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MASTER'S THESIS

ANALYSIS OF MONETARY TRANSMISSION CHANNELS IN TURKEY

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ABSTRACT

Master's Thesis

Analysis of Monetary Transmission Channels in Turkey

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Monetary policy exerts its impact on economic activity through monetary transmission channels. On that account, knowing operation of specific transmission mechanisms is a prerequisite for policy makers to be able to conduct appropriate policies. Within this context, this thesis examines operation of several transmission channels in Turkey for the period 2003 through 2013 to understand underlying mechanisms of monetary propagation process and thereby enhance knowledge about consequences of monetary policies. Estimation results based on Vector Autoregression (VAR) methodology reveal that conventional monetary transmission channels do not operate properly during the low inflation period. Although evidence suggests that interest rate, exchange rate and bank lending channels are operating partially; empirical support for transmission mechanism is generally weak and inconclusive.

Keywords: Monetary policy, Transmission mechanisms, VAR model

ÖZET

Yüksek Lisans Tezi

Türkiye'de Parasal Aktarım Kanallarının Analizi

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Para politikası ekonomik aktivite üzerindeki etkisini parasal aktarım kanalları yoluyla gösterir. Bu sebeple, uygun politikaları uygulayabilmeleri adına belirli aktarım mekanizmalarının işleyişini bilmek politika yapıcılar için bir önkoşuldur. Bu bağlamda, bu tez parasal yayılım sürecindeki mekanizmaları anlamak ve bu yolla para politikalarının sonuçları hakkındaki bilgi birikimini arttırmak için 2003-2013 yılları arasında Türkiye'deki çeşitli parasal aktarım kanallarının işleyişini incelemektedir. VAR metodu kullanılarak yapılan analizler geleneksel parasal aktarım kanallarının düşük enflasyon döneminde uygun bir şekilde çalışmadığını ortaya koymuştur. Her ne kadar elde edilen bulgular faiz kanalı, döviz kuru kanalı ve banka kredi kanalının kısmen işlediğini gösterse de genel olarak aktarım mekanizması için ampirik destek zayıf ve yetersizdir.

Anahtar Kelimeler: Para Politikası, Aktarım mekanizmaları, VAR modeli

THE ANALYSIS OF MONETARY TRANSMISSION IN TURKEY

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ABBREVIATIONS

ADF	Augmented Dickey-Fuller Test
AIC	Akaike Information Criterion
CBRT	Central Bank of the Republic of Turkey
CPI	Consumer Price Index
EDDS	Electronic Data Delivery System
FAVAR	Factor-Augmented Vector Autoregression
FED	Federal Reserve System
G7	Group of Seven
GMM	Generalized Method of Moments
ISE	Istanbul Stock Exchange
OLS	Ordinary Least Squares
TSI	Turkish Statistical Institute
UK	United Kingdom
US	United States
VAR	Vector Autoregression

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INTRODUCTION

In today's world, it is generally accepted that monetary policy is a powerful tool to steer economy. In a widespread manner, authorities are using monetary instruments to achieve some ultimate economic goals such as low inflation, high economic growth and high employment. Mostly, however, central banks do not have ability to alter these variables directly. Indeed, a policy impulse exerts its impact on target variables by means of some intervening variables such as interest rates, exchange rates, asset prices and credit facilities. That is to say, impact of monetary policy actions on economic activity occurs indirectly via interaction of various factors. In literature, this process in which policy shifts initially lead changes in intermediate variables and then manipulate prices and aggregate output in the economy is known as monetary transmission mechanism.

By the virtue of the fact that monetary policy actions are transmitted into economy via particular channels, understanding operation of transmission process is very important for policy-makers. In order to manipulate target variables in line with their intentions, authorities should know which channels are more effective in transmission process and what the impact of applied policies on particular variables is. However, these are not very easy tasks, as by definition, transmission mechanism is a complex, and, in particular, an uncertain process involving interaction of many variables.

In order to understand underlying mechanisms of monetary propagation process and thereby enhance knowledge about consequences of monetary policies, researchers vastly investigate the channels of monetary influence over the past several decades. As a result of these efforts, theoretical channels through which monetary policy can influence aggregate output and prices are defined clearly in literature. However, empirical studies mostly provide controversial and inconsistent evidence on operation of monetary transmission mechanism. Existing literature shows that effectiveness of general propagation mechanism and, in particular, importance of specific channel in this process varies across countries and across time. On that account, it can be stated that there are still some unresolved parts in monetary transmission mechanism literature and the field requires further and deeper

analysis on country-specific factors to shed light on process of monetary propagation.

Given the preceding discussions, this thesis examines operation of transmission mechanism in Turkey. According the author of this thesis, Turkish economy is an interesting case study for monetary policy analysis as it has experienced major structural changes recently. Until the early years of 2000s, Turkey has a fragile economy that is characterized with high inflation, budget deficits and dollarization problems, which collectively hinder effectiveness of monetary policy applications. However, with the end of 2001 economic crisis, Turkish economy begins to discard its structural problems and enters into a new era due to implemented economic reforms. Additively, in 2002, Central Bank of the Republic of Turkey (CBRT) announced its intention to transition to inflation-targeting regime and determined short-term interest rates as the primary policy instrument. As a consequence of these policy shifts, inflation rate and expectations decline to acceptable levels in recent years and economic environment become more stable compared to pre-crisis period.

In line with these developments, most studies in literature state that operation of monetary transmission mechanism has changed dramatically during the last decade. Generally, it is argued that low inflation environment facilitates monetary policy applications and makes them more influential over inflation and aggregate demand dynamics, suggesting strengthening of monetary transmission mechanism in Turkey. In this thesis, the main motivation is testing this hypothesis by providing evidence on operation of specific monetary transmission channels over the period 2003-2013. In order to do that the thesis sets up different Vector Autoregression (VAR) systems for each transmission channel and estimates impact of given monetary policy shocks on variables belong to particular models. In literature, this approach is mainly considered as a useful way to understand operation of monetary transmission mechanism as it provides opportunity to trace out influence of monetary innovations over both intermediate and target variables in the models and therefore allows for making inferences about effectiveness of particular channels in the transmission process. Accordingly, this thesis employs VAR methodology to explore underlying mechanisms of monetary propagation process in Turkey.

Two main findings emerge from empirical analysis. First, contrary to expectations, estimation results reveal that monetary transmission mechanisms do not operate properly during the low inflation period. Evidence shows that monetary policy shocks have no significant influence over changes in inflation rate. Also, it is found that inflation rate is unresponsive to innovations in most intervening variables. These results indicate that instead of shifts in other variables, price level changes are mainly driven by their own shocks, indicating presence of an expectations channel in transmission process. Second, results put forth that albeit conducted monetary policies are inconclusive for inflation rate shifts, they have still ability to lead changes in some intervening variables, including cost of borrowing rates, exchange rates and credit aggregates, suggesting partial operation of some channels in transmission process in Turkey. This finding indicates that monetary policy shifts associated with movements in particular intermediate variables are influential over aggregate demand level in the economy. That is, although inflation dynamics are somewhat independent form monetary shocks, monetary policy applications are not totally ineffective on economic activity. However, in a number ways, estimation results presented in this thesis are not consistent with theoretical expectations. Considering this fact, the main conclusion of this thesis is that monetary transmission mechanism does not operate effectively in Turkish economy.

The remainder of the thesis is structured as follows. The next chapter provides an overview of monetary transmission mechanism regarding theoretical aspects in the literature. This chapter first discusses various theoretical approaches to monetary transmission mechanism and then describes operation of individual transmission channels that are identified in literature. Following this, Chapter 2 reviews empirical evidence on operation of transmission channels in different countries as well as in Turkey to give a general understanding about functioning of monetary propagation process in different financial and economic structures. In Chapter 3, estimation procedures of VAR methodology and derivation of impulse-response functions are presented briefly. Subsequent to introduction of econometric methodology, Chapter 4 describes the dataset used in analysis and documents estimation results for operation of each monetary transmission channels. The final

section summarizes the main findings and concludes thesis with delivering last opinions about monetary policy applications in Turkey.

CHAPTER 1
THE MONETARY TRANSMISSON MECHANISM

1.1. APPROACHES TO MONETARY TRANSMISSON MECHANISM

The interaction between monetary policy and real activity has a long history in economics. Up to the present, many researchers attempt to identify role of monetary policy applications in price and output variations. Overall, there is a consensus among economists that monetary authorities have ability to lead changes in economic activity at least in the short-run. However, underlying mechanisms of this influence are still subject to considerable debate in literature. Throughout history, economists follow many different theoretical approaches and provide a wide range of explanations to transmission process of monetary impulses. In particular, however, this large set of ideas can be grouped into two broad categories as Keynesian and monetarist, regarding their approaches to effectiveness of monetary policy on economic activity, and more specifically to transmission mechanism (Cengiz, 2008: 115-124; Mishkin, 2007a: 583-596). In short, the main distinction between these two views comes from their treatment on money demand function. While Keynesian approaches consisting of both Keynesian theories on money and Tobin's portfolio theory give specific role to interest rates in money demand function and transmission mechanism, monetarist views including classical as well as monetarist theories analyze monetary transmission mechanism by using revisions of quantity equation. In the following lines, both of these two approaches are discussed briefly to provide a basis for further analysis about specific propagation channels.

In Keynesian view, monetary policy innovations are transmitted into economy via IS-LM mechanism. According to Keynesians, transmission process occurs in two-stage. In the first stage, innovations in monetary policies lead to changes in liquidity level in the money market and thereby cause interest rates to fluctuate. In the second stage, these changes in interest rates affect real sector by altering firm investments and other interest-sensitive spendings, which ultimately shift aggregate demand and price level in the economy. In this regard, Keynesian approach indicates an indirect transmission mechanism for monetary policy in which

monetary impulses are transferred into economy via influence of interest rates over agents' spending decisions. This mechanism, therefore, suggests that Keynesians consider interest rate as the primary element that reflects shifts in the money market into goods and services market.

On the other side, monetarists postulate a quite different transmission process for monetary policy actions. In contrast to Keynesian indirect monetary transmission process, monetarists assert that changes in monetary policy directly affect economy by altering all components of aggregate spending (Orhan and Erdoğan, 2008: 193). According to monetarist view, an increase in money supply is associated with a temporary raise in proportion of real money balances in portfolio of individuals. This situation directly lowers marginal utility of holding money compared to other assets and leads economic agents to engage in transactions to replace their money balances with other assets until marginal utility of holding each asset in the portfolio become equal to each other. Correspondingly, demand for both financial and real assets shifts and causes relative prices to change. In line with the changes in relative prices, economic agents begin to reestablish their demand composition by increasing their spending on consumption and investment goods. As a result, aggregate demand level shifts up and ultimately leads higher output level in the economy.

In summary, monetarist approach reveals that transmission mechanism operates via effect of induced changes in relative prices of assets on aggregate demand level. This implies that in contrast to Keynesian approach, interest rates do not play any distinctive role in transmission process. Indeed, monetarists see interest rate on money as only one of the relative prices in the economy and thus give relatively limited role to interest rate changes in propagation mechanism of monetary policy (Meltzer, 1995: 59, Spencer, 1974: 8). In addition, monetarists claim that given the fact that there are numerous relative prices in the economy, monetary transmission mechanism consists of more than one channel in contrast to Keynesian view in which transmission mechanism operates mainly via interest rate channel.

Besides their way of explaining monetary transmission mechanism, Keynesian and monetarist views have also different implications for effectiveness of monetary policy. For instance, while Keynesians state that monetary policy has a

limited power to effect economic activity, monetarists indicate that changes in monetary policy is the main factor that leads variations in output level.

In Keynesian analysis, it is believed that money demand schedule and velocity of money are highly sensitive to changes in interest rates. That is, agents' demand for money is characterized with high interest rate elasticity. With this respect, Keynesians state that monetary policy actions that alter market interest rates are likely to shift money demand schedule as well. This, in turn, will bring about further variations in money market and change equilibrium level of interest rates after a money supply shock. Consequently, monetary policy will lose its control on market interest rates and thereby become ineffective to direct aggregate demand and price level in the economy.

By contrast, monetarists think that money demand function and velocity are not responsive to changes in interest rates as Keynesian economists assert. Friedman (1966: 72) notes that there is a consensus in literature on inelastic nature of money demand function. That is, changes in interest rate have relatively small effect on economic agents' incentive to hold money (Mishkin, 2007a: 507-509). On that account, monetarists claim that money demand function is stable, suggesting induced changes in money supply have ability to alter both interest rates and output level in the economy.

However, monetarist economists state that effect of a monetary policy action on aggregate output level is not very predictable and certain. Although monetary actions lead changes in aggregate output level, there are some ambiguities about how and when these effects emerge. According to monetarists, influence of a given monetary shocks over real economic activity can only be observed in time due to existing lags in transmission process. For that reason, they state that monetary policies should be applied by care. For instance, monetary authorities should not follow discretionary monetary actions all the time to rebalance economy; as such policies may lead undesirable fluctuations in aggregate income level and prices due to timing lapses (Keyder and Ertunga, 2012: 444). Indeed, some economists including Friedman mainly emphasize that rather than discretionary policies, predictable policies are more suitable for economic stabilization, as these policies lower uncertainties about expected prices and reduce informational costs for

economic agents (Friedman, 1966: 83-84; Meltzer, 1995: 50; Orhan and Erdoğan, 2008: 197). This reveals that even though monetarists accept influence of monetary policy actions over real activity, they are against discretionary policy applications that are used to direct aggregate output and price level in the economy.

The theoretical differences between Keynesian and monetarist approaches discussed above also reflect in their way of modeling monetary transmission mechanism. While Keynesians generally constitute structural models to examine monetary propagation process, monetarists use reduced-form analysis to capture interactions between monetary actions and macroeconomic variables.

Broadly speaking, Keynesian structural models, which include many equations defining equilibrium situations in multiple markets, aim to capture all possible interactions among macroeconomic variables (Aslan, 2009: 588). In essence, these models are very useful for economists to understand how monetary transmission mechanism operates and what the consequences of conducted policies on intermediate and final macroeconomic variables are. Moreover, this type of analysis helps monetary authorities to improve their knowledge about functioning of individual channels of monetary transmission process and thereby implement more accurate policies in order to control prices and aggregate demand level in the economy.

However, using structural models comprise some deficiencies as well. For instance, most of the time, economists set restrictions to parameters of structural models in order to cover some theoretical concerns. Although these restrictions enable researchers to capture some theoretical issues, they can sometimes deteriorate prediction power of the models and mislead obtained results from estimations if they are not defined truly. Therefore, it is fair to state that Keynesians structural models are useful inasmuch as their structures are designated correctly. Otherwise, these models can only give poor estimations about consequences of applied policies or given shocks, which may harm decision making process by misguiding policy makers (Mishkin, 2007a: 583-587, Sims, 1980: 1).

On the other hand, in monetarist attitude, effects of money supply on aggregate output level is handled by reduced form analysis that directly examine interaction between monetary policy and output. The main assertion of monetarists is

that changes in money supply influence output level through operation of many channels that cannot be defined completely by structural models. In this sense, monetarists indicate that the best way to analyze relationship between monetary policy and output is using two-variable reduced form analysis. One major advantages of focusing on reduced form approach is that there is no restriction on the relationship between money supply and aggregate output level, which can restrain full effect of one on other. By using this type of analysis, the influence of money supply on output level is covered directly without considering identification problems occur in structural models. However, one drawback of reduced-form approach is that the results from such analysis can misguide researchers about the link between money and output, as evidence of interaction of two variables does not necessarily imply a causal relationship between them. For instance, synchronized fluctuations in money supply and output can be originated from another exogenous factor that is not included in the model. In this regard, evidence obtained from reduced form analysis should also be evaluated by caution similar to that of structural models.

Overall, it can be said that both Keynesian and monetarist approaches have great contributions to monetary policy analysis. Both of these analyses provide a general framework to understand impact of induced monetary policy shifts on economic activity. However, these broad arguments do not examine operation of specific channels through which monetary actions affect aggregate output and prices. In the following section, details of monetary propagation mechanism are presented by regarding individual transmission channels that are identified in the literature.

1.2. CHANNELS OF MONETARY TRANSMISSON MECHANISM

1.2.1. Interest Rate Channel

According to the traditional IS/LM framework, at a given profitability level, investment expenditures and interest rates are inversely related. The inverse relationship between investment level and interest rates comes from individual firm's investment behaviors. At a given time, firms have various investment opportunities

that offer different returns with several maturities. Before investing money in any of them, firms array these projects according to their expected returns. In order to gain sufficient benefit from an investment, firms try to choose projects that have higher returns than their costs. As market interest rates on borrowing opportunities represent the cost of financing of these investments, high interest rates allow only a small portion of projects to stay profitable. For that reason, firms give up launching many of these projects and lower their investment expenditures when interest rates are high in the market. In contrast, when market interest rates are relatively low, firms stimulate their investment expenditures as more projects become profitable in comparison to their cost of borrowing (Aslan, 2009: 395). In this point of view, the operation of traditional interest rate channel can be shown as follow:

$$M_s \uparrow \rightarrow r \downarrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

Where M_s stands for an expansionary monetary policy, r is the real cost of borrowing, I is the investment level and Y is the aggregate spending. As it is indicated in the schema, interest rate channel runs through the influence of conducted monetary policies over real interest rates. According to this channel, increases in money supply that lower real interest rates in the market reduce real cost of borrowing for firms. Following this, firms increase their investment expenditures as more investment projects become profitable at ongoing market rates. Accordingly, aggregate demand rises and brings about an expansion in output level in the economy.

Apart from firms, interest rate channel is influential over consumers as well. Similar to firms, consumers also regard movements in real interest rates when they want to make costly spending. As demand for housing and durable goods is directly related with borrowing conditions, changes in real interest rates resulting from innovations in monetary policy shifts spending level of consumers as well. In this respect, underlying mechanisms of interest rate channel is also applicable to consumers' expenditures on housing and durable goods (Mishkin, 1996: 2).

In interest rate channel, monetary policy actions are supposed to be transmitted into economy through real interest rates instead of nominal ones because

economic agents only consider changes in real cost of borrowing when they evaluate their investment decisions. In this sense, operation of interest rate channel relies on the assumption that monetary authorities have ability to shift real interest rates in the economy. Although, central banks have no direct control on real interest level, they can affect this variable indirectly through changing short-term nominal rates if prices in the economy are sticky at least in the short run. This mechanism works as follow: With the slow adjustment of prices, a change in nominal interest rates stemming from a monetary policy action will lead variations in the spread between nominal market rates and inflation rate. Since real interest rates are roughly defined as the difference between nominal interest rate and inflation, a change in short term nominal rates will alter the level of real cost of borrowing in the economy (Hubbard, 1995: 64, Taylor, 1995: 18). On that account, short-term stickiness in prices is an important assumption for operation of interest rate channels as it enables monetary authorities to control real interest rate through changing short-term interest rates in the money market.

However, price stickiness is not the only prerequisite for an active interest rate channel; the structure of the economy should satisfy three more conditions to be able to talk about an effective transmission mechanism operating through interest rate channel. Firstly, there should be a pass-through mechanism from short-term nominal interest rates to long-term real interest rates. That is, induced shifts in short term nominal interest rates should be influential over long-term real interest rates. If this is not the case, applied monetary policies cannot be influential over aggregate demand level through interest rate mechanism as economic agent generally considers long term real interest rates when they decide on making investment. Secondly, an effective transmission mechanism via interest rates presupposes a money demand function with low interest elasticity. Because, unless money demands function is insensitive to interest rate changes, monetary authorities cannot shift interest rates through controlling monetary aggregates. As a consequence, monetary policy implications may become obsolete in managing behaviors of agents. Thirdly, investment expenditures, housing spending and durable goods consumption should be sensitive to changes in real interest rates. If spending behavior of economic units is independent from interest rate movements, monetary authorities cannot control the

level of spending expenditures in the economy through applying policies. Therefore, interest rate channel of monetary propagation mechanism will be ineffective to transfer induced policy shifts into real economy (Taylor 1995: 14-18).

1.2.2. Asset Price Channels

1.2.2.1. Exchange Rate Channel

In an open economy, besides the traditional interest rate channel, exchange rate mechanism also plays an important role in monetary transmission process (Smets and Wouters 1999: 489). The rationale for this belief is coming from the impact of exchange rate fluctuations on relative prices of tradable goods and net exports. According to exchange rate channel, a monetary policy action that alters the domestic real interest rates will change the relative return on domestic and foreign denominated assets. In order to rebalance their portfolio, economic agents will switch their composition of domestic and foreign currency holdings, which will directly cause fluctuations in the level of exchange rates. Consequently, terms of international trade, volume of net exports and ultimately aggregate output level will change (Dornbusch, 1976: 1162). Briefly, the transmission mechanism through exchange rate can be shown as follows:

$$M_s \uparrow \rightarrow r \downarrow \rightarrow e \uparrow \rightarrow NX \uparrow \rightarrow Y \uparrow$$

Where M_s refers to an expansionary monetary policy, r is the level of real domestic interest rates, e is the exchange rate that is defined as the value of the foreign currency in terms of domestic currency, NX is the level of net exports and Y is the level of aggregate demand. Hereunder, the effect of exchange rates on aggregate demand operates through the following channel: An expansionary monetary policy that lowers the domestic real interest rates will pull down the real return on domestic currency denominated assets. On that occasion, individuals will begin to sell domestic currency denominated assets in their portfolio and try to replace them with foreign currency denominated assets. This behavior will raise

demand for foreign currencies and increase the value of exchange rate. Due to rising exchange rate, imported goods will become more expensive in comparison to domestic ones and demand for foreign goods will decrease in domestic market. At the same time, exported goods will become cheaper in foreign markets and demand for domestically produced goods will rise in other countries. As a result, the depreciation of domestic currency will brings along a comparative advantage in international trade, and with this respect, both net exports and aggregate demand will increase (Erdoğan and Yıldırım, 2008: 96-97; Mishkin, 2001: 7).

It is worth to say that exchange rate channel can only be effective if a country applies a floating exchange rate regime. Under fixed exchange rate regime, monetary policy changes cannot alter the level of aggregate demand through net exports as relative price of import and export goods is fixed to a specific value (Mundell, 1963: 484). In addition, the functioning of exchange rate channel is based on the assumption that monetary authorities are able to control real exchange rates to a certain extent. If this is not the case, exchange rates will not be responsive to conducted monetary policies.

Apart from these preconditions, the effectiveness of exchange rate changes on net exports depends on some country-specific factors such as openness rate, level of international capital mobility and foreign-source dependency of production factors (Disyatat and Vongsinsirikul, 2003: 407; Mundell, 1963: 475-476). The impact of exchange rate fluctuation on output level and inflation can vary quite a lot across countries depending on the relative importance of these factors. For instance, it is anticipated that the influence of exchange rate movements over aggregate demand and prices is relatively more significant in countries that are more integrated to world economy (Ca'Zorzi et al., 2007: 7).

Also, the response of price level and aggregate demand to changes in exchange rates depends on the weight of imported goods in the production process. Especially, in developing countries in which production depends intensively on imported intermediate goods, exchange rate channel can operate adversely. That is, an expansionary monetary policy that lowers the value of domestic currency can raise the price of foreign goods and thereby increase the cost of production (Smets and Wouters, 1999: 491).

1.2.2.2. Tobin's Q Channel

Tobin's q channel is one of the asset price channels that emphasize the role of stock market valuations in the variability of investments and aggregate spending. Tobin (1969) states that monetary policies can affect investment level in the economy through changing the value of q. He defines q as the ratio of market value of the capital to its replacement cost and assures that the link between financial and real sector mainly comes from the movements in q value which affects investors' incentive to make new investments (Tobin, 1969: 21). According to Tobin, a q value over unity implies that firms' market value of capital is higher than their replacement costs. In such a case, it becomes more advantageous for firms to make new investments through issuing new shares as newly issued shares are priced higher than their existing capital stock. This means that firms can obtain more funds in relative to their replacement cost of capital. Hence, following a rise in q value firm investments will increase, and depending on this, aggregate output level will mount up. Inversely, a q value less than unity will depress spending on new investments as issuing new shares will bring about only few funds to firms relative to their replacement cost of capital. In such a situation, firms will be more enthusiastic about investing in other company stocks rather than making new capital investments. This tendency will lower aggregate investment spending in the economy and ultimately lead output production to fall (Mishkin, 1995: 5-7).

