Is There Credit Channel in Turkey

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IS THERE CREDIT CHANNEL IN TURKEY

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ABSTRACT

IN THIS PAPER WE DEVELOP VECTOR AUTOREGRESSIVE (VAR) MODELS TO ANALYZE THE EFFECTS OF MONETARY POLICY ON CONSUMER RESPONSE IN TURKEY FOR THE PERIOD 2005-2009. THIS PAPER IS AN ENDEAVOR TO DETERMINE AFFECTS ON POLICY SHOCK ON NON-PERFORMING LOANS AND NON-PERFORMING CREDIT CARD VOLUMES IN TURKEY. FOR THIS PURPOSE WE USE MONTHLY DATA ON INTERBANK OVERNIGHT BORROWING RATE, LOAN RATES, LOANS VOLUMES, CONSUMPTION, INFLATION, NON-PERFORMING LOANS AND NON-PERFORMING CREDIT CARD VOLUMES. THE MAIN RESULTS OF VAR ANALYSIS REFLECT A POSITIVE RESPONSE OF LOANS RATES AND INFLATION AND NEGATIVE RESPONSE OF CREDIT VOLUMES AND CONSUMPTION. OUR FINDINGS SHOW THAT MONETARY POLICY SHOCK HAVE LIMITED AFFECTS ON NON-PERFORMING LOANS AND NON-PERFORMING CREDIT CARD VOLUMES.

ÖZET

BU ÇALIŞMADA VEKTÖR OTOREGRESYON MODELLER KULLANILARAK PARA POLİTİKASININ TÜKETİCİ DAVRANIŞLARI VE EKONOMİK DEĞİŞKENLER ÜZERİNE ETKİLERİ 2005-2009 DÖNEMİ İÇİN İNCELENMİŞTİR. BU ÇALIŞMANIN FARKLI BİR AMACI DA TAKİBE DÜŞMÜŞ KREDİLERİN VE TAKİBE DÜŞMÜŞ KREDİ KARTLARININ PARA POLİTİKASINA NASIL TEPKİ VERDİĞİNİN ARAŞTIRILMASIDIR. BU AMAÇLA BANKALAR ARASI GECELİK BORÇLANMA ORANI, KREDİ FAİZLERİ, KREDİ HACİMLERİ, TÜKETİM, ENFLASYON, TAKİBE DÜŞMÜŞ KREDİLER VE TAKİBE DÜŞMÜŞ KREDİ KARTLARI AYLIK BAZDA İNCELENMİŞTİR. ÇALIŞMANIN SONUÇLARINA GÖRE POZİTİF PARA POLİTİKASI ŞOKUNA KREDİ FAİZLERİ VE ENFLASYON POZİTİF TEPKİ VERİRKEN KREDİ HACİMLERİ VE TÜKETİM NEGATİF TEPKİ VERMİŞTİR. TAKİBE DÜŞMÜŞ KREDİLERİN VE TAKİBE DÜŞMÜŞ KREDİ KARTLARININ TEPKİSİ İSE SINIRLI KALMIŞTIR.

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1. INTRODUCTION

In this paper, using Vector Autoregressive (VAR) models, we analyze the effects of monetary policy on consumer response in Turkey for the period of 2005-2009. To identify consumer response, we use monthly data on loan rates, loan volumes, consumption, inflation, non-performing loans, and non-performing credit card volumes in Turkey. Our results show that in Turkey positive monetary policy shock works through the traditional credit channel, increasing loan rates, decreasing loan volumes and as a result contracting consumption and these results are similar with Örnek (2009), Öztürkler and Çermikli (2007), Gertler and Gilchrist (1994) and Çavuşoğlu (2010). Specifically, this paper is an endeavor to determine affects of policy shock on non-performing loans and non-performing credit card volumes in Turkey. Our findings indicate monetary policy shock have limited affects on non-performing loans and non-performing credit card volumes. According to variance decomposition results policy rate explains up 3 percent of the forecast error variance in non-performing loans 10 months later and explains up to 1 percent of the forecast error variance in non-performing credit card volumes one year later.

In literature there are studies which investigate the affects of monetary policy on consumer loans and credit card expenditure. For instance Peek and Rosengren (1995) show that the loan supply of capital unconstrained banks decrease when the interbank interest rate increases whereas those of capital constrained banks remain unchanged. On the other hand Gertler and Gilchrist (1994) show that consumer loans decline following a monetary policy shock and Ludvigson (1998) finds evidence of a loan-supply effect through auto loans. Additionally, Öztürkler and Çermikli (2007) examine the relationship between monetary policy, bank credits and the real economy in Turkey from 1990 to 2006. The authors show that when there is a positive shock on inter-bank money market interest rates, the real credit growth rates decline. Cengiz and Duman (2008) show that the banks reduce the credit supply instead of decreasing their securities in order to deal with the problems after the monetary contraction.

Section 2 and Section 3 contain a brief overview of macroeconomic and banking sector developments in Turkey between 2002 and 2009 and monetary policy transmission channels, respectively. Section 4 offers a review of the literature focused on the effects of monetary policy on loans, Section 5 and Section 6 explain the VAR model and data used, respectively. The results of the effect of monetary policy shocks are shown in the Section 7

that also presents the impulse response functions and decomposition of the variance and Section 8 contains conclusion.

2. MACROECONOMIC AND BANKING SECTOR DEVELOPMENTS IN 2002-2009

Until beginning of 2000's, Turkish economy can be characterized by chronic high inflation with volatile key macroeconomic indicators (interest rate, exchange rate, growth rate), high dependence on short-term foreign capital and fiscal dominance. Looking at the experience of Turkey with volatility, the standard deviation of real GDP growth has steadily increased from 3,3 to 5,5 and 6,3 percent during 1980-88, 1989-1994, and 1995-2001, respectively. In addition, the volatility[1] of real short-term capital inflows has increased from 1,2 to 7,3, and 4,8 percent during 1980-88, 1989-1994, and 1995-2001, respectively. Increasing short-term capital inflows have also led to considerable appreciation of domestic currency and hurt tradable goods sectors. Exchange rate volatility[2] from 2,4 percent during 1995-2001 to 3,4 percent during 2002-2007. (Demir 2009)

On January 2000, a three-year exchange rate based stabilization program[3], which was backed by the IMF, was launched to put the economy into a healthier path. But the program was hobbled by financial crisis on November 2000 and February 2001. As a result, capital inflow increased, interest rate declined and fragility of banking sector increased. Also inflation rate started to increase due to the depreciation of the Turkish Lira. Following these crisis pegged exchange rate regime was converted in floating exchange regime and "Transition Towards Strong Economy Program" including various economic reforms particularly focusing on restructuring banking sector and reducing the uncertainties in financial markets was launched. Objectives of the program were 1) restructuring of financial sector, 2) increasing transparency in the state and strengthening of public, enhancing of competition and efficiency in the economy and strengthening of social solidarity. After the flexible exchange regime was adopted and the legal independence of

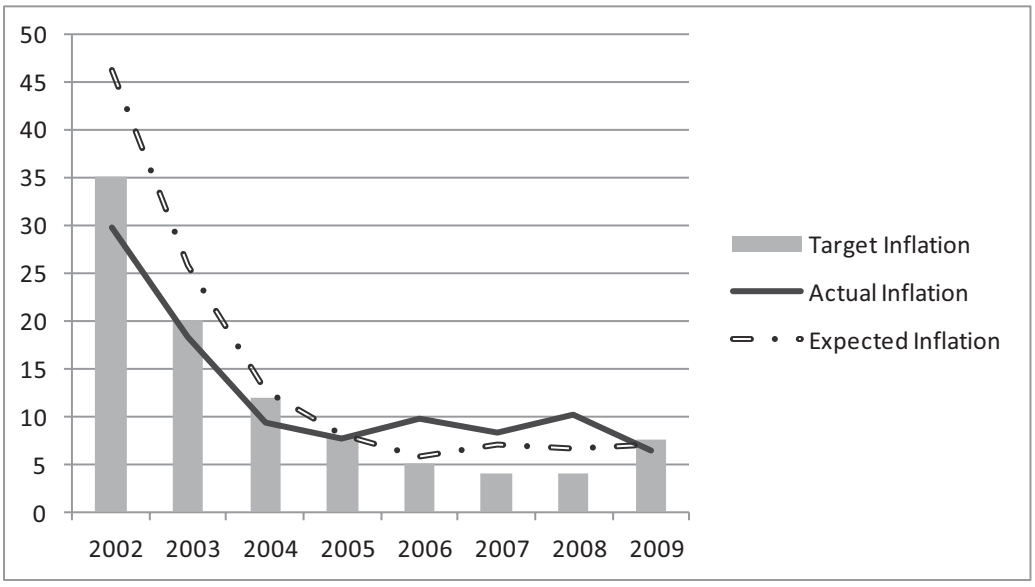
[1] measured by the average standard deviation of annual percentage change
[2] measured by 12 month standard deviation of monthly real exchange rate percentage changes
[3] Objectives of the program were: 1) decreasing the inflation rate to one digit numbers within three years, 2) decreasing the real interest rates to reasonable levels, 3) using economic resources more efficiently. Three main components of the program were: 1) an increase in the primary surplus by applying contractionary fiscal policies, realization of structural reforms, and acceleration of privatizations, 3) fiscal and monetary policies that focus on the low inflation target.

the CBRT was granted in 2001, implicit inflation targeting (IT) regime was established during the 2002-2005 period.

Between 2002 and 2005 implicit inflation-targeting regime was established because preconditions of explicit inflation-targeting regime were not yet fulfilled. According to Masson et al. (1997) these prerequisites are: 1) Central Bank independence; floating exchange rate, low level of inflation, absence of fiscal dominance and development of reliable inflation forecasting system[4].

Between 2002 and 2006 (implicit inflation-targeting period), real growth has averaged over 7% and inflation rate has fallen to single digit levels. Total Public debt declined to 41,4% end of 2005 which was 64,7% as of first quarter of 2002 (see Table 2). Along with the declining year-end consumer price inflation expectations, which was 35% as of first quarter of 2002, inflation rate gradually fell to 7,7% end of 2005, which was 68% at end of 2001. During this period, economical growth kept an increasing path (see Table 2), exchange rate and financial volatility declined and Central Bank of the Republic of Turkey (CBRT) continuously decreased short-term interest rate until 2006 (see Figure 1). Along with the improvements in the macroeconomic indicators, Turkey established explicit inflation targeting regime as of 2006.

