DID CREDIT CRUNCH CAUSE A COLLAPSE IN PRIVATE INVESTMENT?: TURKEY CASE

Birgül CAMBAZOĞLU
Gedik University,
Gedik Vocational School of Higher Education, Seyhli/Pendik, Istanbul, Turkey
E-mail: bcambazoglu@gedikmyo.edu.tr

Sevcan GÜNEŞ
Pamukkale University, Faculty of Economics and Administrative Sciences, Pamukkale University Denizli, Turkey
E-mail: sgunes@pau.edu.tr

Abstract

The economists have focused on credit crunch since 1990's. The economists are not in consensus as to what constitutes the credit crunch. The differences in definitions come from the causes of credit contraction. Credit crunch is generally accepted as an enormous decline period in credit supply. Although the credit crunch is seen as a supply phenomenon, some economists define it as a demand issue. Investment declines significantly as result of an increase in credit rationing. The purpose of this study is to investigate the dependence of private investment on money and credit supply in Turkey. In other words, we want to quantify the effect of credit contraction in the banking sector on private fixed investment.

VAR model is used to identify the existence of credit crunch through four economic variables: Private fixed investment, money stock (M2), bank loans to private sector and interest rate of commercial loans for the period ranging from 2003:01 to 2010:08. According to results of this study, it can be said that the credit crunch that we dealt with as a supply phenomenon leads to an investment collapse (slump) in Turkey.

The paper proceeds as follows: Section I provides theoretical background of credit channels and credit crunch. Section II summarizes recent empirical studies. Section III describes variables and discusses the empirical findings of the model. Section IV provides concluding remarks.

Keywords: Credit Crunch, Investment Slump, Turkey, VAR

JEL Classification Code: E51; E52

1.INTRODUCTION

1.1.Credit Crunch

The effects of output level of monetary channels on real variables such as employment have been the subject of numerous researches. The effects of Central Banks' open market operations (OMO) in the market by selling or buying bonds on variables other than the interest rates are also discussed. In other words, the credit channel extends traditional money channel of monetary transmission mechanism by affecting the investment decisions of individuals and companies (Hubbard, 1994: 7).

It is observed that the changes in economic variables which are results of business cycles are not generally caused by large amount interest rate changes or by the changes in the amount of money. For this reason, some other factors that affect real economy have been investigated. Some economists have analyzed the effects of financial markets on total demand changes with micro-analysis. Bernanke, Gertler and Gilchrist (1996) have named the exaggeration of the effects in initial shocks in total demand due to the financial conditions of the market as "financial accelerator".

For many companies, banks are the only source for funding of investment projects. These firms that are rather small and medium-scaled cannot finance their projects by issuing securities in financial markets. They usually borrow funds at loanable funds market from financial institutions and often through banks. Therefore, changes in credit supply directly affect the investment projects and budget constraints of firms and thus their spending decisions (Saarenheime, 1995:7). The interaction between net investments and wealth was examined by Gertler and Hubbard (1988), Sharpe (1994), Mishkin (1977, 1978) and by many other empirical studies and also, Bernanke (1991) showed in his study that credit supply had an important role in the determination of potential output level (Hubbard, 1994: 12). In cases where the financial system is bank dominated and high leverage, monetary shocks make financial system more vulnerable against crisis. Under such circumstances, the credit channel of transmission mechanism is likely to lead to a credit crunch.

Especially after 1990, economists focused on the concept of credit crunch. However, economists are not able to have a general judgment for the reasons of contraction in output. They agree that the credit crunch should be defined as a sharp and large period of decline except for the periods of business cycles (Yuan and Zimmermann, 1999: 323).

When experiencing the crunch of credit, the relationship between credit availability and interest is changing. Credit crunch occurs in two different forms (Ding, et al, 1998: 7): The credit supply curve shifting to the left through given interest rates and in cases of credit rationing (non-price credit rationing) regardless of interest rates. Bernanke et. al. (1991) has defined credit crunch as the credit supply curve shifting to the left in cases when there is safe real interest rate and the nature of potential borrowers were fixed. This case refers to the large amount of reduction in credit supply. In particular, the credit slowdown and credit crunch periods are mixed with each other.