Tobin identifies that monetary policies have indirect effects on q through portfolio adjustment process. According to him, economic agents hold diversified portfolios including many assets such as money, stocks, bonds and others by comparing their risks and relative returns. Hence, monetary authorities can effect portfolio composition of agents by altering relative return of assets. For example, an expansionary monetary policy that lowers short-term market interest rates will lower relative return on bonds. In order to rebalance their portfolios, economic agents will start a substitution process from bonds to other assets. As stocks are one of the alternatives to bonds, economic agents will increase their demand for them. This will lead stock prices to rise. As a consequence of rising market value of shares, the q

ratio will increase and directly stimulate investment rate of companies (Tobin 1978: 424). The mechanism for Tobin's q channel can be shown as follow:

$$M_s \uparrow \rightarrow P_s \uparrow \rightarrow q \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

Where M_s is the money supply, P_s is the stock prices, q is the ratio of market value to replacement cost of capital, I is the investment level and Y is the aggregate spending.

The link between stock market and investments can also be constituted through the effect of stock prices on cost of financing. As the value of a firm is the sum of its total financing sources of capital, namely bonds and stocks, the appropriate discount rate for future cash flows of investments should be the weighted average of the returns on equities and bonds. For that reason, any change in the return on bonds or stocks will alter the required rate of return of investments and shift the firms' investment decisions. Correspondingly, an expansionary monetary policy that raises stock prices and lowers their relative returns will ultimately stimulate investments due to diminishing cost of finance of capital (Bosworth et al., 1975: 280-283).

Tobin's q theory can also be applied on durable goods and residential investment. For instance, an expansionary monetary policy that stimulates demand for durable goods and housing will raise market price of the existing houses and durables compared to their replacement cost. In this stance, the q ratio calculated for housing or durables will increase. Eventually, spending on housing and durable goods production will go up and lead aggregate output level to rise (Tobin, 1978: 425).

1.2.2.3. Wealth Channel

According to wealth channel, changes in the monetary policy can direct the level of output and inflation through its effects on consumers' wealth. Ando and Modigliani (1963: 57-59) state that consumption level of individuals is not related with the level of current income only; instead, it is proportional to the present value

of consumers' total available income resources over their lifespan. This simply refers that wealth is one of the main factors that influence individuals' consumption decisions (Modigliani, 1966: 162). As wealth can be hold in many asset forms such as share of stocks, land, house, precious metals or foreign currencies, fluctuations in their value can alter the level of consumption via changing total net wealth. This means that policy applications that have ability to cause changes in the value of these assets, can be influential over total wealth of individuals and thereby over their consumption level. Depending on this assumption, the transmission mechanism through wealth channel can be shown as follows:

$$M_s \uparrow \rightarrow P_a \uparrow \rightarrow W \uparrow \rightarrow C \uparrow \rightarrow Y \uparrow$$

Where M_s is the money supply, P_a is the price of a particular asset, W is the total wealth, C is the total consumption spending over non-durables, and Y is the aggregate spending. According to that mechanism, an expansionary monetary policy that raises demand for financial and real assets will boost their prices. Accordingly, individuals' wealth will increase and promote their consumption on goods and services. As a conclusion, aggregate demand level will rise and pull an upward trend in both total production and prices in the economy.

As mentioned above, in this mechanism P_a can be expressed as the price of any asset that individuals invest their money in. For example, in theory, it is accepted that value of stocks, lands and houses can be replaced in P_a (Mishkin, 1995: 6-7). In Turkey, besides from these assets, precious metals and foreign currencies should be considered in this channel. Because, it is known that Turkish citizens hold some precious metals and foreign currencies in their portfolios in order to protect themselves from inflation threat and devaluation of YTL (Başçı et al. 2007: 485). Especially, holding gold as mattress saving is very common among Turkish households. Although cannot be measured specifically, it is known that a significant portion of individual wealth is stored in form of gold, which indicates that changes in gold prices can be effective on the level of consumption spending in Turkey. That is, the same mechanism can transmit effects of an expansionary policy on aggregate output level through shifting demand for gold.

Along the same lines, foreign currency holding is another tradition among Turkish citizens. Similar to the case in many other developing countries, Turkish people usually hold foreign currencies as an asset in their portfolio to protect themselves from domestic currency depreciations. Also, economic agents usually constitute borrowing contracts in terms of foreign currencies to skip out the influence of high inflation. For that reason, economic agents' balance sheet status and their net wealth are generally sensitive to movements in exchange rates in Turkey. This indicates that besides the net exports channel; exchange rate changes have ability to shift output level via wealth mechanism (Mishkin, 2001: 7-9).

1.2.3. Credit Channels

1.2.3.1. Bank Lending Channel

The bank-lending channel emphasizes the role of intermediation facilities of banks in transmission process. According to this view, monetary practices can direct economic activity by not only changing the cost of capital, but also effecting aggregate credit supply of banks. The main reasoning of this mechanism comes from existing imperfections in the credit market. Given the fact that there are high asymmetric information problems in the credit market, several types of borrowers cannot meet their financing needs without intermediary services. For that reason, banks are considered as special institutions for many borrowers who have no direct access to financial markets. In light of these explanations, Bernanke and Blinder (1988) developed a model that gives a distinctive role to bank loans in monetary transmission process. According to this model, it is assumed that bank credits and other financial instruments are imperfect substitutes for borrowers (Bernanke and Blinder, 1988: 2). That is, many economic agents cannot easily find any other way to finance their expenditures if banks' loan supply decline abruptly. This situation enables monetary authorities to direct aggregate demand level in the economy by controlling bank's ability to produce credits. A monetary policy that shifts aggregate credit supply level will effect investment spending of bank-dependent firms which in turn lead fluctuations in investments and thereby aggregate output level (Hubbard,

1995: 65-66). Schematically, the operation of bank lending channel can be shown as below:

$$M_s \uparrow \rightarrow \text{Bank deposits} \uparrow \rightarrow \text{Bank loans} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

The above mechanism indicates that an expansionary monetary policy that raises aggregate money supply and bank deposits will increase banks' ability to supply credits. Correspondingly, banks will expand their credit supply and, by this way, will provide required finance for investment spending of loan-dependent firms. As a result, investments will rise and bring about a shift in aggregate demand level in the economy.

The effectiveness of credit channel in transmission mechanism depends on three main conditions. First one is the substitutability level of alternative financing sources for firms. If firms consider bank credits and other financing opportunities as perfect substitutes to each other, changes in the credit conditions cannot influence the investment schedule of firms. In such a case, monetary policy impulses that narrow banks ability to produce credits cannot dampen firms' investment spirit, as they can easily replace bank loans with other financing options to smooth their operations. Within this context, it can be said that if firms have many options to finance their spendings and bank loans have no distinctive role in their financing scheme, bank-lending channel will not operate properly. On the contrary, if firms have limited alternatives to banks or bank loans, fluctuations in bank credits are likely to alter their spending level, suggesting an active lending channel in transmission process (Bernanke, 1993: 56). One supportive condition for the operation of bank lending channel is the existence of small sized firms in the market. Because, expenditures of such firms mostly rely on bank loans as they have less opportunities to finance their spending directly from capital and bond markets. Therefore, the effectiveness of lending channel is directly related with the proportion of small and loan-dependent firms in the economy (Kashyap and Stein, 1994: 223-224; Gertler and Gilchrist, 1994: 312-313).

Second condition that influences the operation of lending channel is banks' attitude towards assets. If banks do not consider any difference between marketable

securities and loans or do not prefer any specific allocation among them, the lending channel will become ineffective to transmit conducted policies to credit market. Suppose that banks suffer from a sudden drop in their reserves as a consequence of a contractionary policy. In this case, banks will endeavor to meet their reserve requirements by liquidating some portion of their assets. If banks do not see any difference between loans and securities, they will attempt to sell their securities at first because securities are more liquid assets than loans. By doing this, they will maintain their credit volume and therefore pass off the impact of a tightening monetary policy. Accordingly, Central Banks' influence over banks' credit volume will decline and bank lending channel become inoperative. Hence, it can be said that bank-lending channel is effective only if banks consider loans and marketable securities as imperfect substitutes. Otherwise, flexible asset composition of banks weaken the link between loan supply and monetary policy and thereby lower effectiveness bank lending channel (Bernanke, 1993: 56; Kashyap and Stein 1994: 233-234).

Final condition that determines the effectiveness of bank lending channel is the structure of banks' liability account. If the size of non-deposit sources is considerably high in banks' balance sheets, the credit supply process become independent from monetary maneuvers. For example, if banks' liability account is relatively flexible and do not suffer from any capital constraints, monetary policy actions that indicate negative deposit shocks will have only little impact on banks available resources (Kishan and Opiela, 2000: 138:139). In such a case, applied policies will not imply any variation in aggregate credit volume and lending channel will become powerless to transmit policy shocks to real economy (Gertler and Gilchrist, 1994: 312).

1.2.3.2. Balance Sheet Channel

In credit view, apart from its direct impact on banks' lending ability, monetary policy can alter aggregate credit supply and thereby economic activity indirectly by changing the soundness of borrowers' balance sheets. According to this channel, policy applications that shift borrowers' net worth value can change their

credit suitability and thereby their potency to take loans from banks. The theoretical reasoning for this argument comes from informational frictions in the credit markets. As banks face with informational asymmetries in lending process, they demand collateral from borrowers to lower their risks. Normally, banks prefer to issue credits to borrowers who have favorable balance sheets as they can offer more collateral in return for the default risk of issued loans. Therefore, borrowers' net worth becomes important in loan applications as it represents their capacity to generate collateral for banks. With this respect, fluctuations in the value of net worth is likely to influence lending behavior of banks, and in this sense, open a road for monetary policy to effect aggregate demand. If authorities are able to alter the value of net worth of firms by using monetary tools, they can affect firms' credit worthiness and thereby direct the total credit supply in the economy (Hubbard, 1995: 65; Cecchetti, 1995: 85-86).

One possible way for monetary policy to influence net worth of firms comes from its effect on stock prices. An expansionary monetary policy that increases money supply can stimulate demand for stocks and thereby boost their prices. In that case, higher stock prices improve firms' balance sheets and ultimately increase their net worth. This lowers asymmetric information problem between banks and firms and stimulates banks to extend their credit supply. As a consequence of lowered frictions in the credit market, lending activity increases and thereby both investment spending and aggregate demand rises in the economy (Bernanke and Gertler, 1999: 20). In a nutshell, the operation of this mechanism can be represented as follow:

$$M_s \uparrow \rightarrow P_s \uparrow \rightarrow \text{Information Problems} \downarrow \rightarrow \text{Lending} \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

There are two other ways that monetary policy actions can affect balance sheets of firms. The first channel operates through the effect of monetary policy on firms' cash flows. According to this mechanism, an expansionary monetary policy that lowers nominal interest rates will improve firms' balance sheets by raising their cash flows. As a result, firms' creditworthiness will increase and this will in turn ease their chance to take bank credits (Gertler and Gilchrist, 1994: 311-312).

The second channel works through the link between unexpected price level changes and net worth of firms. In this mechanism, it is claimed that if firms have a fixed amounts discharge schedule for their debts, expansionary monetary policies that causes an unanticipated increases in price level will reduce the real value of firm's debts. Consequently, lower value of debts will bring about an improvement in firms' balance sheet and ultimately raise their net worth, which in turn will promote their credit accessibility (Mishkin, 1996: 12).

1.2.3.3. Household Liquidity Channel

The household liquidity channel refers to the affect of monetary policy actions on the households' liquidity conditions, which determine their demand for durable goods and housing. Apart from other credit channels that emphasize the role of intermediation of lenders and their desire to create loans for economic units, the liquidity channel highlights the importance of households' wish to get loans. The rationale for this mechanism comes from the imperfect market structure of consumer durables and housing. As there are high informational and transactional costs in these markets, consumer durables and houses are highly illiquid assets. In this respect, if economic agents want to liquidate their houses or durables at the ongoing market price, they cannot receive the fundamental price of these assets (Mishkin, 1976: 642-643; Kearl and Mishkin, 1977: 1572). This situation force consumers to be cautious about making expenditures on these assets. Because, in an urgent situation, households will be unable to get a satisfying offer in the market. As a result, economic agents' expectations about possibility of experiencing a financial distress in the near future will likely affect their expenditures on durables and housing (Kearl and Mishkin, 1977: 1573). They will presume to do such an expensive spending only if they have enough liquid sources or relatively strong balance sheets to overcome a financial difficulty.

In this regard, an applied monetary policy that improves individuals' financial position will stimulate their demand for durables and housing. Consequently, as many households are unable to purchase these assets with an advance payment, they will raise their demand for bank loans to get financial aid. If this were so, banks will

raise their credit volume whereupon aggregate demand will shift and economy enters into an expansionary process. As a schematic form, household liquidity channel can be presented as follows:

$M_s \uparrow \rightarrow P_a \uparrow \rightarrow V_a \uparrow \rightarrow$ Liquidity of Households $\uparrow \rightarrow$ Demand for Consumer Durables or Housing $\uparrow \rightarrow$ Loan Demand $\uparrow \rightarrow Y \uparrow$

Where M_s symbolizes an expansionary monetary policy, P_a is the price of a particular financial asset, V_a is the value of financial assets and Y is the aggregate output level. Briefly, the schema indicates that if monetary authorities apply an expansionary monetary policy, demand for financial assets will mount up and increase their prices. Rising prices of financial assets will bring about an improvement in the financial position of households' balance sheets and hereby will stimulate their housing or durables expenditures. In order to finance their spendings, households will boost their demand for bank loans related with durables and housing, which consequently will scale up aggregate demand and output level in the economy.

CHAPTER 2
EMPIRICAL LITERATURE

In literature, a large body of papers has examined the link between monetary policy and real economic activity following the seminal review made by Friedman and Schwartz (1963), which argues that changes in monetary policies matter for real economic activity. Since then, many researchers provide supportive evidence for the influence of monetary policy over output level and prices in the economy (Sims 1980: 20-25; Romer and Romer, 1989: 143-169; Taylor, 1995: 20-21). However, these studies do not identify particular channels that transmit monetary policy action into economy. Although they imply that monetary policy affects economic activity, they do not shed light on how this influence comes about. On that account, the literature on monetary transmission mechanism is quite different from general monetary policy literature as it mainly concentrates on examining operation of specific transmission mechanisms and their relative effectiveness in conveying monetary policy actions to real activity.

Briefly, monetary transmission mechanism refers to operation of various channels through which monetary policy affects prices and output level in the economy. Considering the fact that given monetary policy shocks have both direct and indirect influence over numerous macroeconomic variables including interest rates, exchange rates, credit aggregates, asset prices and output transmission mechanism of monetary policy represents a complex and a sophisticated process consisting of interaction of many variables. For that reason, this subject receives a great deal of attention from economists throughout the history. Numerous papers attempt to examine the operation of monetary propagation mechanism by following both theoretical and empirical approaches. As a consequence of these studies, plenty of channels and ways through which monetary policy actions influence economic activity are recognized in existing literature. Roughly, transmission channels of monetary influence are grouped into three broad categories. These are namely interest rate channel, asset price channels and credit channels (Mishkin 1996: 2-15). As mentioned in previous chapters, each of these mechanisms explains operation of a particular propagation channel of monetary policy. For instance, interest rate channel

refers to changes in output and prices due to shift in interest rate sensitive investment and consumption spending while that of asset price and credit channels respectively stands for transmission processes operating through changing relative prices and borrowing conditions in response to innovations in policy stance. Although underlying transmission mechanism of each channel is quite different form each other, neither of these channels operates in isolation. Instead, studies on monetary transmission mechanism indicate that channels of monetary influence usually operate simultaneously in the economy.

Broadly speaking, literature on monetary policy transmission mechanism has grown substantially over the last three decades. A large body of study tries to provide evidence for operation and effectiveness of transmission mechanism in different countries by employing various approaches and methods. For that reason, literature on monetary transmission mechanism is very rich and comprehensive. In this literature survey, to provide systematic understanding about operation of monetary transmission mechanism in different country structures and to simplify making cross-country comparisons, empirical studies on each transmission channel are presented separately by order. Also, international and Turkish literature is represented individually in subsequent sections. International literature is introduced firstly to constitute theoretical background of monetary transmission process and to summarize early evidence obtained from international studies parallel to those theoretical developments. On the other side, literature on Turkey is presented in a separate sub-section just after the international literature to provide convenience while comparing results of international studies with Turkish experience. Also, discussing evidence on Turkey in an individual section facilitates making comparisons between results of this study and that of reached in previous studies in Turkey.

In the following sub-section international literature on monetary transmission mechanism is discussed briefly by considering both theoretical and empirical aspects of each transmission channel. Thereafter, in section 2.2 scope of literature survey is narrowed and entire effort is made to shed light on operation of monetary transmission mechanism in Turkey.

2.1. INTERNATIONAL LITERATURE

The process by which monetary policy actions are conveyed into economy is known as monetary transmission mechanism. As noted before, this process mainly operates through three major mechanisms: traditional interest rate channel, asset price channel and credit channels. Throughout history, each of these transmission mechanisms draws considerable attention from economists. For that reason, there is a large amount of research in literature, which investigates, theoretical as well as practical importance of every channel in monetary transmission process.

The operation of interest rate channel is one of the most examined mechanisms of monetary transmission process in existing literature. Typically, interest rate channel operates via traditional IS/LM model in which policy induced changes in real cost of borrowing is expected to shift volume of investment spending and in turn aggregate demand level in the economy. Therefore, interest rate mechanism indicates that monetary policy actions, which influence real interest rates in the market, will in turn shift level of investments and output respectively. Within this context, monetary policies can be influential over aggregate output level via interest rate channel if only two conditions are satisfied. First, there should be a pass-through mechanism from monetary policy actions to real interest rates that determine user's cost of capital. Second, agents' spending on investments, housing and durables should be responsive to changes in real cost of borrowing stemming from policy shifts.

These two propositions of interest rate mechanism are tested empirically by many studies over different countries as well as over different time periods. For instance, in one of the first studies, Litterman and Weiss (1985: 154-155) found that monetary policy shifts have no direct influence over real interest rates in the United States (US). For that reason, they state that monetary transmission mechanism is not operating as suggested in traditional IS/LM model. By contrast, Christiano and Eichenbaum (1991: 13-25) indicate that monetary policy actions are effective on market interest rates and thereby on economic activity. They show that in many cases unanticipated expansionary monetary policy shocks lower market interest rates and rise output, consistent with the expectations of interest rate channel. Christiano,

Eichenbaum and Evans (1994: 8-12) also reveal that contractionary monetary shocks are effective on economic activity in the US. They show that a tightening policy action that pares down short-term interest rates results in lower real output, price and employment level as well as higher unemployment rate. They also find that in response to monetary contraction sales and profits of manufacturing firms decline significantly while their inventory accumulation accelerates, which collectively indicates for a slow down in aggregate demand level. As a result, they state that monetary policy shocks are transmitted into economy in a way that is suggested by IS/LM model. Similarly, Bernanke and Gertler (1995: 30-34) find that consumer durables, nondurable consumption, residential investments, business fixed investments, inventories and final demand decline following a monetary tightening, as interest rate channel predicts. However, they also note that reaction time and magnitude of these variables do not fully compatible with conventional views.

Moreover, Sims (1992: 980-997) and Dale and Haldane (1995: 1615-1623) put forth that interest rate shocks are influential over prices and output in five industrialized countries, including Germany, France, US, Japan and United Kingdom (UK). Results obtained from VAR estimations reveal that positive interest rate innovations, which refer to tightening monetary policy, generally, lead increases in prices and decreases in output. They state that although negative reactions of output are quite compatible with predictions of Keynesian transmission process, perverse response of prices to the interest rate innovations-the so-called prize puzzle phenomenon-throw suspicion on operation of traditional interest rate channel in these countries.

Additionally, Mojon (2000: 9-16) and De Bondt 2002: 13-19) investigate whether there is a pass-through mechanism from policy rates to various bank rates in European countries to assess the role of interest rate channel in euro zone. Both studies find that policy shocks are reflected in banks' loan rates, although the degree of pass-through varies from country to country. By virtue of the fact that loan rates are responsive to policy shocks, they state that interest rate channel is effective in European countries. Besides these studies, Angeloni et al. (2003a: 21-27) review previous studies to examine operation of interest rate channel in euro area. They find that interest rate channel plays a significant role in European transmission

mechanism. Although the level of influence varies across individual countries, an unanticipated rise in the policy rate generally reduces output and prices in European countries. More specifically, they state that much of the reduction in output is due to fluctuations in investments rather than in consumption. However, the link between user' cost of capital and investments is not very clear in whole euro area. In some countries, there is evidence of existence of credit channels such as bank lending or balance sheet channels that transmit monetary policy action into investments and output. But, putting all together, they conclude that interest rate channel is the foremost transmission mechanism in euro zone.

Angeloni et al. (2003b: 1268-1300) analyze effect of a given interest rate shock on economic activity in the US and European countries respectively to evaluate whether compositional differences in output response play a role in transmission mechanism. Initially, they find that interest rate mechanism operates effectively in both regions. In majority of the cases, following a contractionary policy shock output declines sharply while prices fall less slowly. However, they note that the prominent factor in transmission process is different between US and European countries. Evidence reveals that interest rate channel mainly operates through investments in euro area while consumption is the dominant factor in US transmission mechanism.

Barth and Ramey (2002) engage in an empirical analysis to provide a reasonable explanation to prize puzzle phenomenon. They state that interest rate shifts are not only influential over components of aggregate demand schedule, such as consumption and investments. Instead, changes in interest rates also lead shifts in supply side of the economy by altering firms' production costs. According to them, higher interest rates that raise firms' marginal cost of capital force them to increase their prices. For that reason, contractionary monetary policy actions that usually push up interest rates result in higher inflation and lower output production in the economy. In order to test whether there is such a cost channel, they analyze data of US economy over the period 1959 and 2000. Evidence implies that contractionary monetary shocks that increase firms' production costs lead lower productivity, employment and output level in the economy. In addition, both interest rates and prices scale up following a monetary tightening, as suggested in cost channel. For

that reason, they state that interest rate channel operates mainly via supply side dynamics in the US (Barth and Ramey, 2002: 202-234).

Later on, Mojon et al. (2002: 2121-2126), Dedola and Lippi (2005: 1546-1565), Chowdhury et al. (2006: 1001-1012), Gaiotti and Secchi (2006: 2026-2033) and Tillmann (2008: 2732-2742) respectively provide supportive evidence for operation of cost channel in the US and majority of other industrialized countries. On the contrary, analyzing the period 1959-2004 Rabanal (2007: 925-934) states that cost channel of transmission mechanism is not working in the US economy. He shows that after a given monetary shock inflation and interest rates moves in reverse direction, which indicates that demand side dynamics dominates supply side effects of interest rates in transmission mechanism. Accordingly, he denotes that evidence does not point out operation of any distinctive cost channel mechanism in the US economy. Parallel to those findings, Kaufmann and Scharler (2009: 43-46) also state that responses of output to interest rate shocks is generally stemming from variations in aggregate demand side, not from supply side cost effects. In addition, evidence collected by Drake and Fleissig (2010: 2815-2818) imply that interest rate-consumption channel is the prevailing mechanism in UK economy.

On the other hand, the evidence on developing countries also indicates that interest rate channel is one of the most important mechanisms in monetary transmission process. However, similar to advanced countries the degree of effectiveness of this mechanism varies significantly across countries. For instance, Mohantly and Turner (2008: 10-13) state that in recent years interest rate channel has become the most effective transmission mechanism in majority of developing countries due to lowered fiscal pressure, declined inflation, reduced volatility and increased credibility of monetary policies in these countries. Supportively, Karim and Azman-Saini (2013: 405-410) put forth that interest rate channel is functioning in Malaysia. By using firm-level data they find that investment spending of firms are highly responsive to shocks in policy variables. Following a monetary policy action that alters interest rates, cost of borrowing increases and causes investment spending of individual firms to decrease. Along the same lines, Minella and Souza-Sobrinho (2013: 413-418) state that interest rate channel is operating well in Brazil. Their structural model estimations reveal that policy shocks are influential over both

household consumption and firm investment while the former is much responsive to changes in monetary policy. They also find that household consumption has more impact on output variation compared to investments. On that account, they conclude that household interest rate channel is the most effective transmission mechanism in Brazil economy.