Figure 1: Target Inflation, Actual Inflation, Expected Inflation between 2002-2009

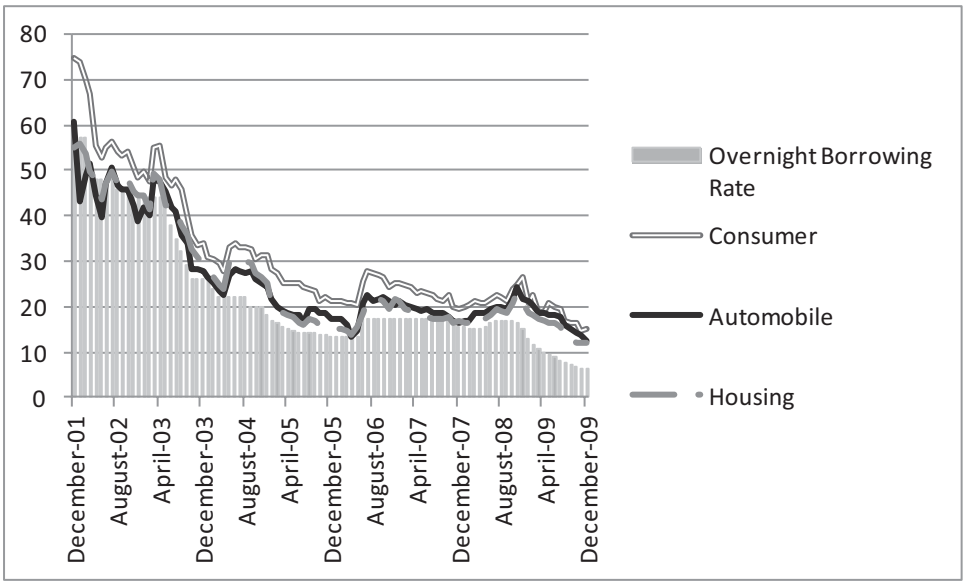


Source: Central Bank of the Republic of Turkey

[4] see more Kara (2006)

Within the May-June 2006 period, the global turmoil affected emerging markets. In Turkey, this turmoil resulted in changing direction of capital flows and raising in exchange rates. CBRT responded by increasing the overnight interest rates by the end of 2006 (see Table 2). Due to the higher inflation rate CBRT kept the O/N interest rates high. After some easing at the beginning of 2008, the rates were raised from 15,25% to 16,75% between May 2008 and July 2008 period. The later rate was kept unchanged until November 2008. By the summer of 2008, the global crisis had already hit Turkey and industrial production had started falling. Also should be noted that the interest rate increases of the CBRT were carried out at around a time when, for instance, in the USA the Federal Reserve cut the O/N Federal Funds rate on four occasions between January and April 2008, from 4,25% to 2,00%. There was another rate cut in mid-October 2008. Between November 2008 and September 2009, the CBRT cut O/N rates 11 times; the borrowing rate was reduced from 16,75% to 7,25%[5].

Figure 2: Rates between 12:2001 - 12:2009



Source: Banking Regulation and Supervision Agency and Central Bank of the Republic of Turkey

Throughout the inflation targeting period Turkish banking sector has a transformation in terms of banking sector. The size of the banking industry increased from 213 billion TL in 2002 to 799 billion TL at the end of 2009, with a growth of 275 percent. After the year 2002, in which inflation targeting was carried out as the monetary policy and a relative stability was maintained, the industry concentrated on credits, which is its main brokering

[5] see more Uğur (2010)

functionality. Whilst the portion of loans in assets were 22,3% in 2002, it reached 49,9% in 2009. The stability in macroeconomics and the steps taken to restructure the financial zone, transformed the active baking industry structure from providing resources to public to an entity that financed companies and household. One can argue that this change in the structure made competition more important and brought service variety and quality with it. (Bilgin, Kartal 2009)

Table 1: Banking Sector Developments (2002-2009)

Basic Indicators (million TL)	2002	2009	Ratio (%)	Indicator Proportion (%)	2002	2009
Assets	212.675	798.533	275	Loans/Assets	22,3	49,9
Loans	47.368	398.088	740	Deposites/ Assets	65,7	66,1
Deposites	139.773	527.639	277	Loans/Deposites	33,9	75,4
Consumer Loans	4.641	92.604	3979	TL Loans/Loans	41,2	73,0
Consumer Credit Card Expenditure	4.335	35.487	719			
TL Loans	19.534	290.777	1389			
Basic Indicators (million TL)	**2004**	**2009**	**Ratio (%)**	**Indicatior Proportion (%)**	**2004**	**2009**
NPL (Consumer Loans)	94	3.896	4045	NPL(Consumer Loans)/Loans	0,1	1,0
NPL (Consumer Credit Cards)	631	4.304	582	NPL (Credit Cards)/Credit Card Expenditures	4,6	12,1

Source: The Banks Association of Turkey, Banking Regulation and Supervision Agency and author's own calculation.

One of the important facts about the balance sheets of the period from 2002 and credit accounts is that consumer loans, which were 9,8% of the loan volume in 2002, reached 23% at the end of 2009. As the decrease of interest rates and increase in positive expectations, consumers started to spend and the banks head for consumer loans. Consumer loans which consist of consumer credit cards, reached 93 billion TL with 2009, from 4,4 TL in 2002 with a growth 3979 percent. The portion of personal loans to total assets grew to 16% in 2008, from 2% in 2001. In addition to these non-performing loans reached 3.896 million TL from 94 million TL in 2009 with a growth %4045 percent and non-performing credit card volumes reached 4.304 million TL with a growth 582 percent.

Loans, whose portion to the assets grew to 49,9% from 22,3% in the period 2002-2009 when consumer loans are taken into account and volume of the loans grew 740% in this period, Also one of the indicators of the brokering functionality whom the growth in credit points out, percentage of assets turning into credits, reached 73,0% from 33,9% in the period 2002-2009.

Another improvement in loans that stands out in loans is the growth of TL loans from 41,2% to 73,0% in the period 2002-2009. This situation can be seen as the result of de-dollarization[6] during low inflation times, also as the result of growth of foreign loans the private sector takes[7].

Table 2: Macroeconomic Indicators 2001Q1-2009Q4

	Growth Rate	Expected Inflation	Target Inflation	Consumer Inflation	Interest Rate	Total Public Debt Stock
2002Q1	0,3	46,3	35,0	65,1	48,00	
2002Q2	6,4	36,5	35,0	42,6	48,00	
2002Q3	6,2	35,1	35,0	37,0	46,00	
2002Q4	11,1	32,2	35,0	29,7	44,00	64,71
2003Q1	8,1	25,8	20,0	29,4	44,00	
2003Q2	4,0	26,6	20,0	29,8	38,00	
2003Q3	4,3	22,5	20,0	23,0	29,00	
2003Q4	5,2	19,4	20,0	18,4	26,00	55,58
2004Q1	10,0	12,6	12,0	9,5	22,00	
2004Q2	11,9	11,6	12,0	7,4	22,00	
2004Q3	8,1	10,7	12,0	8,1	20,00	
2004Q4	8,0	9,9	12,0	9,4	18,00	49,14
2005Q1	8,5	8,0	8,0	8,6	15,50	
2005Q2	7,7	7,5	8,0	8,6	14,25	
2005Q3	7,6	7,2	8,0	7,9	14,25	
2005Q4	9,8	7,5	8,0	7,6	13,50	41,38
2006Q1	5,9	5,7	5,0	8,1	13,50	
2006Q2	9,7	7,2	5,0	9,6	17,25	
2006Q3	6,3	10,2	5,0	10,8	17,50	
2006Q4	5,7	9,9	5,0	9,8	17,50	34,29
2007Q1	8,1	7,1	4,0	10,3	17,50	
2007Q2	3,8	7,6	4,0	9,5	17,50	
2007Q3	3,2	7,3	4,0	7,1	17,25	
2007Q4	4,2	7,8	4,0	8,2	15,75	29,19
2008Q1	7,0	6,7	4,0	8,8	15,25	
2008Q2	2,6	9,5	4,0	10,3	16,25	
2008Q3	0,9	10,8	4,0	11,7	16,75	
2008Q4	-7,0	11,1	4,0	10,9	15,00	29,54
2009Q1	-14,7	7,1	7,5	8,4	10,50	
2009Q2	-7,8	6,3	7,5	5,7	8,75	
2009Q3	-2,8	5,9	7,5	5,3	7,25	
2009Q4	5,9	5,8	7,5	5,4	6,50	32,53

Source: Central Bank of the Republic of Turkey, Republic of Turkey Prime Ministry Undersecretariat of Treasury and author's own calculation.

Growth Rate and Consumer Inflation: Percentage change with respect to the same period of the previous year.

Expected Inflation: Expectations Survey of the Central Bank, expected year-end consumer price inflation.

Target Inflation: Year-end inflation target.

Interest Rate: Weighted average overnight borrowing rate of Central Bank of the Republic of Turkey.

Total Public Debt Stock: Quarterly ratios are calculated by using the sum of the current and last three quarters of GDP.

[6] see more Ozcan and Us (2007)
[7] see more Bilgin, Kartal(2009)

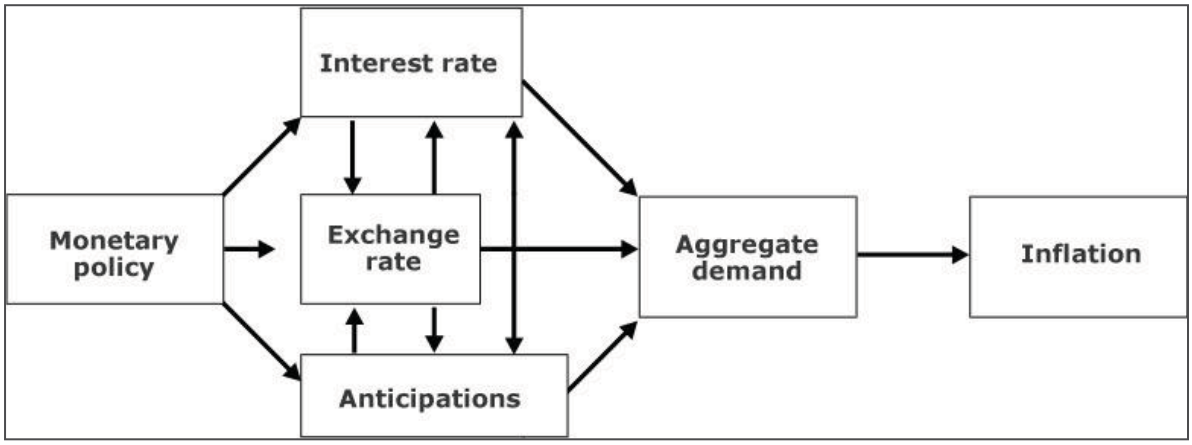
3. MONETARY POLICY TRANSMISSION MECHANISM

The Monetary Transmission Mechanism (MTM) describes how policy-induced changes impact on real variables such as output, employment or inflation. In literature there are various empirical researches on the monetary transmission mechanism, enabled by Sim's (1980) introduction of vector autoregressive model into macroeconomics (Favero 2001).

