rGDP) approaches the zero line over time. This means that the shock applied to the Log(card) has temporary effect.

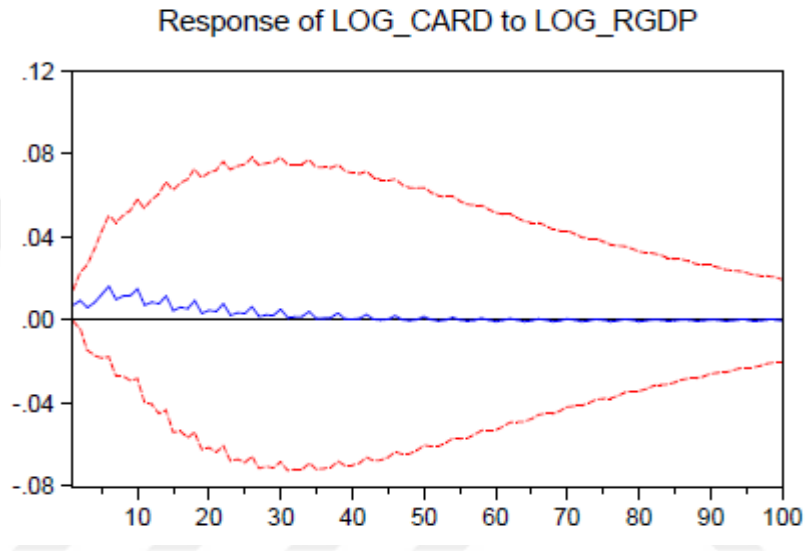


Figure 4.16: Response Graph of Log(Card) for VAR Model 4

As it can be seen in Figure 4.16, Log(Card) approaches the zero line over time. This means that the shock applied to the Log(rGDP) has temporary effect.

Table 4.16: Variance Decomposition Results for VAR Model 4 of Log(rGDP)

Variance Decomposition of LOG_RGDP:			
Period	S.E.	LOG_RGDP	LOG_CARD
1	0.049151	100.0000	0.000000
2	0.063968	99.15324	0.846764
3	0.068714	99.08325	0.916748
4	0.070065	99.05579	0.944213
5	0.086643	98.88923	1.110765
6	0.095774	98.63988	1.360116
7	0.098787	97.79146	2.208537
8	0.100055	96.23602	3.763982
9	0.108893	95.48247	4.517530
10	0.114330	95.20107	4.798935

Finally, the results of the variance decomposition analysis for rGDP are presented in Table 4.16. At the end of 10 periods, only 4,79% of the variance in the log (rGDP) appears to be from Log (Card).

Table 4.17: Variance Decomposition Results for VAR Model 4 of Log(Card)

Variance Decomposition of LOG_CARD:

Period	S.E.	LOG_RGDP	LOG_CARD
1	0.027262	6.652906	93.34709
2	0.047074	6.175759	93.82424
3	0.070886	3.430780	96.56922
4	0.088069	3.152737	96.84726
5	0.104987	3.583582	96.41642
6	0.117121	4.801490	95.19851
7	0.127178	4.682301	95.31770
8	0.134053	4.971467	95.02853
9	0.140290	5.235575	94.76442
10	0.145287	5.943807	94.05619

Looking at Table 4.17, it can be seen that only 5,94% of the variance in Log (Card) at the end of 10 periods is derived from Log (rGDP).

4.3.5. VAR Model 5: Inflation & Total Credit

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the inflation and the credit card volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 4 according to the tests. This means that we will model VAR (4) for Inflation & Total Credit. The coefficients of the VAR (4) models established and the test results are presented in Table 4.18. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. There are no jointly significant coefficients according to the test results.

Table 4.18: Coefficients and test results of VAR (4) for Inflation & Total Credit

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.695069	0.135280	5.138001	0.0000*
C(2)	-0.164694	0.166020	-0.992013	0.3238
C(3)	0.072379	0.170707	0.423999	0.6726
C(4)	0.367547	0.138134	2.660799	0.0092*
C(5)	0.036739	0.045891	0.800570	0.4254
C(6)	0.058973	0.062907	0.937455	0.3510
C(7)	-0.078451	0.061463	-1.276382	0.2050
C(8)	-0.004822	0.039799	-0.121159	0.9038
C(9)	-0.059652	0.067219	-0.887427	0.3772
C(10)	-0.202663	0.410008	-0.494290	0.6223
C(11)	0.576844	0.503176	1.146408	0.2546
C(12)	-1.195990	0.517379	-2.311630	0.0230*
C(13)	1.034474	0.418658	2.470927	0.0153*
C(14)	1.056340	0.139086	7.594845	0.0000*
C(15)	0.027728	0.190660	0.145431	0.8847
C(16)	-0.163391	0.186283	-0.877108	0.3827
C(17)	-0.005705	0.120622	-0.047296	0.9624
C(18)	0.661453	0.203729	3.246733	0.0016*
Determinant residual covariance		8.19E-08		

* indicates significant p-values at 0.05 significance level

The equations obtained at %5 significance level are given below.

Log(inf)= (4.14)

0,695*Log(inf)(-1) + 0,367*Log(inf)(-4)

Log(Total)= (4.15)

0,6614 - 1,196*Log(inf)(-3) + 1,034*Log(inf)(-4) + 1,056*Log(Total)(-1)

VAR(4) Model for Inflation & Total Credit has been established. Now let's test the model effect-response graphs.

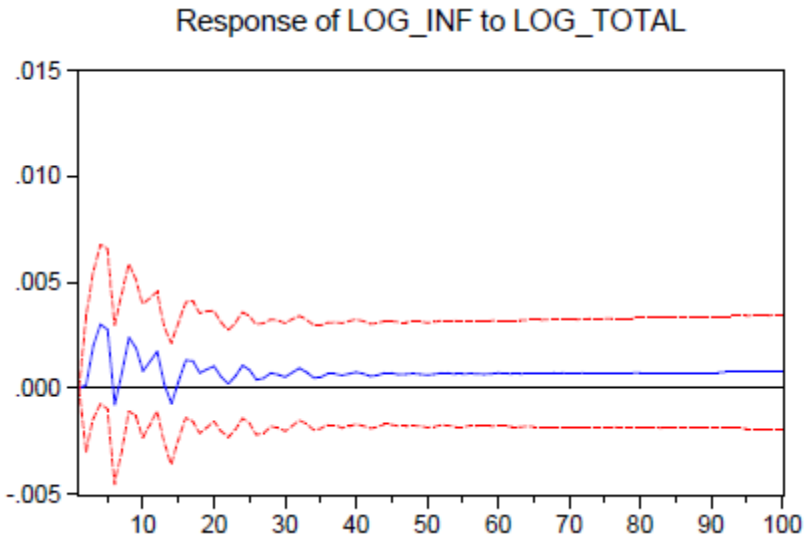


Figure 4.17: Response Graph of Log(inf) for VAR Model 5

Figure 4.17 and Figure 4.18 show the inflation and total credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.17 and 4.18, dependent variables approaches the zero line over time. This means that the shock applied to the independent variables has temporary effect.

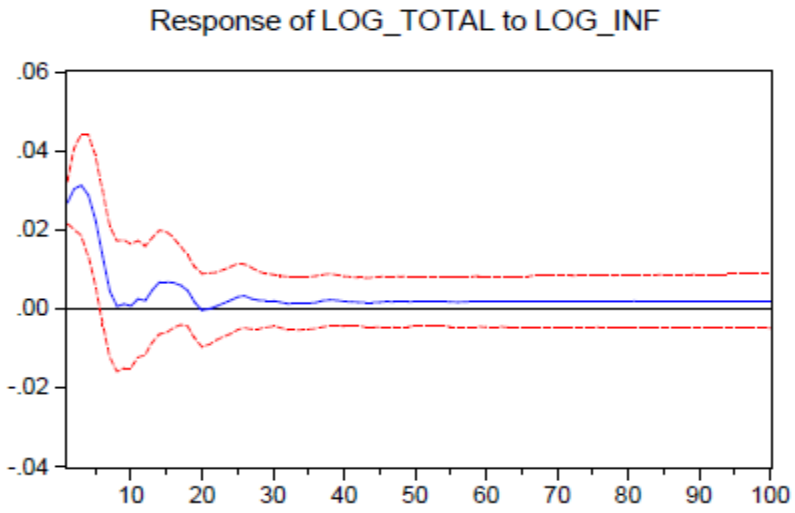


Figure 4.18: Response Graph of Log(Total) for VAR Model 5

Table 4.19: Variance Decomposition Results for VAR Model 5 of Log(inf)

Variance Decomposition of LOG_INF:			
Period	S.E.	LOG_INF	LOG_TOTAL
1	0.010633	100.0000	0.000000
2	0.012970	99.16873	0.831271
3	0.013915	91.14147	8.858532
4	0.014415	86.22290	13.77710
5	0.015475	85.68579	14.31421
6	0.016543	86.07122	13.92878
7	0.017370	85.06114	14.93886
8	0.017959	83.77749	16.22251
9	0.018660	83.25811	16.74189
10	0.019396	83.21763	16.78237

Finally, the results of the variance decomposition analysis for inflation are presented in Table 4.19. At the end of 10 periods, only 16,78% of the variance in the Log (inf) appears to be from Log (Total).

Table 4.20: Variance Decomposition Results for VAR Model 5 of Log(Total)

Variance Decomposition of LOG_TOTAL:			
Period	S.E.	LOG_INF	LOG_TOTAL
1	0.032228	0.249516	99.75048
2	0.047006	0.790048	99.20995
3	0.059558	0.500064	99.49994
4	0.069186	1.845145	98.15486
5	0.076188	1.875009	98.12499
6	0.080541	1.703941	98.29606
7	0.083998	1.689664	98.31034
8	0.086754	1.622857	98.37714
9	0.089104	1.631259	98.36874
10	0.090947	1.747348	98.25265

Looking at Table 4.20, it can be seen that only 1,75% of the variance in Log (Total) at the end of 10 periods is derived from Log (inf).

4.3.6. VAR Model 6: Inflation & Commercial Credit

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the inflation and the credit card volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 7 according to the tests. This means that we will model VAR (7) for Inflation & Commercial Credit. The coefficients of the VAR (7) models established and the test results are presented in Table 4.21. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. There are no jointly significant coefficients according to the test results.

The equations obtained at %5 significance level are given below.

Log(inf)= (4.16)

0,719*Log(inf)(-1) + 0,341*Log(inf)(-4)

Log(Com)= (4.17)

0,918 + 1,114*Log(inf)(-4) + 1,327* Log(inf)(-6) + 1,168*Log(Com)(-1)

VAR(7) Model for Inflation & Commercial Credit has been established. Now let's test the model effect-response graphs.

Table 4.21: Coefficients and test results of VAR (7) for Inflation & Commercial Credit

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.719546	0.160201	4.491508	0.0000 *
C(2)	-0.231556	0.188925	-1.225654	0.2242
C(3)	-0.021167	0.193669	-0.109294	0.9133
C(4)	0.341418	0.183040	1.865269	0.0661
C(5)	-0.104970	0.199476	-0.526229	0.6003
C(6)	-0.033266	0.198920	-0.167233	0.8676
C(7)	0.268050	0.170196	1.574953	0.1195
C(8)	0.014199	0.047646	0.298009	0.7665
C(9)	0.062535	0.068302	0.915565	0.3629
C(10)	-0.058260	0.064165	-0.907974	0.3668
C(11)	0.026844	0.059971	0.447614	0.6557
C(12)	-0.094709	0.057834	-1.637621	0.1057
C(13)	0.104905	0.058344	1.798042	0.0762
C(14)	-0.034871	0.040520	-0.860586	0.3922
C(15)	-0.029867	0.105736	-0.282467	0.7784
C(16)	0.008981	0.503864	0.017824	0.9858
C(17)	0.047865	0.594204	0.080554	0.9360
C(18)	-0.549755	0.609126	-0.902531	0.3697
C(19)	1.113315	0.575694	1.933866	0.0570
C(20)	-0.524065	0.627389	-0.835311	0.4062
C(21)	1.327859	0.625640	2.122400	0.0372 *
C(22)	-0.968361	0.535298	-1.809014	0.0745
C(23)	1.168604	0.149856	7.798203	0.0000 *
C(24)	-0.271488	0.214824	-1.263770	0.2103
C(25)	0.108221	0.201812	0.536249	0.5934
C(26)	-0.267121	0.188622	-1.416175	0.1609
C(27)	0.022757	0.181897	0.125108	0.9008
C(28)	0.072959	0.183502	0.397589	0.6921
C(29)	0.001559	0.127444	0.012233	0.9903
C(30)	0.918412	0.332560	2.761640	0.0072 *
Determinant residual covariance		6.25E-08		

* indicates significant p-values at 0.05 significance level

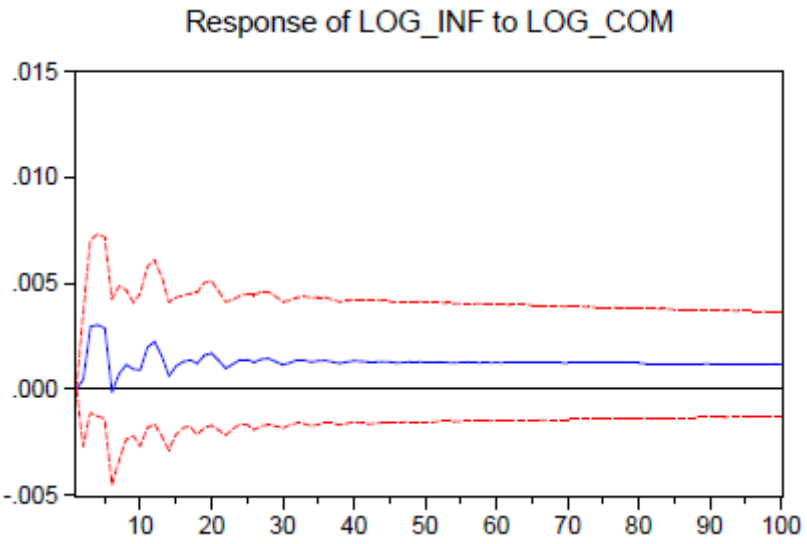


Figure 4.19: Response Graph of Log(inf) for VAR Model 6

Figure 4.19 and Figure 4.20 show the inflation and total credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.19 and 4.20, dependent variables approaches the zero line over time. This means that the shock applied to the independent variables has temporary effect.