By contrast, some studies on developing countries point out a weak interest rate transmission mechanism. For example, Moreno (2008: 71-74) documents that long-term interest rates do not give significant reactions to shifts in short-term policy rates in developing countries. They find that instead of domestic policy applications, external shocks such innovations in US policy rate and changes in expectations are the driving factors of long-term interest rates in emerging markets. Taken together he states that interest rate channel is not a strong transmission mechanism in emerging market economies. In addition, Yue and Zhou (2007: 10-12) imply that interest channel do not play any significant role in China. Their analysis based on Granger causality tests show that neither household consumption nor firm investments is sensitive to interest rates. Depending on this, they state that traditional interest rate channel is not operating in China. By analyzing a large set of countries, Mishra et al. (2012: 279-295) also indicate that transmission mechanism through interest rate channel does not exist in low-income countries. Results show that policy rates are powerless to alter market interest rates, which point out a weak transmission mechanism via interest rate channel in these countries.

Farther than conventional interest rate channel, monetary transmission mechanism operates through asset price channels as well. As noted before, there are three main asset price channels that convey monetary policy actions into economic activity. These are briefly exchange rate channel, Tobin's q channel and household wealth channel. Although each of these channels indicates a different transmission process, they collectively rely on the assumption that induced changes in asset prices lead variations in aggregate demand and general price level in the economy. For instance, exchange rate channel refer to impact of policy-induced shifts in exchange rate parity on relative prices of tradable goods and thereby on net export level, which ultimately affect aggregate output and price level in the economy. On the other side, Tobin's q channel implies a transmission mechanism operating through stock

markets. In this channel, it is proposed that monetary policy actions that lead variations in stock prices will ultimately effect investment spending of firms through changing relative cost of capital. Lastly, household wealth channel is ascribed to influence of policy-induced changes in asset prices over individuals' portfolio value and consumption incentive, which directly cause fluctuations in level of aggregate demand and general prices in the economy (Ireland, 2005: 3-5; Mishkin, 2001: 1-9).

Over the last forty years, an increasing number of papers have investigated the role of so-called asset price channels in transmission process by following different approaches. This literature mainly indicates that operation of each of these asset price mechanisms show large disparities across countries and across time. However, it is worth to note that majority of the previous studies provide supportive evidence for operation of asset price channels.

Following the theoretical framework established by Dornbusch (1976), numerous studies examine role of exchange rates in transmission mechanism. To illustrate, Eichenbaum and Evans (1995: 980-1007) investigate whether there is an exchange rate channel in the US. They reveal that monetary policy shocks that change market interest rates lead remarkable variations in both nominal and real exchange rates, which in turn cause output and price fluctuations, as expected. Consequently, they state that exchange rate channel is effective in US economy. Similarly, Kalyvitis and Michaelides (2001: 257-261) reveal that exchange rate mechanism is active in the US. Their analysis show that contractionary monetary policies generally lead immediate appreciation in US dollar and effect terms of trade in favor of US economy as expected. Along these lines, Dale and Haldane (1995: 1615-1623), Cushman and Zha (1997: 440-446) and Smets (1997: 9-16) reach similar results for UK, Canada and three major European countries respectively. In addition to them, analyzing data of industrialized countries Kim and Roubini (2000: 576-579) state that exchange rate mechanism operates in compliance with theories.

Smets and Wouters (1999: 496-514) also investigate impact of policy-induced shifts in exchange rates on international trade figures to assess operation of exchange rate channel in Germany. Evidence indicates a strong and well-functioning exchange rate pass-through mechanism in German economy. According to their results, a contractionary policy shock that raises domestic interest rates leads a

significant appreciation in exchange rates. In line with the appreciation of the exchange rate, real trade balance, net exports and real output level decline respectively. Accordingly, they state that exchange channel of monetary transmission mechanism operates effectively in Germany. In analogy to this study, Kim (2001: 199-202) and Els et al. (2003: 721-728) provide supportive evidence for operation of exchange rate mechanism in European countries. Furthermore, Angeloni et al. (2003a: 10) state that compared to the U.S., exchange rate channel is more influential over prices and output level in euro area. More recently, Blaes (2009: 10-18) also report that monetary policy shocks have significant influence over real exchange rates and real exports in euro zone. Results of FAVAR estimations show that after a monetary contraction both real exports and euro exchange rate falls, consistent with the predictions. By analyzing the data of four developed open economies, including Australia, Canada, New Zealand and Sweden Bjornland (2009: 67-75) also reveals that monetary policy shocks are effective on exchange rates and thus exchange rate mechanism is active in this set of countries.

Contrary to these studies, some researchers put forth that exchange rate channel does not play any significant role in monetary transmission mechanism. For instance, Barran et al. (1996: 17-18) state that except Spain, exchange rate channel does not operate properly in majority of European economies. By the same token, Disyatat and Vongsinsirikul (2003: 405-410) produce weak empirical support for operation of exchange rate and asset price channels in Thailand economy. Quite differently, some studies indicate that exchange rate mechanism operates in a different way that is postulated in theories. For example, Grill and Roubini (1995) report that monetary shocks cause unexpected movements in exchange rates in G7 countries. On the contrary to theoretical implications, their results show that a monetary contraction leads depreciations in value of domestic currency in all countries except US. In this respect, they conclude that similar to so-called prize puzzle phenomenon, there is also an exchange rate puzzle in these countries (cited in Cushman and Zha, 1997: 435).

Existing literature on low-income and developing countries indicates that functioning of exchange rate channel is quite different in these countries compared to their developed counterparts. Devereux et al. (2006: 480) state that given the fact that

high liability dollarization, conventional trade mechanism does operate in line with expectations in most developing counties. Also, Mishkin (2001: 7-9) purports that shifts in the value of exchange rates may not bring about predicted changes in net exports and aggregate output level in developing countries as such shifts generally cause deteriorations in agents' balance sheets and alter their consumption, investment and production patterns. In addition, it is also noted that imposed restrictions in exchange rate markets and high inflation usually hinder operation of exchange rate mechanism in these countries (Mishra et al., 2012: 287-288; Ca'Zorzi et al., 2007: 6).

These propositions are empirically supported by several studies. For instance, Boughrara (2009: 9-10) shows that exchange rate channel does not play a significant role in monetary propagation process in Tunisia and Morocco. Estimation results based on VAR models reveal that policy shocks are not influential over nominal exchange rates in both countries. Supportively, Mishra et al. (2012: 279-295) find that exchange rate channel does not exist or if exist operates very leanly in low-income countries. Moreover, Ca'Zorzi et al. (2007: 12-17) show that monetary authorities have less direct control over prices in emerging markets. Their estimations reveal that compared to advanced countries pass-through mechanisms from exchange rates to import and consumer prices are higher in emerging countries that experience high inflation, suggesting a weak transmission mechanism from policy actions to prices.

By contrast, some papers provide evidence in favor of effective exchange rate mechanism in developing countries. For example, Bhattacharya et al. (2011: 10-21) point out an active and well functioning exchange rate mechanism in India. By analyzing data between 1997-2009 they show that policy-induced shifts in exchange rates are associated with significant variations in prices and output production. As a result, they state that exchange rate mechanism plays a dominant role in transmission process in Indian economy. Similarly, Minella and Souza-Sobrinho (2013: 413-418) find evidence of effective exchange rate mechanism in Brazil. They show that besides interest rate channels, monetary policy actions are influential over output and prices via exchange rate mechanism.

Besides effect of exchange rate changes on international trade dynamics, previous studies also investigate the role of policy-induced asset price changes in investment and consumption decisions of economic agents. A significant literature pioneered by Modigliani (1966) and Tobin (1969) has documented theoretical as well as empirical importance of asset prices in monetary transmission mechanism. However, in comparison to other transmission mechanisms, empirical support for effectiveness of asset price channels is not very robust. Despite the fact that most studies point out a causal chain among monetary policy actions, asset values and aggregate demand, a considerable amount of paper indicate that the size of the asset price impact on economic activity is relatively small compared to other channels.

In one of the first empirical studies, Bosworth et al. (1975: 261-290) probe the influence of stock market variations over consumption and investment expenditures in the US to verify theoretical link between asset price changes and aggregate demand components. Estimation results imply that changes in stock prices are only effective on non-durable consumption expenditures of economic agents; durable consumption and investments do not respond significantly to stock price innovations. Accordingly, he states that the impact of stock price variations on economic activity is limited with consumption-wealth channel of monetary transmission mechanism. Just after this study, Mishkin (1976: 648-653) and Kearl and Mishkin (1977: 1576-1584) respectively show that changes in financial wealth are also influential over durable consumption and housing investment, suggesting a household investment channel for monetary propagation mechanism. By analyzing data of US economy McCarthy and Peach (2002: 143-150) and Mishkin (2007b: 14-23) also point out an active monetary transmission mechanism via housing channel. They both find that house price changes stemming from policy shocks are influential over residential investments and thereby over aggregate demand level, in line with predictions of asset price channel. Additively, Bernanke and Gertler (1999: 18-42) reveal that induced asset price changes are also transmitted into economy via balance sheet and wealth channels.

More recently, Gilchrist and Leahy (2002: 91-93) show that asset price changes lead important variations in investments and consumption expenditures. According to their results, if monetary authorities follow an inflation targeting

policy, a positive shock in net worth value reduces risk premium and stimulate investments, which in turn leads an output rise in the economy. However, in such a situation consumption spending declines as monetary authorities' inflation targeting policies cause real interest rates to rise. On the other hand, they show that if monetary policy tries to eliminate asset price booms by following a net worth targeting, both investment and output become unresponsive to net worth shocks while consumption responds by falling. Accordingly, they state that monetary policy rules should not take asset price changes into consideration as using such policy rules may lead recessions in the economy by depressing investments and consumption expenditures.

Quite to contrary, Ludvigson et al. (2002: 118-128) reveal that asset prices do not play a dominant role in US transmission mechanism. According to their estimations based on structural VAR models, the marginal impact of wealth channel is relatively weak compared to other channels of monetary influence. Despite the fact that monetary policy shocks bring about some changes in asset prices and consumption spending, these variations do not imply large and significant shifts in output. Hence, they conclude that contrary to its theoretical significance, the wealth-consumption channel has relatively small influence over aggregate economic activity.

In literature, rather than analyzing the whole transmission process, some studies focus on the link between asset values and monetary policy actions to assess operation of asset price channels. Although these studies are not sufficient to understand exact transmission mechanism, they give a notion about the existence of particular asset price channels in the economy. In one of these studies, Rigobon and Sack (2004: 1565-1573) illustrate that monetary policy actions are influential over stock prices and market interest rates in the US economy. Results obtained from heteroscedasticity-based estimation procedure imply that increases in policy rate have a negative impact on various stock market indices. In addition, it is found that market interest rates rise immediately after a positive innovation in policy rates. Taken together, they state that both findings indicate existence of an asset price mechanism in the US. Afterwards, Ehrmann and Fratzscher (2004: 726-735) and Bernanke and Kurtner (2005: 1223-1253) also confirm negative impact of

contractionary policy shocks on stock prices and point out a transmission mechanism through stock prices.

Apart from US, the literature on other countries also provides supportive evidence for the link between monetary policy and asset prices. For example, by estimating separate VAR models for UK economy Dale and Haldane (1995: 1615-1623) and Kontonikas and Ioannidis (2005: 1113-1114) respectively show that both stock prices and exchange rates are sensitive to monetary policy shocks, suggesting operation of transmission mechanisms via asset prices. Supportively, by evaluating results of previous studies, Altissimo et al. (2005: 13-36) state that wealth channel functions quite well in majority of industrialized countries. But, they also note that empirical support for Tobin's q and balance sheet channels is not as straightforward as that of wealth channel. Furthermore, Giuliodori (2005: 528-539) focuses on role of house market in monetary transmission mechanism in euro zone and shows that house price channel is effective in majority of European countries. He also states that results are more pronounced for countries that have relatively developed house market backed by efficient mortgage system. More recently, Blaes (2009: 10-18) put forth that asset price channels operates properly in euro area. Estimations based on impulse response analysis show that tightening of monetary policy lower both stock prices and household wealth, which in turn collectively lead decreases in consumption and investment expenditures, as expected. However, he denotes that similar to US the size of the influence of policy-induced shifts in asset prices over spending level of agents is relatively small, indicating a weak transmission mechanism via asset valuation.

In addition to them, Goyal and Yamada (2004: 184-197) point out an effective Tobin' q channel in Japan. They find that variations in Tobin's q ratio have significant impacts on investment spending of firms, which implies a possible transmission mechanism operating through stock market channel. On the contrary, Tease (1993: 52-59) show that q value has a limited and mostly insignificant impact on business investment in G7 countries. He states that after controlling other economic factors, the marginal explanatory power of q value become ignorable in most of the countries.

Beyond industrialized countries, previous studies also examine role of asset price channels in developing and transition economies. Similar to advanced country cases, results vary considerably across countries. While some studies reveal that monetary policy applications have ability to shift asset prices and aggregate demand, others produce weak empirical support. For example, Ivanovic and Lovrinovic (2008: 14-17) show that monetary policy instruments such as money supply or interest rates have significant impact on stocks markets and house prices in Croatia. Supportively, Vithessonthi and Techarongrojwong (2012: 495-504) reveal that stock price variations are associated with monetary policy shocks in Thailand. In addition, by examining the operation of wealth channel in fourteen emerging markets, Peltonen et al. (2012: 159-163) put forth that changes in stock and housing prices are highly influential over consumption spending of households, in line with the predictions of wealth channel.

Apart from these, some studies indicate that asset price changes have slight impact on consumption and investment decision of economic agents. To illustrate, Funke (2004: 418-421) find that stock market changes have relatively small impact on consumption spending of households in a set of emerging market economies. More recent evidence collected by Boughrara (2009: 10-11) also implies that monetary policy actions have no remarkable influence over stock prices in Tunisia and Morocco. Additionally, results show that there is no link between asset price changes and real economic activity. Moreover, Koivu (2012: 313-318) reveal that wealth channel of monetary transmission mechanism is not very powerful in China. Estimations based on structural VAR indicate that although asset prices and household consumption are sensitive to monetary policy innovations, the size of the wealth channel is not very notable, as it is the case in many advanced countries. On that account, the author state that asset price channel exists but operates leanly in China. Lastly, Mishra et al. (2012: 285-288) report a weak asset price mechanism in low-income countries. They state that poorly developed, and shallow capital markets together with illiquid real estate markets hinder operation of transmission mechanism via asset prices in this set of countries.

With the beginning of the 1980s, economists begin to suggest another transmission mechanism called credit channel as an alternative to interest rate and

asset price channels. In this channel, the main argument is that conventional approaches based on IS/LM model fall short of unveiling entire impact of monetary policy on economic activity, as they generally leave out credit market imperfections. Bernanke and Blinder (1988: 1-2) state that in traditional market models, all financing sources of borrowers including bonds, stocks and bank loans are assumed as perfect substitutes. For that reason, interest rate changes are considered as the only propagating factor of monetary policy practices and bank loans have no distinctive role in transmission process. However, as a matter of fact many borrowers could only raise funds by intermediation of banks due to imperfections in credit market, bank loans are special for some borrowers and apart from interest rate variations, changes in the volume of bank credits are therefore influential over spending of bank-dependent agents.

Brunner and Meltzer (1988: 446-447) emphasize role of credit market imperfections in transmission mechanism as well. They claim that money-view in which there is no distinguished role for bank loans can only give incomplete and erroneous conclusions about the impact of monetary shocks on economic activity because this approach misses out the augmentative role of bank loans in transmission process. Accordingly, they state that credit markets should be included into monetary policy analysis.

In accordance with these discussions, Bernanke and Blinder (1988: 2-6) develop a model that postulates a privileged role to bank loans in monetary transmission mechanism. In this model, it is stated that loans and other financing instruments are not perfect substitutes to each other. That is, economic agents are not able to adjust their financing schema perfectly when they face with a sharp decline in bank loans. In this respect, the model suggests that monetary policy applications that influence availability of bank credits will in turn affect the spending of bank-dependent borrowers and therefore change aggregate demand and price level in the economy.

Following Bernanke and Blinder (1988), numerous studies discuss the theoretical background of credit channels and try to identify disparities between traditional money view and credit view (Meltzer, 1995: 62-66; Hubbard, 1995: 63-67; Cecchetti, 1995: 85-87; Oliner and Rudebusch 1996: 3-4; Rabin and Yeager,

1997: 294-298; Bernanke, 1993: 56-57). In brief, these studies settle over the fact that there are two main distinctive transmission mechanisms in credit view. The first mechanism, named as bank-lending channel operates through banks' ability to produce loans. According to this channel, changes in the volume of bank credits resulting from monetary policy actions affect spending pattern of borrowers whose expenditures heavily rely on bank loans. Hence, aggregate demand and prices changes due to shift in expenditures of bank-dependent agents. In this respect, bank-lending channel postulates a transmission process working through variations in volume of bank loans resulting from monetary policy shocks. On the other side, the second mechanism called balance sheet channel or broad credit channel emphasizes the role of changing financial situation of various economic units in transmission process. In this channel, it is proposed that monetary policy practices that influence economic agents' net worth, liquidity level and cash flows are likely to change their balance sheet strength. As a consequence, external finance premium for these actors varies and leads fluctuations in their spending, which ultimately shift aggregate demand level and prices in the economy.

Based on these theoretical arguments, large bodies of literature try to document the empirical importance of credit view in monetary transmission mechanism. Parallel to the theoretical developments, early evidence on operation of credit channels has come from United States. In his preliminary study, King (1986) examines the role of credit channels in transmission mechanism in US by comparing relative effectiveness of monetary and credit aggregates on output level. Estimation results imply that rather than credits, fluctuations in deposits affects the volume of economic activity. That is, monetary aggregates are much more influential than credit aggregates over output level in the economy. In addition to this, the evidence obtained from analysis do not support credit-rationing hypothesis for the US. Hence, he concludes that bank loans do not play any distinctive role in US monetary transmission process over the sample period (King 1986: 297-301).

Romer and Romer (1990: 154-155) also state that evidence for US does not suggest any independent role for bank lending. According to them, banks ability to obtain low cost funds by issuing certificates of deposits lowers monetary authorities' impact on loan supply. Hence, the link between monetary policy and lending

activities is practically weaker than that is supposed in credit view. In addition to this, they also find that instead of changes in loan volume, monetary disturbances are the main sources of output shifts. In this regard, they conclude that empirical analyses do not provide any supportive evidence for the existence of an independent propagation mechanism operating through lending channel. In a similar way, Ramey (1993: 20-37) also find that traditional interest rate channel is more effective than credit channels in the US. Evidence from different estimation procedures indicates that fluctuations in credit aggregates have no significant influence over aggregate output level, while monetary aggregates have ability to explain majority of variations in economic activity. As a result, he notes that monetary transmission process does not include any bank-lending channel in US.

On the contrary to above studies, Bernanke and Blinder (1992) provide supportive evidence for the operation of bank lending channel in US. Their VAR estimations covering the period 1959-1978 imply that monetary policy shocks are influential over banks' balance sheets and economic activity respectively. They find that after a monetary contraction, bank deposits decline immediately as expected. Following this reduction, banks adjust their asset side by lowering both of their credit supply and security holdings to match their reserve requirements. However, the response rate of these assets is quite different. While securities drop immediately in return for a positive funds rate shock, bank loans begin to fall after sixth month. Also, it is found that the impact of monetary policy on loans is long-lasting in comparison to securities. Therefore, they denote that monetary policy actions are effective on banks' ability to produce loans as indicated in lending view. In addition to these findings, they provide evidence for the link between credits and aggregate economic activity as well. Analyses show that there is a sequential relationship between bank loans and unemployment rate. Following the contraction in bank loans, unemployment rate begins to increase immediately and the effect appears to be permanent until loans turn back to their baseline. This timing coincidence between movements of unemployment rate and loans is interpreted as an evidence for the impact of declining bank lending on economic activity. In this respect, the authors state that credit channel is operating in US economy (Bernanke and Blinder, 1992: 917-920).

Bernanke and Gertler (1995) also put forth that there is evidence for the effectiveness of credit channel in US. According to them, traditional cost of capital channel does not provide any clear explanations to timing and magnitude differences among responses of various macroeconomic variables including final demand, investments and consumption to monetary shocks (Bernanke and Gertler, 1995: 30-34). In this sense, they investigate whether credit market imperfections has a role in propagating mechanism of monetary policy. Their VAR estimations based on quarterly data for the period 1965-1994 show that balance sheets of firms are affected by monetary shocks as suggested in credit view. After a monetary innovation, firms experience a cash squeeze and their balance sheet strength deteriorates. In addition, the timing of the cash squeeze resulting from worsening credit market conditions coincides with the decline in output, investments and inventories, which implies that balance sheet channel has impact on real activity. For the bank lending channel, they try to expose the effect of monetary shocks on external finance premium of borrowers by using graphical analyzes. Results reveal that terms of lending in credit markets deteriorates during tight money periods, which point out that monetary policy actions are influential over credit markets, as predicted in bank lending mechanism. Also, they find that federal funds rate and mortgage burden of consumers moves synchronously, which indicate that monetary policy actions indirectly effect housing demand of consumers by changing their external finance premium. On the basis of these findings, the study conclude that credit channel, as a monetary transmission mechanism, exists in the US (Bernanke and Gertler, 1995: 37-46).

Some studies state that results presented above are quite problematic to point out an independent credit mechanism in transmission process as changes in volume of bank lending in return for monetary policy shocks can emanate from demand side dynamics as well as from supply side shocks. That is, reaction of credit aggregates to monetary policy changes can purely evolve out of variations in economic activity that influence demand for bank credits rather than impact of exogenous policy shocks on credit supply. In such a case, banks' loan supply becomes a function of economic activity and varies endogenously with shifts in aggregate output. Therefore, one cannot attribute changes in volume of bank loans in response to

monetary shocks to operation of credit channels. On that account, studies considering only changes in credit aggregates after a policy shock is criticized as they suffer from so called identification problem and thus are indicated as inconclusive about existence of transmission mechanisms working through credit market imperfections. In order to overcome this identification problem and provide evidence on credit channels, some researchers try to control demand side and supply side effects on credit markets by using various methods.

In one of these papers, Kashyap et al. (1993: 84-96) investigate shifts in financing preference of firms during periods of contractionary monetary policy to examine the operation of bank lending channel in the US. Results of their analyses show that tightening monetary policies lead a substitution in financing schema of firms from bank loans to alternative financing options. It is found that during periods of monetary contraction ratio of bank loans to total financing expense falls while the weight of commercial paper issuance increases. This implies that although firms' demand for finance continues to remain significant, loan supply decreases. That is, volume of bank lending declines mostly due to supply side dynamics stemming from impact of policy shifts on banks' lending behavior. Furthermore, estimations reveal that induced shifts in financing choice of firms are influential over their investment expenditures. Evidence indicates that falling loan share in total financing expense resulting from tight money applications dampens investment expenditures of firms, consistent with the predictions of credit view. On that account, the authors state that decreasing loan share in firms' financing expense together with declining investment expenditures during episodes of monetary tightening suggest that there is an active lending channel in the US.

Ludvigson (1998: 368-382) reaches parallel results by examining the impact of monetary policy changes on consumers' automobile demand. Similar to Kashyap et al. (1993), he finds that contractionary monetary policy shocks that lower the ratio of bank loans to the sum of bank and nonbank loans lead a significant reduction in consumers' demand for automobiles. That is, monetary policy actions that affect banks' consumer loan supply cause consumption level of households to change. Accordingly, he concludes that credit channel is not operating only through investment spending of firms but also through consumption demand of households.

More recently, Haan et al. (2007: 910-921) and Haan et al. (2010: 1162-1172) also provide support for the role of consumer loan market in U.S. and Canadian transmission mechanism respectively.