There are various stages in the monetary policy transmission process. Under inflation targeting the key monetary policy instrument is the short-term interest rate[8]. The first stage the transmission process is changing in the policy rate. This change leads to movements in market rates, These are commercial bank deposit and lending rates, asset prices, expectations and exchange rate. The second stage of the transmission process occurs on private consumption and investment, and thereby on aggregate demand. In the third stage changes in aggregate demand affect the level of activity in the domestic economy, which in turn should have the desired effect on the inflation rate in the final stage of the monetary policy transmission process.

MTM can be characterized as a set of channels of monetary policy impulse propagation, through which the central bank affects demand and prices in the economy. Four channels have been highlighted in the literature such as: interest rate channel, the credit channel, the exchange rate channel and the asset price channel.

Figure 3: Monetary Policy Transmission Mechanism



Source: www.cairn.info/revue-economie-internationale-2008-4-page-127.htm

[8] IMF Working Paper WP 11/229

3.1 EXCHANGE RATE CHANNEL

The exchange rate is one of the intermediate policy variables through which monetary policy is transmitted to the larger economy through its impact on the value of domestic currency, domestic inflation (the pass-through effect), the external sector, macroeconomic credibility, capital flows and financial stability. Thus, changes in the exchange rate might induce changes in the relative prices of goods and services, and the level of spending by individuals and firms, especially if significant levels of their wealth are held in foreign currencies. The change in the exchange rate affects the domestic economy by both aggregating demand and supply (F.K. Ohuche Bank of Nigeria series 17).

This is demonstrated in the following schematic:

PR ↓⇒ i↓⇒E ↓⇒NX ↑⇒Y ↑

A decrease in policy rate (PR) causes the domestic real interest rate (i) to fall. Therefore, assets which are denominated in domestic currency are less attractive than assets denominated in foreign currency, resulting in a depreciation of domestic currency (E). The depreciation of the domestic currency makes domestic goods relatively cheaper than foreign goods, thereby causing net export (NX) and output (Y) to rise (Hung, 2009).

3.2 ASSET PRICE CHANNEL

Monetary policy affects asset prices such as bonds, equity shares, and real estate, changing firms' stock market values and household wealth. Changes in stock market values and household wealth in turn affect aggregate demand. Tobin's (1969) Q-theory of investment and Ando and Modigliani's (1963) life-cycle theory of consumption are two famous views of the asset price channel in the monetary policy transmission.

Tobin's Q (1969) is defined as the ratio of the market value of a firm to the replacement cost of capital owned by that firm. Following a monetary tightening, equity prices fall and Q declines. A lower Q makes investment more costly for the firm, reducing investment and aggregate output (Ireland 2005). The scheme of this mechanism:

PR ↓⇒ PE↑⇒q ↑⇒I ↑⇒Y ↑

A decrease in policy rate (PR) increases household spending and the demand for assets. The price of assets (PE) goes up relative to the real cost of reposition of capital. Tobin's Q

increases and firm have the opportunity of acquire more capital with a low issue of equities. The higher Q induces to higher real investment spending and real output increases (Reyes 2002).

The asset price channel also creates a wealth effect that increase or decrease consumption and the aggregate demand. The wealth effect on consumption is based on the life-cycle model of Modigliani (1971). In his model, consumers determine their consumption spending by considering their lifetime resources, including human capital, real capital, and financial wealth. Common stocks are a major component of consumers' financial wealth.

The process is seen in the following schematic:

PR ↑⇒ PE↓⇒q ↓⇒I ↓⇒Y ↓

An increase in policy rate decreases household spending and the demand for assets. The price of assets goes down relative to the real cost of reposition of capital and consumers spend less on consumption and output (Hung 2009).

3.3 CREDIT CHANNEL

Bernanke and Gertler (1995) identify two channels through which central bank policy influences credit markets: the bank lending channel and the balance sheet channel.

The balance-sheet channel operates through the net worth of firms, with the effects of adverse selection and moral hazard. A decrease in the firm's net worth means that lenders can rely on lower collateral for their loans, which raises the problem of adverse selection and reduce lending for investment spending. Lower net worth also results in the problem of moral hazard because business owners have a lower equity stake in the firm and, therefore, have incentive to take part in risky projects. As a result, lending and investment spending decreases (Mishkin, 1995). The scheme of this mechanism:

PR ↑⇒ PE↓⇒adverse selection & moral hazard ↑⇒Lending ↓⇒I ↓⇒Y ↓

An increase in policy rate leads to a decrease in the prices of equities and rise the problems of adverse selection and moral hazard. As a result of this lending, investment spending and output decrease.

The bank lending channel focuses on the effects of policy-induced actions on the supply of bank credit. Theories and models of the bank lending channel emphasize that if some of the borrowers are bank-dependent (i.e. they do not have other forms of external financing) and bank loans are imperfect substitutes for other assets, monetary policy may operate through a bank lending channel. Monetary tightening decreases the supply of bank reserves reducing bank lending especially for banks that are depending on deposits. Then, bank-dependent firms are forced to cut back their investment spending. The reduction in output following a monetary tightening results from financial market imperfections (Ireland, 2005).

The schematic for the bank lending channel is as follows:

PR ↑⇒bank deposits ↓⇒bank loans ↓⇒I ↓⇒Y ↓

A tightened monetary policy leads to a decrease in bank deposits which further decreases the money that banks have to loan out. As a result of this, investment and output decrease.

3.4 INTEREST RATE CHANNEL

Under an inflation targeting monetary policy regime, the central bank periodically adjusts a short term nominal interest rate in response to inflationary pressure. Provided that this response is sufficiently large, in the presence of short run nominal rigidities or imperfect information, an increase in the short term nominal interest rate causes an increase in the short term real interest rate, inducing inter temporal reductions in consumption and investment (Vitek 2006).

This process can be illustrated in the following schematic:

PR↓⇒i ↓⇒I ↑⇒Y ↑

Expansionary monetary policy causes the real interest rate (i) to fall, which means that the cost of capital is lowered. The fall in real interest rate induces businesses to increase spending on investments spending and consumers to increase their housing and durable expenditures, which are also considered investment. Increase in investment spending (I) leads in turn to an increase in aggregate demand and a rise in output (Y) (Hung 2009).

4. LITERATURE REVIEW

In literature there are various studies related to monetary policy, consumer credits and consumer response. Gertler and Gilchrist (1994) show that consumer loans decline significantly following a monetary policy shock, while Ludvigson (1998) finds evidence of a loan-supply effect through auto loans. With updated data, Den Haan, Sumner and Yamashiro (2007) find similar results for consumer loans. Kashyap and Stein (1995, 2000), and Gertler and Gilchrist (1993, 1994) provide an empirical evidence showing that small commercial banks do contract lending after a negative policy shock and small firms are affected by that contraction (see also Kishan and Opiela (2000)).

According to Peek and Rosengren (1995), the loan supply of capital unconstrained banks decrease when the interbank interest rate increases (monetary policy changes) and the loan supply of capital constrained banks remain unchanged. Lyziak, Przystupa, Wrobel (2008) suggested that monetary impact of monetary policy on loan supply is weak due to the fact that Polish banks hold large amounts of highly liquid assets. Therefore, in response to a tighter monetary policy, they can reduce their stocks of most liquid assets and insulate loan portfolios.

Pagan and Catao (2010) analyzed monetary policy transmission mechanism to understand which monetary policy shocks affect output, inflation, and other relevant aggregates in such economies for Brazil and Chile. The results show that credit growth and output are declining following policy rate shock in Brazil and Chile.

Khundrakpam (2011) found that besides the positive influence of economic activity on bank credit, policy induced expansion or contraction in deposit or Money supply makes banks to adjust their credit portfolio correspondingly. Over the period of 2001:3 to 2011:3, 100 basis points increase in policy rate reduced the annualized growth in nominal and real bank credit by 2,78 percent and 2,17 percent respectively. Bhaduri and Goyal (2011) used yearly bank balance sheet data from 1996 to 2007 to analyze the monetary policy transmission in India with the help of bank lending channel hypothesis and found that small illiquid banks are more affected by policy changes and effect is more pronounced in areas of non-priority sector lending and domestically owned banks are more sensitive to policy rate changes vis-a-vis foreign banks.

Hakan Yılmazkuday (2010) used a unique monthly data set that covers overall credit card usage in a small-open economy (Turkey) to investigate a possible credit channel of monetary policy transmission through credit cards. The results indicate that, although credit card usage has been affected only around 3-4% by the monetary policy shocks, it was affected more during the implicit inflation-targeting regime compared to the explicit inflation-targeting,

Öztürkler and Çermikli (2007) examined the relationships among monetary policy, bank credits and the real economy in Turkey from 1990 to 2006 period. They showed that when there is a positive shock on inter-bank money market interest rates, the real credit growth rates reduces and this went on for two quarters. They also concluded that due to the two-way relationship between real credit supply and industrial production. when there is an increase in the credit demand as a result of real economic growth, the central bank can use the interest rates as a monetary policy in order to meet this increase.

Örnek (2009) examined the impact of monetary policy shock on output and prices for Turkey with quarterly data covering the period 1990 and 2006. In order to test the working of monetary policy transmission channels VAR model is constructed and results, which are based on impulse response functions and variance decomposition with quarterly aggregate date. He concludes that traditional interest rate and exchange rate channels are working but there are no statistical significant results about asset price and bank credit channels in Turkey. In addition, Çavuşoğlu (2010) analyzed pass-through of policy rate to bank loans rate and results show that the Central Bank is able to affect bank rates (loan and deposit) on an average of three months by changing its policy rate.