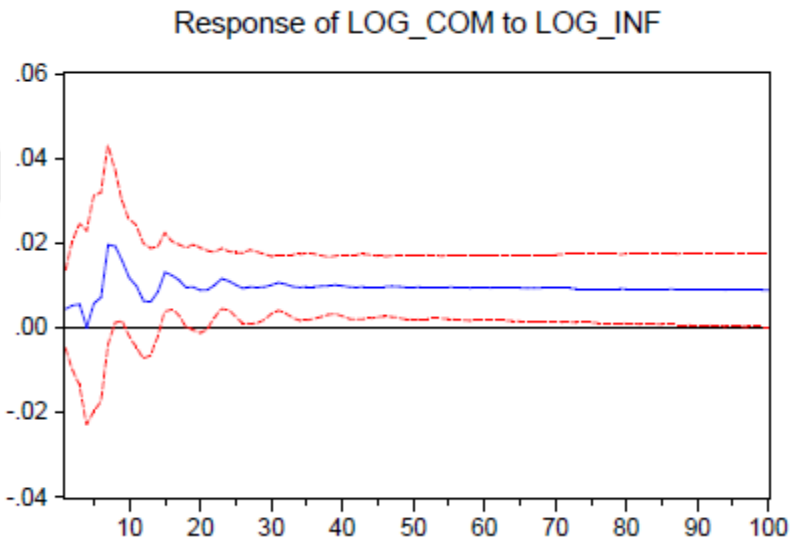


Figure 4.20: Response Graph of Log(Com) for VAR Model 6

Finally, the results of the variance decomposition analysis for inflation are presented in Table 4.22. At the end of 10 periods, only 9,38% of the variance in the Log (inf) appears to be from Log (Com).

Table 4.22: Variance Decomposition Results for VAR Model 6 of Log(inf)

Variance Decomposition of LOG_INF:			
Period	S.E.	LOG_INF	LOG_COM
1	0.010615	100.0000	0.000000
2	0.013122	99.87169	0.128306
3	0.013881	95.34550	4.654501
4	0.014220	91.04128	8.958721
5	0.014871	88.04523	11.95477
6	0.015199	88.54756	11.45244
7	0.015357	88.54827	11.45173
8	0.015770	88.60574	11.39426
9	0.017089	89.99252	10.00748
10	0.017896	90.61819	9.381811

Table 4.23: Variance Decomposition Results for VAR Model 6 of Log(Com)

Variance Decomposition of LOG_COM:			
Period	S.E.	LOG_INF	LOG_COM
1	0.033388	1.690780	98.30922
2	0.051362	1.727168	98.27283
3	0.063086	1.888098	98.11190
4	0.072370	1.434757	98.56524
5	0.077401	1.789283	98.21072
6	0.079194	2.515217	97.48478
7	0.082095	7.970332	92.02967
8	0.084441	12.68065	87.31935
9	0.086098	15.46807	84.53193
10	0.087059	16.93325	83.06675

Looking at Table 4.23, it can be seen that only 16,93% of the variance in Log (Com) at the end of 10 periods is derived from Log (inf).

4.3.7. VAR Model 7: Inflation & Customer Credit

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the inflation and the credit card volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests

are presented in Appendix B. Lag length was selected as 4 according to the tests. This means that we will model VAR (4) for Inflation & Customer Credit. The coefficients of the VAR (4) models established and the test results are presented in Table 4.24. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. Although the some coefficients of Customer Credit are not significant individually for second equation, it is seen that all coefficients of credit card together are jointly significant on credit card.

Table 4.24: Coefficients and test results of VAR (4) for Inflation & Customer Credit

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.713373	0.136770	5.215852	0.0000*
C(2)	-0.151044	0.170457	-0.886111	0.3779
C(3)	0.093563	0.175250	0.533884	0.5947
C(4)	0.334467	0.140555	2.379615	0.0194*
C(5)	0.006289	0.036115	0.174150	0.8621
C(6)	0.019283	0.055206	0.349298	0.7277
C(7)	0.008323	0.052837	0.157532	0.8752
C(8)	-0.028082	0.028473	-0.986251	0.3266
C(9)	-0.020235	0.056540	-0.357880	0.7213
C(10)	-0.021402	0.483161	-0.044297	0.9648
C(11)	0.530862	0.602164	0.881590	0.3803
C(12)	-1.459951	0.619097	-2.358194	0.0205*
C(13)	1.090841	0.496532	2.196919	0.0305*
C(14)	1.234677	0.127582	9.677497	0.0000*
C(15)	-0.325717	0.195024	-1.670139	0.0983
C(16)	-0.150681	0.186654	-0.807276	0.4216
C(17)	0.159777	0.100586	1.588457	0.1156
C(18)	0.861724	0.199737	4.314299	0.0000*
Determinant residual covariance		1.24E-07		

* indicates significant p-values at 0.05 significance level

The equations obtained are given below.

Log(inf)= (4.18)

0,713*Log(inf)(-1) + 0,334*Log(inf)(-4)

Log(Cust) = (4.19)

0,861 -1,459*Log(inf)(-3) + 1,091*Log(inf)(-4) + 1,234*Log(Cust)(-1) – 0,325*Log(Cust)(-2) – 0,150*Log(Cust)(-3) + 0,159*Log(Cust)(-4)

VAR(4) Model for Inflation & Customer Credit has been established. Now let's test the model effect-response graphs.

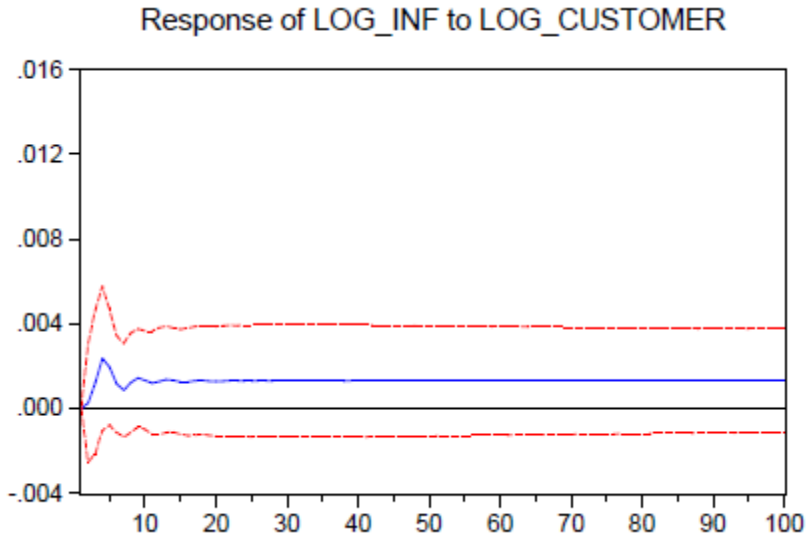


Figure 4.21: Response Graph of Log(inf) for VAR Model 7

Figure 4.21 and Figure 4.22 show the inflation and customer credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.21, Log(inf) approaches the zero line over

time. This means that the shock applied to the Log(Customer) has temporary effect.

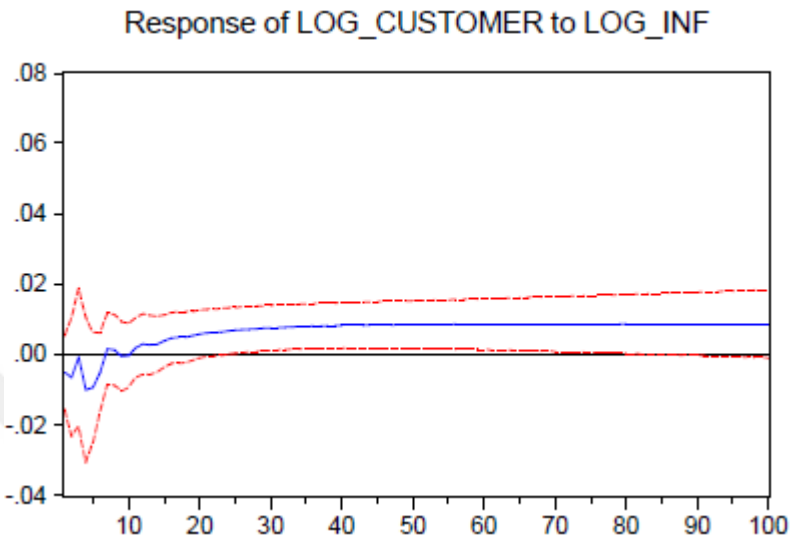


Figure 4.22: Response Graph of Log(Customer) for VAR Model 7

As it can be seen in Figure 4.22, Log(Customer) approaches the zero line over time. This means that the shock applied to the Log(inf) has temporary effect.

Table 4.25: Variance Decomposition Results for VAR Model 7 of Log(inf)

Variance Decomposition of LOG_INF:			
Period	S.E.	LOG_INF	LOG_CUSTO...
1	0.010976	100.0000	0.000000
2	0.013466	99.96778	0.032216
3	0.014035	99.22469	0.775311
4	0.014425	96.60606	3.393941
5	0.015569	95.52354	4.476462
6	0.016899	95.74105	4.258949
7	0.017640	95.86009	4.139914
8	0.018129	95.62610	4.373900
9	0.018812	95.35911	4.640888
10	0.019682	95.31590	4.684099

Finally, the results of the variance decomposition analysis for inflation are presented in Table 4.25. At the end of 10 periods, only 4,68% of the variance in the log (inf) appears to be from Log (Customer).

Table 4.26: Variance Decomposition Results for VAR Model 7 of Log(Customer)

Variance Decomposition of LOG_CUSTOMER:

Period	S.E.	LOG_INF	LOG_CUSTO...
1	0.038775	1.772004	98.22800
2	0.061632	1.850859	98.14914
3	0.076947	1.198709	98.80129
4	0.085429	2.355020	97.64498
5	0.090499	3.183906	96.81609
6	0.093692	3.273550	96.72645
7	0.096007	3.143467	96.85653
8	0.098043	3.030180	96.96982
9	0.099968	2.917775	97.08222
10	0.101740	2.818247	97.18175

Looking at Table 4.26, it can be seen that only 2,81% of the variance in Log (Customer) at the end of 10 periods is derived from Log (inf).

4.3.8. VAR Model 8: Inflation & Credit Card

As previously done, variables are checked whether variables are stationary or not. Looking at Table 4.1, it can be seen that both the inflation and the credit card volume variables are stationary in the logarithms of the series.

As a second step, the appropriate lag is determined for the variables to be used in the VAR model. There are various tests for this and the results of these tests are presented in Appendix B. Lag length was selected as 5 according to the tests. This means that we will model VAR (5) for Inflation & Credit Card. The coefficients of the VAR (5) models established and the test results are presented in Table 4.27. Some of the coefficients seem to be insignificant. In this case, a coefficient diagnostic test which results are presented in Appendix C is require. Although the some coefficients of Credit Card are not significant individually

for first equation, it is seen that all coefficients of credit card together are jointly significant on inflation.

The equations obtained are given below.