Contrary to these findings, Brandy (2011: 251-262) reveals that the significance of consumer-lending channel of monetary policy declines recently is in the US. Evidence obtained from VAR estimations over the period 1968-2006 implies that especially after 1980s contractionary monetary policy shocks are not effective to depress bank lending to consumers, Instead, it is found that bank lending to consumers increases after a monetary contraction. These results suggest that contrary to expectations consumers are not exposed to liquidity constraints in times of monetary tightening. That is, monetary policy actions are not effective on consumer demand and bank lending as supposed in credit view. With this respect, study conclude that consumer channel of bank lending mechanism is not functioning in US.

In literature, it is also argued that shifts in monetary policy might have disproportionate impact on cross-sectional units depending on their characteristics and balance sheet structures. In this regard, previous studies focus on two main aspects of credit channel. While some studies discuss the role of firm-specific factors, others examine the role of different bank characteristics in transmission mechanism. The main motivation behind these studies is testing the credit view hypothesis that propose that disadvantaged set of firms and banks are likely to bear the brunt of money tightening.

To provide an empirical basis for this argument, Kashyap and Stein (1994: 225-240) discuss the validity of lending view assumptions for US economy by analyzing capital structure of firms and balance sheets of banks. Cross-sectional data on firms indicate that bank loans are the main source of finance of many companies. Especially, it is found that small and medium-sized firms depend heavily on bank loans in terms of their short-term finance needs. On the other side, they show that there is a systematic difference among banks with various sizes in terms of their asset composition, which implies that banks are not indifferent about the relative size of their loans and securities in their balance sheets. Therefore, monetary actions are likely to be effective on loan supply of banks as well as on investment levels of

companies, as it is indicated in lending channel. In this respect, they conclude that in the US balance sheet structure of firms and banks are convenient with the presumptions of lending channel.

Gertler and Gilchrist (1994) investigate whether monetary policy shifts have disproportional influence over firms with different size. Given the fact that small firms have no direct access to capital markets like large firms, their operations rely heavily on bank loans. The implication of this is that small firms are more sensitive to monetary policy shocks. In contrast, large firms that are able to raise funds by using various financing sources will not likely to respond much to policy shifts. Therefore, one can expect that there should be a quantitative difference among small and large firms in terms of their response to monetary shocks. In order to test this hypothesis, the researchers employ quarterly data of manufacturing firms in the US for the period 1960-1991. Initially, they divide firms into two groups as small and large, considering their asset size, and then estimate various VAR models for each group respectively. In general, results show that monetary policy shocks have heterogeneous impact on firms with different size. It is found that contractionary monetary policies influence small firms disproportionately, as expected. Following a monetary tightening, small firms' inventories, sales and short-term borrowings decline sharper than large firms. The drop in sales and inventories along with short-term borrowings indicate that small firms have difficulties to obtain relevant finance for their operations during episodes of tight money. On the contrary, there is no significant change for the large firms in terms of their production and financing capability. Despite the fact that monetary authorities follow contractionary policies, large firms maintain their inventory and short term borrowing levels. Therefore, they have no hardship to finance their operations even in tight money periods. In a nutshell, all these findings indicate that small firms, which relatively depend on bank loans, are affected more than large firms that have various options to finance their operations. On that account, results of this study implies that monetary propagation mechanism operating through credit channels has heterogeneous influence over cross-sectional units with various sizes (Gertler and Gilchrist 1994: 319-338).

Christiano et al. (1994: 18) provide supportive evidence for the heterogeneous impact of contractionary monetary policies on firms with different

size as well. Their estimations show that compared to small firms, large firms have less difficulty to raise funds by increasing their short-term borrowings after a monetary shock. Parallel to the findings of these studies, Oliner and Rudebusch (1996: 8-10) also reveal that small firms are adversely affected from contractionary policy shifts. By using quarterly data of US manufacturing firms over the period 1958 and 1992, they find that small firms' investments become more dependent to internal financing sources during periods of monetary tightening while investment schema of large firms do not change significantly. This evidence indicates that external finance premium rises only for small firms during episodes of monetary tightening, which in turn force them to use internal sources to finance their investment expenditures, as suggested in broad credit channel. In this regard, authors of the study state that broad credit channel is operating through small firms in the US.

More recently, Ashcraft and Cambello (2007: 1521-1527) suggest that balance sheet channel is an important component of transmission mechanism in the US According to their results, balance sheet strength of borrowers has significant impact on changes in loan supply of banks in return for monetary shocks. The evidence from various estimations indicates that relatively weak balance sheet status of borrowers bring about lower volume of bank loans. This implies that borrowers net worth value and creditworthiness play a significant role in reaction of banks' loan supply to induced shocks in monetary policy, consistent with the anticipations of balance sheet mechanism. Furthermore, Diaz and Olivero, (2010: 2046-2052) provide evidence in favor of asymmetric impact of policy shocks over US firms with different sizes as well. Briefly, study put forth that disadvantage firms that have relatively small size are affected more from induced monetary policy and credit market shocks.

Apart from firms, some studies investigate whether monetary policy actions have disproportionate influence over banks with different balance sheet structures. In majority of these studies, it is found that there are cross-sectional differences among banks' lending behavior in return for monetary actions. For instance, Kashyap and Stein (2000: 417-425) examine the impact of liquidity level and size on lending behavior of US commercial banks over the period 1976-1993. They find that

tightening monetary policies are more effective on banks, which have relatively smaller size, and less liquid balance sheets. Evidence shows that during tight money periods, the loan supply of small and illiquid banks decline more than that of large and liquid banks. Accordingly, they state that monetary policy shifts have stronger implications for banks with smaller size and illiquid balance sheet, as these banks have relatively limited opportunities to raise external finance during episodes of monetary contraction. Similarly, Kishan and Opiela (2000: 131-138) imply that loan supply of small and undercapitalized banks is more responsive to changes in monetary policy compared to that of large and well-capitalized banks. In this regard, they state that besides size and liquidity, capital structure of banks play a role in credit mechanism of US monetary policy. In addition to these studies, Kishan and Opiela (2006: 272-282) reveal that expansionary and contractionary monetary policies have disproportionate impacts on banks with different capital structure. It is found that loan supply of capital-constraint banks is affected adversely from tightening policies. Also they put forth that expansionary policy stimulate only well-capitalized banks' loan volume; the loan supply of capital-constraint banks do not respond significantly to expansionary policies. Hence, they indicate that expansionary and contractionary monetary policies have asymmetric influence over loan supply of banks with different capital structure, which means aside from bank specific factors policy stance also matters for operation of credit channel.

Following the growing literature in the US, researchers begin to examine role of credit market imperfections in other countries' transmission mechanisms as well. In one of the earliest studies Favero et al. (1999: 10-12) investigate the operation of bank lending channel in Europe by using micro-level data of banks in France, Germany, Spain and Italy. They show that bank-lending channel is not functioning well in continental Europe. Overall, the estimations reveal that volume of bank loans do not give meaningful reactions to changes in monetary policy. Furthermore, the results do not change considerably even after controlling banks' balance sheet strength and size. For that reason, they conclude that there is not enough empirical evidence for the operation of credit channels in European countries. Similarly, by analyzing impact of monetary shocks on household and firm loans over the period

1982-1996, Garretsen and Swank (2003: 42-48) state that bank-lending channel is not working properly in Netherlands.

Quite the contrary, Bacchetta and Ballabriga (2000: 18-24) provide evidence for the existence of credit mechanism of monetary policy in European countries. Their VAR estimations based on quarterly data of thirteen European countries and the US show that broad credit channel is in operation in most countries. It is found that bank loans drop after a contractioanary policy shocks in majority of the countries, as suggested in credit channel literature. Also, impulse-response analysis reveals that output level of countries decline synchronously with the reduction in bank loans. With respect to these results, they state that albeit the institutional differences, broad credit channel operates effectively as a transmission mechanism in European countries as well as in US.

Parallel to results of Bacchetta and Ballabriga (2000), Hülsewig et al. (2006: 2898-2906) also find that there is an active credit channel in Germany. Their VAR estimations in which identification problem is taken into account indicate that a contractionary policy shock bring about a sharp reduction in loan supply of banks, as credit view suggested.

In analogy to research on the US economy, international studies that investigate operation of credit channels in other developed countries have also documented the heterogeneous influence of monetary policy shocks over firms and banks that have different characteristics. For instance, Huang (2003: 499-505) and Mizen and Yalcin (2006: 203-207) analyze micro-level data of firms in UK to identify firm level asymmetries. Briefly, they show that disadvantaged firms that are relatively young, risky, small, indebted and bank-dependent are affected adversely from monetary policy shocks. Results of these studies imply that firms with relatively vulnerable structure cannot offset reduction in bank loans and struggle to access short-term debt market after a rise in interest rates. Also, both studies point out that employment and inventory investment vary with changing composition of firms' external finance, which indicate that monetary policy shocks impact real economic activity in UK. Mateut et al. (2006: 620-627) analyze role of trade credits in UK to assess whether firm-to-firm financing opportunities have implications for transmission mechanism. They state that from a theoretical point of view trade

credits are substitutes for bank loans in financing schedule of firms. Especially small and disadvantaged firms may resort to trade credits when they experience trouble to access loan markets due to tightening monetary policies. In such a situation, induced monetary shocks will lose their effectiveness on economic activity, as firm-to-firm financing alternatives will compensate narrowed bank lending activities. To confirm this view, they employ data of 16.000 manufacturing firms and estimate panel models by considering firm-specific factors and trade credits. Estimation results imply that trade credits play a significant role in transmission process. It is found that during periods of monetary tightening, share of bank loans in total financing expense of small firms declines while that of trade credits increases. In particular, this evidence indicates that financially constraint firms maintain their activities by obtaining finance from nonbank alternatives even after a contractioanry policy shock. Therefore, the link between economic activity monetary policy applications is attenuated by trade credits. With this respect, it is stated that existence of credit relationships among firms lower effectiveness of monetary policies on credit facilities and thus weaken operation of credit channel in UK.

On the other side, international literature focusing on bank-specific factors also put forth that cross-sectional differences among banks are influential over transmission of monetary policy in other developed countries. For instance, Ehrmann et al. (2001: 24-35) find that not size but liquidity of banks creates asymmetries in banks' lending reaction to monetary shocks in euro zone. Analyses show that monetary policy applications are more influential over illiquid banks. It is found that loan supply of less liquid banks is more responsive to applied monetary policies as expected. On the other side, estimations do not find any significant disparity in loan supply of banks with different size, which indicates that on contrary to expectations size of individual banks do not play a role in European monetary transmission mechanism.

By analyzing data of banking groups in Germany over the period 1975-1997, Kakes and Sturm (2002: 2083-2090) show that there are disparities in response of small and large banks to induced policy shifts. Their estimations indicate that although they have large amount of security holdings, loan supply of small banks decline sharply after a contractionary monetary shock. By contrast, large banks do

not give any significant reaction to policy shifts, which point out their ability raise funds from other sources after a shift in monetary policy. The evidence, therefore, imply that rather than large banks, small banks which have limited access to other financing sources bear the brunt of monetary policy actions as it is the case in the US. Along the same lines, Gambacorta (2005: 1746-1755) reveal that bank-specific factors have significant impact on bank lending mechanism of monetary transmission process in Italy. It is shown that not size but liquidity, capital structure and access to internal capital markets are effective in lending behavior of banks in return for monetary shocks. Similarly, Hosono (2006: 392-403) find that transmission mechanism of monetary policy in Japan also comprises cross-sectional differences among banks. More recently, Altunbas et al. (2009: 1003-1005) put forth that besides size, liquidity, risk and capital structure securitization level of banks have also important implications for monetary transmission process in European countries.

As presented above, majority of the previous literature concentrate on operation of credit channels in industrialized countries. Since most of these countries have deep and efficient financial markets as well as highly developed and regulated banking sectors, the studies presented above have some limitations to make general inference about effectiveness of credit channels in different country structures. For instance, transition economies and developing countries have relatively shallow and inefficient financial markets dominated by public debt instruments and banks (Bhattacharya et al., 2011: 3). Therefore, implementing monetary or regularity policies by only considering results obtained from developed country studies may not be appropriate for developing or transition economies as these country groups have quite different economic structure and credit market dynamics.

In order to highlight functioning of credit channels in different economic structures and enhance knowledge about monetary transmission mechanism, researchers recently begin to investigate operation of credit channels in countries other than developed ones. For instance, Matousek and Sarantis (2009: 326-333) employ data of eight Central and Eastern European Countries, including Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia to examine operation of bank lending channel. Their panel data estimations for each country over the period 1994 and 2003 point out that in general bank-

lending channel is working, but its size and effectiveness varies across countries. According to their results, short term interest rate used as a proxy to monetary policy stance individually does not have any direct impact on loan supply of banks in majority of the analyzed countries. However, they find that volume of credit supply changes with respect to shifts in monetary policy when interest rates and some bank-specific factors are considered jointly. Evidence shows that liquidity and bank size together with short-term interest rates are effective on bank credits in most of the countries; only capital structure is found unrelated with the volume of loan supply. Apart from this, there is also empirical support for the influence of loan supply over aggregate output production. Estimations show that there is a significant and positive relationship between loan supply and output growth of countries. Considering the fact that banking sector is the dominant financing source of borrowers in these countries due to underdeveloped capital markets, authors state that these findings are convenient with the expectations. With this respect, they conclude that in compliance with the structure of their financial system, lending channel is functioning in majority of countries in this region. Similarly, Köhler et al. (2006: 20-31) and Jimborean (2009: 368-374) also show that credit channels are integral parts of transmission mechanism in Central and Eastern European countries.

Studies on other emerging countries also produce supportive evidence for credit channels. To illustrate, Arena et al. (2006: 19-24) find that bank-specific factors such as liquidity, capitalization and foreign ownership are effective on credit prorogation mechanism in Asian and Latin American countries. In a similar vein, Olivero et al. (2011: 1039-1051) present evidence for the existence of bank lending channel for the same region. Their panel data estimations show that negative monetary policy shocks generally bring about significant reduction in bank loans, as expected. They also show that bank-specific factors and consolidation in banking industry have significant impact on transmission of monetary shocks in this set of countries. More specifically, Mello and Pisu (2010: 52-59) examine role of lending channel in Brazil by using aggregate data over the period 1995 and 2008. Their VECM estimations in which supply and demand side effects are identified reveal that monetary policy actions are effective on loan supply of banks. Similarly, Mora (2013: 140-148) supports operation of bank lending channel in Mexico by using

bank level data. Evidence presented in this study indicates that dollarization play a significant role in propagation mechanism of monetary policy. Consistent with the predictions, it is found that banks that have relatively larger share of foreign currency holdings are less responsive to policy shifts. Also, parallel to the findings of other studies, he shows that lending channel mainly operates through small banks.

2.2. LITERATURE ON TURKEY

In Turkey, empirical studies on monetary transmission channels have come up with the early years of 2000s, parallel to developments in other developing countries. Overall, it can be said that previous studies are far from providing a straightforward and a well-arranged knowledge about transmission mechanism in Turkey as empirical results vary considerably with investigated period and employed estimation technique. However, as a general assessment, one can state that interest rate channel is an effective transmission mechanism in Turkey, as much of the previous literature produces supportive evidence for the influence of interest rates over volume of economic activity and price levels. By contrast, evidence on other transmission mechanisms such as asset price and credit channels is mostly controversial and inconclusive.

For interest rate channel many empirical studies indicate that effectiveness of this mechanism gained ground after 2001 economic crisis, in line with the recent developments in policy applications. Before 1989, the monetary authorities mainly conduct policies by using monetary aggregates. With the beginning of 1990s, the main policy instrument shifts from broad monetary aggregates to balance sheet components of the Central Bank. Thereafter, managed exchange rate program is employed just before the 2001 crisis to control inflationary expectation in the economy (Eroğlu, 2009: 28-31). But, monetary authorities abandon this regime immediately after the crisis of 2001 and head to apply an inflation targeting policy. This policy shift brings about a change in the major policy instrument from nominal exchange rates to short term interest rates and increases role of interest rates in transmission mechanism in Turkey (Başçı et al., 2007: 475-476).

In addition to these developments, recent structural changes in Turkish economy facilitate operation of interest rate mechanism as well. Before 2001 economic crisis, chronic problems of Turkish economy such as high inflation, rigidities in inflation expectations, risky economic environment and high government and public debts are the main factors that hinder operation of interest rate channel by reducing the nexus between spending decisions of economic units and interest rates. But, due to the applied economic recovery program after 2001 crisis, both inflation rate and inflationary expectations decline recently, which provide a reliable environment for the transmission process through interest rates (Başçı et al., 2007: 476 - 478).

In compliance with these developments, empirical studies provide supportive evidence for the role of interest rates in transmission process as well. For instance, Şahinbeyoğlu (2001: 30-34) indicates that interest rate channel of monetary transmission mechanism is partially operating in Turkish economy. Estimations show that after a rise in nominal interest rates, real interest level increases and lowers inflation and output level, as suggested in interest rate mechanism. However, evidence reveals that these effects on inflation and output are transitory and the magnitude of their impact is relatively small as economic agents evaluate their expectations immediately due to the high inflationary structure of Turkish economy. Consequently, the author states that interest rate channel operates but rapid adjustment process for prices and large budget deficits leading high real interest rates impair its effectiveness in monetary transmission mechanism.

Quite differently, Aydın (2007: 18-21) investigates the impact of monetary policy changes on bank lending rates to evaluate operation of interest rate channel in Turkey. The panel data estimations covering the period between 2001 and 2005 indicate that all type of loan rates have long run relationship with money market rates. Especially, during the rapid credit expansion period between 2003 and 2005, it is found that cash, automobile and housing loan rates are responsive to policy rates. As a result, analyses reveal that credit market prices are responsive to shifts in policy rates, suggesting that monetary policy applications are effective on cost of borrowing conditions and thereby on investment and consumption spending of economic agents.

Büyükakın et al. (2009: 113-115) also provide supportive evidence for the operation of interest rate channel between 1990 and 2007 by using causality tests. They find that changes in overnight rate are the main motivation of variations in investments, price level and production. Results reveal that interest rate fluctuations lead changes in fixed capital investments, industrial production index and prices, as supposed in interest rate mechanism. On that account, the authors state that transmission process operating through interest rate channel is effective in Turkey.

Similarly, by using the data between 1995 and 2007, Erdogan and Yıldırım (2009: 67-68) point out that interest rate mechanism is active in Turkish economy. The impulse response analysis based on VAR estimations indicate that in the short-run, monetary policy shocks that raise real interest rates lower both fixed capital investments of firms and durable goods expenditure of households. This implies that changes in real cost of borrowing resulting from policy actions are effective on agents' demand for investment goods and durables respectively. In light of these results, study reveals that policy actions are transmitted into real economy through underlying mechanisms of traditional interest rate channel.

Using quarterly data between 1990 and 2006, Örnek (2009: 113-115) also states that interest rate shocks are influential over both aggregate output and inflation level. It is found that after an increase in overnight rate, real output level fall sharply within two quarters and this impact continue significantly for 4 or 5 quarters. But, on the contrary to priori expectations, it is observed that inflation react positively to a contraction in monetary policy. A given positive shock to overnight rate increases inflation by three percent within two quarters. This finding indicates that similar to many other countries, prize-puzzle problem is also prevailing in Turkey. Moreover, the results of variance decomposing method point out that overnight rate is the second most influential variable for explaining the volatilities in GDP and inflation apart from their own impact; almost thirty percentage of the variation in GDP and inflation is coming from overnight rate shocks. As a conclusion, study put forth that interest rate channel is an important part of transmission process in Turkey.

Beside interest rates, researchers also investigate the role of asset prices in monetary policy transmission mechanism in Turkey. In brief, the previous literature on asset price channels provides controversial results parallel to those studies on

other countries, which make it difficult to comment about relative importance and effectiveness of these mechanisms.

When exchange rate mechanism is considered, it is important to mention that apart from international trade channel, exchange rate fluctuations have further implications for Turkish economy, as it is case in many developing countries. Başçı et al. (2007: 478-485) state that due to effect of currency substitution and import-dependent production structure, exchange rate channel might not work in a conventional way, as suggested in international trade channel. They note that due to dollarization effect, balance sheet status of economic agents and production pattern of firms are highly sensitive to fluctuations in the value of exchange rate parity. For that reason, induced shifts in exchange rates are likely to create negative wealth effects and increase cost of production, which may collectively lead unexpected changes in general price level and volume of output production.

Şahinbeyoğlu (2001: 30-31) try to examine the operation of exchange rate channel by using impulse response functions. The evidence indicates that on contrary to above propositions, exchange rate mechanism operates quite well in Turkey. It is found that a contractionary monetary policy that appreciates domestic currency leads simultaneous decline in both inflation and output level. Particularly, the response of inflation to a positive interest rate shock is parallel to the reaction of real exchange rate. With respect to these findings, the study reveals that international trade channel of exchange rate mechanism is functioning adequately in Turkish economy.

On the contrary, using data over the period 1995-2006, Erdoğan and Yıldırım (2008: 103-105) show that monetary policy shocks cause only short-run fluctuation in real exchange rates and transmission process through exchange rate mechanism is incomplete. Their results reveal that following a monetary tightening, real exchange rate declines within two months but recovers itself quickly and begins to rise until forth month. Thereafter, the influence of interest rate shock over exchange rates dies out within a short period of time. Although, this finding indicates that monetary policies are effective on value of real exchange rate parity, study do not infer any transmission process from exchange rates to economic activity. Also, variance decomposition results imply that variations in real exchange rate have no

considerable impact on trade balance, output and inflation. Hence, they conclude that transmission mechanism through exchange rate is partially operating.

Örnek (2009: 120-122) finds that policy actions are effective on real exchange rates but this impact is not parallel to theoretical expectations. Estimations based on VAR methodology show that after a positive interest rate shock, real exchange rate declines by 5% within two quarters. This unexpected response of real exchange rate to monetary policy shock is explained by the influence of changing interest rates over expectations of economic agents. Given the fact that individuals perceive interest rate increases as precursors of an inflationary period in the near future, they attempt to sell their domestic currency denominated assets to protect themselves from the burden of inflation and tend to hold foreign currency denominated assets. As a result, the value of domestic currency depreciates after a contractionary monetary action. Considering previous experiences of Turkish people about high inflation, this explanation is convenient with the results of this study. In addition, similar to findings of Erdoğan and Yıldırım (2008), the results indicate that the link between economic activity and real exchange rate is relatively weak. Impulse response functions and variance decomposition analyses show that real exchange rate shocks are not influential over inflation and output level.

Quite to contrary, Kara and Öğünç (2011: 6-9) state that exchange rate variations and import prices are effective on inflation dynamics in Turkey for the period 2002-2011. It is estimated that a 10% increase in exchange rates pushes up prices by 1.5% within a year. However, they denote that the significance of pass through mechanism from exchange rates to prices has been weakening recently.

More recently, Arabacı and Baştürk (2013: 119-128) report that monetary shocks lead perverse movements in real exchange rates. They find that contrary to expectations, exchange rate parity increases after a contractionary policy shock, suggesting an exchange rate puzzle in Turkey.

Beyond exchange rates, other asset prices also draw attention from researchers. For example, Aktaş et al. (2008: 8-13) investigate the influence of conducted monetary policies on various financial market elements to assess operation of asset price channel in Turkey. In order to do that they initially make a distinction between expected and unexpected monetary policy actions and then

estimate impact of policy surprises on stock market indices, long-term interest rates, exchange rates and risk premium. The regression analyses based on daily data between 2004 and 2008 imply that only unexpected policy actions are effective on financial markets. They find that only bond market elements and risk premium are responsive to unexpected rise in policy rate; all bond returns with various maturities and risk premium rate increase following a positive shift in policy rate. By contrast, estimations do not point out any considerable impact of monetary policy shocks on stock market prices and exchange rates. In this regard, they state market interest rates are the primary instruments that reflect monetary policy practices to real economy.

Similarly, Örnek (2009: 118-119) declares that stock market channel is not operating in Turkey as well. The analyses based on the impulse response functions and variance decomposition methods show that policy shocks have no influence over stock market prices. Also, output level does not exhibit any systematic reaction in return for stock market innovations. Then, he states that empirical evidence does not suggest operation of Tobin's q channel as a transmission mechanism in Turkey.