5. THE MODEL

Vector autoregressive (VAR) models are widely used in the empirical analysis of the monetary policy issues. The VAR estimations were firstly used by Sims (1972) to measure causality. Following this, the approach has been extended to include variance decomposition, impulse response, structural modeling and forecasting. Basically, VAR model is a dynamic system of equations that allows interactions between economic variables while imposing minimal assumptions about the structure of the economy. Therefore, using the VAR approach provides two significant advantages: First, it allows

the endogeneity of variables, thereby consist the interdependences between monetary policy and economic developments. Second, as opposed to a large – scale fully specified structural model, the VAR analysis focuses on reducing form of relations and thus only requires a simple model with a small number of variables. In addition to this using OLS estimation methodology, which can be considered as a simple and easy procedure, estimation of a VAR model provides with better results than complex simultaneously equations models. All of these specifications allow researchers to set a flexible dynamic that captures the causality directions in which each variable affects the others (Chow 2004). In this study, a benchmark VAR model is used to analyze credit channel of Turkish economy:

$$AY_t = C(L)\, Y_{t-1} + D(L)\, X_t + B\varepsilon_t$$

where the matrix includes all coefficients describing the simultaneous relationships between variables, the matrix includes all coefficients reflecting the lagged linkages between variables, the D(L) matrix contains all coefficients pointing out the link between endogenous and exogenous variables, the B matrix is a diagonal matrix and vector ε includes the residuals, Y_t is the endogenous variables X_t vector, is the exogenous variables vector. By multiplying the VAR system with the A inverse matrix we obtain:

$$Y_t = A^{(-1)}C(L)\, Y_{t-1} + A^{(-1)}\, D(L)\, X_t + A^{(-1)}\, B\varepsilon_t$$

This can be rewritten as:

$$Y_t = \alpha Y_{t-1} + \beta X_t + \mu_t$$

Where

$$\alpha = A^{(-1)}C(L)$$

$$\beta = A^{(-1)}\, D(L)$$

$$\mu = A^{(-1)}\, B\varepsilon$$

where: Y_t is the endogenous variables vector, X_t is the exogenous variables vector, μ_t is the vector of error terms α is a matrix that includes all coefficients describing relationships between endogenous variables.

Working with non-stationary variables could lead to misleading results and create wrong suppositions in the models. Some of our variables were non-stationary. Thus these needed to be transformed by differencing in order to achieve stationary. In this study, we used the Dickey-Fuller test (ADF test)[9]. Transformed variables and test results are represented in Table 6.

An important point of about VAR models is finding optimal lag length. Considering a VAR system with p lag length and n variables, each equation consists of n*p coefficient and one constant. Hence, while expanding lag length will cause reducing degree of freedom rapidly. Therefore, optimal lag length should not be causing autocorrelation between residuals but at the same time should provide adequate information about interaction between variables (Çiçek 2005).

In literature Akaikke Information Criterion (AIC), Likelihood Ratio (LR), Final Prediction Error (FPE), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ), are used to find the opitmal lag length. Exception of the LR test, smallest test value indicates the opitmal lag length.

Our purpose is to analyze the effects of the monetary policy on the general economic variables and consumer credits. Therefore, we use three VAR models, which include policy and non-policy variables. All VAR models in this paper were checked by various econometric tests whether their results are reliable. For that purpose firstly, LM test was processed to analyze autocorrelation. According to test results, all the VAR models' residuals probability value greater than 0.05 and, hence, we can read it as there is no autocorrelation in the models. Second test was employed to analyze heteroscedasticity. According to the White Heteroscedasticity Test results, we found Chi Sq. 750 and probability 0.5134 for the first VAR, Chi Sq 300 and probability 0,2609 for the second VAR, Chi Sq 300 and probability 0,6681 for the third VAR which means there is no heteroscedasticity in VAR models. Finally, the VAR models were tested by Jarque- Bera

[9] If the absolute value of the test value is greater than the absolute value of critical value, we concluded that the variable is stationary.

to check whether residuals have normal distribution. All the joint probability value is 0,00 and this means models residuals are not normally distributed. But in this paper normal distribution assumption was ruled out.

Model 1:

In model 1, we analyze responses of loan rates and volumes to monetary policy shock. Variables are: Interbank overnight repo rate as a monetary instrument, consumer loan rate, housing credit rate, consumer loan volume and housing loan volume.

$$Y \quad [\text{Ddonsa} \;\; \text{Dihtfsa} \;\; \text{Dkonutfsa} \;\; \text{Dihtsa} \;\; \text{Ddkonutsa}]'$$

Model 2:

In model 2, we analyze impact of monetary policy shock on loans volume, consumption and price to understand monetary policy transmission steps are operating or not. Hence, we selected four variables: Interbank overnight repo rate, total loans volume, total consumption and inflation to analyze Turkish economy in terms of MTM.

$$Y \quad [\text{Ddonsa} \;\; \text{Dkresa} \;\; \text{Dtuketsa} \;\; \text{Dddenfsa}]'$$

Model 3:

With the last model we analyze responses of non-performing loans and credit cards volumes to monetary policy variations; hence, in model 3 we selected five variables. These are: Interbank overnight repo rate, non performing loans volume, non performing credit cards volume, total consumption and inflation.

$$Y \quad [\text{Ddonsa} \;\; \text{Dtpkksa} \;\; \text{Dtpksa} \;\; \text{Dtuketsa} \;\; \text{Dddenfsa}]'$$

6. DATA

In order to analyze monetary policy transmission mechanism in Turkey, we examined monthly data covering period from December 2004 to December 2009[10]. While studies in

[10] We do not include the data before December 2004 and after December 2012 for two reasons. One of the reasons that,consumer credit volume variable, which is used in VAR models, is not available before December 2004. The other reason, after May 2010, CBRT changed its official policy rate from overnight lending rate to weekly lending rate and fixed it at %5.75. In addition to this CBRT started to use different policy instruments such as Required Reserve Ratio. Also, in June 2011 Banking Regulation and Supervision

this stream of literature often employ quarterly data, given the length of our sample we decided to work at the monthly frequency. In this paper, we set interbank overnight repo rate[11] as a monetary policy variable. Overnight lending rate, Total consumption and Inflation data are obtained from CBRT Electronic Data Delivery system, credit rates and volume data are obtained from BRSA Interactive Weekly Bulletin. All variables are seasonally adjusted[12], converted into real value by using consumer price index[13] and expressed in logarithms. Variables are represented in Table 1.

Table 3: Variables and Explanations

Variable	Explanation
Ddonsa	Interbank Overnight Repo Rate
Dihtfsa	Consumer Loan Rate
Dihtsa	Consumer Loan Volume
Dkonutfs	Housing Loan Rate
Ddkonuts	Housing Loan Volume
Dtuketsa	Total Consumption
Dkresa	Total Loans Volume
Dkksa	Credit Card Expenditure
Dddenfsa	Inflation
Dtkpksa	Non-performing Credit Card Volume
Dtkpsa	Non-performing Loans Volume

Note: "sa" indicates that the variable is seasonally adjusted, "d" indicates first difference to provide stationary, "dd" indicates second difference to provide stationary, "ddd" indicates thirth difference to provide stationary.

Agency (BRSA) increased Loan Loss Provision ratio to slow-down credit growth. Hence trying to explain period of 2010 and onward with only policy rate may direct us to mistaken results.

[11] This variable is calculated by weighted average method.

[12] Moving Average method was used to provide seasonally adjusted data.

[13] To find real value of variables, all of them divided by consumer price index (2003 =100).

7. RESULTS

7.1 MODEL 1

Table 4: Lag Order Selection Criteria for Model 1

Lag	LogL	LR	FPE	AIC	SC	HQ
0	176.4037	NA	1.20e-09	-6.348284	-6.164118	-6.277258
1	233.1704	100.9187	3.73e-10	-7.524830	-6.419839	-7.098678
2	286.1418	84.36192	1.36e-10	-8.560809	-6.534992*	-7.779531*
3	306.8044	29.08067	1.70e-10	-8.400164	-5.453521	-7.263759
4	347.0784	49.22370	1.09e-10	-8.965865	-5.098396	-7.474334
5	383.4603	37.72942*	8.90e-11*	-9.387419*	-4.599124	-7.540761

* 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

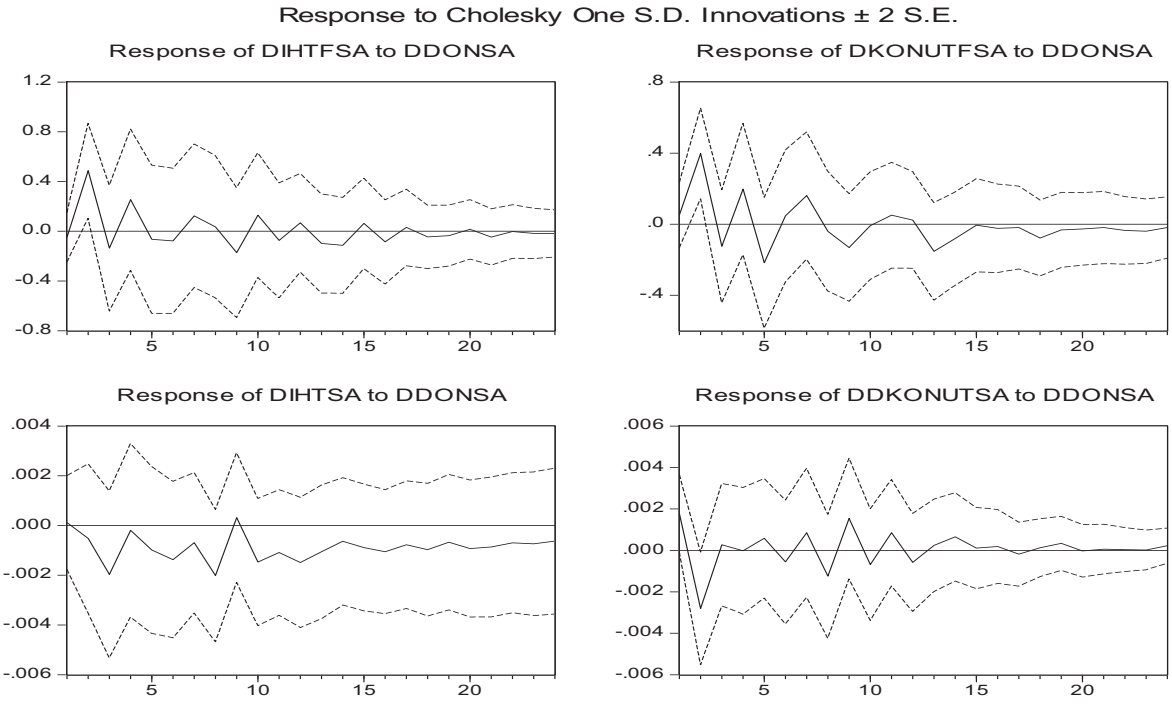
In the light of information which is mentioned above, we assumed the max lag length 5 and observed test results. In this paper optimal lag length is generally determined using AIC test results. Hence according to the AIC test result optimum lag length stated 5.