Log(inf)= (4.20)

0,887*Log(inf)(-1) – 0,053*Log(Card)(-1) + 0,214*Log(Card)(-2) – 0,233*Log(Card)(-3) + 0,14*Log(Card)(-4) + 0,057*Log(Card)(-5)

Log(Card)= (4.21)

0,689 + 0,99*Log(inf)(-4) + 1,268*Log(Card)(-1) – 0,742*Log(Card)(-3) + 0,715*Log(Card)(-4) - 0,309 Log(Card)(-5)

Table 4.27: Coefficients and test results of VAR (4) for Inflation & Credit Card

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.877853	0.151697	5.786896	0.0000*
C(2)	-0.282970	0.199973	-1.415040	0.1607
C(3)	0.251736	0.186581	1.349202	0.1808
C(4)	0.064788	0.184318	0.351504	0.7261
C(5)	0.086581	0.144979	0.597193	0.5519
C(6)	-0.053412	0.044357	-1.204133	0.2318
C(7)	0.214542	0.068055	3.152507	0.0022*
C(8)	-0.233033	0.064911	-3.590037	0.0005*
C(9)	0.014425	0.076409	0.188789	0.8507
C(10)	0.057175	0.043945	1.301043	0.1967
C(11)	0.052537	0.066169	0.793987	0.4294
C(12)	-0.023253	0.476876	-0.048761	0.9612
C(13)	0.326393	0.628639	0.519206	0.6050
C(14)	-0.511461	0.586540	-0.871997	0.3856
C(15)	-0.610736	0.579425	-1.054038	0.2948
C(16)	0.990458	0.455759	2.173206	0.0325*
C(17)	1.268188	0.139441	9.094786	0.0000*
C(18)	-0.019531	0.213938	-0.091291	0.9275
C(19)	-0.742006	0.204056	-3.636293	0.0005*
C(20)	0.715732	0.240201	2.979723	0.0037*
C(21)	-0.309683	0.138148	-2.241678	0.0276*
C(22)	0.689779	0.208010	3.316085	0.0013*
Determinant residual covariance		5.64E-08		

* indicates significant p-values at 0.05 significance level

VAR(5) Model for Inflation & Credit Card has been established. Now let's test the model effect-response graphs.

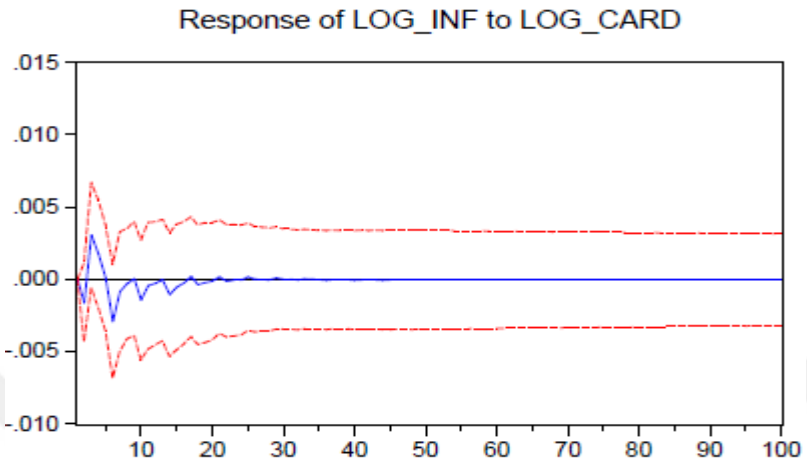


Figure 4.23: Response Graph of Log(inf) for VAR Model 8

Figure 4.23 and Figure 4.24 show the inflation and total credit models' responses, repectively. In this test, the time course of the effect, which is caused by the shock to an independent variable at time 0, on dependent variable is shown. As it can be seen in Figure 4.23 and 4.24, dependent variables approaches the zero line over time. This means that the shock applied to the independent variables has temporary effect.

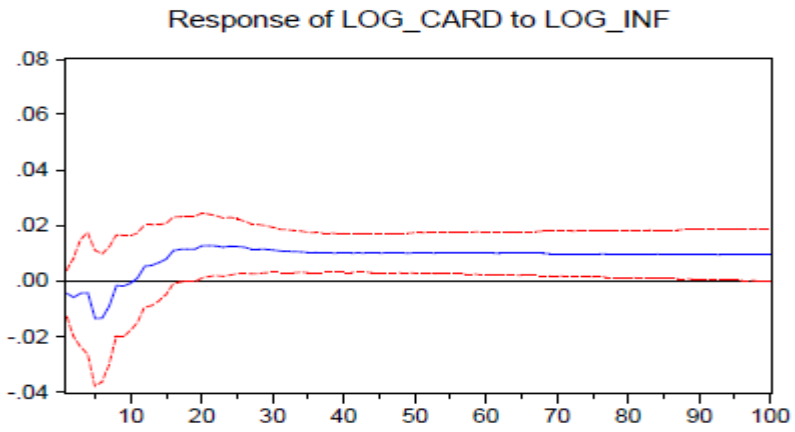


Figure 4.24: Response Graph of Log(Card) for VAR Model 8

Table 4.28: Variance Decomposition Results for VAR Model 8 of Log(inf)

Variance Decomposition of LOG_INF:			
Period	S.E.	LOG_INF	LOG_CARD
1	0.009793	100.0000	0.000000
2	0.013290	98.50134	1.498661
3	0.014308	94.18254	5.817463
4	0.014903	93.28222	6.717778
5	0.015904	94.09930	5.900699
6	0.017536	92.36119	7.638814
7	0.018208	92.69912	7.300876
8	0.018825	93.14144	6.858556
9	0.019774	93.78418	6.215817
10	0.021019	94.02461	5.975389

Finally, the results of the variance decomposition analysis for inflation are presented in Table 4.28. At the end of 10 periods, only 5,97% of the variance in the log (inf) appears to be from Log (Card).

Looking at Table 4.29, it can be seen that only 4,39% of the variance in Log (Card) at the end of 10 periods is derived from Log (inf).

Table 4.29: Variance Decomposition Results for VAR Model 8 of Log(Card)

Variance Decomposition of LOG_CARD:			
Period	S.E.	LOG_INF	LOG_CARD
1	0.030786	2.104299	97.89570
2	0.049746	2.208389	97.79161
3	0.069568	1.527995	98.47200
4	0.079134	1.485616	98.51438
5	0.090357	3.355306	96.64469
6	0.097518	4.756319	95.24368
7	0.103387	4.978712	95.02129
8	0.106011	4.758309	95.24169
9	0.108857	4.542514	95.45749
10	0.110683	4.399144	95.60086

4.4. Granger Causality Test

The fact that there is a strong relationship between the two variables does not mean that there is causality between those variables. For this reason, the relations we find with regression analysis do not mean causality. According to Granger(1969), if past period values of a variable such as X contribute to the prediction of a different variable such as Y, X is the Granger cause of the Y variable. According to Granger, if Y's forecast is more successful using the past values of X than not using the past values of X (other terms do not change), X is the cause of Granger of Y. Granger causality analysis is based on two equations, given Equation (4.22) and (4.23), that are based on the VAR model.

$$Y_t = \alpha + \sum_{i=1}^{m} \beta_i \times Y_{t-i} + \sum_{i=1}^{m} \delta_i \times X_{t-i} + u_i \tag{4.22}$$

$$X_t = \theta + \sum_{i=1}^{m} \gamma_i \times Y_{t-i} + \sum_{i=1}^{m} \rho_i \times X_{t-i} + u_i \tag{4.23}$$

There are 4 possible outcomes from these equations.

1. If the coefficients of X in Eq. (4.22) are not zero and the coefficients of Y in Eq. (4.23) are not different from zero, there is causality from X to Y.
2. If the coefficients of X in Eq. (4.22) are not different from zero and the coefficients of Y in Eq. (4.23) are not zero, there is causality from Y to X.
3. If the coefficients of X in Eq. (4.22) are not zero and the coefficients of Y in Eq. (4.23) are not zero, there is mutual causality between X and Y.
4. If the coefficients of X in Eq. (4.22) are not different from zero and the coefficients of Y in Eq. (4.23) are not different from zero, there is no causality between X and Y.

For the Granger causality test, the number of delays in the models must first be determined. Since the Granger causality test is based on the VAR model, the number of delays must be determined according to the VAR model.

4.4.1. Granger Causality Test Between rGDP and Total Credit

We have set the number of delays to 5 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.30.

When the Table 4.30 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for both direction at the level of 5% significance. This means that there is mutually causality between Log(rGDP) and Log(Total Credit).

Table 4.30: Granger Causality Between rGDP and Total Credit

Dependent variable: LOG_RGDP

Excluded	Chi-sq	df	Prob.
LOG_TOTAL	11.59851	5	0.0407
All	11.59851	5	0.0407

Dependent variable: LOG_TOTAL

Excluded	Chi-sq	df	Prob.
LOG_RGDP	12.27320	5	0.0312
All	12.27320	5	0.0312

4.4.2. Granger Causality Test Between rGDP and Commercial Credit

We have set the number of delays to 5 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.31.

Table 4.31: Granger Causality Between rGDP and Commercial Credit

Dependent variable: LOG_RGDP

Excluded	Chi-sq	df	Prob.
LOG_COM	12.74034	5	0.0259
All	12.74034	5	0.0259

Dependent variable: LOG_COM

Excluded	Chi-sq	df	Prob.
LOG_RGDP	9.840907	5	0.0799
All	9.840907	5	0.0799

When the Table 4.31 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for first equation at the level of 5% significance. This means that there is causality from Log(Total Credit) to Log(rGDP) just one direction.

4.4.3. Granger Causality Test Between rGDP and Customer Credit

We have set the number of delays to 5 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.32.

Table 4.32: Granger Causality Between rGDP and Customer Credit

Dependent variable: LOG_RGDP

Excluded	Chi-sq	df	Prob.
LOG_CUST...	12.30235	4	0.0152
All	12.30235	4	0.0152

Dependent variable: LOG_CUSTOMER

Excluded	Chi-sq	df	Prob.
LOG_RGDP	8.987794	4	0.0614
All	8.987794	4	0.0614

When the Table 4.32 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for first equation at the level of 5% significance. This means that there is causality from Log(Customer) to Log(rGDP) just one direction.

4.4.4. Granger Causality Test Between rGDP and Credit Card

We have set the number of delays to 6 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.33.

Table 4.33: Granger Causality Between rGDP and Credit Card

Dependent variable: LOG_RGDP

Excluded	Chi-sq	df	Prob.
LOG_CARD	4.072277	6	0.6669
All	4.072277	6	0.6669

Dependent variable: LOG_CARD

Excluded	Chi-sq	df	Prob.
LOG_RGDP	14.18524	6	0.0276
All	14.18524	6	0.0276

When the Table 4.33 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for second equation at the level of 5% significance. This means that there is causality from Log(rGDp) to Log(Card) just one direction.

4.4.5. Granger Causality Test Between Inflation and Total Credit

We have set the number of delays to 4 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.34.

When the Table 4.34 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for second equation at the level of 5% significance. This means that there is causality from Log(inf) to Log(Total) just one direction.

Table 4.34: Granger Causality Between Inflastion and Total Credit

Dependent variable: LOG_INF

Excluded	Chi-sq	df	Prob.
LOG_TOTAL	5.611845	4	0.2301
All	5.611845	4	0.2301

Dependent variable: LOG_TOTAL

Excluded	Chi-sq	df	Prob.
LOG_INF	11.11917	4	0.0253
All	11.11917	4	0.0253

4.4.6. Granger Causality Test Between Inflation and Commercial Credit

We have set the number of delays to 7 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.35.

When the Table 4.35 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for second equation at the level of 5% significance. This means that there is causality from Log(inf) to Log(Commercial) just one direction.

Table 4.35: Granger Causality Between Inflation and Commercial Credit

Dependent variable: LOG_INF

Excluded	Chi-sq	df	Prob.
LOG_COM	7.313531	7	0.3970
All	7.313531	7	0.3970

Dependent variable: LOG_COM

Excluded	Chi-sq	df	Prob.
LOG_INF	14.18707	7	0.0480
All	14.18707	7	0.0480

4.4.7. Granger Causality Test Between Inflation and Customer Credit

We have set the number of delays to 4 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.36.

Table 4.36: Granger Causality Between Inflation and Customer Credit

Dependent variable: LOG_INF

Excluded	Chi-sq	df	Prob.
LOG_CUST...	2.438233	4	0.6557
All	2.438233	4	0.6557

Dependent variable: LOG_CUSTOMER

Excluded	Chi-sq	df	Prob.
LOG_INF	11.93726	4	0.0178
All	11.93726	4	0.0178

When the Table 4.36 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for second equation at the level of 5% significance. This means that there is causality from Log(inf) to Log(Customer) just one direction.

4.4.8. Granger Causality Test Between Inflation and Credit Card

We have set the number of delays to 7 when we first set up the VAR model between these two variables. Accordingly, Granger Causality Analysis Results are presented in Table 4.37.

Table 4.37: Granger Causality Between Inflation and Credit Card

Dependent variable: LOG_INF

Excluded	Chi-sq	df	Prob.
LOG_CARD	17.31912	5	0.0039
All	17.31912	5	0.0039

Dependent variable: LOG_CARD

Excluded	Chi-sq	df	Prob.
LOG_INF	16.18135	5	0.0063
All	16.18135	5	0.0063

When the Table 4.37 is examined;

$H_0 = There\ is\ no\ causality\ between\ variables$

The H_0 is rejected for both direction at the level of 5% significance. This means that there is mutually causality between Log(inf) and Log(Credit Card).