On the contrary, Akay and Nargeleçekenler (2009: 146-149) using monthly data between 1997 and 2008 illustrate that the stock market channel is active in Turkey. In parallel with the theoretical expectations, their VAR estimations suggest that contractionary monetary policy shocks have negative impact on stock prices. It is also observed that changes in the stock market are effective on inflation rate. When a positive shock appears on stock prices, inflation increases for a five-month period and then turns to its baseline path. Accordingly, they conclude that transmission channel through stock market prices is functioning in Turkey. In a similar vein, Duran et al. (2010: 29-30) investigate the impact of policy rate decisions on stock market indices. Results based upon Generalized Method of Moments (GMM) estimations reveal that there is a negative relationship between short-term policy rate and stock market prices. It is found that a 25 basis point rise in policy rate lowers broad stock market index by approximately 0.85%. Therefore, results of this study suggests that monetary shocks are influential over stock prices and thus transmission mechanism operates effectively through capital markets in Turkey.

Duran et al. (2012: 29-31) also find that monetary policy actions have significant impact on asset prices. Estimations put forth that innovations in short-term policy rate bring about changes in both equity and bonds markets. Evidence show that there is a positive relationship between policy rate and yields on government bonds; a rise in short term policy rate increases bond yields with various maturities ranging from 6 to 36 months. In addition, monetary policy shocks are associated with a decline in stock prices: after a positive 100 basis points increase in short term policy rate stock prices falls by 3.4%. Consequently, they denote that both stock and bond markets are integral parts of monetary transmission mechanism in Turkey. On the other side, estimations show that policy makers have no significant impact on exchange rate market, which indicates that exchange rate transmission mechanism is inoperative.

In comparison to other transmission mechanisms, credit channels get more attention from researchers in literature. Numerous papers attempt to highlight functioning of credit channels by using various methods and aspects. While some of them use macro-level variables such as credit aggregates to provide evidence on credit channel, others prefer to explore cross-sectional heterogeneity in the mechanism by using micro-level bank data.

Parallel to international literature, early studies in Turkey try to examine the potential role of credit channels in transmission process by analyzing characteristics of Turkish financial system. In one of these papers, İnan (2001: 9-15) states that during the period between 1990 and 2000, the structure of Turkish financial system is convenient with most of the assumptions of credit channel. He presents supportive evidence for the fact that banks are the major finance suppliers of firms and most of the firms have little opportunity to raise finance from nonbank institutions. In this respect, he notes that bank loans and other financing sources are not substitutable to each other for firms. Secondly, he claims that monetary authorities have ability to affect loan supply of banks as banks' major source of funds is deposits. He asserts that the appreciable weight of deposits in the liability side of the balance sheet of banks makes them more sensitive to monetary policy changes. Thus, monetary authorities can shrink banks' ability to produce loans through using policy instruments such as required reserve ratios or interest rates. On the contrary to these

findings, he states that high liquidity of Turkish banks might stymie the operation of credit transmission mechanism. In order to protect themselves from the highly volatile and risky economic environment, banks in Turkey generally prefer to hold large amount of securities in their portfolio. This situation increases their balance sheets flexibility and creates an opportunity for them to shield their loan portfolio from monetary policy actions, which lowers relative effectiveness of credit channels. However, in spite of the fact that banks have liquid balance sheets, the study implies that in general most of the assumptions of credit channels are sound in Turkey. More recent studies also support the idea that the structure of banking system and the characteristics of financial markets are consistent with the prerequisites of a proper credit transmission mechanism (Cengiz and Duman, 2008: 86-90; Aktaş and Taş, 2007: 64-65). Only, the share of public banks in banking sector and the inflationary period until 2001 crisis are considered as major factors that could harm the transmission process. Overall, these papers reveal that Turkish financial market is suitable for an effective transmission process via credit market.

However, contrary to predictions of these studies, empirical analyses mainly provide conflicting results about significance of credit channels. While some studies suggest a strong transmission mechanism via credit channels, others do not find any clear evidence of operation of credit channels.

To illustrate, Gündüz (2001: 20-26) investigates the functioning of bank-lending channel by using monthly data between 1986 and 1998. Overall, he finds that the bank-lending channel is partially effective in Turkey. The estimation results show that a monetary policy action that narrows monetary conditions in the economy lowers the deposits level of banks. Correspondingly, banks adjust their asset side by shrinking credit supply and selling securities, as suggested in credit view. However, it is found that the initial decline of securities is more severe than that of credits in the short run. After a monetary contraction, while securities reach their tough by falling approximately 1.7% in the second month, credits react later than securities and drop by 1.3% in the third month. This finding implies that banks slight the impact of monetary lessening on credit supply by selling their securities. On the other hand, results indicate that banks' loan supply is effective on the production capacity of the economy. In addition to parallel movement of credits and industrial

production index in impulse-response graphics, variance decomposition analysis reveals that credits have an important role in explaining the variation of production index while the reverse do not hold. Hence, the author denotes that credit volume declines mainly due to supply side effects coming from exogenous shocks in monetary policy rather than that of demand side dynamics stemming from slowing economic activity. With this respect, study reveals that bank-lending channel operates properly within the sample period.

Çavuşoğlu (2002: 21-26) also tests the significance of bank lending channel by using panel data of 58 banks between 1988 and 1999. The two-step GMM results show that there is not any significant relationship between monetary policy actions and credit growth. In addition to this, he notes that the bank size has no considerable impact on responses of banks to changing monetary conditions. On the other side, the results point out that holding of government securities in their balance sheets functions as an air bag for banks to pass off monetary shocks, which indicates that monetary authorities have no direct control on credit supply mechanism and thus applied policies are unable to force banks to alter their lending volume. Moreover, it is found that rather than monetary policy actions, structural features of banks are influential over credit supply of banks. Results show that both lagged capital ratio and liquidity indicator are positively related with the growth of credit supply, which implies that well-capitalized and more liquid banks can issue loans easier than that of banks with lower capital and illiquid financial status. However, despite the fact bank-specific factors play some role in transmission process, the study concludes that bank-lending channel is not operating properly in Turkey.

Similar to Çavuşoğlu (2002), Şengönül and Thorbecke (2005: 933-934) also attempt to document whether monetary policy decisions have disproportional impact on banks with different liquidity levels. In order to test this hypothesis, they use monthly data of 60 commercial banks over the period 1997-2001. In brief, they provide evidence for the presence of the bank-lending channel in Turkey. The two-step regression results show that banks with lower liquidity levels reduce their loan supply more than that of banks with high liquidity. In addition, smaller banks are found more sensitive to monetary policy applications compared to larger banks. As a result, study illustrates that conducted monetary policies have heterogeneous impact

on Turkish banks with different size and balance sheet structure. Aklan and Nargeleçekenler (2008: 125-127) also reach similar results by using the quarterly panel data of 51 banks covering the period between 1998 and 2001. Their estimations reveal that banks with lower liquidity ratio reduce their credit supply more than banks that hold more liquid assets in their portfolios.

Apart from these studies, Özçiçek (2006: 262-266) investigates whether credit mechanism is running in Turkey by analyzing macro level data. The results of Granger Causality test imply that there is no causality relationship between monetary aggregates and credit volume. Also, the outcome of VAR analysis points out that money supply shifts are influential over credits only in short-run; after a monetary expansion, credits returns to their original levels within a quarter. In this sense, results refer to a weak relationship between monetary policy actions and bank credits. Additionally, the causality between GDP and bank credits runs unilaterally from GDP to credits. This finding indicates that the amount of credits is determined endogenously by demand side factors rather than that of supply side affects coming from monetary policy innovations. That is, influence of demand side factors outweighs the supply side dynamics in credit markets. As a conclusion, study suggests that credit channels are not operating effectively in Turkey.

On the contrary, by using panel data of 34 commercial banks over the period between 2001 and 2006, Aktaş and Taş (2007: 68-73) find that bank-lending channel is active in Turkey. Their estimations show that as a monetary policy indicator, overnight interest rate has a significant and negative impact on loan supply. Supportively, Öztürkler and Çermikli (2007: 63-66) also reveal that credit mechanism has an important role in transmission process. By using Pairwise Granger Causality analysis, they exhibit a unilateral causality relation from policy shocks to real credit growth between 1990 and 2006. In addition to this, their results indicate a bidirectional relationship between real credit growth and industrial production index. That being the case, they claim that credit channel is significant in Turkey and monetary authorities have ability to alter volume of credits and thereby shift aggregate economic activity through implementing monetary policies. More recently, Cengiz and Duman (2008: 96-100), Erdogan and Beşballı (2009: 37-38) and Taş et al. (2012: 68-71) respectively provide supportive evidence for bank lending channel

as well. All these studies show that after a monetary contraction, both credit supply and output production falls in line with the predictions of credit channel, suggesting existence of a bank lending transmission mechanism in Turkey.

Quite different from other studies, Arslan and Yapraklı (2008: 97-100) focus on the relationship between bank credits and inflation. Their results point out a bilateral association between loan supply of banks and inflation rate. It is found that while inflation has a negative impact on the volume of generated bank loans, credits, in turn, affect inflation in a positive way, as expected in credit view. They state that negative influence of inflation over credit volume is stemming from ascended uncertainties and risk level in the economy. As banks try to protect themselves by charging higher interest rates on loans during episodes of high inflation, aggregate credit demand in the economy decreases. Also, banks become more reluctant to issue new credit due to upward default risk on credits during inflationary times. Therefore, due to both supply side and demand side dynamics financial intermediation facilities are impeded in periods of high inflation, as suggested in the study.

In their alternative study, Özlü and Yalçın (2010: 15-18) discuss the role of trade credits in transmission mechanism by analyzing the liability composition of firms over the period 1996 and 2008. Their panel data estimations provide evidence for the existence of both bank lending channel and trade credit mechanism in Turkish economy. Empirical results demonstrate that following a monetary tightening, the share of trade credits in total liabilities increases while the share of bank loans falls, consistent with the predictions of credit view. Moreover, estimations imply that induced monetary policy shifts have disproportionate impact on borrowers with different size. It is exhibited that in general, large firms are less responsive to induced policy shocks as they are not financially constraint compared to smaller firms and have better access to bank loans due to their high collateral value. On the other hand, evidence shows that following a monetary contraction, small and medium sized firms attempt to raise funds through trade credits to finance their expenditures. Hence, results indicate that despite the fact that volume of available bank credits fall, SMEs succeed in continuing their operations by using trade credits. Consequently, the authors assert that existence of trade credit mechanism dilutes the

impact of monetary tightening on smaller firms and curtails the operation of bank lending channel in Turkey.

In literature, some studies try to understand whether varying inflationary environment in the economy creates any impact on functioning of credit channel as well. In this respect, Çatik and Karaçuka (2012: 1239-1242) analyze the era between 1986 and 2010 and compare their results obtained in low inflation period with that of high inflation periods. Their threshold VAR estimations reveal that in contrast to high inflationary period, interbank rate as a policy measure has considerably more influence over prices in low-inflationary period. This result indicates that traditional interest rate channel becomes more effective in disinflation period. On the other side, it is observed that credit shocks have become more influential over price level and industrial production in episodes of low inflation. This outcome is read as credit and real economy link gains ground in lower inflation era. However, they state that monetary tools have no significant power on credit supply in both periods, which implies that credit aggregates behave independent from monetary policy actions. Hence, study put forth that although the importance of bank lending channel has ascended recently, monetary transmission mechanism mainly runs through interest rate channel in Turkey.

Overall, similar to asset price channels, empirical studies provide controversial results about the operation of credit mechanism in Turkey. In this sense, it can be said that the traditional interest rate channel is the only mechanism that prior studies agree on its significance. Therefore, this outcome implies that effectiveness of other channels and their relative importance in monetary transmission process are still questionable in Turkey.

In addition to this, as presented above, a large amount of previous studies focus mainly on one or two of the monetary channels to examine the transmission process. Although these studies are useful to shed light on operation of a particular channel, they are not sufficient to carry out evaluations about operation of whole transmission process. Fulfilling this gap in Turkish literature is one of the main objectives of this thesis.

CHAPTER 3
METHODOLOGY: VECTOR AUTOREGRESSION (VAR) MODEL

In this thesis, VAR methodology is used to examine functioning of monetary transmission channels in Turkey. The main motivation of using VAR procedure is obtaining relevant impulse-response functions for each transmission channel to analyze the influence of monetary policy shocks over the economy. In this chapter, estimation procedure of VAR system is discussed briefly. The dataset and specification of VAR models for each transmission process are presented in chapter 4 together with obtained results from estimations.

The VAR methodology is developed by Sims (1980) as an alternative to large-scale structural macroeconomic models. Since then this method is widely used by economists to examine empirical relationships between macroeconomic variables. According to Sims, there are "incredible" numbers of restrictions in large macroeconomic models, which do not provide any additional benefit for making forecasting and policy projections. In addition, the priori restrictions about the categorization of exogenous and endogenous variables in these models are highly questionable insomuch not base on an economic theory. For that reason, structural models suffer from specification problems that impair their practical usage for policy analysis (Sims, 1980: 1-3).

Within this context, Sims suggests an unrestricted strategy to analyze interactions between macroeconomic variables. He abandons the structural modeling approach in which variables are classified as exogenous and endogenous by priori restrictions, and develops an a-theoretical method that treat all variables as endogenous (Sims, 1980: 15-16). In such a system, each variable is explained by its own previous values together with the rest of the variables' current and lagged values in the model. As all variables are assumed as endogenous, the number of equations in the model is simply equal to number of endogenous variables being considered in the analysis. In mathematical form, a general VAR system that involves k variables and p lagged values for each variable can be shown as follows (Tarı, 2010: 453):

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \varepsilon_t \qquad (1)$$

Where y_t is a $k \times 1$ vector that involves all included variables in the model, c is a $k \times 1$ vector that stands for constant terms, A_i are $k \times k$ coefficient matrices and ε_t is a $k \times 1$ error terms vector. As the maximum number of included lagged values for each term is equal to p, this system is called p^{th} order VAR and is shown as VAR(p). Such a system is able to capture all interrelations between variables in the model, as it does not contain any priori restriction. Each variable is allowed to respond for changes in all remaining factors in the system, which provides more flexible and richer structure to understand connections among variables. In this sense, forecasting analysis based on VAR procedure is considered as good as large structural models (Brooks, 2008: 291-292; Stock and Watson 2001: 101-102). In addition, estimation procedure of such a system is easier than structural models as each equation can be estimated simply by applying Ordinary Least Squares (OLS) procedure. For that reasons, VAR approach is evaluated as one of the most advantageous methods in macroeconomic analysis as it has a less complicated estimation procedure in comparison to structural models, does not require any priori restriction about variables and captures almost all possible relationships between variables considered in the system.

However, construction of such a model brings about some problems as well. One major problem with VAR is that the requirement of the estimation of large number of parameters. If there are k equations and each equation contains a constant term and the lagged values of each variable, total number of parameters estimated will be equal to $(k + pk^2)$. Such a large number of parameter estimation sometimes leads statistical inference problems due to the consumed degrees of freedom unless the data length is sufficiently long (Brooks, 2008: 292).

In addition, economic interpretation of individual coefficients becomes so complicated as in most cases, the sign and the magnitude of coefficients in front of the lagged values of same variable show unstable pattern. Therefore, in VAR models, individual coefficient estimates are not useful for economic inference (Sims, 1980: 20-21; Gujarati and Porter, 2009: 789). For the very reason, researchers developed further techniques such as impulse-response functions and variance decomposition method to interpret outcomes of VAR estimations. While impulse-response functions are exercised to trace-out the response of variables with respect to

shocks in other variables, variance decomposition method is employed to measure the proportional contributions of each variable's own shocks to the variations in dependent variable. In this thesis, impulse response functions and their graphical representations are used to interpret obtained results of VAR estimation. For that reason, only derivation process of impulse response functions and their implications are explained in detail.

The specification of VAR modeling contains some problems as well. Firstly, the outcome of VAR system is highly sensitive to chosen lag length (Gujarati and Porter, 2009: 788). In this regard, determination process of optimal number of lag length for each variable becomes so crucial to reach proper results. In most cases, economic theory does not suggest any specific number of lags for the problem under consideration. Also, optimal lag length for a model can vary depending on the aim of the study and the frequency of employed data in analysis. Although lag length can be specified arbitrarily by researchers, most empirical studies use information criterions to specify optimal lag length in the model.

Secondly, the ordering of variables is critical for VAR estimations as it affects the design of impulse-response functions (Stock and Watson, 2001: 103). Also, order of variables has some important consequences about economic interpretation of results. In this sense, sequencing of variables should be determined by care. One way to do that is using economic theory. In some cases, economic theory suggests a causal chain among variables, which enable researcher to specify ordering of variables. But, most of the time, theoretical arguments do not indicate any clear sequencing. For that reason, empirical studies can sometimes apply causality tests to solve ordering issue.

Finally, in order to obtain a stable VAR system in which impacts of given shocks die out in time, all variables should be collectively stationary (Gujarati and Porter, 2009: 788; Brooks, 2008: 299). Unless variables are stationary, routine statistical inference procedures cannot be applied. Also, impulse response functions will not be fading in time (Enders, 1995: 309). For that reason, before estimating the model, the stationary condition for all variables should be checked. If there are some non-stationary variables in the model, they have to be transformed into stationary series by applying a differencing procedure.

On the other hand, it is claimed that as statistical inference is not the main concern of VAR, one can do estimations by using non-stationary series (Brooks 2008: 292-293). Also, it is stated that differencing procedure can be harmful on forecasting ability of VAR as it leads informational loss in dataset (Enders, 1995: 301). However, most of the empirical studies use stationary variables in their analysis as such a system produce more reliable impulse-response functions that provide convenience in interpretation of outcomes.

All in all, despite its argued deficiencies, VAR methodology is considered as highly practical and even less problematic than large-scale structural models in terms of both estimation and specification procedures (Stock and Watson, 2001: 113-114). Also, it has a dynamic and unrestricted structure, which allows data to capture all interactions among variables. In this regard, VAR methodology is considered as a proper method for forecasting analysis on macroeconomic relations in the economy. The following subsection explains estimation steps of a VAR system and then presents how impulse response functions are derived from VAR estimations.

3.1. ESTIMATION PROCEDURE OF VAR

Suppose that the model under consideration involves only two variables, y_{1t} and y_{2t}, and their first lags. Following Enders (1995: 295), this bivariate VAR(1) model can be shown as follows:

$$y_{1t} = \beta_{10} - \beta_{12}y_{2t} + \alpha_{11}y_{1t-1} + \alpha_{12}y_{2t-1} + \varepsilon_{1t} \quad (2)$$

$$y_{2t} = \beta_{20} - \beta_{21}y_{1t} + \alpha_{21}y_{1t-1} + \alpha_{22}y_{2t-1} + \varepsilon_{2t} \quad (3)$$

Where y_{1t} and y_{2t} are stationary time series, ε_{1t} and ε_{2t} are white noise disturbance terms which stand for respective shocks of y_{1t} and y_{2t}, and βs and αs are the corresponding coefficients of included variables in the model. This equation system is called as structural or primitive VAR. In this model, each of the dependent variables, y_{1t} and y_{2t}, are explained by their first lagged values, plus respective contemporaneous and first lagged value of the remaining variable in the system. As

the value of each dependent variable is determined within the model, both y_{1t} and y_{2t} are considered as endogenous variables in this equation system.

However, such a model is not suitable for OLS estimation. As each of the equations contains contemporaneous terms, there is a feedback mechanism among endogenous variables. This implies that unless β_{12} or β_{21} is equal to zero, ε_{1t} or ε_{2t} will have an indirect impact on explained variables. In this case, the correlation between, ε_{1t} and ε_{2t}will not be equal to zero, which violates the uncorrelated error terms assumption of OLS. Hence, least squares methodology will be inappropriate to estimate such a system unless the correlation among error terms removed (Enders, 1995: 296).

In fact, by using matrix algebra, this equation system can be transformed into a reduced-form model that is appropriate for OLS technique. In order to provide convenience during operations, equation 2 and 3 are rewritten in matrix notation as follows:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} -\beta_{12} & 0 \\ 0 & -\beta_{21} \end{bmatrix} \begin{bmatrix} y_{2t} \\ y_{1t} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad (4)$$

If we bring contemporaneous terms together on the left side, we obtain:

$$\begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad (5)$$

or

$$Ay_t = \theta_0 + \theta_1 y_{t-1} + \epsilon_t \qquad (6)$$

where

$$A = \begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix},\ y_t = \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix},\ \theta_0 = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix},\ \theta_1 = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix},\ y_{t-1} = \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix},$$
$$\epsilon_t = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

If we pre-multiply both sides of Equation (6) by A^{-1}, we can get the following reduced-from VAR model:

$$y_t = \omega_0 + \omega_1 y_{t-1} + e_t \qquad (7)$$

Where

$\omega_0 = A^{-1}\theta_0,$
$\omega_1 = A^{-1}\theta_1,$
$e = A^{-1}\epsilon_t$

Equation (7) is named as VAR in standard form. In this equation, the dependent variables are explained by only predetermined variables, as there is no contemporaneous term in the right hand side of the equation. Therefore, the reduced-form parameters of each equation can be obtained by using OLS method.

However, reduced-form VAR estimations do not contain the relevant information to derive parameters of structural model as structural Equations (2) and (3) suffer from identification problems. In order to show the identification problem in structural model, the Equation (7) is rewritten in scalar from as follow:

$$y_{1t} = w_{10} + w_{11} y_{1t-1} + w_{12} y_{2t-1} + e_{1t} \qquad (8)$$
$$y_{2t} = w_{20} + w_{21} y_{1t-1} + w_{22} y_{2t-1} + e_{2t} \qquad (9)$$

Where w_{i0} and w_{ij} are the elements of ω_0 and ω_1 matrices respectively, and refer to the coefficients of reduced form equations. If we compare structural and reduced form systems, it is clear that the structural equations are underidentified. Because, the number of obtained parameter estimates from reduced form model is lower than the number of parameters of structural equations. One reason of this problem is the similar formulation of structural equations. As the predetermined variables are exactly the same in both of the structural equations, we cannot get relevant information for identification. For that reason, it is impossible to obtain structural parameters from reduced-form parameter estimates. In addition, both of the

residuals of reduced-form equations, e_{1t} and e_{2t}, contain combined effect of structural equation shocks, ε_{1t} and ε_{2t}, which complicates economic interpretation of derived impulse response functions based on these reduced form equation shocks (Enders 1995: 300-303).

Nevertheless, if we impose some restrictions on coefficients of structural form, the identification problem can be solved. One appropriate method to solve identification problem of structural equations is using a triangular method by imposing restrictions on contemporaneous coefficients by order (Sims, 1980: 21). Suppose that Equation (2) is restricted assuming β_{12} is equal to zero. This assumption implies that while y_{2t} do not have any contemporaneous impact on y_{1t}, variations in y_{1t} influence y_{2t} simultaneously. In such a case, the structural Equation (2) becomes identical to its reduced-form version, which enables us to obtain estimates of structural parameters, β_{10}, α_{11} and α_{12} directly by applying least squares method on Equation (8). Accordingly, by using these estimated values together with the estimated reduced-form coefficients from Equation (9), the structural parameters of Equation (3) can be obtained. As a result, the assumption of no feedback mechanism in the first structural equation solves the underidentification problem in the model. The similar results can also be achieved by assuming β_{21} is equal to zero, which is just the opposite of first assumption. At this time, there will be no instantaneous term in Equation (3), which implies no feedback mechanism from y_{1t} to y_{2t}. Hence, structural parameters of Equation (3) can be directly estimated from Equation (9), as these two equations are identical. Similarly, other structural parameters can be obtained by using the estimates of structural parameters of third equation together with derived reduced-form coefficients from Equation (9). Consequently, the model will be just identified as it yields all estimates of structural equation parameters.

In addition, by using such identification restrictions, one can decompose the impact of structural error terms on reduced-form residuals, which make it possible to derive meaningful impulse-response functions. The recursive schema that is applied in Choleski decomposition method is one alternative for overcoming identification problem. In brief, this strategy assumes that variables affect each other by following an order. This assumption enables us to obtain structural error terms sequentially and

thereby use them as shocks in impulse-response functions. The details about derivation process of impulse-response functions and Choleski decomposition method are examined in the following subsection.