Impulse-response functions and variance decomposition are sensitive to sequence of the variables in VAR models. In literature, variables are commonly ordering from the exogeneity to endogeneity. The first variable is that the exonegeity means this variable does not react to the shocks, which affect other variables, the last variables endogeneity means, this variable responses its own shocks and the different shocks which effect other variables (2005, Çiçek). Sequence of variable can be found by using Granger Causality Test and also can be found by the help of economic theory. Taking into account monetary policy transmission theory, the variables were ordered: DDONSA, DIHTFSA, DKONUTFSA, DIHTSA and DDKONUTSA.

Analyzing a VAR model with estimated coefficients is a hard study. Hence, commonly used method to estimate the dynamic response of each variable to an unexpected change in another variable is the impulse response functions graphs. Figure 4 shows responses of rate and volume of consumer and housing credits. In the first graph, consumer credit rate rises

immediately in two months after one standard deviation increase in policy rate[14]. But after two months, response is falling. When we look at the second graph we find the same effect. Housing loans rate is rising immediately following the policy rate shock. But this increase is bigger than consumer loans. Last two graphs in the table represent responses of loan volumes of consumer and housing loans. It is obvious that consumer and housing loans are reducing after standard deviation shock to the policy rate. But response of consumer loans volume's response is realized three months later. When we look at the three months averaged data of the impulse response functions we find similar results (Figure 7). After the positive response, consumer and housing loans rate start to decline three months later, and housing loans volume start to increase four months later. When we look over all results about loans rates and volumes' response against the policy rate shock, they are consistent with the monetary transmission theory and our expectations.

Figure 4: Impulse Response Functions of Rate and Volume of Consumer and Housing Loans



[14] Same results with Çavuşoğlu (2010).

7.2 MODEL 2

After showing relationships between policy rate loans rate and volume, we set a new VAR model to analyze effects of policy rate on loans, credit cards, consumption and price. Hence we select five variables: DDONSA, DKRESA, DKKSA, DTUKETSA, DDDENFSA.

Table 5: Lag Order Selection Criteria for Model 2

Lag	LogL	LR	FPE	AIC	SC	HQ
0	418.311758195899	NA	1.16e-13	-15.59667	-15.41079	-15.52519
1	492.791248132577	132.0957	1.80e-14	-17.46382	-16.34856*	-17.03495
2	539.371114992612	73.82469*	8.18e-15*	-18.27816*	-16.23351	-17.49188*
3	563.425152640266	33.58488	9.06e-15	-18.24246	-15.26843	-17.09879
4	586.588610788476	27.97097	1.11e-14	-18.17316	-14.26975	-16.67209
5	612.235452038549	26.13074	1.37e-14	-18.19756	-13.36477	-16.33911

* 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

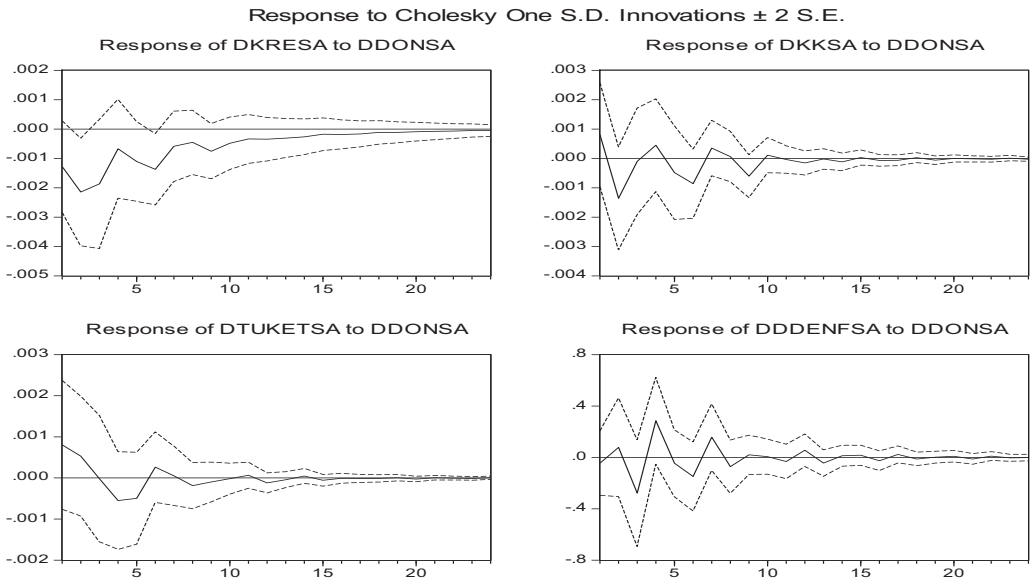
When we look at the optimum lag selection test results, as mentioned formerly, lag length was selected according to the AIC test and was set 2.

Figure 5 shows responses of total loans volume, credit cards volume, total consumption, and inflation against to the one standard deviation shock on policy rate. First two graph show that total loans and credit card volumes are reducing immediately and reaching the deepest level in two months following the policy rate shock[15]. After this falling, loans volume rises and reaches initial level in fourth month. But credit cards volume's response shorter than loans volume's. It is reaching its initial level just two months later. This result is consistent with the decrease of consumer and housing loans as we showed above. The second graph represents response of total consumption. As per our expectations total consumptions' response direction is negative in four month. This means consumption's response comes latter than loans and credit cards. Graph 3 represents response of inflation

[15] Same results with Bernanke and Gertler (1995).and Öztürkler and Çermikli (2007).

against the one standard deviation shock. Contrary to expectations, monetary transmission theory and our expectation, it is clear to see that inflation's response direction is positive for two months[16]. We can see the expected response of inflation two months later. Taking into account the three month averaged data of the impulse response functions (Figure 8) we see that, after negative response, credit volumes start to increase three months later, consumption start to increase seven months later and credit card volumes start to increase six months later.

Figure 5: Impulse Response Functions of Total Loans Volume, Credit Cards Volume, Total Consumption and Inflation



7.3 MODEL 3

In this paper our main goal is to analyze the effects of monetary policy transmission on consumer loans, particularly, non-performing credits and non-performing credit cards. Hence, we set a new VAR model and selected five variables which were ordered DDONSA (CRBT interbank overnight repo rate), DDTPKSA (non performing loans), DDTPKKSA (non performing credit card volumes), DTUKETSA (total consumption) and DDDENFSA (inflation).

16. According to our VAR results, we may explain the positive response of inflation against to the policy rate shock with ascending inflation expectations.

Table 6: Lag Order Selection Criteria for Model 3

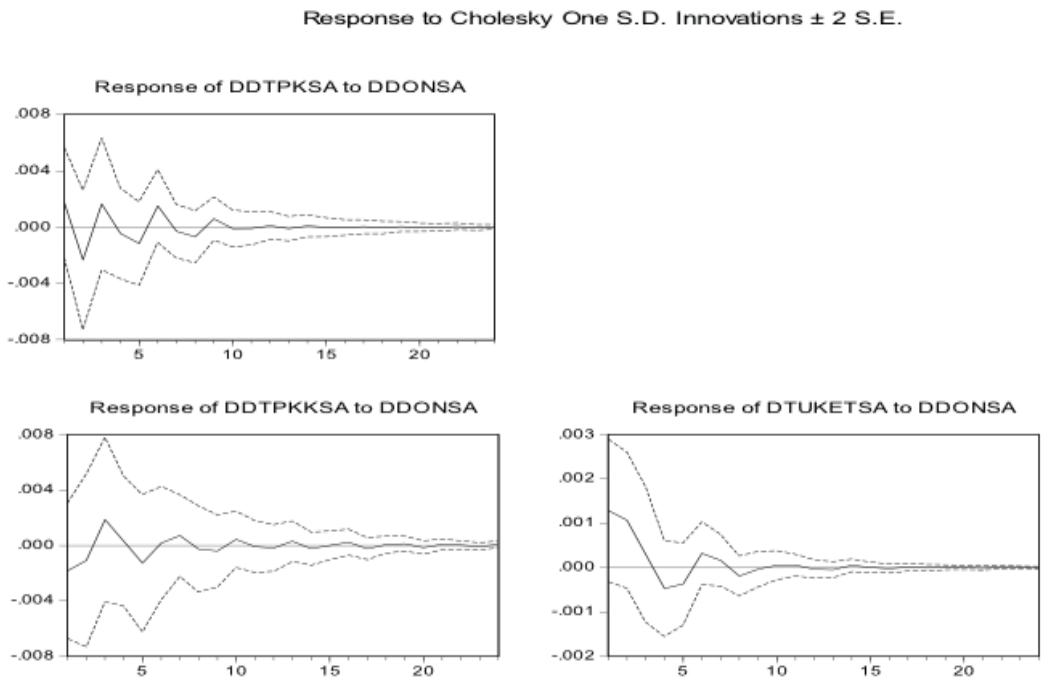
Lag	LogL	LR	FPE	AIC	SC	HQ
0	314.1782	NA	5.90e-12	-11.66710	-11.48122	-11.59562
1	376.4356	110.4188	1.45e-12	-13.07304	-11.95778	-12.64416
2	444.1436	107.3108*	2.97e-13*	-14.68466	-12.64002*	-13.89839*
3	468.4735	33.97012	3.26e-13	-14.65938	-11.68535	-13.51571
4	494.3715	31.27303	3.60e-13	-14.69326	-10.78986	-13.19220
5	529.2175	35.50346	3.13e-13	-15.06481*	-10.23202	-13.20635

* 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

When we look at the optimum lag selection test results, we see that LR, FPE SC and HQ tests suggest the lag selection as 2, hence, lag length was selected according to these results and was set 2.

Figure 6 shows responses of non-performing loans, non-performing credit cards, and total consumption against to one standard deviation shock on policy rate. When we look at the second and third graphs, it is obvious that responses of non-performing loans and non-performing credit cards are dissimilar. Non-performing loans volume's response direction is negative which shows when policy rate have one standard deviation shock, non performing loans volume reduces and reaches the deepest level two months later. On the other hand, response of non-performing credit card volume's direction is positive and reaches the top level in third month. Also, the response starts to fade out ten months later. In addition, upon closer inspection, we can see that response of non-performing loans volume realizes earlier than the non-performing credit card volume. When we look at the three months averaged data of the impulse response functions we find similar results (Figure 9). Response of non-performing loans' direction is negative, response of non-performing credit card volumes' direction is positive and response of consumption's direction is negative.