4.4.9. The Summary of Granger Causality Results

In Table 4.38, the results of all granger causality analysis are presented.

Table 4.38: The results of all granger causality analysis

Series	Causality Result
rGDP & Total Credit	Mutual Causality
rGDP & Commercial Credit	From Com. to rGDP
rGDP & Customer Credit	From Cust. to rGDP
rGDP & Credit Card	From rGDP to Card
Inflation & Total Credit	From inf. to Total Credit
Inflation & Commercial Credit	From inf. to Commercial Credit
Inflation & Customer Credit	From inf. to Customer Credit
Inflation & Credit Card	Mutual Causality

When the results are analyzed, it is seen that the change in total credit volume is effective on real GDP. This means that it can contribute to the desired real growth if the credit volume is adjusted to the goals of the country. This can also be interpreted as demand-driven growth at the same time. On the other side, the changes in real GDP has an effect on the total credit volume. Even if the source is credit / debt, this can be interpreted as the products have been purchased.

When the sub-fracture of the total credit are examined, consumer and commercial loans have an impact on real GDP while credit cards are not

effective. In this case, targeted growth on real GDP can be achieved through consumer and commercial credits. On the other hand, credit cards are generally used for consumption, so they are not causal on real GDP.

Inflation is a cause of the total credit volume when we look at the analysis of causality between inflation and loans. Besides, it is also the cause of all the sub-fractures of the credit. When inflation is considered as a decrease in the purchasing power of the money, it can be said that the economic units set credit demands according to inflation in order to maintain the current consumption level.

The causality relation is graphically presented in Figure 4.25.

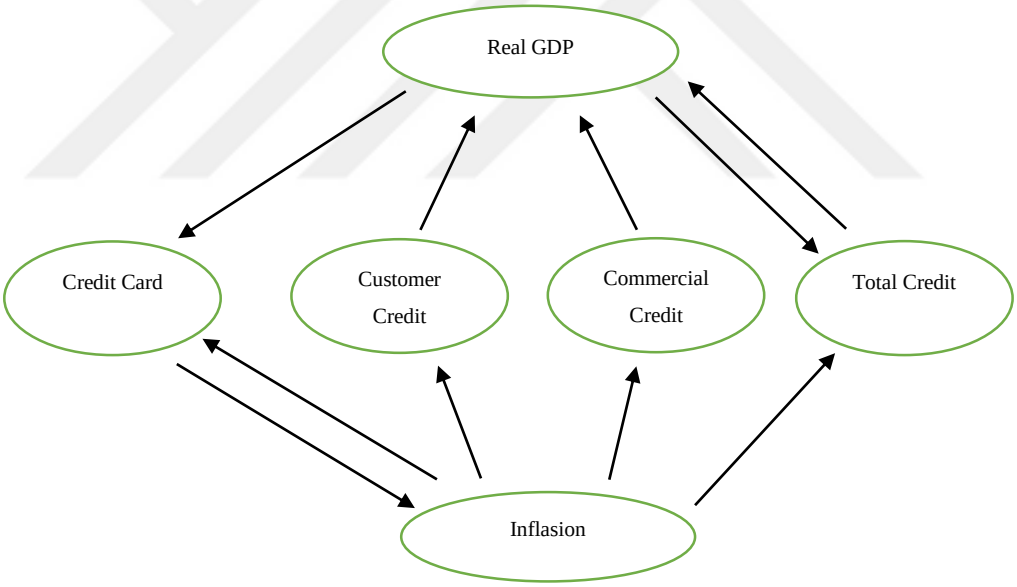


Figure 4.25: Graphical Representation of Causality Relations

The model parameters that can be analyzed for the effects of all credit types on real growth and inflation are given in Appendix D and E, respectively.

CHAPTER V

CONLUSIONS

Economic growth is one of the most important items of world economic agenda. Especially after the global financial crisis of 2008, slowed down in economic growth has caused some questions about the validity of the current economic system. For this reason, economic growth, which was previously the focus of the world of economics, has become a subject that has been studied even more. In this context, many studies have been carried out on the relationship between credits and economic growth.

The credits have a basic mission in meeting the financing needs of the economies for growth. Therefore, especially in developing economies, serious works are being done and measures are taken in order to increase credit volume. because financing of both the consumption and the production can be achieved through credits and whatever growth model is applied, credits have great importance.

In this study, the effects of total credit volume and credit types on real growth and inflation were investigated. Before making an econometric analysis, the stationarity of the series was checked and the series made stationary. After ensuring the stability of the series, VAR models had been preferred for analysis. This is why VAR models can simultaneously solve multiple equation spaces. Because while economic data affect many factors at the same time, they can also be affected by many factors. This reduces the usefulness of single equation models in the analyzes made. The simultaneous equations are used to investigate

the relationship between series rather than to predict the future of the series. So the structure of the system is analyzed. VAR models are also a proposed method for solving simultaneous equations. VAR Models are not built on economic assumptions, exogen and endogen variables are not determined. The model behaves as both endogenous and exogenous to all variables and analyzes the relationship system between them. In this sense, the VAR model is separated from the simultaneous equations.

After establishing and analyzing VAR Models on real GDP, inflation and loans, a Granger Causality analysis was conducted to determine the directions of the relations. As a result of this analysis, real GDP and inflation-causing credit types have been identified. The results show that real growth can be achieved without causing inflation by using loans. It is also possible that the credits lead to inflation without any real growth. This depends entirely on which channel the credits are transferred to.

The relationship between credit and economic growth in the literature is often a matter of concern. According to King & Levine (1993), one of the subparameters related to financial development was credit growth and they claimed that there was a strong relationship between economic growth and credit growth in their work. From the same perspectives, Jayanatre&Strahan P(1996) found that there was a strong relationship between bank lending sensitivities and economic growth in America. Qin& Ndiege(2013) showed that there is a strong relationship between credit growth and economic growth in study using Tanzania's economic data. Just as in King & Levine (1993) and , Jayanatre& Strahan(1996) studies, in this study, the existence of the relation between the economic growth and the credit growth is once more revealed. It is seen that there is a mutual causality relationship between collective credit volume and real growth in this study. In addition, inflation is seen as a reason for the total credit volume.

From Backe & Zumer (2005) study, it can be concluded that the increase in credit volume alone does not yield exactly the desired results, but that directing loans to the right areas would allow for an increase in production, that is, an increase in real GDP. The results we achieve in our work support the From Backe & Zumer (2005) study. When we examine the causality relationships that we have achieved as a result of this study, some credit types, customer and commercial credits, have causality on real GDP, whereas some credit types, credit card, have no such causality.

Many studies have been conducted on the relationship between economic growth with credit growth in Turkey. Durkaya (2010) investigated the causality between credit growth in 1998-2008 and economic growth in Turkey and claim a causality from economic growth to credit growth. The results we have achieved support Durkaya (2010). In addition, it also revealed that there is causality from credit growth to economic growth at the same time. That is, the causality relationship between total credit and economic growth is mutual.

Yılmaz (2014) claimed that, in Turkey, the rapidly increasing volume of credits in recent years did not enough support economic growth because of use of these credits for the consumption of imported goods instead of production. We can say that this result is relatively supported by the work we do. especially because the type of credit mentioned by Yılmaz (2014) includes mainly credit cards. According to our work, credit cards are not a cause of real GDP, however inflation.

Mercan (2013) investigated the relationship between credit growth and economic growth between 1992 and 2011, and found a meaningful relationship. However, as a result, he expressed that the credit should lead to production instead of consumption. It is necessary to clearly examine the types of loans that are expressed by the consumption word in this study. If the credit card spending

meant by the consumption word is the result that we find supports this. However, if we mean consumer loans, according to our results, consumer loans are a cause of real GDP. In fact, it is not the right approach to give loans only to increase production. Credits should be directed both to increase supply and increase demand.

This relationship between credit and economic growth makes banks a strong component of economic governance. If we evaluate the results we achieve, it is necessary to improve the credit composition of the banks, which will increase real GDP, for the sake of Turkey's economy. In this framework, it may be advisable for banks to support commercial credits that will turn into investment and consumer credits that people will use for long-term needs or the investment rather than credit cards that trigger rapid consumption. It should not be forgotten that banks' attempts to maximize their daily profits, like any commercial enterprise, could be a destruction for the country's economy and therefore the banking sector in the future.

In this study, the main purpose of investigating the relationship between credit growth and real growth and inflation is to show how critical the credit is for economies. In the current economic system, money is given to the banks by the central bank as dept. The banks inject the money they have received into the economic system by providing credit to economic units. In simpler terms, the banks give credit which they receive from the central bank to the economic units. That is, the banks borrow from the central bank and lend to the economic units. In this way the banks initially finance the economy. The other and main task of banks is to collect surplus funds and give them to those who need funds. The banks will increase the credit volume in the economy. There is a fundamental misunderstanding at this point. The banks actually give only the collected funds to the economy as credit. The answer of this question is "no". In the current economic system, banks give credits according to fractional reserve system.

According to this system, banks hold a certain amount of deposits, collected from economic units, as reserves and give the rest to the system as credits. Banks record the credit, they have given, as deposit and they lend this deposit as credit again (Gündogan, 2016).

It is expressed that the credit volume in the current system is adjusted by the central bank through various instruments. However, some empirical work suggests that this is not exactly the case, and they claim that banks do not need to collect deposits to give credit. For this reason, they claim that the banks set the amount of credit in the economy. Ideas of economists advocating this view have been presented in Chapter 2.

As a result of our analyzes, it is proved how important the credits are for the economy. Through loans, the economy can reach the desired level of growth, or it can be embroiled in a completely inflationary manner. This is a very serious force. Even if we make a very optimistic assumption that the amount of credits in the economy is entirely controlled by the central bank, it should not be forgotten that the central bank is an autonomous institution which a aimed price stability. It should not be forgotten that price stability does not mean economic prosperity.

As a result, it is emphasized once again how important the credits are for the economy. In addition, the fact that the loans in the economy have been controlled by the banks is also revealed through the literature. In summary, it is essential for our country to make an economic model that can increase the credit volume in line with the economic objectives of the state. The power to set the credit volume and to steer the credit as desired has important enough to be indispensable.

REFERENCES

Allen, F. & Santomero (2001). *What do financial intermediaries do?* Journal of Banking & Finance, 25(2001), 271–294.

Allen, F. & Gale, D. (2004a). *Financial intermediaries and markets*. Econometrica, 72, 1023–1061.

Allen, F., & Gale, D. (2004b). *Competition and financial stability*. Journal Money, Credit, Banking, 36, 453–480.

Altan, M. (2001). *Fonksiyonlar ve İşlemler Açısından Bankacılık*, Beta Yay.

Angel, J. (2016). *On the ethics of fractional reserve banking*. Journal of Competitiveness Studies, *24*(3), 164.

Arestis, P., & Eichner, A. S. (1988). *The post-Keynesian and institutionalist theory of money and credit*. Journal of Economic Issues, 1003-1021.

Arslan Ö. & Küçükaksoy İ., (2006) "Finansal Gelişme ve Ekonomik Büyüme İlişkisi: Türkiye Ekonomisi Üzerine Ekonometrik Bir Uygulama", *İstanbul Üniversitesi İktisat Fakültesi, Ekonometri ve İstatistik Dergis*i, Sayı 4, İstanbul, s.26.

Artan S.,(2007). "*Finansal Kalkınmanın Ekonomik Büyümeye Etkileri"*, İktisat İşletme Finans Dergisi, Sayı 22, İstanbul, , s.70–89.

Aschheim, J. (1959). *Commercial banks and financial intermediaries: fallacies and policy implications.* Journal of Political Economy, LXVII(February), 59–71.

Askari, H., & Krichene, N. (2016). *100 Percent Reserve Bankıng And The Path To A Sıngle-Country Gold Standard*. Quarterly Journal of Austrian Economics, 19(1), 29.

Backe, P. and Zumer, T. (2005). *Developments in Credit to the Private Sector in Central and Eastern European EU Member States: Emerging From Financial Repression-A Comparative Overview*. Oesterreichische Nationalbank Papers

Balkas, K. (2004). *Kredi Kavrami ve Sektor Kredilerine Gore Turkiye'deki Belli Basli Sektorlerin Analizi.* Ankara Universitesi Sosyal Bilimler Enstitusu Isletme Anabilim Dalı, Unpublished Thesis.

Ball, L. (2011). *Money, banking and financial markets*. Macmillan

Baltensperger, E. (1980). *Alternative approaches to the theory of the banking firm*. Journal of Monetary Economics, 6, 1–37.

Bencivenga, V. R., & Smith, B. (1991). *Financial intermediation and endogenous growth.* Review of Economic Studies, 58, 195–209.

Bernanke, B., & Gertler, M. (1995). *Inside the black box: The credit channel of monetary policy transmission*. Journal of Economic Perspectives, 9(4), 27–48.