Credit slowdown indicates the existence of a general situation. However, credit crunch is related to a more specific situation (it is specific because it is related to credit existence). In credit crunch, funds to be borrowed over current interest cannot be founded even in periods when there is excessive credit demand. In addition to that, banks are reluctant to give loans during this period. Due to the tendency of direct borrowing in financial markets, flow of funds to banks decreases. Decline in deposit accounts of financial intermediaries forces banks to achieve reserve requirement ratio which results in credit restraint. For these reasons, credit crunch is usually taken as a case of supply side issue (Clair and Tucker, 1993: 3). However, it is very difficult to separate the supply and demand side effects from each other, because some of the common factors of supply and demand reduce the willingness of both supply and demand of loanable funds (Ding et al, 1998:5; Ghosh and Ghosh, 1999: 7). In general, the crunch of credit is taken as a supply issue in international studies (Kleisen and Tatom, 1992: 24).

Bernanke et. al. (1991) attributes the decline in credit supply to demand and supply factors. That is: The disruption in balance sheet of borrowers during crisis periods reduces their credibility. Therefore, their credit demands decline. In addition to this, the equity capital of banks falls due to unpaid credit accounts which lead banks to narrow the credit supply. Changes in banks' risk perception; (compensation of overall risk and hedging) is forcing them to increase loan interest rates (Lamberte, 1999:7). In other words, credit interest rates are rising due to the increase in the overall risk ratio. As a result, the credit supply curve is shifting to the left. In this case, banks are tending towards risk-free assets. Thus, the difference between the loan interest rates and the return of risk-free assets (such as treasury bills and government bonds) is growing (Borensztein and Lee, 2002: 4).

1. LITERATURE

Credit crunch question has been analysed by many studies which are based mostly on aggregate data. Bernanke et. al. (1991) couldn't mention the strict effect of credit crunch during and after the recession. They mentioned that credit demand factors have contributed in an important way to the slowdown in bank lending. Ding, Domaç and Ferri (1998) found evidence of credit crunch in the widening gap between loan rates and risk free bond rates. Ferri and Kang (1999) had found that banks with lower capital reduce their credit amount and raise their lending rate instantly. Kim (1999) and Ghosh and Ghosh (1999) analysed credit crunch by looking at demand and supply conditions. While Kim found that the demand for bank loans exceeded the loan supply after the financial crisis, Ghosh and Ghosh (1999) failed to find an excess demand for credit. Borenstein and Lee (2002) examined the existence of credit crunch after the financial crisis in Korea. This study found out that credit crunch was the outcome of the structural changes in the financial sector rather than that of general monetary contraction. Kim (1999) empirically tested the existence of credit crunch in Korea. The results showed that, compared to large firms, small and medium sized firms faced a serious credit crunch in the loan market. Saarenheimo's (1995) study had found that the link from credit supply to investment is statistically significant in Finland. The results of Lamberte's (1999) analysis didn't support the idea that there had been a credit crunch in the Philippines after the Asian financial crisis in 1997. The results of this study imply that credit crunch is due to recession in business cycles. Bijapur (2010) investigated the effectiveness of credit crunch in US economy. The result of this study suggests that the weakness of monetary transmission mechanism comes from both a "credit crunch effect" and a "recession effect". However he couldn't differentiate individual effects.

In addition to monetary base variables, there have been various reasons that cause credit crunch in an economy. For instance, declines in bank capital results in pressure on banks. Regulators or managers of these banks limit their ability to extend new credit. Another reason is the resolution of the failed banks and thrift. During and after the resolution process, those intermediaries necessitate increased demand for capital. The funds which are used for the health of financial industry limit the capital available to fund new loans. In addition to that, severe recessions may change bank's risk perceptions. Their willingness to supply credit is likely to be reduced. At the end, the regulatory burden also contributes to credit crunch by imposing an extra cost on banks.

3. DATA AND EMPIRICAL MODEL

3.1. Data Selection

The purpose of this study is to reveal the private fixed investment variable's relation with both money and credit supply variables. For this purpose, the problem for the period 2003:01-2010:08 has been tested by means of the unrestricted VAR method by using data sets of four variables. The model selection was based on the study of Saarenheimo (1995). Based on the VAR models formed under this frame, the endogenous variables, money stock, private fixed investment and banks' private loans were used; whereas the exogenous variable is the interest rate of commercial loan. The symbols *M2, INV, DLOAN* and *INT* were used to represent money stock, private fixed investment, banks private loans and commercial loans interest rate variables, respectively. The private fixed investment data was obtained from the machinery and equipment entry. As 89 % of commercial loans are met by deposit banks in the Turkish financial system (BDDK, 2007), it was appropriate to use the total commercial loans of deposit banks for representing the bank loans. The *M2* variable was obtained from the International Monetary Fund and the data set of variable was obtained from the data base of the Fund's International Financial Statistics (IMF's IFS), whereas the others were provided by the Turkish Central Bank, Electronic Data Delivery System (EVDS).