3.2. DERIVATION OF IMPULSE-RESPONSE FUNCTIONS

In VAR methodology, the estimated results are not interpreted in a conventional way in which the main emphasize is on the sign and the value of individual coefficients. Because, in most cases, VAR system produces a large number of coefficient estimates; so that interpretation of each of them can be troublesome in economic sense. In this regard, instead of making inference by considering the sign and magnitude of individual coefficients, empirical studies derive impulse-response functions to interpret outcomes of VAR models.

Impulse-response functions are produced by using a basic algorithm that draws the reaction of each variable in the system to a given shock. On that account, one can observe the impact of various innovations on each variable by plotting the obtained values from impulse response functions on a time graph. This provides convenience to visualize how variables change through time as a response to given shocks.

To illustrate how impulse response functions are derived, the VAR model should be transformed into Vector Moving Average form (VMA) as follows (Enders, 1995: 305-306):

$$y_t = \mu + \sum_{i=0}^{\infty} \omega_1^i \, e_{t-1} \qquad (10)$$

Where

$\mu = [\bar{y}_1 \; \bar{y}_2]$,

$\bar{y}_1 = [w_{10}(1 - w_{22}) + w_{12}w_{20}]/[(1 - w_{11})(1 - w_{22}) - w_{12}w_{21}]$

$\bar{y}_2 = [w_{20}(1 - w_{11}) + w_{21}w_{10}]/[(1 - w_{11})(1 - w_{22}) - w_{12}w_{21}]$

By using matrix notation, Equation (10) can be expressed as below:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \bar{y}_1 \\ \bar{y}_2 \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix}^i \begin{bmatrix} e_{1t-1} \\ e_{2t-1} \end{bmatrix} \quad (11)$$

If reduced-form residuals are denoted in terms of structural error terms as:

$$\begin{bmatrix} e_{1t-1} \\ e_{2t-1} \end{bmatrix} = [1/(1-\beta_{12}\beta_{21})] \begin{bmatrix} 1 & -\beta_{12} \\ -\beta_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (12)$$

We obtain:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \bar{y}_1 \\ \bar{y}_2 \end{bmatrix} + [1/(1-\beta_{12}\beta_{21})] \sum_{i=0}^{\infty} \begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix}^i \begin{bmatrix} 1 & -\beta_{12} \\ -\beta_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (13)$$

Then, supposing that

$$M_i = \left[\omega_1^i/(1-\beta_{12}\beta_{21})\right] \begin{bmatrix} 1 & -\beta_{12} \\ -\beta_{21} & 1 \end{bmatrix} \quad (14)$$

VMA can be settled in terms of structural error terms as follows:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \bar{y}_1 \\ \bar{y}_2 \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} M_{11}(i) & M_{12}(i) \\ M_{21}(i) & M_{22}(i) \end{bmatrix} \begin{bmatrix} \varepsilon_{1t-1} \\ \varepsilon_{2t-1} \end{bmatrix} \quad (15)$$

Where $M_{kl}(i)$ stands for each element of M_i matrix. To provide more simplicity this equation can be written just as below:

$$y_t = \mu + \sum_{i=0}^{\infty} M_i \, \varepsilon_{t-i} \quad (16)$$

In Equation (16), respective $M_{kl}(i)$ reflects impacts of structural shocks on y_{1t} and y_{2t}. In this stance, one can follow the response of y_{1t} or y_{2t} to shocks in ε_{1t} and ε_{2t} by calculating values for each period. This exercise is the essential part of impulse-response analysis as it enables us to examine the behavior of each variable after a given unit shock in one of the error terms. However, as stated above, some restrictions should be imposed on structural equations to solve identification problem

and thereby decompose the impact of structural shocks. This can be done by dropping one of the feedback terms, either β_{12} or β_{21}, from structural equations. Suppose that there is no feedback term in Equation (3), therefore β_{21} is assumed to be equal to zero. If we estimate reduced form model by OLS, we can obtain the following equations:

$$e_{1t} = \varepsilon_{1t} - \beta_{12}\varepsilon_{2t} \quad (10)$$

$$e_{2t} = \varepsilon_{2t} \quad (11)$$

These equations imply that, one can directly estimate the error term of the structural Equation (3), ε_{2t}, by assuming y_{1t} has no contemporaneous influence on y_{2t}. In addition, ε_{1t} can be calculated as values of e_{1t}, ε_{2t} and β_{12} can be obtained from reduced form estimations. Such restrictions have important consequences on dynamic interaction of variables in the VAR model. The assumption of no feedback term in Equation (3) implies that while innovations in ε_{1t} and ε_{2t} influence y_{1t} within the period, y_{2t} is not affected from contemporaneous shocks in ε_{1t}; only innovations in ε_{2t} is influential over y_{2t}. This means that there is only one-way directional effect within the period from y_{2t} to y_{1t}, but not the way around. Therefore, y_{2t} comes prior than y_{1t} in ordering.

As it is mentioned, imposed restrictions have significant influence over calculation and the economic interpretation of impulse-response functions. For that reason, one has to be cautious about identification schema of structural equations. One way to do this is using Choleski decomposition method in which restrictions are imposed by following a triangular schema. In this method, the system equations are restricted sequentially by assuming that only preceding variables in ordering has instantaneous impact on their successors within the same period; there is no contemporaneous impact from variables coming later in ordering to preceding ones. Therefore, Choleski decomposition method implies that there is a causal chain among variables. Variables are ordered from exogenous to endogenous one and then equations are estimated by following this order. In this stance, a dependent variable whose equation contains no cotemporaneous term is considered as the most exogenous variable in the system and comes first in ordering. This means, shocks in

this variable have simultaneous impact on others while shocks in other variables have no simultaneous impact on that variable. On the contrary, if an equation involves all contemporaneous terms, the dependent variable of that equation is considered as the most endogenous variable and is listed at last place in ordering. This indicates that such a variable is responsive to all contemporaneous shocks in the system, but innovation in this variable can be effective on others only after a period.

In sum, by using Choleski decomposition schema, we can decompose the impact of structural shocks and thereby derive impulse-response functions based on estimates of structural error terms. However, as examined above, calculated values for impulse-response functions rely on a specified ordering among variables. In this context, if correlation among residuals is relatively high, the outcomes of VAR estimations become sensitive to sequencing of variables. For that reason, if there is no suggested causal chain among variables, one can obtain misleading results by ordering variables randomly. In this regard, sequencing of variables should be determined by care by either following economic theories or causality tests. Although causality tests can give some idea about the relationship among variables, if exists, following a theoretical suggestion is more appropriate way to order variables. But, results should be checked against ordering sensitivity of the system as well by using alternative estimation schemas (Brooks, 2008: 301).

CHAPTER 4
DATA AND RESULTS

4.1. DATA AND GENERAL ESTIMATION PROCEDURE

This thesis employs the monthly data of a large set of macroeconomic variables covering the period 2003 to 2013 to analyze the operation of monetary transmission channels in Turkey. Except the data of exports and imports gathered from the website of Turkish Statistical Institute, all data used in econometric analyses are obtained from the database of Central Bank of Turkey called Electronic Data Delivery System (EDDS). In the following lines, the data and general specification approach used in econometric analysis are introduced briefly. Estimations and results for each channel are presented just after this subsection.

In general, analyses on monetary transmission channels comprise four steps. The first one is the specification of a policy variable to measure monetary policy actions. In theory, it is mentioned that selected monetary variable should satisfy some requirements to be named as an appropriate policy indicator. There are two main points that one should take into consideration while selecting a policy variable. Firstly, monetary authorities should be able to control or affect the selected variable directly. That is, central bank should own necessary tools to imply changes in the chosen policy indicator (Dale and Haldane, 1995: 1612). Secondly, selected policy variable should be able to influence other macroeconomic variables in the economy. In other words, macroeconomic variables should be responsive to changes in the monetary policy variable. If only a variable satisfies these conditions, it can be used in quantitative analyses as a monetary policy indicator.

In literature, researchers employ numerous proxies, including monetary aggregates, different interest rates, interest rate spreads and monetary condition indices to measure and reflect Central Bank's policy actions. One of the early studies, Bernanke and Blinder (1992) compare the effect of alternative policy indicators on measures of economic activity to determine the most appropriate policy measure for transmission analysis. Their estimations based on Granger causality and variance decomposition tests indicate that federal funds rate is superior to other

measures of policy stance including monetary aggregates and Treasury bill rates in terms of explaining variations in economic activity (Bernanke and Blinder, 1992: 904-910). Given the fact that federal funds rate is directed by the policies of Federal Reserve System (FED), they state that federal funds rate reflects shifts in monetary policies and therefore can be used as an indicator of policy stance in quantitative analysis (Bernanke and Blinder, 1992: 919).

Since then, many of empirical analyses on transmission channels employ short-term money market rates as a monetary policy indicator (Bernanke and Gertler, 1995: 30; Ludvigson, 1998: 368; Bacchetta and Ballabriga, 2000: 16; Ludvigson et al., 2002: 120; McCarthy and Peach, 2002: 141; Garretsen and Swank, 2003: 41; Yue and Zhou, 2007: 9). Similarly, a large portion of studies that subject monetary transmission process in Turkey use overnight interest rates for their econometric analysis as well (Aydın, 2007: 5-6; Öztürkler and Çermikli, 2007: 62; Büyükakın et al., 2009: 107; Örnek, 2009: 111; Duran et al., 2012: 30-31). The main advantage of using overnight interest rate as a policy indicator over monetary aggregates is that it reflects both the attitude of Central Bank on monetary policy and liquidity considerations of economic agents in the money market (Bacchetta and Ballabriga, 2000: 18). In other words, it enables us to observe how money market conditions change with respect to shifts in the stance of monetary policy. On the other hand, monetary aggregates themselves comprise endogenous shocks stemming from variations in real economic activity and money demand schedule (Cecchetti 1995: 88). For that reason, they are not representing purely policy-induced shock. On the contrary, as short-term interest rates directly captures changes in monetary policies, they reflect policy innovations policy in a better way than monetary aggregates. On that account, in literature short-term money market rate is considered as a more convenient monetary policy indicator. In this stance, following the theoretical arguments and approaches used in existing studies, weighted average overnight interest rate is used as a proxy to monetary policy stance in all econometric analyses.

As a second step, following the determination of the monetary policy variable, one has to specify the intermediate and target variables in the model to be able to make econometric analysis on transmission process. In practice, central banks have limited tools to directly influence target variables such as employment, growth

or inflation. For that reason, monetary authorities try to affect some intermediate variables such as credit aggregates, real exchange rates or asset prices to accomplish their purpose. In monetary transmission literature, selected intermediate variables refer to the operation of particular transmission channels. For that reason, each transmission mechanism requires inclusion of different intermediate variables in the analysis.

In this thesis, monthly inflation rate calculated from Consumer Price Index (CPI) is used as a target variable of monetary policy. On the other side, intermediate variables used in the analyses are determined in accordance with the theoretical suggestions for each channel. As each channel operates via different mechanism intermediate variables used in analyses are different from each other for individual channels. Just because of this reason, intermediate variables employed in econometric models are introduced during estimations of each transmission mechanism.

Following the data selection, ordering of variables should be specified as a third step of the analysis of transmission channels. As stated in chapter 3, the sequencing of variables has important consequences on VAR estimations and derived impulse-response functions. The common tradition in VAR analysis is ordering variables from exogenous to endogenous and applying a triangular scheme to obtain structural shocks. The general approach used in majority of previous literature is ordering monetary policy variable after target and intermediate variables as it has an endogenous character in comparison to other macroeconomic variables. In most of the studies, policy variable is usually ordered at last under the assumption of monetary authorities have ability to respond to shocks in other variables within the period while other variables can only respond to policy innovations after a time period. The other way around, target variable is usually ordered at first place by assuming that this variable responds to other variables with a lag while all other variables are affected from contemporaneous changes in this variable.

In this thesis, analyses are made by following the approach discussed above. The general ordering scheme applied in all VAR estimations is as follows:

$$INFLATION \leftrightarrow INTERMEDIATE\ VARIABLE(S) \leftrightarrow OVERNIGHTRATE$$

By using such an ordering, it is presumed that policy makers have enough information about the state of the economy and therefore can respond to shocks in macroeconomic variables within the period. By ordering target variable and intermediate variables before monetary policy indicator, it is envisaged that the influence of monetary policy shocks on economic indicators is likely to be observed with a lag, depending on the assumption that it takes time for economic agents to perceive policy changes and adapt their behaviors. These assumptions are quite plausible in today's economic environment as frictions in the economy prevents agents to give timely and accurately response to policy shifts while reaction period of Central Banks in return for economy developments have declined recently due to advances in information gathering process.

Finally, before making estimations, one has to determine the number of lag length included in the models. As VAR results are highly sensitive to chosen lags in estimations, specification of number of lags should be done by care. One way to determine appropriate lag length in VAR analyses is using an information criterion that recommends an optimal lag number, considering the model and data length. In literature, the most commonly used information criterion is Akaike Information Criterion (AIC). In comparison to other information criterions such as Schwarz and Hannan-Quinn, AIC suggests longer lag lengths as a result of its lower penalty term. In this sense, using AIC is more advantageous as it enables to cover more information among variables in the model by making possible to select higher lag length. Because of these reasons, AIC is employed to assign appropriate number lags for each model in VAR estimations.

4.2. EMPIRICAL RESULTS

4.2.1. Interest Rate Channel

In order to test the effectiveness of interest rate channel in Turkey a four-variable VAR model covering the period February 2007 to March 2013 is constructed. The starting year for the sample period is specified as 2007 as data for monthly investment expenditures index is only available from that year forward. The

set of variables, their explanations and abbreviations are shown in Table 1. Whole dataset is obtained from the electronic database of Central Bank of Turkey.

Table 1: The Set of Variables Used in Interest Rate Channel

ON	Simple Interest Rate Weighted Average (Overnight)
CRERATE	Weighted Average Interest Rates for Turkish Lira Bank's Commercial Loans
INVESTCH	Monthly Percentage Change in Seasonally Adjusted Fixed Investment Expenditure Index
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

Here, as stated above, ON is used as an indicator of monetary policy actions. That is, shocks in ON is interpreted as policy shifts in the model. In this sense, while positive shocks in overnight rate is considered as a sign of monetary tightening, negative shocks are thought as an indication of expansionary policy actions implemented by monetary authorities. The second variable in the model is CRERATE, which is the average interest rate that banks charge on their commercial loans. Loan rate is included in the model to refer changes in cost of borrowing conditions of firms in return for policy shifts. Thirdly, the INVESTCH is put into model as a measure of investment expenditures. This variable represents the monthly percentage changes in seasonally adjusted investment expenditures index generated by CBRT and indicates changes in the incentive of real sector agents to make investments. The positive changes in index imply that investment expenditures of firms increase during the period while negative changes point out a cut back in investments. In this sense, fluctuations in the index value reflect variations in the level of investments in the economy. Therefore, it is considered that investment index can be used as a proxy to real investment expenditures. The last variable employed in the model is MOINF that stands for monthly changes in CPI.

As stated earlier, variables should be made stationary before estimations to provide reliable results. In order to do that stationarity condition for each variable is tested by using Augmented Dickey-Fuller (ADF) procedure. The results of ADF test with a constant term indicate that all variables except INVESTCH contain a unit

root. Hence, ON, CRERATE and MOINF are transformed by taking their first differences.[1]

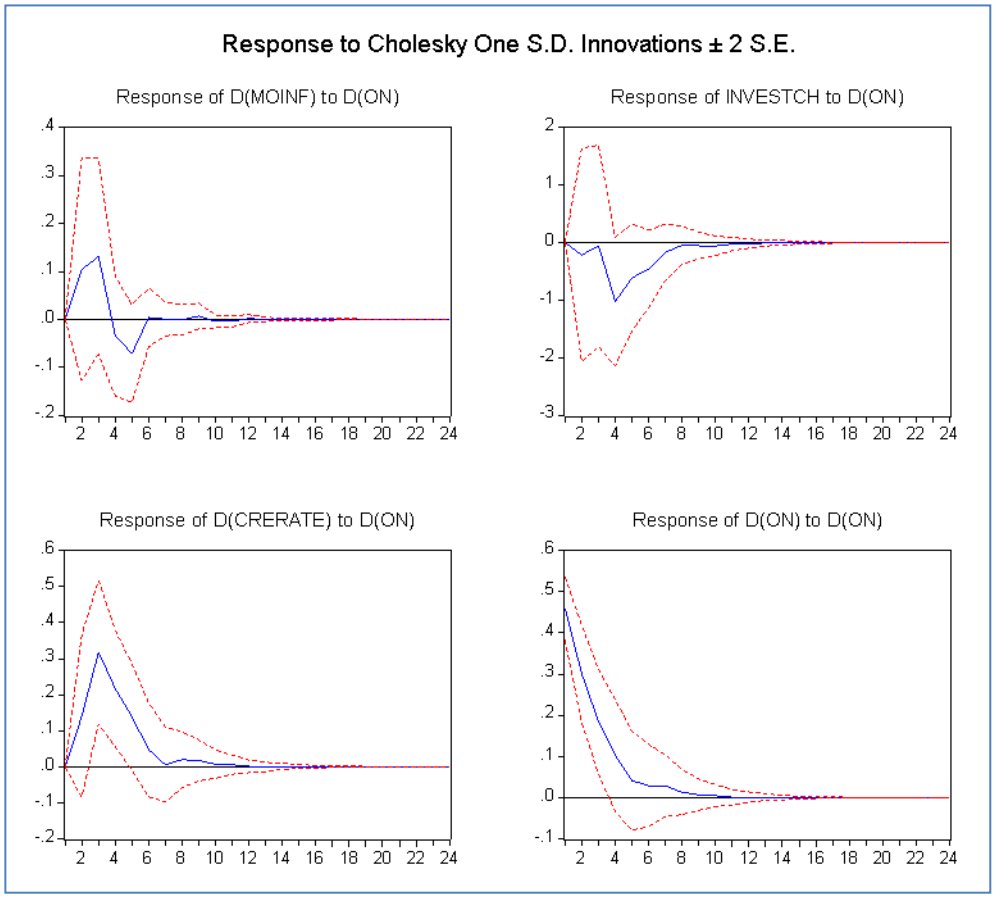
The ordering of variables in the VAR model is specified as MOINF, INVESTCH, CRERATE and ON, assuming that monetary policy shifts represented by shocks in ON effects other variables in the system after a period while that of variables have contemporaneous impact on policy actions. The appropriate lag length for the model is specified as two based on the suggestion of AIC.[2]

The impulse-response graphics derived correspond to triangular Choleski decomposition scheme that follows the specified ordering is shown in Figure 1 and Figure 2. Each graphic shows the estimated dynamic reaction of a variable to given positive one standard deviation shocks in ON and CRERATE respectively. In the charts, the vertical axis shows the magnitude of the reaction of a particular variable to given shocks while horizontal axis indicates the time span of the response in monthly scale. The solid lines show the dynamic responses of the variables and the dashed lines stand for two standard error bands that determine statistical confidence interval. The reaction of a variable is considered as statistically significant if only three of the lines are collectively over or below the zero line.

According to results shown in Figure 1, policy shocks are effective only on loan rates. The average loan rate begins to increase immediately after a monetary tightening. In the third month, when the response of loan rate to positive overnight rate shock reaches its maximum, average loan rate become 0.3% higher than its initial level. The effect of policy shock remains significant on credit rates between the third and fifth month. Thereafter, the loan rate begins to decline and turns to its pre-tightening levels about seventh month. This finding indicates that monetary policy shocks are effective on firms' cost of borrowing conditions. After a tightening, firms face with higher interest rates which deteriorate their investment incentive. However, results shown in Figure 1 imply that policy shocks have no direct influence over inflation and investment. Although both inflation and investments fluctuates after policy innovation, these reactions are statistically insignificant.

[1]Detailed results of ADF tests for each channel is reported in Appendix 1.
[2]Detailed results of Lag Lenght Selection tests for each model is reported in Appendix 2.

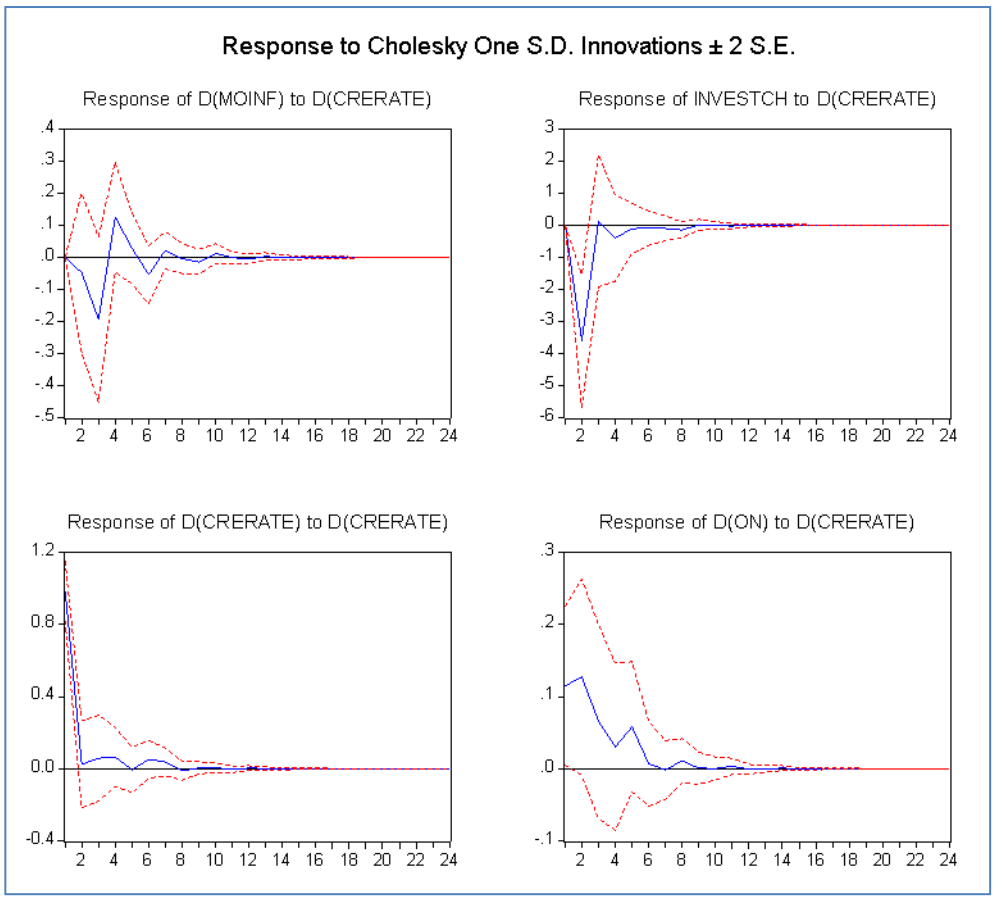
Figure 1: Reponses of Inflation, Investments, Average Loan Rate and Overnight Interest Rate to a Monetary Policy Shock



In order to see the impact of rising cost of borrowing rate on investments, the response of each variable to given loan rate shocks is represented in Figure 2. Results point out that innovations in average loan rate are influential over investments. Following the positive shock in loan rates, investments decline sharply. According the Figure 2, monthly change in investment expenditure index falls by 0.35% in the second month. This finding suggests that increases in cost of borrowing are influential over firms' investment decisions. However, the downfall in investments last a short time. After the second month, firms begin to raise their investments and investment index recovers its initial drop. On the other hand, similar to overnight rate, shocks in loan rates do not cause any significant effect on monthly inflation change. Although, inflation declines parallel to slowdown in investments in return for a loan rate shock, this response is not statistically significant. Therefore, it can be

said that fluctuations in inflation are independent from loan rates as similar to overnight rate.

Figure 2: Responses of Inflation, Investments, Average Loan Rate and Overnight Interest Rate to a Shock in Average Loan Rate



In the light of these results, it can be stated that interest rate channel is partially operating in Turkey. Despite the fact that tightening monetary policies raise cost of borrowing and this, in turn, lowers investments in the economy, these developments do not cause any significant changes in monthly inflation rate. This implies that implemented monetary policies are not sufficient to control inflation through interest rate channel even these policies are able to effect some intermediate variables such as loan rates and investments. This situation indicates that interest rate channel is not operating properly over the sample period.