Figure 6: Impulse Response Functions of Non-performing Credit, Non-performing Credit Card, and Total Consumption



Variance decomposition of the variance-covariance matrix has been widely used to identify monetary policy shock (see Christiano 1999, Stock and Watson 2005). By definition, variance decomposition shows the proportion of forecast error variance for each variable that is attributable to its own innovation and to innovation in the other endogenous variables. This method provides complementary information on the dynamic behavior of the variables in the system. It is possible to decompose the forecast variance into the contributions by each of the different shocks. (Godwin Chigozie Okpara 2010).

Table 7: Variance Decomposition Results of Non-performing Credit Volumes

Period	S.E.	DDONSA	DDTPKSA	DDTPKKSA	DTUKETSA	DDDENFSA
1	0.327966	1.423589	98.57641	0.000000	0.000000	0.000000
2	0.346247	2.200225	96.96529	0.010612	0.803007	0.020868
3	0.399758	2.740315	95.44331	0.518709	1.232254	0.065412
4	0.409527	2.644270	91.42959	2.913865	2.715754	0.296520
5	0.418186	2.812601	89.17827	4.427524	2.868517	0.713085
6	0.425713	3.268135	88.50202	4.378652	2.862779	0.988409
7	0.429223	3.248071	87.58191	5.260166	2.910622	0.999229
8	0.429967	3.287083	86.61895	6.176736	2.877500	1.039727
9	0.431913	3.341378	86.37207	6.192042	2.873641	1.220866
10	0.432249	3.327812	85.96937	6.483607	2.868066	1.351146

Non-performing loans and credit card volumes' variance decomposition results are presented in Table 7 and Table 8. Table 7 shows that the gross part of variation on non-performing loans is explained by itself. Contribution of non-performing credit cards 4% in fifth month and 6% in the first year. Contribution of policy rate is only 3% in sixth month and stays in this level. When we look at the non-performing credit cards' variance decomposition table, the most effective variables on variations of the non-performing credit cards are non-performing loans and inflation after its own variations. Non-performing credits explains up 6 percent of the forecast error variance in non-performing credit cards 5 months later while Inflation explains up to 4 percent of the forecast error variance in non-performing credit cards one year later.

Table 8: Variance Decomposition Results of Non-Performing Credit Card Volumes

Period	S.E.	DDONSA	DDTPKSA	DDTPKKSA	DTUKETSA	DDDENFSA
1	0.327966	1.000102	1.590311	97.40959	0.000000	0.000000
2	0.346247	0.746607	0.880417	97.87065	0.181196	0.321127
3	0.399758	1.222660	2.804862	93.52057	0.280010	2.171898
4	0.409527	1.100473	5.723745	88.69539	0.537161	3.943233
5	0.418186	1.180672	6.472357	87.54540	0.730325	4.071249
6	0.425713	1.171012	6.422764	87.63882	0.730236	4.037164
7	0.429223	1.203232	6.580251	86.80746	0.992316	4.416741
8	0.429967	1.166933	6.549557	86.40806	1.083795	4.791651
9	0.431913	1.174820	6.493511	86.38660	1.076000	4.869070
10	0.432249	1.192354	6.564887	86.23244	1.135889	4.874432

CONCLUSION

In this paper, we provide empirical evidence on the effects of monetary policy changes on consumer loans, credit cards volume, inflation, total consumption, non- performing credits and non-performing credit cards, using monthly data between the period 2004:12-2009:12. In our analysis, we used the VAR approach, which is considered sorts of benchmark in econometric modeling of monetary policy, was first used by Sims (1972) to measure causality.

First, we analyzed responses of rate and volume of loans to policy rate variations in order to show monetary policy transmission works or not in terms of credit channel. Later, we

set a new VAR model to analyze effects of policy rate on loans, credit cards, consumption and price. Results showed that, monetary policy transmission works in 2005:01-2009:12 period. When policy rate increase, banks are increasing their loan rate and borrowing volume is reducing. Also, along with the monetary policy shock, total loans, credit cards and consumption is reducing as expected but inflation is increasing. The reason of this dissimilarity can be explained with the inflation expectation.

In model 3 we analyzed non-performing loans and credit card responses against monetary policy shock. Our results indicate monetary policy shock has limited affects on non-performing loans and non-performing credit cards volume and responses of non-performing loans and non-performing credit cards are dissimilar. Non-performing loans volume response direction is negative which means when policy rate have a positive one standard deviation shock, non-performing loans volume is reducing and reaching the deepest level two months later. Response of non-performing credit card volume's direction is positive and reaches the top level in third month. Also, their responses start to lose policy rate shock influence ten months later. In addition to these, upon closer inspection, we see that response of non-performing loans volume realizes earlier than the non-performing credit card volume and inflation is more influential on non-performing credit card volumes than policy rate.