3.2. VAR Estimation

Before using any VAR estimation, it is necessary to control the statistical convenience of the variables. First of all nominal variables are deflated by the consumer price index (2005=100). Then all variables, except for the commercial loans interest rate, are measured in logarithms. Finally it was researched whether variables contained seasonality. As *INV* variable has been determined to contain seasonal effects, it was freed from seasonal effects by using the *X11* procedure.

3.2.1. Preliminary Tests of VAR Model

According to the VAR method, all variables must be stationary. In this context, the Augmented Dickey- Fuller (ADF) unit root test was used in order to determine whether all variables covered by the models were stationary or not. The variables which are not stationary in level, first difference were taken. In other words, as a result of the ADF test statistics, it was determined that the *INV, DLOAN, M2 and INT* variables were *I(I)* (Table 1).

Table 1: Augmented Dickey-Fuller Test Results

	Level				1st Difference		
Variables	τ_μ	τ_τ	τ	**Variables**	τ_μ	τ_τ	τ
INV	-1.862	-3.147	0.606	*INV*	-2.729	-2.868	**-2.725**[*]
DLOAN	-2.152	-1.057	3.794	*DLOAN*	**-3.062**[*]	-3.444	-1.807
M2	-1.524	-1.071	2.804	*M2*	**-5.119**[*]	-5.321	-4.249
INT	-1.467	-2.301	-1.6	*INT*	-5.047	-5.069	**-5.016**[*]

Note: Values written in bold show the variables that are static at 5% significance level in first difference.

Before the prediction of a VAR model, the optimal lag length of the model must be determined. Likelihood (LR), Prediction Error (FPE), Akaike Info Criterion (AIC), Schwarz Criterion (SC) and Hannan-Quinn (HQ) statistics were used in determining the appropriate lag length. Based on the results of Table 2, the optimal lag length was decided to be three which is supported by *LR, FPE, AIC* and *HQ.*

Table 2: VAR Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	2.95E-09	-11.12686	**-10.95200***	-11.05661
1	18.87947	2.88E-09	-11.15204	-10.7149	-10.97642
2	7.560116	3.24E-09	-11.03597	-10.33655	-10.75498
3	**49.52534***	**2.03e-09***	**-11.50696***	-10.54525	**-11.12059***

Note: Values written in bold and indicated with the mark * show the appropriate lag length for relevant tests.

Regarding the Model which has a lag length that was determined to be three, the H_0 hypothesis based on the assumption that there is no autocorrelation as the significance level (Prob.) values for the LM test are higher than 0.05 for the third lag is not rejected.

Table 3: VAR Residual Serial Correlation LM Test

Lags	LM-Stat	Prob.
1	13.09523	0.158
2	3.629977	0.934
3	14.20161	0.115

The reliability of the Model which has a lag length that was determined to be three was tested based on the 0.05 significance level by four diagnostics tests as the Breusch-Godfrey Serial Correlation LM Test, ARCH Test, White Heteroskedasticity Test and the Ramsey Reset Test (Table 4). Based on the results obtained, the reliability of the applied model was also confirmed with diagnostic tests. In addition, the model has tested for structural break by the CUSUM test. No structural break was found.

Table 4: Residual Diagnostic Various Tests

Diagnostic Tests	P-Values-$\chi^2_{(3)}$
Breusch-Godfrey Serial Correlation LM Test	0.995
ARCH Test	0.997
White Heteroskedasticity Test	0.828
Ramsey Reset Test	0.493

Notes: 5% significance level was considered.

3.2.2. Variance Decompositions

The variance decomposition method is used to overcome the obstacles experienced in the interpretation of the parameters in the VAR model and to determine the source of the changes that occur in a variable. In this context, the variance decomposition results obtained from the estimated Model are presented in Table 5.

According to Table 5, the main source of the variance of the *INV* variable covered by the Model is its own shock. In addition to this, *DLOAN* with its share of average 11,3 % in medium and long-term, is forming the most important source

regarding the variance estimation in *INV*. The *M2* variable, on the other hand, cannot be presented as the main source regarding the change in *INV*.