4.2.2. Asset Price Channels

4.2.2.1. Exchange Rate Channel

The effectiveness of exchange rate channel is tested by estimating a four variable VAR model, including monthly inflation, coverage ratio, real exchange rate and overnight rate in that order. The sample period for the model is between February 2003 and March 2013. Table 2 shows the list of variables used in VAR estimations. Except coverage ratio, all other variables are collected from EDDS. Coverage ratio is calculated by using seasonally and calendar adjusted export and import numbers gathered from database of Turkish Statistical Institute (TSI).

Table 2: The Set of Variables Used in Exchange Rate Channel

ON	Simple Interest Rate Weighted Average (Overnight)
RER	Monthly Percentage Change in CPI Based Real Effective Exchange Rate (2003=100)
COVRATIO	Coverage Ratio (Exports/Imports)
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

In this model, ON and MOINF are included into analysis by the same considerations that is taken into account in other channels. Besides ON and MOINF, other variables used in the model are RER and COVRATIO. The RER variable is included into model to measure the impact of policy changes on terms of international trade. This variable refers to the monthly percentage changes in CPI based real exchange rate index. In this index, numerical increases point to appreciation of domestic currency, namely TRY, and decreases stand for depreciation. In this sense, positive monthly changes indicate that TRY gains value relative to foreign currencies in the current month while negative changes imply that of decreases in the value of TRY. Last variable used in the model is COVRATIO, which refers to fluctuations in net exports. The coverage ratio is calculated by dividing export volume of each month by corresponding import volume. Within this context, increases in coverage ratio represent improvement in balance of international trade while decreases stand for deteriorations.

The unit root tests made by using ADF procedure imply that all variables in the model are stationary in levels. Therefore, the model is estimated by using level values of each variable. As stated above, the ordering that estimations based on is specified as MOINF, COVRATIO, RER and ON. Following the suggestion of AIC, the appropriate lag length for the model is determined as four.

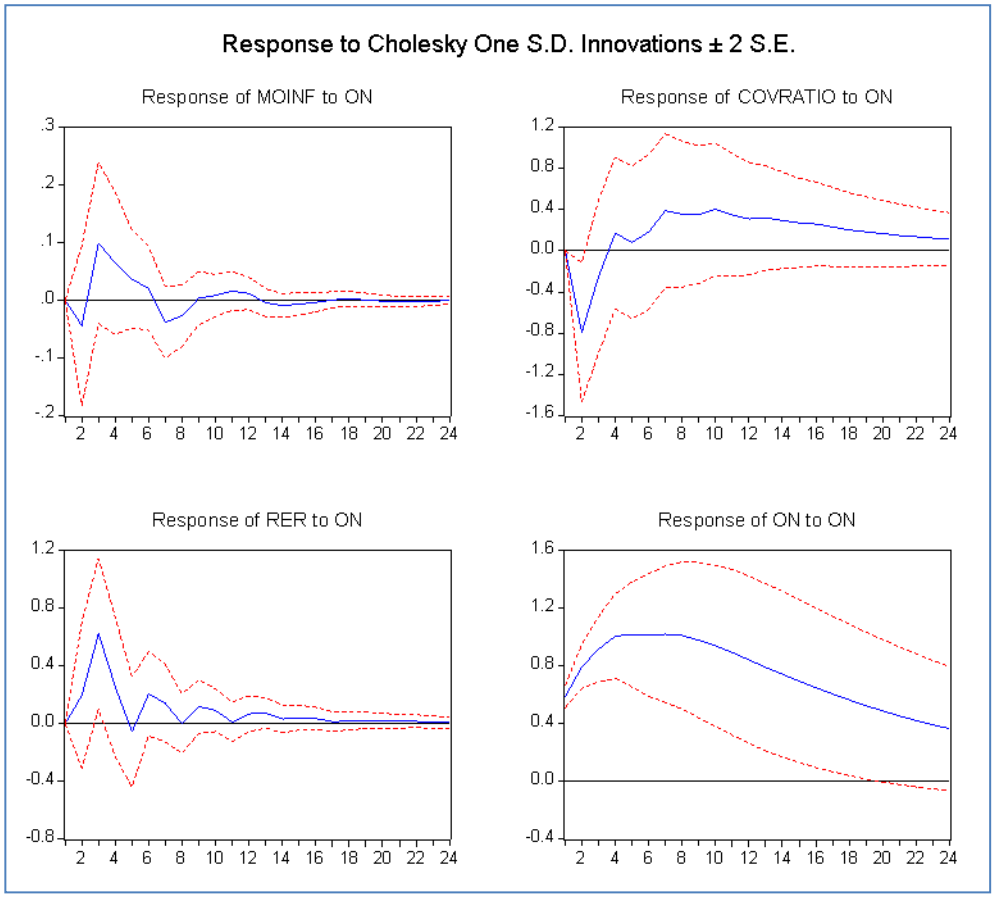
Figure 3 and Figure 4 exhibit the estimated impulse-response functions for a twenty-four month horizon according to specified ordering and lag length. In Figure 3, it is seen that a contractionary monetary policy represented by a positive shock in ON is effective on real exchange rate and coverage ratio. Following the ON shock, real exchange rate begins to rise immediately. In the third month, this increase gains statistical significance and hits its maximum level by increasing 0.6%. After this point, the reaction of real exchange rate loses its momentum and begins to die out around fifth month. This finding implies that tightening of monetary policy cause appreciations in TL in accordance with theoretical expectations. Given the fact that ascended return on TL denominated assets, results suggest that people begin to canalize their portfolio into domestic assets by selling their foreign currency denominated assets. As a result, TL gains value against foreign currencies and real exchange rate begin to rise.

On the other hand, Figure 3 shows that contractionary policy actions have direct influence over coverage ratio. Following the ON shock, coverage ratio begins to move in the opposite direction of that of real exchange rate. Within two months, coverage ratio drops by 0.8 points, which indicates that net exports begin to fall after a policy innovation. However, similar to interest rate channel, results reveal that monetary policy actions have no direct impact on monthly inflation changes. Inflation variable do not give any statistically significant reaction to monetary contraction.

Figure 4 exhibits the response of each variable to the given positive real exchange rate shocks. According to the estimated impulse-response functions shown in Figure 4, coverage ratio declines instantly after a positive RER shock and hits rock bottom in the second month by falling almost 0.8 points. In addition, it is observed that the recovery process of coverage ratio takes a long time; even after two years, coverage ratio cannot reach its pre-shock level. This result indicates that direct

shocks in real exchange rate are more influential than that of overnight rate on trade balance as coverage ratio cannot get over from the impact of real exchange rate changes as quickly as from policy innovations.

Figure 3: Reponses of Inflation, Coverage Ratio, Real Exchange Rate and Overnight Interest Rate to a Monetary Policy Shock

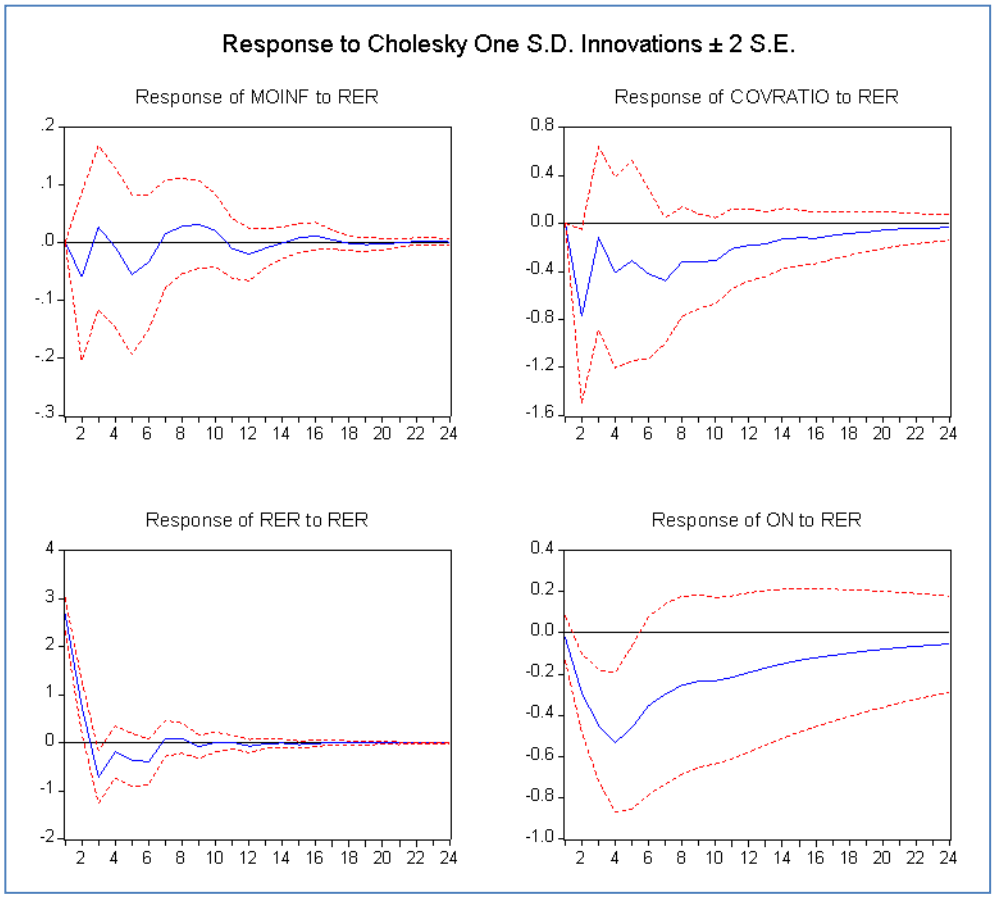


Apart from that there is another interesting point that should be mentioned in Figure 4. After a positive real exchange rate shock, overnight rate begins to fall dramatically about second month and this drop in ON remains statistically significant until sixth month. In the fourth month, overnight rate reaches its lowest level by falling almost 50-basis points. This evidence implies that monetary authorities take step to restraint appreciation of TL, which may otherwise deteriorate terms of trade and lead trade balance deficit. This reaction of overnight rate is quite consistent with the practical applications of monetary authorities in Turkey as from time to time

CBRT intervenes to foreign exchange rate market to keep value of TL within some upper and lower limits.

As is the case with ON shock, Figure 4 also points out that real exchange rate shocks have no direct impact on inflation. After a positive RER shock, monthly inflation fluctuates around zero line and does not show any significant pattern.

Figure 4: Reponses of Inflation, Coverage Ratio, Real Exchange Rate and Overnight Interest Rate to a Shock in Real Exchange Rate



To sum up, results obtained from four variable VAR model suggest that exchange rate mechanism is not in full force and effect in Turkey. Although monetary actions cause sequential fluctuations in intervening variables, namely real exchange rate and coverage ratio, those movements do not cause any significant change in monthly inflation rate. However, one should not be of the opinion that exchange rate channel is insignificant in transmission process of monetary policy. Estimations reveal that monetary policy is effective on terms of trade and net exports

and, depending on these, is able to shift aggregate demand. Therefore, similar to interest rate channel, these results can be interpreted as exchange rate channel is operating moderately in Turkey.

4.2.2.2. Tobin's Q Channel

In Tobin's q channel, the basic proposition is that monetary actions that alter stock prices will shift investment expenditures of firms, and this variation will ultimately lead changes in aggregate demand and inflation. In order to test this hypothesis, a VAR model that contains four variables is estimated by using monthly data over the period 2007:02-2013:03. The list of variables and their brief explanations are presented in Table 3. The relevant data for estimations are obtained from EDDS.

Table 3: The Set of Variables Used in Tobin's Q Channel

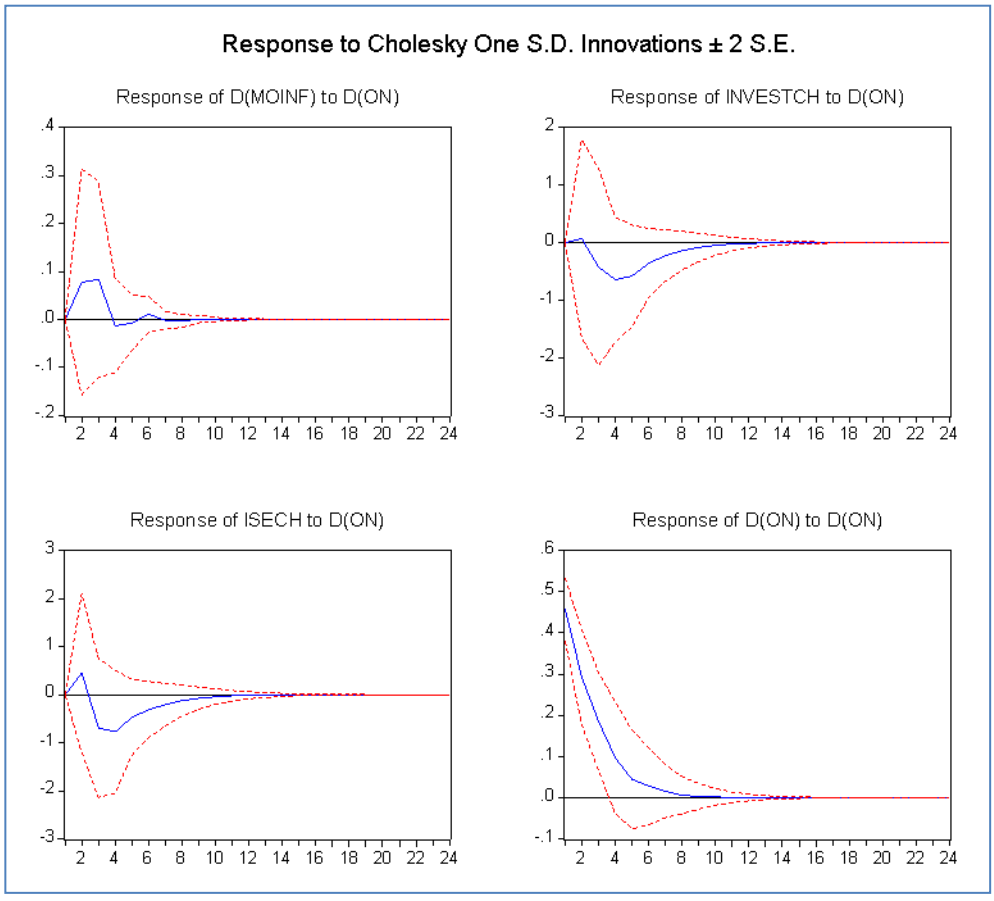
ON	Simple Interest Rate Weighted Average (Overnight)
ISECH	Monthly Percentage Change in Istanbul Stock Exchange (ISE)-100 Index
INVESTCH	Monthly Percentage Change in Seasonally Adjusted Fixed Investment Expenditure Index
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

In this model, the functioning of Tobin's q channel is analyzed by employing overnight rate, ISE-100 index, investment expenditure index and monthly inflation series. All variables except ON is used as monthly percentage changes to provide consistency during analysis. Here, ISE-100 index is put into model to cover shifts in theoretical q value. In this sense, positive changes in ISE-100 index is interpreted as a sign of increasing q value which is likely to foster firm's new investments while negative changes are considered as a downfall in q ratio that probably dampens investment expenditures. Other than ISECH, INVESTCH is used in the model to observe variations in firm's investment spending resulting from changes in stock prices. Again, ON and MOINF are used to refer monetary policy shocks and variations in price level respectively.

Stationarity condition of each variable is checked by using ADF test. Results show that while ISECH and INVESTCH variables are stationary in levels, ON and MOINF series contain unit roots. Hence, ON and MOINF variables are made stationary by taking their first differences separately. In accordance with the general approach used in this thesis, the VAR model is estimated by ordering variables as follows: MOINF, INVESTCH, ISECH and ON. The AIC suggests that two is the optimal lag length for this model. Therefore, VAR estimations are made by including two lags of each variable.

Figure 5 depicts dynamic responses of each variable in the system in return for shocks in policy indicator.

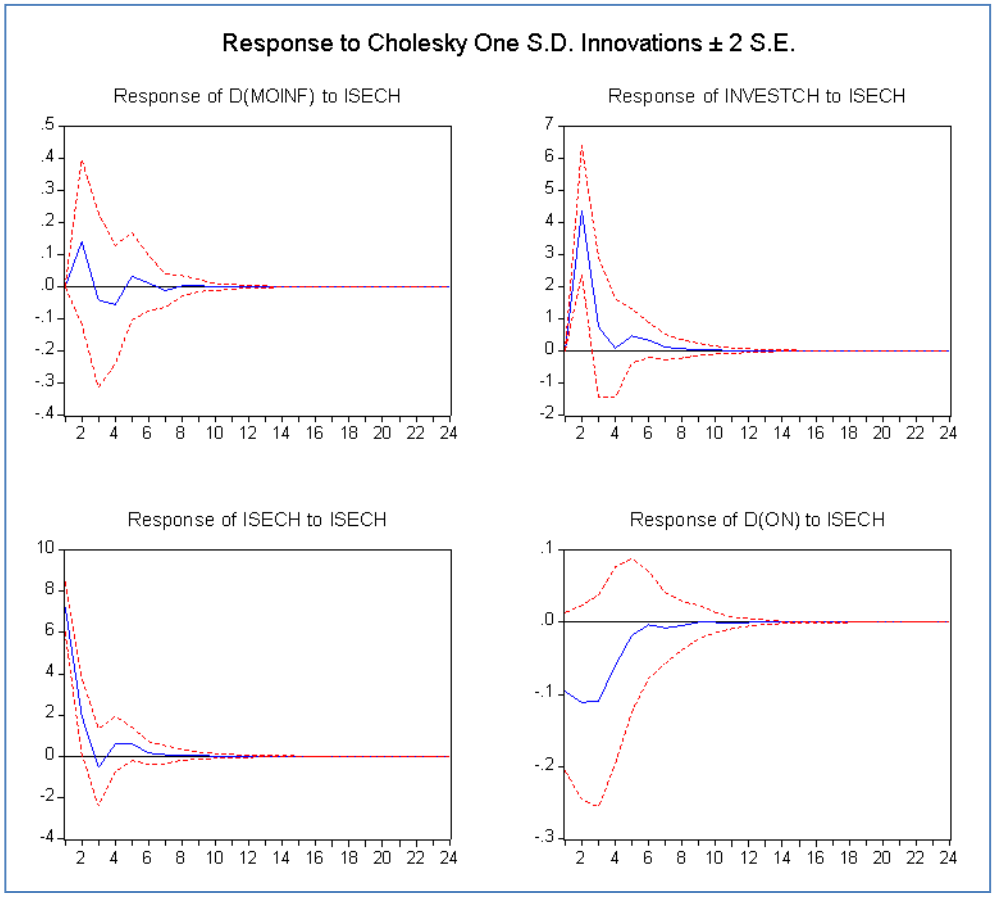
Figure 5: Responses of Inflation, Investments, Stock Market and Overnight Interest Rate to a Monetary Policy Shock



The visual impression from these graphics is that monetary policy shocks have no significant influence over any of the variables in the model; only overnight

rate gives statistically significant response to its own shock. Despite the fact that investments and stock prices moves together after a policy shock by falling down about second month, these reaction are not statistically significant and therefore cannot be interpreted as a sign of transmission process working through stock prices. Parallel with the results obtained in other channels, monthly inflation is found unrelated with policy innovations.

Figure 6: Responses of Inflation, Investments, Stock Market and Overnight Interest Rate to a Shock in Stock Market



On the other hand, impulse-response functions derived after a given shock in ISECH indicates that stock market fluctuations are influential over investment expenditures of firms. According to results shown in Figure 6, investment expenditures increase sharply in the first two months after a positive innovation in stock market. In the second month, rate of increase in investments reaches its peak point by 4% and begins to fall soon after this month. At four months out, investment

expenditures turn back to their initial level and the impact of stock market shock on investments dies out.

In a broad sense, these findings point out that Tobin's q theorem is valid in Turkey as investment spending of firms reacts positively to increases in stock prices. However, these results do not mean that Tobin's q theorem as a transmission channel is working properly. Although firm investments are sensitive to variations in stock prices, neither monetary policy nor stock market shocks are effective on price levels. Moreover, monetary policy shocks have no significant and direct impact on stock prices. Because of these reasons, it is safe to say that Tobin's q channel is not functioning in Turkey within the investigated sample period.

4.2.2.3. Wealth Channel

The operation of wealth channel relies on the assumption that changing asset prices resulting from monetary policy actions are influential over individuals' wealth and ultimately over their consumption level. To ascertain the effectiveness of this mechanism, three different VAR models each including different type of assets that people may hold are estimated. All time series used in this channel are summarized in Table 4. Raw data for each variable is collected from EDDS.

Table 4: The Set of Variables Used in Wealth Channel

ON	Simple Interest Rate Weighted Average (Overnight)
ISECH	Monthly Percentage Change in ISE-100 Index
GOLD	Monthly Percentage Change in Cumhuriyet Gold Selling Price (TRY/Number)
DOLLAR	Monthly Percentage Change in Nominal TRY/USD Quotation (Buying)
CONSACH	Monthly Percentage Change in Spending on Semi-Durable Goods Index
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

As stated above, three different VAR systems are estimated to measure the effect of a fluctuation in wealth level on individual's consumption expenditures. Each VAR model includes one out of three assets shown in Table 4, a monetary indicator, a proxy to consumption expenditures and a monthly inflation variable,

respectively. In this channel, three alternative assets, namely stocks, gold and foreign currencies are considered as components of individual's wealth. Although there are many other financial and real assets that people may invest their money in, these are the most common assets that people living in developing countries hold as an investment tool. Therefore, changes in price of these three assets can give a general idea about variations in individual's portfolio value.

For stocks, monthly percentage change in ISE-100 index that reflect general trend in stock prices are used as similar to previous estimations. In order to capture the effect of variations in gold prices on individuals' consumption patterns, monthly changes in selling price of Cumhuriyet Gold is employed. The intuition behind including gold into analysis is that a great number of Turkish citizens traditionally hold gold as mattress saving. Therefore, fluctuations in gold price may be influential over individuals' consumption incentive and thus create a transmission mechanism for monetary policy. The last asset considered in analysis is monthly percentage changes in nominal TRY/USD exchange rate which is followed closely by economic agents in Turkey. This variable is put into model as many Turkish people hold significant portion of their portfolio in US dollars as a precaution to sudden depreciations in TRY.

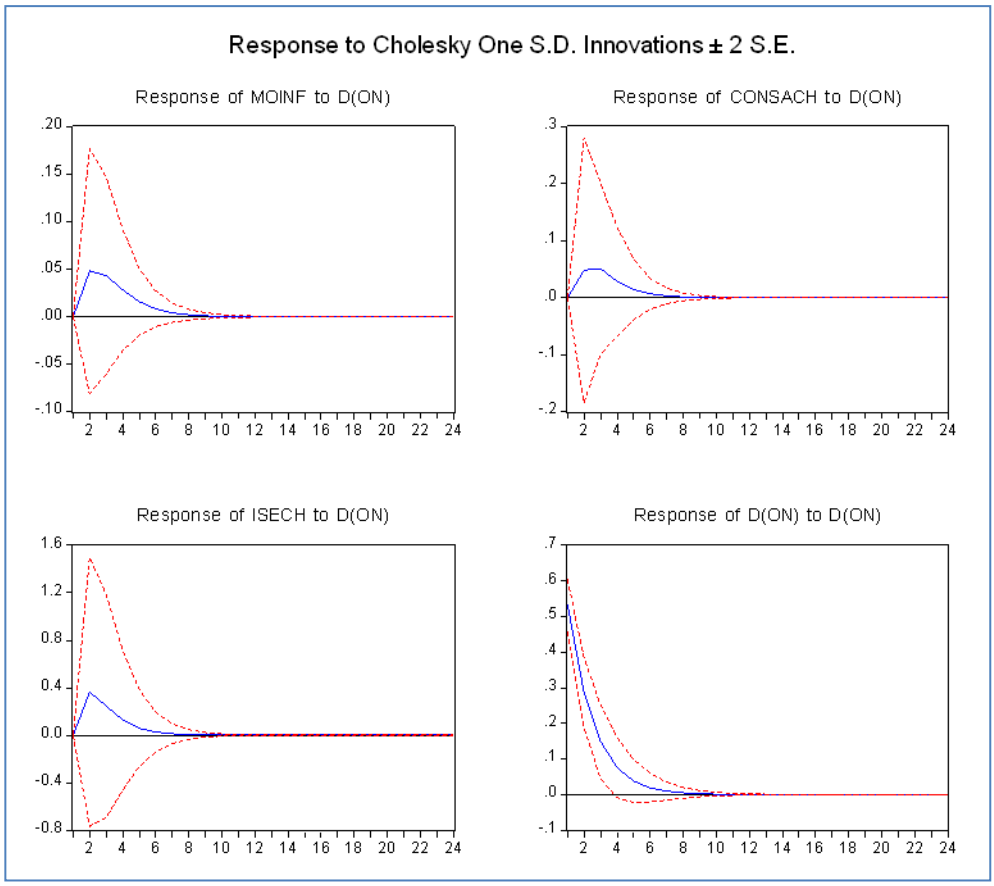
In order to measure the changes in consumption level resulting from asset price variations, monthly index of consumer's semi-durable goods spending published by CBRT is used in models. Briefly, this index mirrors agent's general tendency to spend money on short-lived assets. The index value is generated correspond to the assessment of consumers on spending money on semi-durable goods in the next three months compared to last three months. That is, a change in the index value reflects individual's incentive to make consumption in near future. Accordingly, this index is considered as a proxy to consumption spending of households and is put into model to observe changing consumption pattern in return for policy shifts. In a similar vein to other variables, consumption index is used as monthly percentage changes during estimations. However, monthly changes are not calculated from raw data as consumption index shows seasonal patterns. Before transforming data into monthly percentage changes, seasonal effects in the

consumption index are removed by using Census X12 filter to obtain more reliable indicator of changing consumption patterns.