9. APPENDIX

Figure 7: Impulse Response Functions for Model 1 with Three Months Average Data

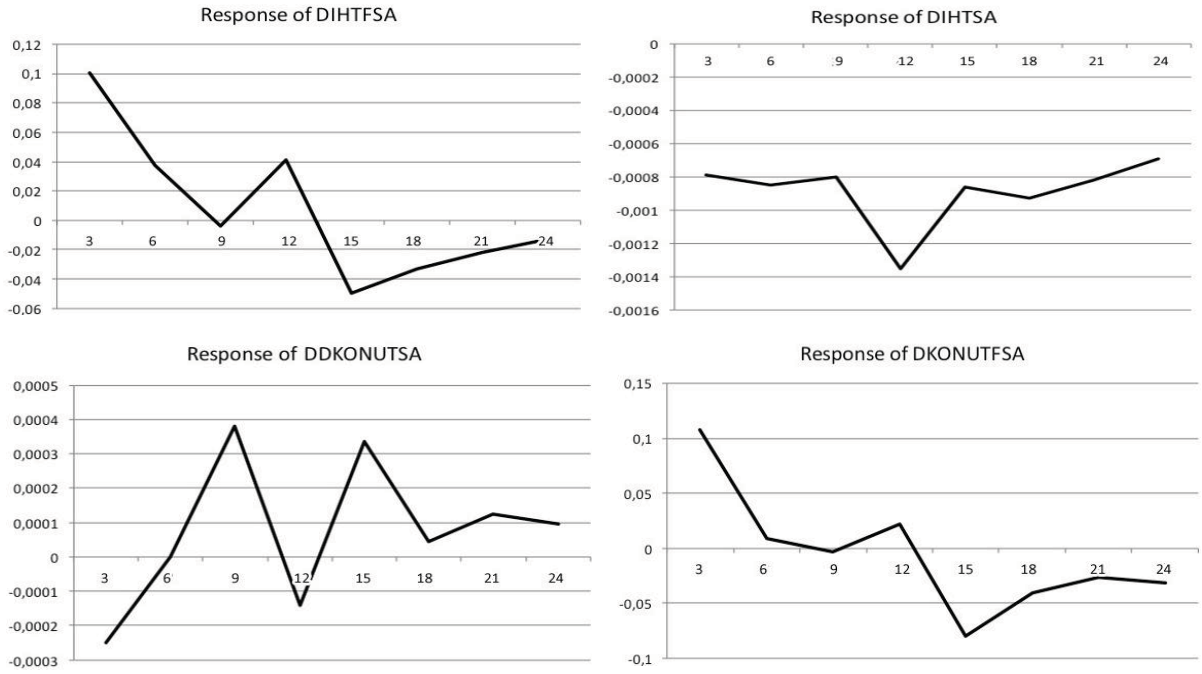


Figure 8: Impulse Response Functions for Model 2 with Three Months Average Data

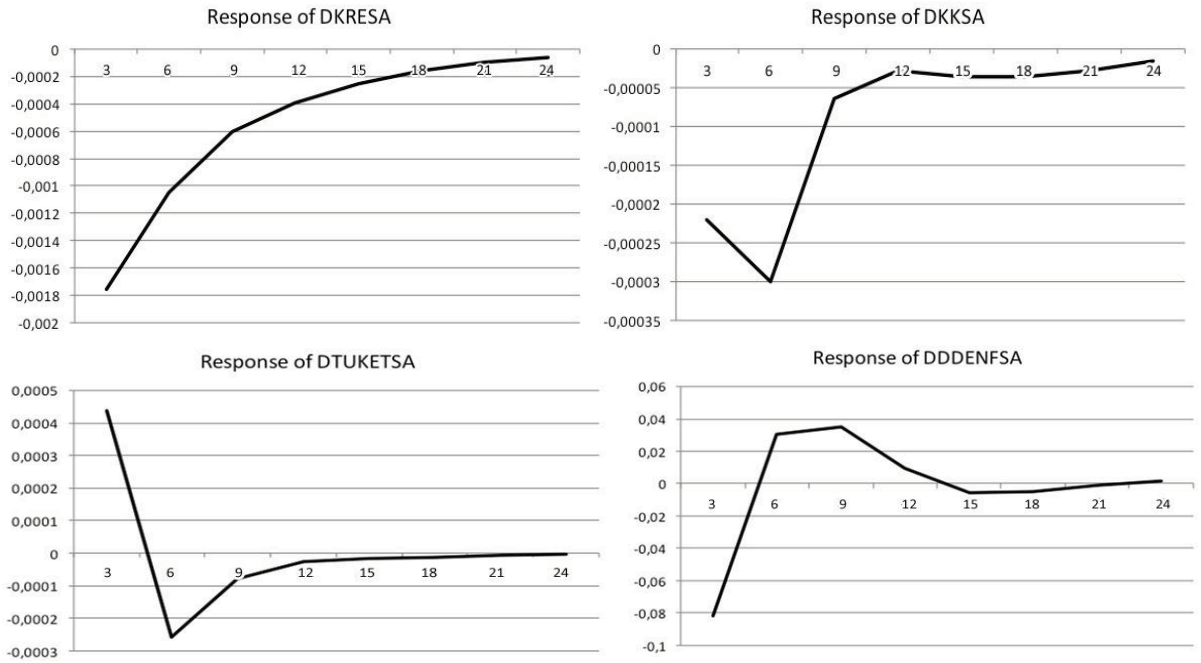


Figure 9: Impulse Response Functions for Model 3 with Three Months Average Data

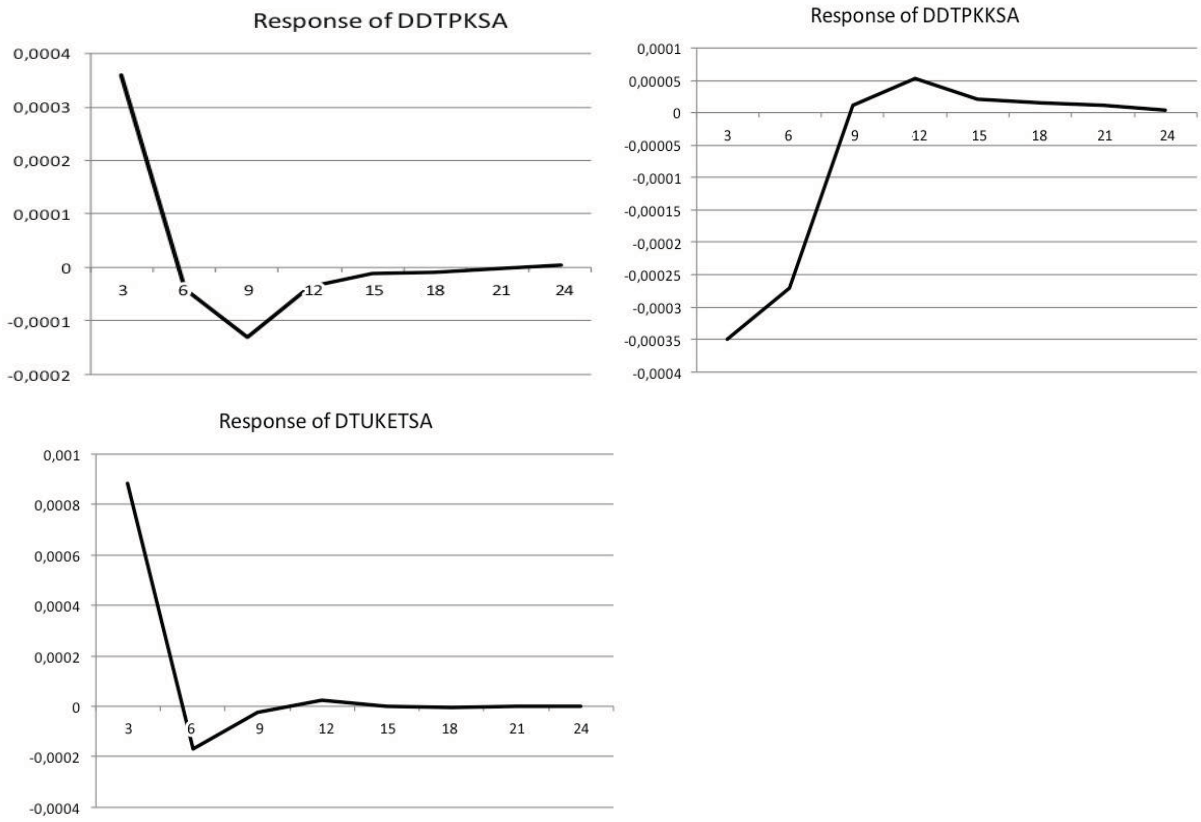


Table 9: Summary Statistics for Model 1

Vector Autoregression Estimates

Date: 06/03/12 Time: 22:00

Sample (adjusted): 2005M07 2009M12

Included observations: 54 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	DDONSA	DIHTFSA	DKONUTFSA	DIHTSA	DDKONUTSA
DDONSA(-1)	-0.049284	1.368994	1.759992	0.000247	-0.009112
	(0.17080)	(0.55921)	(0.51718)	(0.00530)	(0.00535)
	[-0.28854]	[2.44808]	[3.40307]	[0.04666]	[-1.70263]
DDONSA(-2)	-0.257531	-1.143256	-0.808197	-0.002829	-0.000558
	(0.19556)	(0.64027)	(0.59214)	(0.00607)	(0.00613)
	[-1.31687]	[-1.78559]	[-1.36487]	[-0.46622]	[-0.09107]
DDONSA(-3)	-0.075292	1.841070	1.843580	0.003665	-0.002439
	(0.19066)	(0.62422)	(0.57730)	(0.00592)	(0.00597)
	[-0.39490]	[2.94941]	[3.19347]	[0.61955]	[-0.40828]
DDONSA(-4)	0.052144	-1.260948	-1.346322	0.003228	0.001742
	(0.13659)	(0.44719)	(0.41357)	(0.00424)	(0.00428)
	[0.38176]	[-2.81974]	[-3.25534]	[0.76163]	[0.40698]
DDONSA(-5)	0.247371	1.306612	0.232725	-0.004959	-0.001231
	(0.15323)	(0.50167)	(0.46396)	(0.00475)	(0.00480)
	[1.61439]	[2.60453]	[0.50161]	[-1.04309]	[-0.25635]

Table continues

Table 9
continued

DIHTFSA(-1)	-0.231581	-0.911143	0.118798	0.002919	0.002603
	(0.05645)	(0.18483)	(0.17094)	(0.00175)	(0.00177)
	[-4.10211]	[-4.92963]	[0.69498]	[1.66678]	[1.47175]
DIHTFSA(-2)	-0.145555	-0.048179	0.670673	0.001006	-0.002198
	(0.07962)	(0.26067)	(0.24108)	(0.00247)	(0.00249)
	[-1.82813]	[-0.18482]	[2.78196]	[0.40722]	[-0.88104]
DIHTFSA(-3)	-0.019726	-0.558249	0.008477	-0.000128	-0.002099
	(0.08082)	(0.26461)	(0.24472)	(0.00251)	(0.00253)
	[-0.24406]	[-2.10967]	[0.03464]	[-0.05107]	[-0.82870]
DIHTFSA(-4)	-0.049329	0.113924	0.311590	0.000755	-0.001384
	(0.07709)	(0.25240)	(0.23343)	(0.00239)	(0.00242)
	[-0.63986]	[0.45136]	[1.33483]	[0.31559]	[-0.57301]
DIHTFSA(-5)	-0.059382	0.303901	0.320614	0.001034	-0.000143
	(0.05831)	(0.19090)	(0.17655)	(0.00181)	(0.00183)
	[-1.01842]	[1.59194]	[1.81600]	[0.57161]	[-0.07808]
DKONUTFSA(-1)	0.191453	1.508773	0.097864	-0.005973	-0.002616
	(0.06940)	(0.22721)	(0.21013)	(0.00215)	(0.00217)
	[2.75880]	[6.64056]	[0.46574]	[-2.77404]	[-1.20292]
DKONUTFSA(-2)	0.159720	0.131926	-0.582211	-0.001341	-0.003148
	(0.08232)	(0.26953)	(0.24927)	(0.00255)	(0.00258)
	[1.94012]	[0.48947]	[-2.33567]	[-0.52508]	[-1.22055]

Table
continues

Table 9
continued

DKONUTFSA(-3)	0.050192	0.908586	0.243407	-0.002695	0.002915
	(0.08696)	(0.28470)	(0.26330)	(0.00270)	(0.00272)
	[0.57720]	[3.19143]	[0.92446]	[-0.99878]	[1.07000]
DKONUTFSA(-4)	0.008682	0.191106	0.117924	-0.003003	-0.000876
	(0.08144)	(0.26664)	(0.24659)	(0.00253)	(0.00255)
	[0.10661]	[0.71673]	[0.47821]	[-1.18849]	[-0.34322]
DKONUTFSA(-5)	-0.095940	-0.643682	-0.275560	0.002382	0.002754
	(0.08323)	(0.27251)	(0.25203)	(0.00258)	(0.00261)
	[-1.15264]	[-2.36206]	[-1.09338]	[0.92223]	[1.05618]
DIHTSA(-1)	-9.187797	-17.49348	30.28234	0.673009	-0.370496
	(6.75436)	(22.1136)	(20.4514)	(0.20955)	(0.21163)
	[-1.36028]	[-0.79107]	[1.48070]	[3.21164]	[-1.75069]
DIHTSA(-2)	31.50208	58.53021	67.69830	0.195850	0.242753
	(8.72537)	(28.5667)	(26.4194)	(0.27070)	(0.27338)
	[3.61040]	[2.04890]	[2.56245]	[0.72349]	[0.88795]
DIHTSA(-3)	3.472103	10.33905	-16.07575	-0.229690	-0.325399
	(10.6715)	(34.9382)	(32.3120)	(0.33108)	(0.33436)
	[0.32536]	[0.29592]	[-0.49752]	[-0.69376]	[-0.97320]
DIHTSA(-4)	-31.68775	-21.25573	-22.04024	0.157859	0.265087
	(9.12568)	(29.8773)	(27.6315)	(0.28312)	(0.28593)
	[-3.47237]	[-0.71143]	[-0.79765]	[0.55756]	[0.92711]

Table
continues

Table 9
continued

DIHTSA(-5)	-0.075604	-56.92966	-31.89169	0.376448	0.124104
	(10.0377)	(32.8631)	(30.3929)	(0.31142)	(0.31450)
	[-0.00753]	[-1.73233]	[-1.04931]	[1.20882]	[0.39460]
DDKONUTSA(-1)	4.817241	34.76302	1.145807	-0.115840	-0.259478
	(6.87179)	(22.4981)	(20.8070)	(0.21320)	(0.21531)
	[0.70102]	[1.54515]	[0.05507]	[-0.54335]	[-1.20515]
DDKONUTSA(-2)	-2.763786	6.175216	0.885283	-0.149566	-0.318770
	(6.77997)	(22.1975)	(20.5290)	(0.21035)	(0.21243)
	[-0.40764]	[0.27819]	[0.04312]	[-0.71104]	[-1.50058]
DDKONUTSA(-3)	-14.66977	-28.61012	-12.38258	-0.025907	0.242238
	(5.89961)	(19.3152)	(17.8633)	(0.18303)	(0.18485)
	[-2.48657]	[-1.48122]	[-0.69318]	[-0.14154]	[1.31048]
DDKONUTSA(-4)	0.931786	4.408007	1.918300	0.033672	-0.054728
	(4.90694)	(16.0652)	(14.8576)	(0.15224)	(0.15374)
	[0.18989]	[0.27438]	[0.12911]	[0.22118]	[-0.35597]
DDKONUTSA(-5)	-4.194906	0.672122	2.284177	-0.179893	0.169793
	(4.13045)	(13.5230)	(12.5065)	(0.12815)	(0.12942)
	[-1.01561]	[0.04970]	[0.18264]	[-1.40381]	[1.31199]