Table 5: Variance Decomposition of *INV*

Period	*M2*	*DLOAN*	*INV*
1	0.0	12.0	88.0
10	0.4	11.1	88.5
20	0.5	11.2	88.3
25	0.5	11.2	88.3

3.2.3. Impulse- Response Analysis

In Figure 1, a standard deviation obtained for a period of eighteen months shows the term responses of the *INV* variable to *M2* and *DLOAN* shocks. In these figures, the period of time after shocks is shown on the horizontal axis in a monthly scale and the response to shocks of variables is shown as proportional on the vertical axis. In this analysis, the required confidence intervals for the impulse-response functions were provided by using the Monte Carlo simulations (± 2 for standard error).

According to Figure 1, when a standard deviation shock was given to the *M2* variable, the response of the variable to its own shock has been in a decrease direction from the initial period to the second period. Theoretically, the response of *M2* shows a monetary contraction and the *INV* is expected to have a direct decreasing effect on the decrease of monetary contraction. However, the *INV* reached levels of 0.000408 in the second period by moving in the opposite direction. After all, based on variance decomposition, it is normal that *INV* responds in this direction.

As shown in Figure 1, when a standard deviation shock was given to the *DLOAN* variable, the response of the variable to its own shock has been in a decrease direction from the initial period to the third period. In the third period, *DLOAN* showed an increase of 100 % compared to the initial period. Credit crunch had a negative impact on *INV*. In other words, *INV* decreased from the initial period to the third period by providing immediate response to credit crunch. The important point herein is that *INV* shows a decrease of 140 % when *DLOAN* decreases 100 %.

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It is seen that both variables move in the same direction from the third period until the end of the eighth period. Although *DLOAN* gain stability after this period, the *INV* variable did not gain any stability until the end of the eighteenth period. As a result, based on the empirical findings of impulse-response and variance decomposition, it can be said that the *DLOAN* sensitivity of *INV* is high.

Figure 1: Impulse Responses of *Inv* to *M2* and *DLOAN*
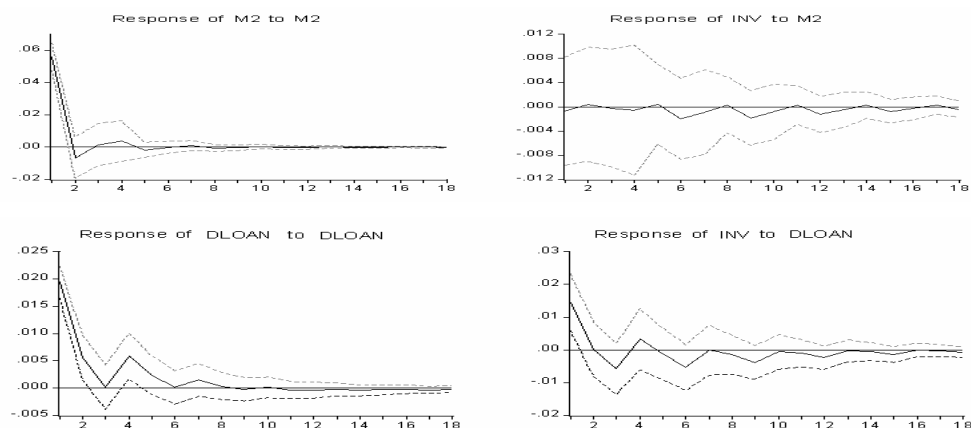
4. CONCLUSION

During the credit crunch process considered as a supply phenomenon, the distortion of balance structures of borrowers changes the risk perception of banks. Therefore, the availability of credit significantly reduces as a result of banks being reluctant to provide a loan. In addition to this, provided that to be dependant also on countries financial structure, the process of credit crunch also brings with an investment collapse. In this study in which it is questioned whether a credit crunch has lead to an investment collapse in Turkey, it has been observed that money supply was not leading directly to an investment collapse. However, it was determined that monetary decisions indirectly led to private fixed investment collapse through credit channel. In other words, the decline of 100 % in credit supply leading to a decline of 140 % in private fixed investment shows an unusual (and suddenly) decline in both variables. This situation is considered to be usual particularly in Turkey where a bank dependant financial structure exists. As a result, in the light of the empirical findings obtained for the period examined for Turkey, it can be said that the credit crunch that we dealt with as a supply phenomenon leads to an investment collapse.

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