Cassel, G. (1918*). Theoretische Sozialökonomie*. Leipzig: C. F.Wintersche Varlagshandlung

Cassel, G. (1923). *The Theory of Social Economy*. T. Fisher Unwin.

Casu, B., & Girardone, C. (2006). *Bank competition, concentration and efficiency in the single European market*. The Manchester School, 74(4), 441–468 Special Issue.

Casu, B., Girardone, C., & Molyneux, P. (2015). *Introduction to banking* (2nd Edition). Pearson Education.

Ceylan S. & Durkaya M., (2010). *Türkiye'de Kredi Kullanımı - Ekonomik Büyüme İlişkisi,* Atatürk Üniversitesi İktisadi Ve İdari Bilimler Dergisi, Cilt: 24, Sayı: 2.

Crick, W. F. (1927). *The genesis of bank deposits*. Economica, 191–202.

Culbertson, J. (1958). *Intermediaries and monetary theory: A criticism of the Gurley- Shaw Theory.* American Economic Review, 48, 119–131

Darıcı, B. (2012). *Financial stability and monetary policy for financial stability in frame of public responsibility:* Analysis of Turkey.) Türkiye Bankalar Birliği Bankacılar Dergisi, 23, 83.

Davenport, H. J. (1913). *The Economics of Enterprise.* New York: Augustus M. Kelley.

Dewatripont, M., Rochet, J. -C., & Tirole, J. (2010). *Balancing the Banks: Global lessons from the financial crisis*. Princeton: Princeton University Press

Diamond, D. W. (1984). *Financial intermediation as delegated monitoring.* Review of Economic Studies, 51, 393–414.

Diamond, D. W., & Dybvig, P. H. (1983). *Bank runs, deposit insurance, and liquidity*. Journal of Political Economy, 91(3), 401–419.

Diamond, D. W. (1991). *Monitoring and reputation: The choice between bank loans and directly placed debt*. Journal of Political Economy, 99(4), 689–721.

Diamond, D.W. (1997). *Liquidity, banks, andmarkets*. Journal of Political Economy, 105(5), 928–956.

Diamond, D. W., & Rajan, R. G. (2001). *Banks, short-termdebt and financial crises: Theory, policy implications and applications*. Carnegie-Rochester Conference Series on Public Policy, 54(1). (pp. 37–71). Elsevier

Douglas, P. H., Fisher, I., Graham, F. D., Hamilton, E. J., King, W. I., & Whittlesey, C. R. (1939). *A program for monetary reform*.

Eatwell, J., Milgate, M., & Newman, P. (Eds.). (1989). *The New Palgrave Money*. Basingstoke: Macmillan.

Fisher, I. (1911), *The Purchasing Power of Money*, New York, MacMillan Ltd., 1963.

Fisher, I. (1935). *100% money*. Adelphi Publication, New York.

Gertler, M., & Kiyotaki, N. (2011). *Financial intermediation and credit policy in business cycle analysis.* Elsevier.

Granger, C. W. J. (1969). *Investigating Casual Relations By Econometric Models And Cross-Spectral Methods*. Econometrica, 37(3), 424-438.

Goddard J. & Wilson J. (2016). *Banking: A very short introduction*. Oxford University Press, USA.

Gorton, G., & Pennacchi, G. (1990). *Financial intermediaries and liquidity creation*. The Journal of Finance, 45(1), 49–71.

Gujarati, D. N. (1999). *Basic Econometrics.(3 rd edition.)* İstanbul: Mc Graw Hill. Literatür Yayıncılık.

Gurley, J. G., & Shaw, E. S. (1955). *Financial aspects of economic development*. American Economic Review, 45, 515–528.

Gurley John G. – Shaw Edward S., (1967*) Financial Structure and Economic Development, Economic Development and Cultural Change,* 15(3), New York, s. 260–267

Guttentag, J. M., & Lindsay, R. (1968, Sep.–Oct.). *The uniqueness of commercial banks.* Journal of Political Economy, 76(5), 991–1014.

Gündoğan, M., & Çetiner, B. G. (2014). *Debt Based Monetary System*. CIE44 & IMSS'14 Proceedings, 14-16 October 2014, Istanbul/Turkey.

Gündoğan, M. (2016). *Sekiz Deniz Yaylası.* Nobel Yayınları, Genisşletilmiş 2. Baskı, Ankara

Hahn, A. C. (1920). *Volkswirtschaftliche Theorie des Bankkredits.* Tübingen: J.C.B. Mohr.

Hawtrey, R. G. (1919). *Currency and Credit*. Longmans, Green and Co.

Hilal Yıldız Bozkurt, (2013). *Zaman Serileri Analizi*, Ekin Kitapevi, Genişletilmiş 2. Baskı, Kocaeli.

Howe, R. H. (1915). *The Evolution of Banking; A study of the development of the credit system*. Chicago: C. H. Kerr & Company.

James, F. C. (1930). *The Economics of Money, Credit and Banking,* New York: Ronald Press Co.

Jayanatre J. & Strahan P. (1996), *"The Finance- Growth Nexus: Evidence from Bank branch Deregulation*", Oxford Journals, Qarterly Journal of Economics, Volume 111, ıssue 3, s.639–670.

Kashyap, A., Rajan, R., & Stein, J. (2002). *Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking*. Journal of Finance, 57, 33–73

Kaya, F. (2013*). Bankacılık giriş ve ilkeleri*. 2. Baskı, İstanbul: Beta Yayınevi

Keynes, J. M. (1930). *A Treatise onMoney*. London: Macmillan

Keynes, J. M. (1936). *The General Theory of Employment. Interest and Money*. London: Macmillan.

King R. - Levine R., (1993) *Finance and Growth: Schumpeter Might Be Right*, Policy Research Working Paper Series 1083, The World Bank, New York,

Lainà, P. (2015). *Proposals for full-reserve banking: a historical survey from David Ricardo to Martin Wolf*. Economic Thought, 4, 1-19.

Litan, R. E. (1987). *What should banks do?*. Brookings Inst Pr.

Lu C.& Shen C., (2012) *"Bank Lending and Economic Growth of Chinese Cities, China and World Economy"*, Volume 20, ıssue 2, , s.59-79.

MacLeod, H. D. (1856). *The Theory and Practice of Banking*, 2 vols., London: Longman, Greens and Co.

Matthews, K., & Thompson, J. (2005). *The Economics of Banking. Chichester*: John Wiley and Sons.

Mercan M. (2013). *Kredi Hacmindeki Değişimlerin Ekonomik Büyümeye Etkisi: Türkiye Ekonomisi İçin Sınır Testi Yaklaşımı*, Bankacılar Dergisi, Sayı 84,

Myers, S. C., & Rajan, R. G. (1998). *The paradox of liquidity.* The Quarterly Journal of Economics, 113(3), 733–771.

Offick, S., & Wohltmann, H. W. (2014). *Money and Credit in the New Keynesian Model*. Review of Economics, 65(3), 253-280.

Parasız, İ. (2005). *Para Banka Finansal Piyasalar*

Phillips, C. A. (1920). *Bank Credit*. New York: Macmillan

Qin X.- Ndiege B.*„(2013). "Role of Financial Development in Economic Growth: Evidence From Saving and Credits Cooprative Societies in Tanzania"*, İnternatioan Journal of Financial Research, Volume 4, No 2,s.115.

Rajan, R. G. (1998). *The past and future of commercial banking viewed through an incomplete contract lens*. Journal of Money, Credit and Banking, 30(3), 524–550

Rodriguez, C. A. (1993). *Money and credit under currency substitution*. Staff Papers, 40(2), 414-426.

Ryan-Collins, J., Greenham, T.,Werner, R. A., & Jackson, A. (2011). *Where does Money come from?* London: New Economics Foundation.

Samuelson, P. (1948). *Economics*. New York: McGraw-Hill

Schumpeter, J. A. (1912). *Die Theorie der wirtschaftlichen Entwicklung*. Leipzig: Duncker und Humblot.

Sims CA (1980) *Macroeconomics and reality*. Econometrica 48:1–48

Smith, Paul F (1966). *Concepts of money and commercial banks*, Journal of Finance, 21, 635-648.

Smith,Warren (1959, November), *Financial intermediaries and monetary controls*, Quarterly Journal of Economics, 73, 533-553.

Solomon, E. (1959). *"Financial institutions in the savings–investment process"*. Conference on Savings and Residential Financing (pp. 10–55). Chicago: U.S. Savings and Loan League (Proceedings).

Stein, J. C. (2014). *Banks as patient debt investors.* Philadelphia, Pennsylvania: American Economic Association/American Finance Association Joint Luncheon speech delivered on 3 January 2014.

Stiglitz, J. (1997). *Economics* (2nd ed.). New York: W. W. Norton.

Şıklar, İ. (2009). *Para Teorisi Ve Politikasi*. Anadolu Universitesi

Tarshis, L. (1962). *Money and Credit*. The American Economic Review, 52(3), 472-480.

Tobin, J. (1963). *Commercial banks as creators of, money',* Cowles Foundation Paper 205 reprinted. In D. Carson (Ed.), Banking and Monetary StudiesIrwin: Homewood

Tobin, J. (1969). *A general equilibrium approach to monetary theory.* Journal of Money, Credit and Banking, 1, 15–29.

Torun N., (2015) *Birim Kök Testlerinin Performanslarinin Karşilaştirilmasi*, Istanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Ekonometri Anabilim Dalı, Yüksek Lisans Tezi

Tunç H. (2013). *Ekonomik Göstergeler Işığında Banka Kredilerinin Büyüme Ve Kalkınmadaki Rolü: Tüketici Kredileri, Taşıt Kredileri, Konut Kredileri Ayrimi,* Doktora Tezi, Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü, İktisat Anabilimdalı

Tutar F. & Ünlüleblebici Y. (2014). *Türkiye'de Kobi Kredilerinin Ekonomik Büyümeye Etkisi (2006-2011),* Global Journal of Economics and Business Studies, Cilt:3, Sayı:5.

Uzunoğlu S. (1996), *Bankacılık,* Ekonomik Araştırmalar Merkezi Yayınları, Ankara

Werner, R. A. (1997). *'Towards a new monetary paradigm: A quantity theorem of disaggregated credit, with evidence from Japan'*, Kredit und Kapital, vol. 30, no. 2, 1997, pp. 276–309.

Werner, R. A. (2005). *New Paradign in Macroeconomics*. Palgrave.

Werner, R. A. (2016). *A lost century in economics: Three theories of banking and the conclusive evidence.* International Review of Financial Analysis, 46, 361-379.

Whittlesey, C. R. (1944). *Problems of our domestic money and banking system*, The American Economic Review, Vol. 34, No. 1, (Part 2, Supplement, Papers and Proceedings of the Fifty-sixth Annual Meeting of the American Economic Association) pp. 245–259.

Wicksell, K. (1898). *Geldzins und Güterpreise. Jena*: Fischer.

Withers, H. (1909). *The Meaning of Money*

Withers, H. (1916). *The Business of Finance*.

von Hayek, F. (1929). *Geldtheorie und Konjunkturtheorie*. Hölder-Pichler-Tempsky.

von Mises, L. (1912). *Theorie des Geldes und der Umlaufsmittel*. Leipzig: Duncker und Humblot.

Yılmaz C. (2014). *Banka Kredileri ve Büyüme İlişkisi,* Kültür Üniversitesi Üretim Ekonomisi Kongresin Mart 2014

Yorgov, I. (2012). *Money and Credit: A Sociological Approach–By Bruce Carruthers and Laura Ariovich*. *Political Studies Review*, *10*(3), 439-440.