Table
continues

Table 9
continued

C	0.036356	0.277340	-0.251947	-0.003532	-0.001227
	(0.10438)	(0.34174)	(0.31605)	(0.00324)	(0.00327)
	[0.34831]	[0.81155]	[-0.79717]	[-1.09081]	[-0.37518]
R-squared	0.835387	0.865335	0.805802	0.724303	0.660930
Adj. R-squared	0.688412	0.745098	0.632411	0.478144	0.358189
Sum sq. resids	1.392898	14.93037	12.77019	0.001341	0.001367
S.E. equation	0.223039	0.730224	0.675336	0.006920	0.006988
F-statistic	5.683846	7.196925	4.647307	2.942424	2.183156
Log likelihood	22.13246	-41.91183	-37.69219	209.6727	209.1404
Akaike AIC	0.143242	2.515253	2.358970	-6.802694	-6.782978
Schwarz SC	1.100901	3.472912	3.316629	-5.845035	-5.825319
Mean dependent	0.017608	-0.186975	-0.094576	0.013610	-0.000989
S.D. dependent	0.399567	1.446338	1.113880	0.009579	0.008723
Determinant resid covariance (dof adj.)		1.25E-11			
Determinant resid covariance		4.67E-13			
Log likelihood		383.4603			
Akaike information criterion		-9.387419			
Schwarz criterion		-4.599124			

Table 10: Summary Statistics of Model 2

Vector Autoregression Estimates

Date: 06/03/12 Time: 22:04

Sample (adjusted): 2005M05 2009M12

Included observations: 56 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	DDONSA	DKRESA	DKKSA	DTUKETSA	DDDENFSA
DDONSA(-1)	-0.003789	-0.004646	-0.003746	0.003029	0.042467
	(0.12249)	(0.00224)	(0.00253)	(0.00224)	(0.35684)
	[-0.03094]	[-2.07431]	[-1.48342]	[1.35284]	[0.11901]
DDONSA(-2)	-0.517913	-0.001463	-0.000496	0.002127	-0.915676
	(0.12393)	(0.00227)	(0.00255)	(0.00227)	(0.36103)
	[-4.17895]	[-0.64569]	[-0.19419]	[0.93881]	[-2.53627]
DKRESA(-1)	7.088748	0.529288	-0.017428	0.204639	5.506025
	(7.59505)	(0.13888)	(0.15657)	(0.13882)	(22.1251)
	[0.93334]	[3.81121]	[-0.11131]	[1.47412]	[0.24886]
DKRESA(-2)	4.327180	0.397175	0.321090	-0.023391	-8.203442
	(7.55781)	(0.13820)	(0.15580)	(0.13814)	(22.0167)
	[0.57254]	[2.87401]	[2.06086]	[-0.16933]	[-0.37260]
DKKSA(-1)	-11.59482	-0.240899	-0.368074	-0.143095	-20.66620
	(7.54810)	(0.13802)	(0.15560)	(0.13796)	(21.9884)
	[-1.53612]	[-1.74542]	[-2.36546]	[-1.03720]	[-0.93987]

Table continues

Table 10
continued

DKKSA(-2)	-17.54561	-0.305718	-0.353523	-0.274386	13.36164
	(7.34023)	(0.13422)	(0.15132)	(0.13416)	(21.3828)
	[-2.39033]	[-2.27779]	[-2.33628]	[-2.04515]	[0.62488]
DTUKETSA(-1)	7.576146	0.280593	0.149197	-0.086011	46.10943
	(7.93850)	(0.14516)	(0.16365)	(0.14510)	(23.1257)
	[0.95435]	[1.93304]	[0.91168]	[-0.59277]	[1.99386]
DTUKETSA(-2)	18.62250	-0.073752	0.052164	-0.200652	26.93491
	(8.16790)	(0.14935)	(0.16838)	(0.14929)	(23.7939)
	[2.27996]	[-0.49382]	[0.30980]	[-1.34402]	[1.13201]
DDDENFSA(-1)	-0.041994	2.05E-05	-6.89E-05	-2.11E-06	-1.144017
	(0.04027)	(0.00074)	(0.00083)	(0.00074)	(0.11731)
	[-1.04278]	[0.02783]	[-0.08300]	[-0.00286]	[-9.75172]
DDDENFSA(-2)	0.021422	-0.000424	-0.001341	0.000535	-0.528103
	(0.04044)	(0.00074)	(0.00083)	(0.00074)	(0.11780)
	[0.52973]	[-0.57295]	[-1.60888]	[0.72390]	[-4.48289]
C	-0.026773	0.003610	0.007263	0.005477	-0.166997
	(0.09741)	(0.00178)	(0.00201)	(0.00178)	(0.28377)
	[-0.27484]	[2.02695]	[3.61694]	[3.07612]	[-0.58850]
R-squared	0.455978	0.752746	0.404636	0.214820	0.800823
Adj. R-squared	0.335085	0.697801	0.272333	0.040336	0.756561
Sum sq. resids	4.679743	0.001565	0.001989	0.001563	39.71303
S.E. equation	0.322481	0.005897	0.006648	0.005894	0.939421

Table continues

Table 10
continued

F-statistic	3.771732	13.69991	3.058397	1.231173	18.09297
Log likelihood	-9.961518	214.1318	207.4159	214.1539	-69.83774
Akaike AIC	0.748626	-7.254709	-7.014853	-7.255496	2.887062
Schwarz SC	1.146463	-6.856872	-6.617016	-6.857659	3.284899
Mean dependent	0.011344	0.012996	0.006864	0.003809	-0.016778
S.D. dependent	0.395477	0.010726	0.007793	0.006017	1.903994

Determinant resid covariance (dof adj.)	3.80E-15
Determinant resid covariance	1.27E-15
Log likelihood	562.9843
Akaike information criterion	-18.14230
Schwarz criterion	-16.15311

Table 11: Summary Statistics of Model 3

Vector Autoregression Estimates

Date: 06/03/12 Time: 23:25

Sample (adjusted): 2005M05 2009M12

Included observations: 56 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	DDONSA	DDTPKSA	DDTPKKSA	DTUKETSA	DDDENFSA
DDONSA(-1)	0.041523	-0.001186	-0.008621	0.002420	-0.260700
	(0.12266)	(0.00551)	(0.00686)	(0.00228)	(0.32432)
	[0.33851]	[-0.21519]	[-1.25736]	[1.06282]	[-0.80382]

Table continues

Table 11
continued

DDONSA(-2)	-0.564987	0.003545	0.001855	0.001168	-0.892582
	(0.12169)	(0.00547)	(0.00680)	(0.00226)	(0.32176)
	[-4.64275]	[0.64861]	[0.27271]	[0.51707]	[-2.77410]
DDTPKSA(-1)	0.980514	-0.878875	0.138750	0.090103	12.66746
	(3.04093)	(0.13659)	(0.16997)	(0.05645)	(8.04024)
	[0.32244]	[-6.43463]	[0.81631]	[1.59618]	[1.57551]
DDTPKSA(-2)	-4.389247	-0.462195	-0.030039	0.028119	23.62133
	(3.11419)	(0.13988)	(0.17407)	(0.05781)	(8.23395)
	[-1.40943]	[-3.30433]	[-0.17257]	[0.48641]	[2.86877]
DDTPKKSA(-1)	-1.379789	-0.004763	-0.904705	-0.025797	-9.947629
	(2.13628)	(0.09595)	(0.11941)	(0.03966)	(5.64834)
	[-0.64588]	[-0.04964]	[-7.57662]	[-0.65051]	[-1.76116]
DDTPKKSA(-2)	-2.564931	-0.110608	-0.590078	-0.046722	-8.776289
	(2.08359)	(0.09359)	(0.11646)	(0.03868)	(5.50903)
	[-1.23102]	[-1.18189]	[-5.06670]	[-1.20797]	[-1.59307]
DTUKETSA(-1)	15.82755	-0.313004	-0.119597	0.055706	35.74020
	(8.00799)	(0.35968)	(0.44761)	(0.14865)	(21.1732)
	[1.97647]	[-0.87022]	[-0.26719]	[0.37474]	[1.68799]
DTUKETSA(-2)	15.73923	-0.446733	0.015847	-0.147376	40.12068
	(8.25704)	(0.37087)	(0.46153)	(0.15328)	(21.8317)
	[1.90616]	[-1.20456]	[0.03434]	[-0.96150]	[1.83773]

Table continues

Table 11
continued

DDDENFSA(-1)	-0.016032	-0.000338	0.001663	0.000565	-1.201934
	(0.03903)	(0.00175)	(0.00218)	(0.00072)	(0.10319)
	[-0.41081]	[-0.19296]	[0.76230]	[0.77983]	[-11.6483]
DDDENFSA(-2)	0.037128	-2.30E-05	-0.000693	0.001035	-0.569610
	(0.03826)	(0.00172)	(0.00214)	(0.00071)	(0.10115)
	[0.97055]	[-0.01341]	[-0.32425]	[1.45768]	[-5.63153]
C	-0.106057	0.001553	0.000118	0.004160	-0.256317
	(0.05969)	(0.00268)	(0.00334)	(0.00111)	(0.15783)
	[-1.77674]	[0.57910]	[0.03531]	[3.75449]	[-1.62405]
R-squared	0.437317	0.550157	0.652692	0.162335	0.830292
Adj. R-squared	0.312276	0.450192	0.575512	-0.023812	0.792579
Sum sq. resids	4.840274	0.009765	0.015122	0.001668	33.83728
S.E. equation	0.327966	0.014731	0.018332	0.006088	0.867145
F-statistic	3.497393	5.503499	8.456793	0.872078	22.01617
Log likelihood	-10.90591	162.8604	150.6138	212.3421	-65.35448
Akaike AIC	0.782354	-5.423587	-4.986208	-7.190791	2.726946
Schwarz SC	1.180191	-5.025750	-4.588371	-6.792954	3.124783
Mean dependent	0.011344	-0.001171	-0.000443	0.003809	-0.016778
S.D. dependent	0.395477	0.019866	0.028136	0.006017	1.903994
Determinant resid covariance (dof adj.)		1.82E-13			
Determinant resid covariance		6.10E-14			
Log likelihood		454.6610			
Akaike information criterion		-14.27361			
Schwarz criterioN		-12.28442			

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