APPENDIX A

Table A1: Unit Rood Test Results of Log(rGDP)

Phillips-Perron Unit Root Test on LOG_RGDP

Null Hypothesis: LOG_RGDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.792033	0.0014
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.006072
HAC corrected variance (Bartlett kernel)	0.007009

Phillips-Perron Test Equation
Dependent Variable: D(LOG_RGDP)
Method: Least Squares
Date: 01/08/18 Time: 07:20
Sample (adjusted): 2003Q2 2017Q3
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_RGDP(-1)	-0.559306	0.121035	-4.621019	0.0000
C	10.38707	2.244268	4.628264	0.0000
@TREND("2003Q1")	0.006372	0.001515	4.205718	0.0001

R-squared	0.279669	Mean dependent var	0.016722
Adjusted R-squared	0.253475	S.D. dependent var	0.092614
S.E. of regression	0.080020	Akaike info criterion	-2.162749
Sum squared resid	0.352174	Schwarz criterion	-2.056174
Log likelihood	65.71971	Hannan-Quinn criter.	-2.121236
F-statistic	10.67691	Durbin-Watson stat	1.720293
Prob(F-statistic)	0.000121		

Table A2: Unit Rood Test Results of Log(Inflation)

Augmented Dickey-Fuller Unit Root Test on LOG_INF

Null Hypothesis: LOG_INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.747493	0.0269
Test critical values:	1% level	-4.124265	
	5% level	-3.489228	
	10% level	-3.173114	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_INF)
Method: Least Squares
Date: 01/08/18 Time: 07:23
Sample (adjusted): 2003Q2 2017Q3
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_INF(-1)	-0.406513	0.108476	-3.747493	0.0004
C	1.879450	0.496175	3.787878	0.0004
@TREND("2003Q1")	0.008044	0.002148	3.744330	0.0004

R-squared	0.203404	Mean dependent var	0.020049
Adjusted R-squared	0.174437	S.D. dependent var	0.011755
S.E. of regression	0.010681	Akaike info criterion	-6.190371
Sum squared resid	0.006275	Schwarz criterion	-6.083796
Log likelihood	182.5208	Hannan-Quinn criter.	-6.148858
F-statistic	7.021886	Durbin-Watson stat	1.851554
Prob(F-statistic)	0.001923		

Table A3: Unit Rood Test Results of Log(Total Credit)

Augmented Dickey-Fuller Unit Root Test on LOG_TOTAL

Null Hypothesis: LOG_TOTAL has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.076471	0.0022
Test critical values:	1% level	-3.550396	
	5% level	-2.913549	
	10% level	-2.594521	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_TOTAL)
Method: Least Squares
Date: 01/07/18 Time: 16:51
Sample (adjusted): 2003Q3 2017Q3
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_TOTAL(-1)	-0.020262	0.004971	-4.076471	0.0002
D(LOG_TOTAL(-1))	0.127317	0.120032	1.060693	0.2936
C	0.459259	0.102367	4.486414	0.0000

R-squared	0.324158	Mean dependent var	0.064453
Adjusted R-squared	0.299127	S.D. dependent var	0.040969
S.E. of regression	0.034299	Akaike info criterion	-3.856221
Sum squared resid	0.063526	Schwarz criterion	-3.748692
Log likelihood	112.9023	Hannan-Quinn criter.	-3.814431
F-statistic	12.95016	Durbin-Watson stat	2.047829
Prob(F-statistic)	0.000025		

Table A4: Unit Rood Test Results of Log(Commercial Credit)

Augmented Dickey-Fuller Unit Root Test on LOG_COM

Null Hypothesis: LOG_COM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.877466	0.0202
Test critical values:	1% level	-4.148465	
	5% level	-3.500495	
	10% level	-3.179617	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_COM)
Method: Least Squares
Date: 01/13/18 Time: 19:33
Sample (adjusted): 2005Q1 2017Q3
Included observations: 51 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_COM(-1)	-0.239897	0.061869	-3.877466	0.0004
D(LOG_COM(-1))	0.152195	0.130777	1.163775	0.2512
D(LOG_COM(-2))	0.211503	0.132017	1.602091	0.1168
D(LOG_COM(-3))	0.009718	0.122192	0.079531	0.9370
D(LOG_COM(-4))	-0.019635	0.118657	-0.165481	0.8694
D(LOG_COM(-5))	-0.124162	0.116887	-1.062233	0.2943
D(LOG_COM(-6))	-0.124522	0.117727	-1.057713	0.2964
D(LOG_COM(-7))	0.034449	0.110119	0.312833	0.7560
C	4.361807	1.098843	3.969454	0.0003
@TREND("2003Q1")	0.012832	0.003575	3.589152	0.0009

R-squared	0.405242	Mean dependent var	0.059885
Adjusted R-squared	0.274685	S.D. dependent var	0.037033
S.E. of regression	0.031540	Akaike info criterion	-3.901237
Sum squared resid	0.040785	Schwarz criterion	-3.522448
Log likelihood	109.4816	Hannan-Quinn criter.	-3.756491
F-statistic	3.103955	Durbin-Watson stat	2.000268
Prob(F-statistic)	0.006182		

Table A5: Unit Rood Test Results of Log(Customer Credit)

Augmented Dickey-Fuller Unit Root Test on LOG_CUSTOMER

Null Hypothesis: LOG_CUSTOMER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.090616	0.0001
Test critical values:	1% level	-3.550396	
	5% level	-2.913549	
	10% level	-2.594521	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG_CUSTOMER)
Method: Least Squares
Date: 01/07/18 Time: 16:50
Sample (adjusted): 2003Q3 2017Q3
Included observations: 57 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_CUSTOMER(-1)	-0.041339	0.008121	-5.090616	0.0000
D(LOG_CUSTOMER(-1)	0.329203	0.111804	2.944463	0.0048
C	0.812861	0.156193	5.204219	0.0000

R-squared	0.720020	Mean dependent var	0.086176
Adjusted R-squared	0.709651	S.D. dependent var	0.090419
S.E. of regression	0.048721	Akaike info criterion	-3.154198
Sum squared resid	0.128184	Schwarz criterion	-3.046669
Log likelihood	92.89465	Hannan-Quinn criter.	-3.112409
F-statistic	69.43561	Durbin-Watson stat	1.741690
Prob(F-statistic)	0.000000		

Table A6: Unit Rood Test Results of Log(Credit Card)

Phillips-Perron Unit Root Test on LOG_CARD

Null Hypothesis: LOG_CARD has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.481688	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001539
HAC corrected variance (Bartlett kernel)	0.002318

Phillips-Perron Test Equation
Dependent Variable: D(LOG_CARD)
Method: Least Squares
Date: 01/07/18 Time: 16:55
Sample (adjusted): 2003Q2 2017Q3
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_CARD(-1)	-0.040397	0.006085	-6.638738	0.0000
C	0.759204	0.106224	7.147183	0.0000

R-squared	0.440408	Mean dependent var	0.054869
Adjusted R-squared	0.430415	S.D. dependent var	0.052907
S.E. of regression	0.039929	Akaike info criterion	-3.569533
Sum squared resid	0.089284	Schwarz criterion	-3.498484
Log likelihood	105.5165	Hannan-Quinn criter.	-3.541858
F-statistic	44.07284	Durbin-Watson stat	1.551082
Prob(F-statistic)	0.000000		

APPENDIX B

Table B1: Lag order Selection Criteria for VAR Model 2

VAR Lag Order Selection Criteria
Endogenous variables: LOG_RGDP LOG_COM
Exogenous variables: C
Date: 01/14/18 Time: 12:17
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-10.71821	NA	0.005645	0.498753	0.574511	0.527703
1	157.4485	316.5492	9.03e-06	-5.939158	-5.711884	-5.852310
2	163.5247	10.96099	8.33e-06	-6.020577	-5.641788	-5.875831
3	177.9929	24.96476	5.54e-06	-6.431096	-5.900791	-6.228450
4	187.3421	15.39866	4.51e-06	-6.640868	-5.959047	-6.380324
5	199.0003	18.28737	3.36e-06	-6.941189	-6.107853*	-6.622747*
6	201.3592	3.515154	3.62e-06	-6.876831	-5.891978	-6.500490
7	205.6655	6.079514	3.62e-06	-6.888843	-5.752475	-6.454604
8	213.7663	10.80109*	3.14e-06*	-7.049660*	-5.761776	-6.557521

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B2: Lag order Selection Criteria for VAR Model 3

VAR Lag Order Selection Criteria
Endogenous variables: LOG_RGDP LOG_CUSTOMER
Exogenous variables: C
Date: 01/14/18 Time: 15:37
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-20.22274	NA	0.008195	0.871480	0.947238	0.900429
1	152.0026	324.1889	1.12e-05	-5.725593	-5.498319	-5.638745
2	160.6747	15.64368	9.32e-06	-5.908810	-5.530021	-5.764063
3	175.6438	25.82909	6.08e-06	-6.338972	-5.808667	-6.136327
4	183.0483	12.19573	5.34e-06	-6.472484	-5.790663	-6.211940
5	191.5036	13.26313*	4.51e-06*	-6.647199*	-5.813863*	-6.328757*
6	193.0314	2.276720	5.02e-06	-6.550250	-5.565398	-6.173909
7	199.0162	8.449118	4.70e-06	-6.628085	-5.491717	-6.193845
8	202.8603	5.125541	4.81e-06	-6.621974	-5.334090	-6.129835

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B3: Lag order Selection Criteria for VAR Model 4

VAR Lag Order Selection Criteria
Endogenous variables: LOG_RGDP LOG_CARD
Exogenous variables: C
Date: 01/14/18 Time: 15:59
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-6.311843	NA	0.004749	0.325955	0.401713	0.354904
1	161.6005	316.0702	7.68e-06	-6.101979	-5.874705	-6.015131
2	162.7773	2.122861	8.58e-06	-5.991265	-5.612476	-5.846519
3	191.0531	48.78972	3.32e-06	-6.943260	-6.412955	-6.740615
4	201.7189	17.56717	2.57e-06	-7.204663	-6.522842	-6.944119
5	211.7623	15.75435	2.04e-06	-7.441659	-6.608323*	-7.123217
6	212.9161	1.719412	2.30e-06	-7.330044	-6.345192	-6.953703
7	217.6110	6.628011	2.27e-06	-7.357293	-6.220925	-6.923053
8	232.8655	20.33937*	1.48e-06*	-7.798647*	-6.510763	-7.306508*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B4: Lag order Selection Criteria for VAR Model 5

VAR Lag Order Selection Criteria
Endogenous variables: LOG_INF LOG_TOTAL
Exogenous variables: C
Date: 01/14/18 Time: 16:22
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	48.07888	NA	0.000563	-1.807015	-1.731257	-1.778065
1	263.6293	405.7420	1.40e-07	-10.10311	-9.875836*	-10.01626
2	266.7058	5.549852	1.46e-07	-10.06690	-9.688106	-9.922149
3	272.1122	9.328701	1.38e-07	-10.12205	-9.591744	-9.919404
4	280.0868	13.13464	1.19e-07*	-10.27792*	-9.596095	-10.01737*
5	280.8059	1.127948	1.36e-07	-10.14925	-9.315915	-9.830809
6	284.0814	4.881058	1.41e-07	-10.12084	-9.135986	-9.744497
7	291.7460	10.82072*	1.24e-07	-10.26455	-9.128183	-9.830311
8	293.9879	2.989092	1.35e-07	-10.19560	-8.907719	-9.703464

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B5: Lag order Selection Criteria for VAR Model 6

VAR Lag Order Selection Criteria
Endogenous variables: LOG_INF LOG_COM
Exogenous variables: C
Date: 01/14/18 Time: 16:55
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	60.49393	NA	0.000346	-2.293880	-2.218122	-2.264930
1	259.4725	374.5479	1.65e-07	-9.940099	-9.712825*	-9.853251*
2	261.6999	4.017996	1.77e-07	-9.870584	-9.491794	-9.725837
3	266.4531	8.201569	1.73e-07	-9.900120	-9.369815	-9.697475
4	273.3806	11.41003*	1.54e-07*	-10.01492*	-9.333104	-9.754381
5	273.8622	0.755485	1.78e-07	-9.876949	-9.043613	-9.558507
6	278.0779	6.282218	1.79e-07	-9.885408	-8.900556	-9.509067
7	284.6476	9.274817	1.64e-07	-9.986179	-8.849811	-9.551939
8	287.2969	3.532512	1.75e-07	-9.933214	-8.645330	-9.441075

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B6: Lag order Selection Criteria for VAR Model 7

VAR Lag Order Selection Criteria
Endogenous variables: LOG_INF LOG_CUSTOMER
Exogenous variables: C
Date: 01/14/18 Time: 17:25
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	6.556818	NA	0.002867	-0.178699	-0.102941	-0.149749
1	256.7172	470.8901	1.84e-07	-9.832046	-9.604773*	-9.745198
2	261.7567	9.090899	1.77e-07	-9.872812	-9.494022	-9.728065
3	266.8122	8.723223	1.70e-07	-9.914204	-9.383899	-9.711559
4	275.7332	14.69340*	1.41e-07*	-10.10718*	-9.425363	-9.846640*
5	277.4694	2.723407	1.55e-07	-10.01841	-9.185070	-9.699964
6	278.6739	1.795007	1.74e-07	-9.908781	-8.923929	-9.532440
7	284.8535	8.724172	1.62e-07	-9.994256	-8.857888	-9.560016
8	287.3902	3.382193	1.75e-07	-9.936870	-8.648986	-9.444731

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table B7: Lag order Selection Criteria for VAR Model 8

VAR Lag Order Selection Criteria
Endogenous variables: LOG_INF LOG_CARD
Exogenous variables: C
Date: 01/14/18 Time: 17:24
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	23.31021	NA	0.001486	-0.835694	-0.759937	-0.806745
1	256.7883	439.4882	1.84e-07	-9.834835	-9.607562	-9.747987
2	259.8071	5.445735	1.91e-07	-9.796358	-9.417569	-9.651611
3	277.6636	30.81121	1.11e-07	-10.33975	-9.809445*	-10.13710
4	282.8858	8.601142	1.06e-07	-10.38768	-9.705856	-10.12713
5	287.1004	6.611228	1.06e-07	-10.39609	-9.562758	-10.07765
6	292.4616	7.989269	1.02e-07	-10.44948	-9.464623	-10.07313
7	301.1523	12.26921*	8.56e-08	-10.63342	-9.497056	-10.19918
8	307.9171	9.019723	7.81e-08*	-10.74185*	-9.453964	-10.24971*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

APPENDIX C

Table C1: Results of Coefficient Diagnostic Test for Coefficients of rGDP on rGDP in VAR Model 1

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.583883	2	0.7468

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.096167	0.130328
C(3)	0.087895	0.129815

Restrictions are linear in coefficients.

Table C2: Results of Coefficient Diagnostic Test for Coefficients of Total Credit on Rgdp in VAR Model 1

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	9.221399	4	0.0558

Null Hypothesis: C(6)=C(7)=C(8)=C(9)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	0.417926	0.208797
C(7)	-0.229695	0.289617
C(8)	-0.235210	0.282603
C(9)	-0.287745	0.276255

Restrictions are linear in coefficients.

Table C3: Results of Coefficient Diagnostic Test for Coefficients of rGDP on Total Credit in VAR Model 1

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	12.27320	5	0.0312

Null Hypothesis: C(12)=C(13)=C(14)=C(15)=C(16)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.043250	0.091376
C(13)	0.051582	0.089989
C(14)	0.149170	0.089635
C(15)	-0.146079	0.090416
C(16)	0.024327	0.094579

Restrictions are linear in coefficients.

Table C4: Results of Coefficient Diagnostic Test for Coefficients of Total Credit on Total Credit in VAR Model 1

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.636804	3	0.8880

Null Hypothesis: C(18)=C(20)=C(22)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(18)	0.098452	0.199975
C(20)	-0.136163	0.190749
C(22)	-0.037168	1.136728

Restrictions are linear in coefficients.

Table C5: Results of Coefficient Diagnostic Test for Coefficients of rGDP on Rgdp in VAR Model 2

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.627679	2	0.7306

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.100614	0.128080
C(3)	0.064212	0.129096

Restrictions are linear in coefficients.

Table C6: Results of Coefficient Diagnostic Test for Coefficients of Commercial Credit on rGDP in VAR Model 2

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	9.024430	3	0.0290

Null Hypothesis: C(7)=C(8)=C(9)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(7)	-0.218816	0.246102
C(8)	-0.166091	0.245566
C(9)	-0.311317	0.234685

Restrictions are linear in coefficients.

Table C7: Results of Coefficient Diagnostic Test for Coefficients of rGDP on Commercial Credit in VAR Model 2

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	9.840907	5	0.0799

Null Hypothesis: C(12)=C(13)=C(14)=C(15)=C(16)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.044997	0.102598
C(13)	0.078113	0.101588
C(14)	0.115102	0.102394
C(15)	-0.152744	0.102732
C(16)	0.023853	0.106544

Restrictions are linear in coefficients.

Table C8: Results of Coefficient Diagnostic Test for Coefficients of Com. Credit on Commercial Credit in VAR Model 2

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	9.621419	3	0.0221

Null Hypothesis: C(18)=C(19)=C(20)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(18)	0.077657	0.195199
C(19)	-0.334741	0.194774
C(20)	-0.206200	0.186144

Restrictions are linear in coefficients.

Table C9: Results of Coefficient Diagnostic Test for Coefficients of rGDP on rGDP in VAR Model 3

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.535124	2	0.7652

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.094558	0.136385
C(3)	0.055045	0.137613

Restrictions are linear in coefficients.

Table C10: Results of Coefficient Diagnostic Test for Coefficients of Customer Credit on rGDP in VAR Model 3

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	5.518004	5	0.3560

Null Hypothesis: C(6)=C(7)=C(8)=C(9)=C(10)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	0.298540	0.181975
C(7)	-0.173695	0.271403
C(8)	-0.079826	0.248410
C(9)	-0.025947	0.237360
C(10)	0.013590	0.132845

Restrictions are linear in coefficients.

Table C11: Results of Coefficient Diagnostic Test for Coefficients of rGDP on Customer Credit in VAR Model 3

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	10.62371	5	0.0594

Null Hypothesis: C(12)=C(13)=C(14)=C(15)=C(16)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(12)	-0.011872	0.111103
C(13)	0.098931	0.113529
C(14)	0.129217	0.114552
C(15)	-0.134046	0.114349
C(16)	-0.003058	0.117830

Restrictions are linear in coefficients.

Table C12: Results of Coefficient Diagnostic Test for Coefficients of Customer Credit on Customer Credit in VAR Model 3

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	14.22692	4	0.0066

Null Hypothesis: C(18)=C(19)=C(20)=C(21)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(18)	-0.285228	0.225921
C(19)	-0.166209	0.206781
C(20)	-0.044485	0.197583
C(21)	0.164977	0.110583

Restrictions are linear in coefficients.

Table C13: Results of Coefficient Diagnostic Test for Coefficients of rGDP on rGDP in VAR Model 4

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.559868	3	0.9056

Null Hypothesis: C(2)=C(3)=C(6)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.134006	0.182862
C(3)	0.035170	0.174063
C(6)	0.064772	0.188141

Restrictions are linear in coefficients.

Table C14: Results of Coefficient Diagnostic Test for Coefficients of Credit Card on rGDP in VAR Model 4

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	4.072277	6	0.6669

Null Hypothesis: C(7)=C(8)=C(9)=C(10)=C(11)=C(12)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(7)	0.223478	0.273806
C(8)	-0.381280	0.473431
C(9)	-0.032982	0.429178
C(10)	0.200146	0.419038
C(11)	-0.204565	0.443286
C(12)	0.200462	0.251471

Restrictions are linear in coefficients.

Table C15: Results of Coefficient Diagnostic Test for Coefficients of rGDP on Credit Card in VAR Model 4

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	5.866428	5	0.3194

Null Hypothesis: C(13)=C(14)=C(15)=C(17)=C(18)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(13)	1.195886	1.623526
C(14)	-0.011949	0.091945
C(15)	-0.138395	0.101425
C(17)	-0.030863	0.106535
C(18)	-0.035773	0.124507

Restrictions are linear in coefficients.

Table C16: Results of Coefficient Diagnostic Test for Coefficients of Credit Card on Credit Card in VAR Model 4

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	105.8293	3	0.0000

Null Hypothesis: C(20)=C(24)=C(25)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(20)	1.413076	0.151868
C(24)	-0.177495	0.245871
C(25)	0.093272	0.139480

Restrictions are linear in coefficients.

Table C17: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Inflation in VAR Model 5

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	1.024375	2	0.5992

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.164694	0.166020
C(3)	0.072379	0.170707

Restrictions are linear in coefficients.

Table C18: Results of Coefficient Diagnostic Test for Coefficients of Total Credit on Inflation in VAR Model 5

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	5.611845	4	0.2301

Null Hypothesis: C(5)=C(6)=C(7)=C(8)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(5)	0.036739	0.045891
C(6)	0.058973	0.062907
C(7)	-0.078451	0.061463
C(8)	-0.004822	0.039799

Restrictions are linear in coefficients.

Table C19: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Total Credit in VAR Model 5

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	1.457272	2	0.4826

Null Hypothesis: C(10)=C(11)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(10)	-0.202663	0.410008
C(11)	0.576844	0.503176

Restrictions are linear in coefficients.

Table C20: Results of Coefficient Diagnostic Test for Coefficients of Total Credit on Total Credit in VAR Model 5

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	3.554927	3	0.3137

Null Hypothesis: C(15)=C(16)=C(17)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(15)	0.027728	0.190660
C(16)	-0.163391	0.186283
C(17)	-0.005705	0.120622

Restrictions are linear in coefficients.

Table C21: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Inflation in VAR Model 6

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	17.28635	6	0.0083

Null Hypothesis: C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.231556	0.188925
C(3)	-0.021167	0.193669
C(4)	0.341418	0.183040
C(5)	-0.104970	0.199476
C(6)	-0.033266	0.198920
C(7)	0.268050	0.170196

Restrictions are linear in coefficients.

Table C22: Results of Coefficient Diagnostic Test for Coefficients of Commercial Credit on Inflation in VAR Model 6

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	7.313531	7	0.3970

Null Hypothesis: C(8)=C(9)=C(10)=C(11)=C(12)=C(13)=C(14)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	0.014199	0.047646
C(9)	0.062535	0.068302
C(10)	-0.058260	0.064165
C(11)	0.026844	0.059971
C(12)	-0.094709	0.057834
C(13)	0.104905	0.058344
C(14)	-0.034871	0.040520

Restrictions are linear in coefficients.

Table C23: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Commercial Credit in VAR Model 6

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	7.752028	6	0.2568

Null Hypothesis: C(16)=C(17)=C(18)=C(19)=C(20)=C(22)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(16)	0.008981	0.503864
C(17)	0.047865	0.594204
C(18)	-0.549755	0.609126
C(19)	1.113315	0.575694
C(20)	-0.524065	0.627389
C(22)	-0.968361	0.535298

Restrictions are linear in coefficients.

Table C24: Results of Coefficient Diagnostic Test for Coefficients of Commercial Credit on Commercial Credit in VAR Model 6

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	7.944962	6	0.2422

Null Hypothesis: C(24)=C(25)=C(26)=C(27)=C(28)=C(29)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(24)	-0.271488	0.214824
C(25)	0.108221	0.201812
C(26)	-0.267121	0.188622
C(27)	0.022757	0.181897
C(28)	0.072959	0.183502
C(29)	0.001559	0.127444

Restrictions are linear in coefficients.

Table C25: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Inflation in VAR Model 7

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	0.785414	2	0.6752

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.151044	0.170457
C(3)	0.093563	0.175250

Restrictions are linear in coefficients.

Table C26: Results of Coefficient Diagnostic Test for Coefficients of Customer Credit on Inflation in VAR Model 7

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	2.438233	4	0.6557

Null Hypothesis: C(5)=C(6)=C(7)=C(8)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(5)	0.006289	0.036115
C(6)	0.019283	0.055206
C(7)	0.008323	0.052837
C(8)	-0.028082	0.028473

Restrictions are linear in coefficients.

Table C27: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Customer Credit in VAR Model 7

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	1.339194	2	0.5119

Null Hypothesis: C(10)=C(11)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(10)	-0.021402	0.483161
C(11)	0.530862	0.602164

Restrictions are linear in coefficients.

Table C28: Results of Coefficient Diagnostic Test for Coefficients of Customer Credit on Customer Credit in VAR Model 7

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	12.79033	3	0.0051

Null Hypothesis: C(15)=C(16)=C(17)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(15)	-0.325717	0.195024
C(16)	-0.150681	0.186654
C(17)	0.159777	0.100586

Restrictions are linear in coefficients.

Table C29: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Inflation in VAR Model 8

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	9.206906	4	0.0561

Null Hypothesis: C(2)=C(3)=C(4)=C(5)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-0.282970	0.199973
C(3)	0.251736	0.186581
C(4)	0.064788	0.184318
C(5)	0.086581	0.144979

Restrictions are linear in coefficients.

Table C30: Results of Coefficient Diagnostic Test for Coefficients of Credit Card on Inflation in VAR Model 8

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	10.31295	3	0.0161

Null Hypothesis: C(6)=C(9)=C(10)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(6)	-0.053412	0.044357
C(9)	0.014425	0.076409
C(10)	0.057175	0.043945

Restrictions are linear in coefficients.

Table C31: Results of Coefficient Diagnostic Test for Coefficients of Inflation on Credit Card in VAR Model 8

Wald Test:
System: Untitled

Test Statistic	Value	df	Probability
Chi-square	2.722494	5	0.7427

Null Hypothesis: C(10)=C(11)=C(12)=C(13)=C(14)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(10)	0.057175	0.043945
C(11)	0.052537	0.066169
C(12)	-0.023253	0.476876
C(13)	0.326393	0.628639
C(14)	-0.511461	0.586540

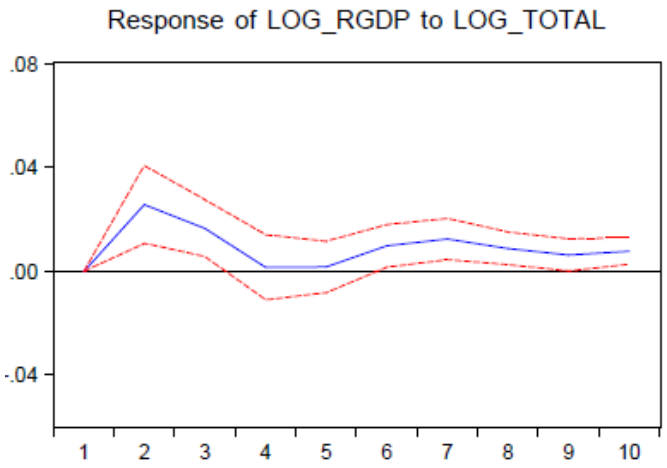
Restrictions are linear in coefficients.

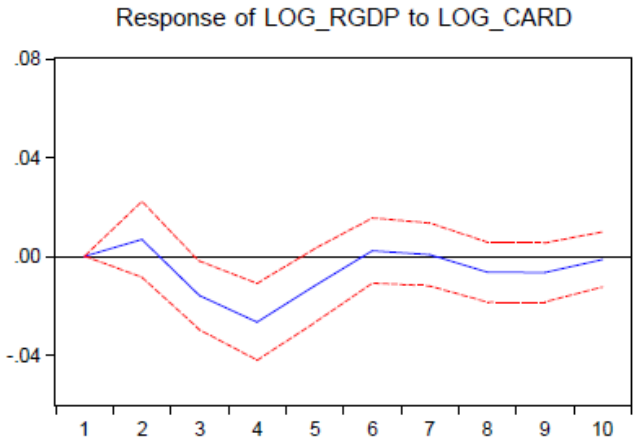
APPENDIX D

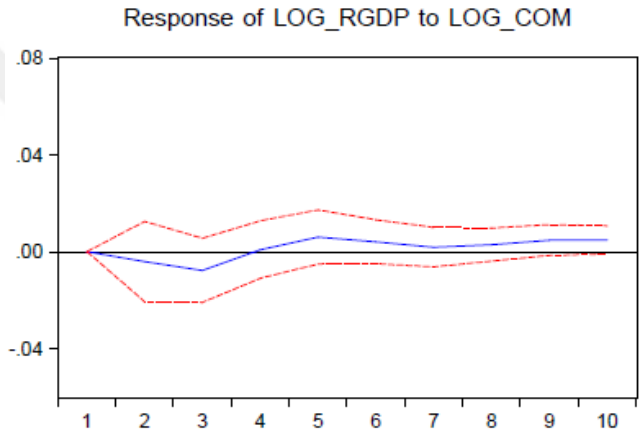
VAR Lag Order Selection Criteria
Endogenous variables: LOG_RGDP LOG_TOTAL LOG_CARD LOG_COM LOG_CUSTOMER
Exogenous variables: C
Date: 01/26/18 Time: 07:20
Sample: 2003Q1 2017Q4
Included observations: 51

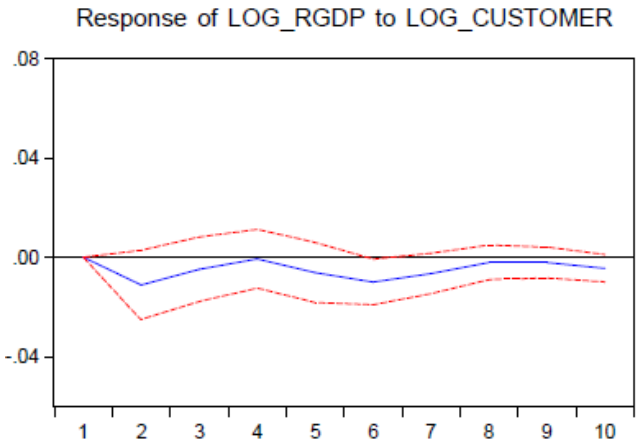
Lag	LogL	LR	FPE	AIC	SC	HQ
0	319.0198	NA	3.09e-12	-12.31450	-12.12511	-12.24213
1	713.9005	696.8483	1.56e-18	-26.81963	-25.68326	-26.38539
2	761.7780	75.10204	6.54e-19	-27.71679	-25.63344	-26.92068
3	792.7830	42.55588	5.57e-19	-27.95228	-24.92196	-26.79430
4	848.5947	65.66086	1.93e-19	-29.16058	-25.18329	-27.64074
5	887.7549	38.39235	1.45e-19	-29.71588	-24.79162	-27.83417
6	956.0385	53.55569	4.16e-20	-31.41327	-25.54204	-29.16970
7	1031.803	44.56744	1.21e-20	-33.40404	-26.58584	-30.79860
8	1147.520	45.37917*	1.30e-21*	-36.96157*	-29.19639*	-33.99426*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion




Response of LOG_RGDP to LOG_CARD
.08
.04
.00
-.04
1
2
3
4
5
6
7
8
9
10


Response of LOG_RGDP to LOG_COM
.08
.04
.00
-.04
1
2
3
4
5
6
7
8
9
10


Response of LOG_RGDP to LOG_CUSTOMER
.08
.04
.00
-.04
1
2
3
4
5
6
7
8
9
10

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/26/18 Time: 07:24
Sample: 2003Q1 2017Q4
Included observations: 57

Dependent variable: LOG_RGDP

Excluded	Chi-sq	df	Prob.
LOG_TOTAL	19.16777	2	0.0001
LOG_CARD	1.194968	2	0.5502
LOG_COM	21.07256	2	0.0000
LOG_CUST...	15.54829	2	0.0004
All	92.28189	8	0.0000

Dependent variable: LOG_TOTAL

Excluded	Chi-sq	df	Prob.
LOG_RGDP	1.850705	2	0.3964
LOG_CARD	13.84714	2	0.0010
LOG_COM	14.13557	2	0.0009
LOG_CUST...	7.732973	2	0.0209
All	26.35557	8	0.0009

Dependent variable: LOG_CARD

Excluded	Chi-sq	df	Prob.
LOG_RGDP	2.743394	2	0.2537
LOG_TOTAL	0.845362	2	0.6553
LOG_COM	1.150237	2	0.5626
LOG_CUST...	1.527675	2	0.4659
All	8.404635	8	0.3950

Dependent variable: LOG_COM

Excluded	Chi-sq	df	Prob.
LOG_RGDP	2.408652	2	0.2999
LOG_TOTAL	14.49088	2	0.0007
LOG_CARD	14.62337	2	0.0007
LOG_CUST...	9.425981	2	0.0090
All	25.31242	8	0.0014

Dependent variable: LOG_CUSTOMER

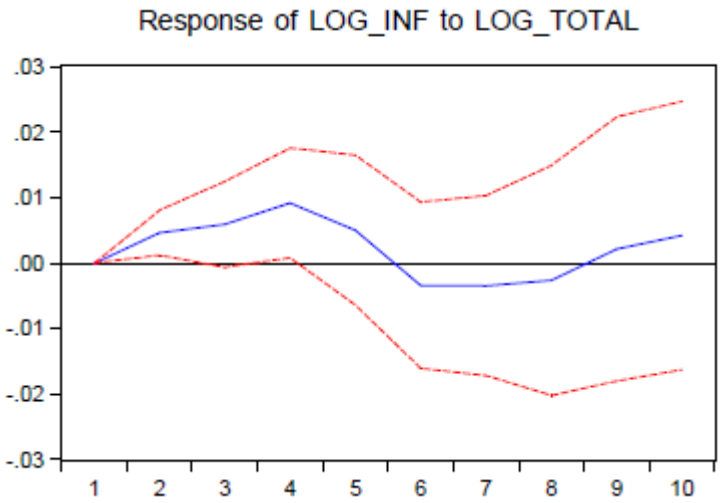
Excluded	Chi-sq	df	Prob.
LOG_RGDP	3.076374	2	0.2148
LOG_TOTAL	12.41506	2	0.0020
LOG_CARD	11.57244	2	0.0031
LOG_COM	12.58752	2	0.0018
All	39.03675	8	0.0000

APPENDIX E

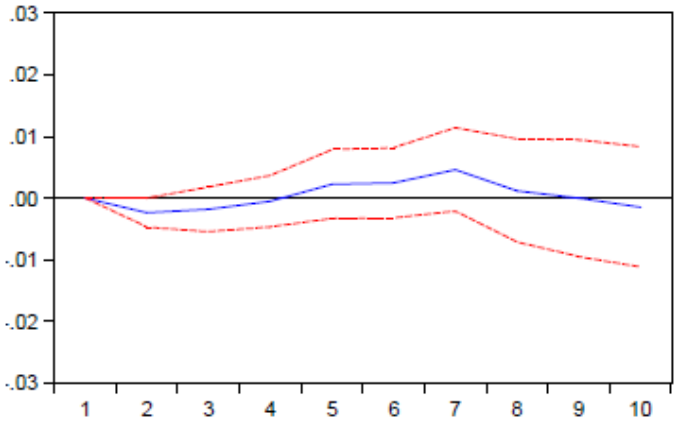
VAR Lag Order Selection Criteria
Endogenous variables: LOG_INF LOG_TOTAL LOG_CARD LOG_COM LOG_CUSTOMER
Exogenous variables: C
Date: 01/26/18 Time: 07:27
Sample: 2003Q1 2017Q4
Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	394.2516	NA	1.62e-13	-15.26477	-15.07537	-15.19239
1	807.4149	729.1119	3.98e-20	-30.48686	-29.35049	-30.05262
2	832.4057	39.20117	4.10e-20	-30.48650	-28.40316	-29.69039
3	875.8028	59.56466	2.15e-20	-31.20795	-28.17764	-30.04998
4	913.2133	44.01231	1.53e-20	-31.69464	-27.71735	-30.17480
5	948.8241	34.91255	1.32e-20	-32.11075	-27.18649	-30.22904
6	1010.697	48.52814	4.88e-21	-33.55676	-27.68553	-31.31319
7	1097.327	50.95874*	9.25e-22	-35.97362	-29.15541	-33.36818
8	1174.171	30.13466	4.56e-22*	-38.00669*	-30.24151*	-35.03939*

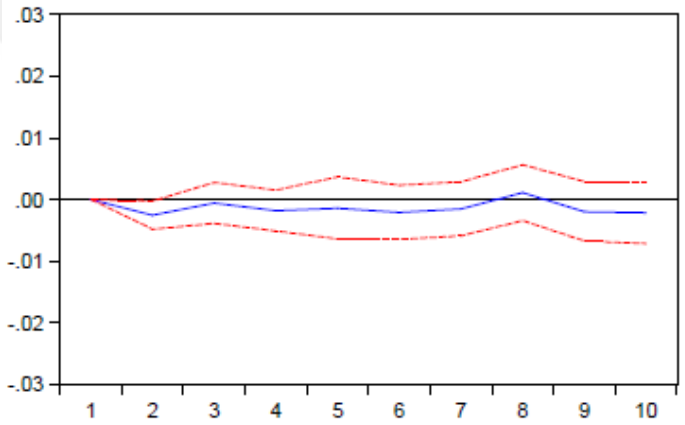
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion



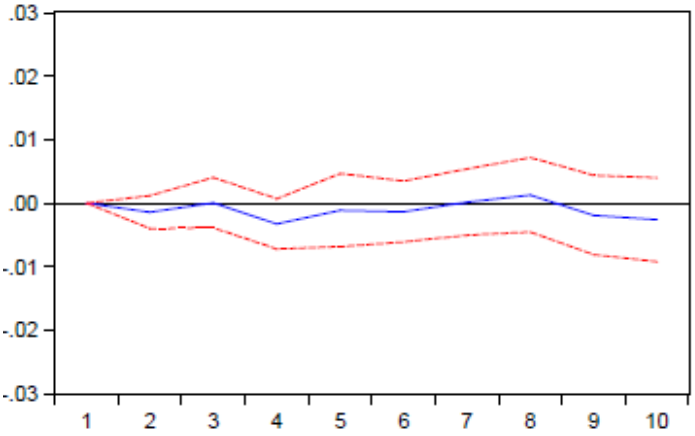
Response of LOG_INF to LOG_CARD



Response of LOG_INF to LOG_COM



Response of LOG_INF to LOG_CUSTOMER



VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/26/18 Time: 07:30
Sample: 2003Q1 2017Q4
Included observations: 51

Dependent variable: LOG_INF

Excluded	Chi-sq	df	Prob.
LOG_TOTAL	21.59472	8	0.0057
LOG_CARD	17.81001	8	0.0227
LOG_COM	24.99505	8	0.0016
LOG_CUST...	22.89535	8	0.0035
All	190.8578	32	0.0000

Dependent variable: LOG_TOTAL

Excluded	Chi-sq	df	Prob.
LOG_INF	3.399623	8	0.9068
LOG_CARD	4.675021	8	0.7917
LOG_COM	5.904848	8	0.6579
LOG_CUST...	5.379896	8	0.7163
All	68.18368	32	0.0002

Dependent variable: LOG_CARD

Excluded	Chi-sq	df	Prob.
LOG_INF	24.16617	8	0.0021
LOG_TOTAL	30.54705	8	0.0002
LOG_COM	31.71698	8	0.0001
LOG_CUST...	35.17901	8	0.0000
All	193.7461	32	0.0000

Dependent variable: LOG_COM

Excluded	Chi-sq	df	Prob.
LOG_INF	3.108451	8	0.9274
LOG_TOTAL	6.457341	8	0.5961
LOG_CARD	4.638735	8	0.7954
LOG_CUST...	5.697964	8	0.6810
All	54.82112	32	0.0073

Dependent variable: LOG_CUSTOMER

Excluded	Chi-sq	df	Prob.
LOG_INF	7.688315	8	0.4645
LOG_TOTAL	9.840507	8	0.2764
LOG_CARD	10.69030	8	0.2199
LOG_COM	11.41010	8	0.1795
All	144.7876	32	0.0000