According to ADF test, all variables except ON are stationary in levels at 5% level. Hence, only ON variable is transformed by taking its first difference to get rid of unit root problem. In each model, the asset under consideration is placed between consumption variable and overnight rate. That is, the sequencing of variables that estimations based on is as follow: MOINF, CONSACH, ASSET VARIABLE (ISECH, GOLD or DOLLAR) and ON. The number of lags included in each of three VAR models is specified as one following the suggestion of AIC.

The impulse-response function derived in return for given positive shocks in ON and financial assets are shown in figures below. The sample period on which figures from 7 to 12 based is February 2004 through December 2012.

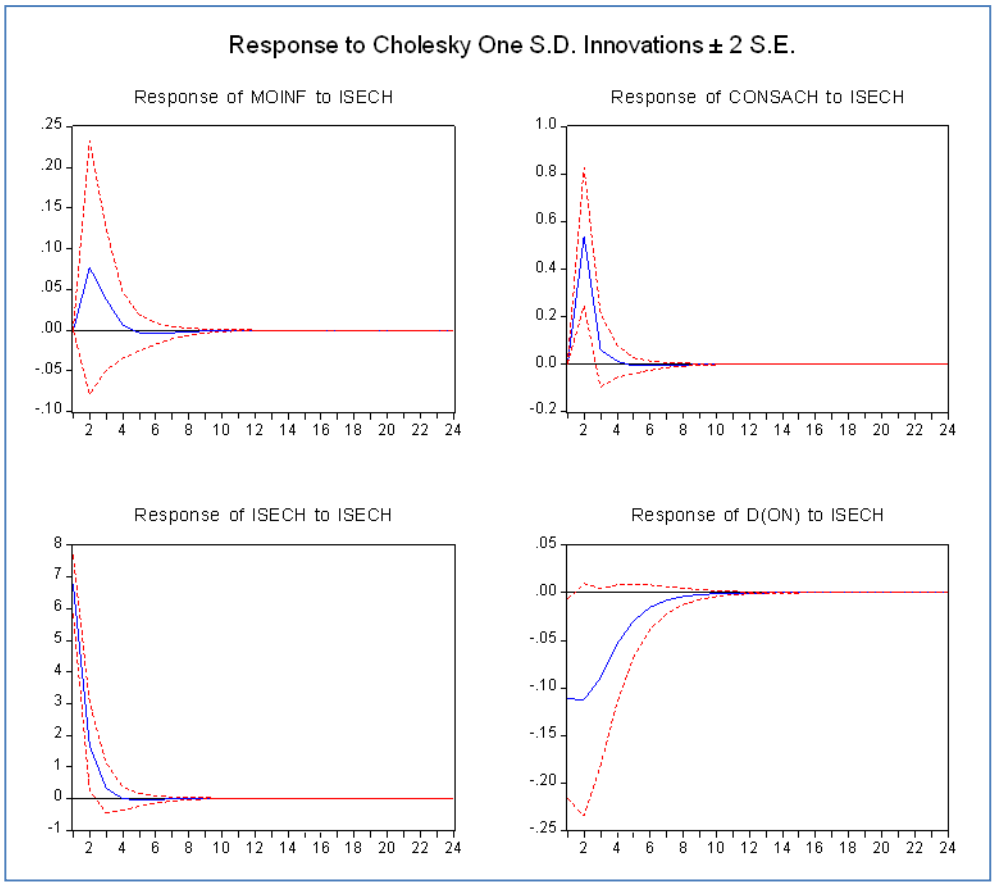
Figure 7: Responses of Inflation, Consumption, Stock Market and Overnight Interest Rate to a Monetary Policy Shock



In brief, results indicate that ON shocks are not influential over any other variables in the system. Neither consumption nor financial assets give statistically significant reactions to monetary policy shocks. Also, similar to results obtained in other channels, monthly inflation does not respond to overnight rate shocks over the sample period. These findings tell us that monetary policy implications are inadequate to alter asset prices and thereby consumption spending of economic agents in Turkey. This means that monetary policies are not transmitted into value of individuals' wealth directly and depending on this, unable to affect their consumption level.

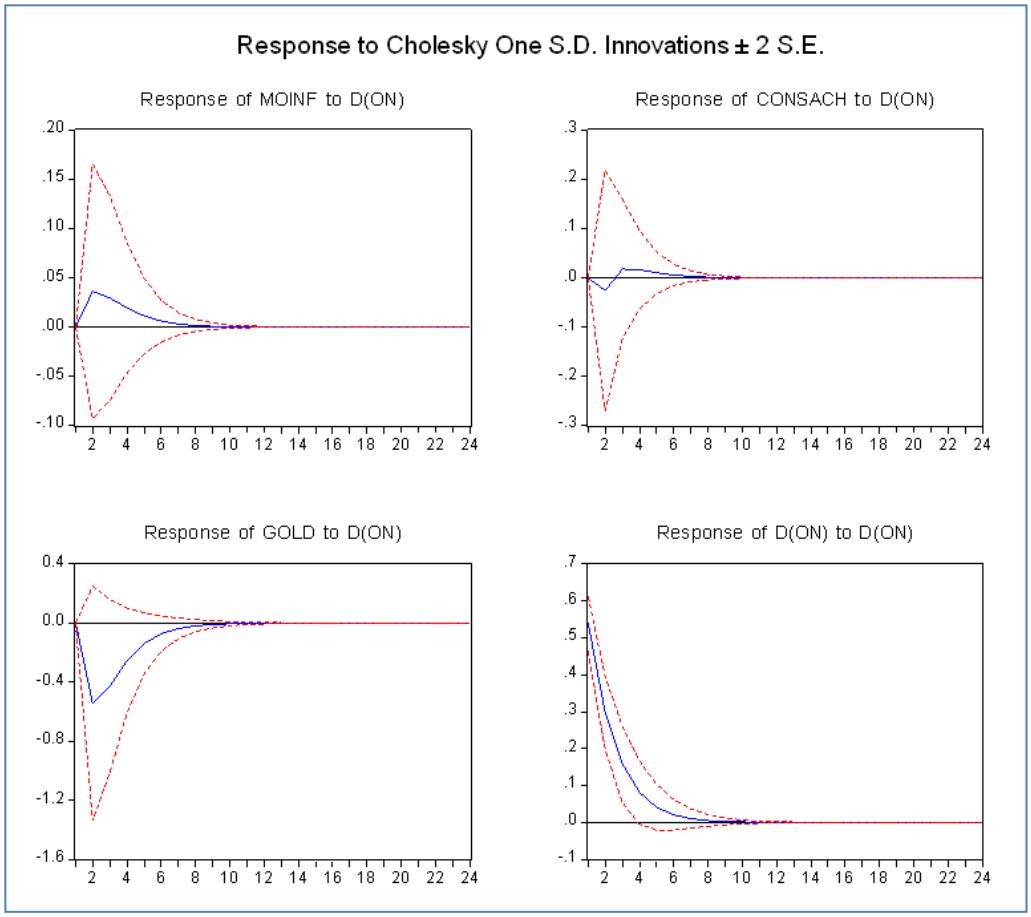
When the reaction of variables to given positive shocks in asset prices are analyzed, it is seen that two out of three assets have significant impact on consumption incentive of households.

Figure 8: Responses of Inflation, Consumption, Stock Market and Overnight Interest Rate to a Shock in Stock Market



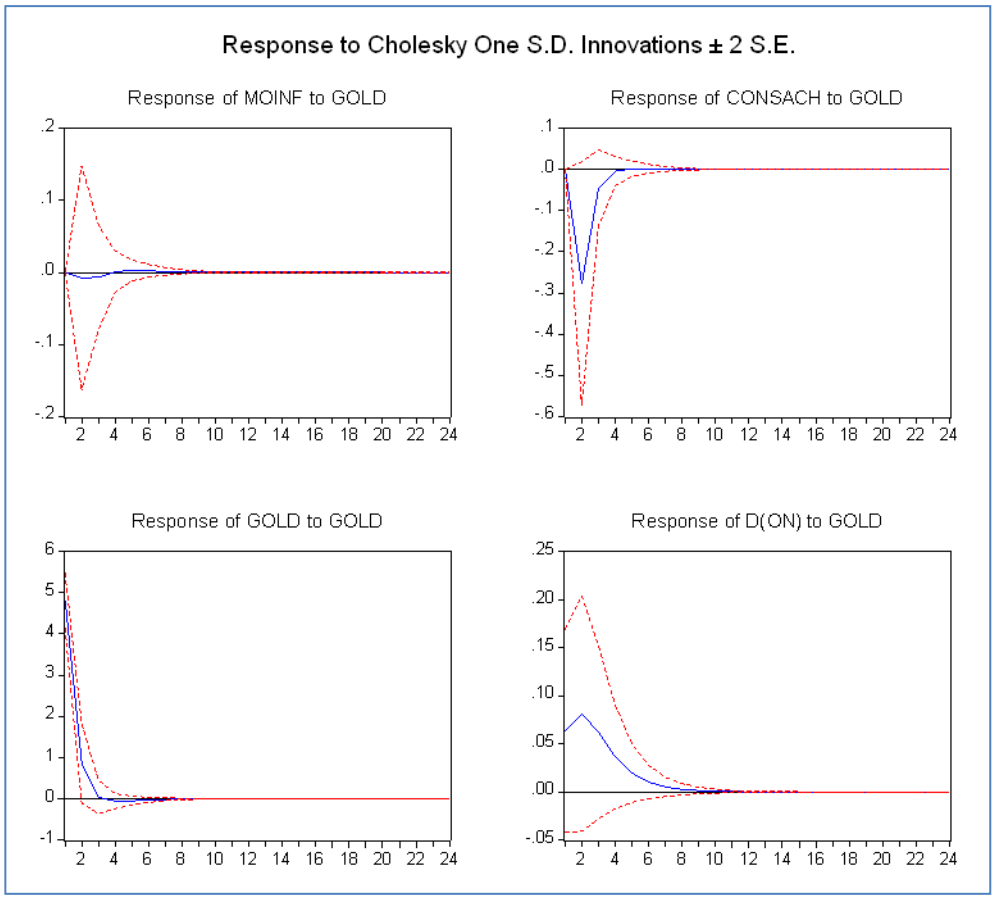
According to Figure 8 that represents dynamic reaction of variables to given shocks in monthly changes in stock market index, consumption level increases by approximately 0.5% within two months after a positive innovation in stock prices. This implies that increases in stock prices have positive impact on consumption spending of economic agents. Although this effect is transitory as response of consumption falls to zero line about third month after an ISECH shock, it vindicates the fact that value of stocks are effective on consumers' wealth and ultimately on their incentive to spend money on consumption goods as Modigliani suggested. On the other hand, this acceleration in consumption expenditures has no significant impact on price level. Albeit monthly inflation moves collaterally with consumption after increasing stock prices, this response is not statistically significant. This reveals that wealth channel is not operating through stock prices as neither monetary nor stock market shocks have influence over monthly price level changes.

Figure 9: Responses of Inflation, Consumption, Gold Prices and Overnight Interest Rate to a Monetary Policy Shock



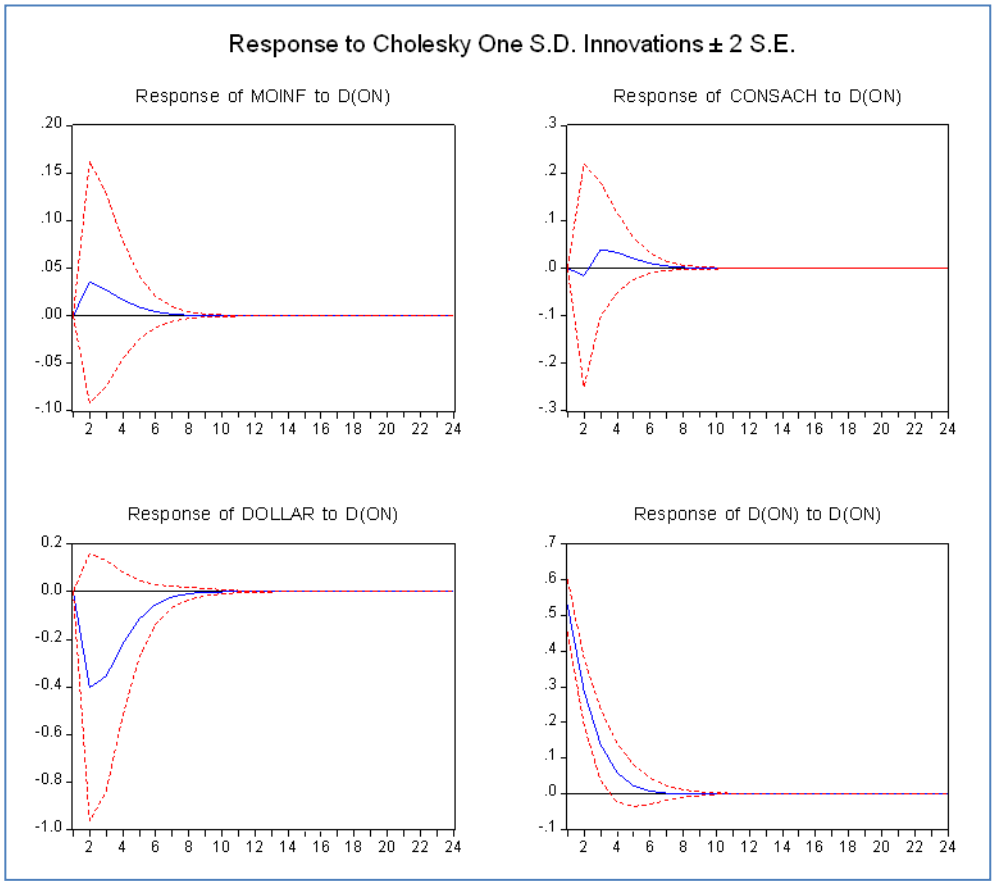
The impulse-response graphics based on respective ON and GOLD shocks show that gold has no role in monetary transmission mechanism in Turkey. Results presented in Figure 9 point out that monetary policy shocks have no direct effect on gold prices, household consumption and inflation. In addition to these findings, Figure 10 demonstrates that consumption and inflation are not responsive to given shocks in gold prices as well. These evidences reveal that contrary to expectations, variations in gold prices are not effective on consumption level of individuals. This result can be explained by the rigidity of Turkish households to change their mattress savings into cash. Traditionally, individuals in Turkey prefer to save money by accumulating gold and are generally reluctant to liquidate their gold savings. Therefore, it is plausible that variations in gold prices have little implication for individuals' accumulated wealth level and consumption incentive.

Figure 10: Responses of Inflation, Consumption, Gold Prices and Overnight Interest Rate to a Shock in Gold Prices



Lastly, obtained impulse-response functions for the model that contains nominal exchange rate imply that fluctuations in the value of TRY/USD parity have important influence over households' desire to spend money on consumption goods. As shown in Figure 12, following the positive shock in TRY/USD rate which stands for depreciation of TRY, consumption decreases by 0.4% within two months. This fact reveals that on the contrary to priori expectations, increases in exchange parity have negative wealth effect for consumers. Although, nominal exchange rate is included into model with the expectation of a positive association between parity rate and consumption, the evidence proves just the opposite.

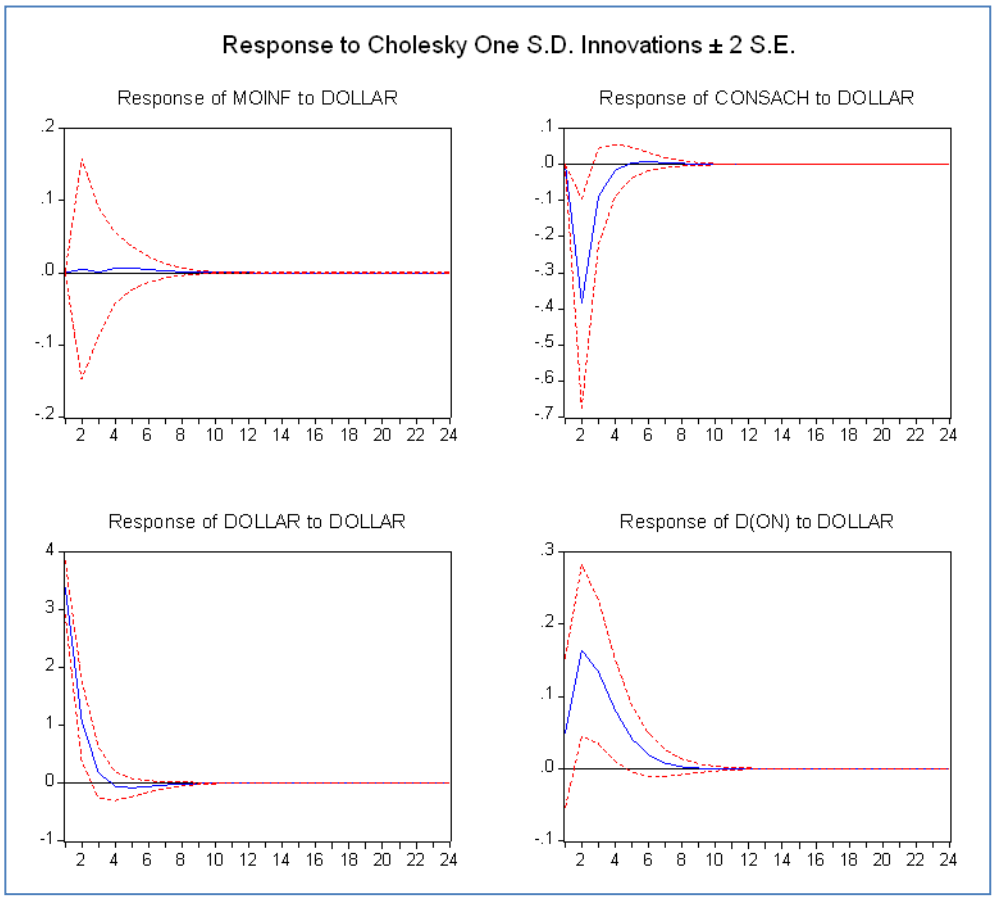
Figure 11: Responses of Inflation, Consumption, Nominal Exchange Rate and Overnight Interest Rate to Monetary Policy Shock



This situation may arise due to effect of some factors. First, in Turkey, individuals generally hold foreign currencies to guard themselves against depreciation of domestic currency. As one factor that stimulates depreciation of

domestic currency is inflationary expectations, individuals may interpret positive shocks in nominal exchange rate as a sign of an inflationary period likely to begin in the near future. As inflation generally raises uncertainty in the market and deteriorates expectations of individuals about the course of the economy, people may behave in a more rigid way to spend money on consumption. Therefore, increases in nominal exchange rate parity may lower aggregate consumption, as it is the case in above results. Second, similar to other developing countries, economic agents in Turkey traditionally consider rapid depreciations in domestic currency as a preview of economic crisis. For that reason, people do not have the intention of spending their money during periods when Turkish lira loses value against foreign currencies. Instead, as estimations suggest, they are more inclined to increase their savings and postpone their spending on non-urgent wants.

Figure 12: Responses of Inflation, Consumption, Nominal Exchange Rate and Overnight Interest Rate to a Shock in Nominal Exchange Rate



In Figure 12, it is seen that overnight rate goes up immediately after a shock in nominal TRY/USD parity and remains higher than its initial level for eight consecutive months. This result reveals that monetary authorities are sensitive to fluctuations in the value of lira. If the value of Turkish lira decreases compared to US dollar, monetary authorities intervene foreign currency market by increasing overnight rate to forestall depreciation of domestic currency.

Other results shown in Figure 11 and Figure 12 indicate that wealth channel do not operate properly through foreign exchange market as well as monetary policy innovations have no remarkable impact on other variable in the system. Although estimations reveal that shocks in nominal TRY/USD parity have some implications on consumption incentive of individuals and monetary policy indicator, these findings do not produce enough empirical support for the operation of wealth channel through exchange rate mechanism in Turkey. Overall, the evidence from three VAR models suggests that wealth channel mechanism operates weakly during the sample period in Turkey. In all three models, it is found that monetary shocks have no significant impact on asset prices. At the same time estimations put forth that fluctuations in asset prices are not effective on changes in price level. It is only found that variations in stock prices and nominal TRY/USD parity have some reflections on consumption level of individuals. But, estimated impacts of these variables on individuals' incentive to make consumption are transitory and not very significant. Therefore, it can be stated that wealth channel does not operates effectively as a monetary transmission mechanism in Turkey.

4.2.3. Credit Channels

4.2.3.1 Bank Lending Channel

According to bank lending channel, monetary policy actions can cause changes in aggregate demand and inflation through altering bank's credit supply. This hypothesis implies that shrinkage in bank's credit supply correspond to a contractionary monetary policy can lower spending of bank-dependent agents and, depending on this, gear down economic activity and inflation in the economy. In

order to test the effectiveness of this mechanism in Turkey, following variables introduced in Table 5 are used in analysis. The sample period that VAR estimations based on is between February 2003 and March 2013 and data series for each variable is gathered from EDDS.

Table 5: The Set of Variables Used in Bank Lending Channel

ON	Simple Interest Rate Weighted Average (Overnight)
REDEP	Monthly Volume of Real Total Deposits in Deposit Money Banks
RESEC	Monthly Volume of Real Securities in Deposit Money Banks
RECRE	Monthly Volume of Real Loans in Deposit Money Banks
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

As shown in Table 5, a five-variable VAR model is formed to derive impulse-response functions. In the model, ON and MOINF are employed as monetary indicator and target variable respectively. The remaining three variables are included in the model to examine the role of credit market in transmission process. To measure the real effect of monetary shocks on banks' lending behavior, each of these three variables is used in real terms. In order to obtain real series, monthly nominal value of each variable is divided by the corresponding month's CPI level. In this way, these variables are purified from nominal effects and are made prepared to reflect only real variations in bank balance sheets. The REDEP variable stands for the real monthly deposit level that is hold in deposit money banks. This variable is included in the model to cover variations in the liability side of the banks with respect to monetary innovations. As deposits are the major funding source for banks, it is expected that any change in monetary stance that alter the volume of deposits is likely to affect banks' ability to generate loans. Therefore, deposit level is used in the model to make inference about how banks' loan creation capacity is influenced by shocks in monetary policy. On account of examining the changes in the banks' asset side, the RESEC and the RECRE variables that stand for volume of real securities and real loans respectively are used in the model. The RECRE variable is employed to measure the direct impact of monetary shocks on bank's loan volume. By using this variable, it is aimed to observe how credit conditions in the economy change with respect to monetary policy shifts. Security holdings, on the other hand, are used

in the model to see how banks arrange their asset side in return for policy shocks. Theoretically, if banks have enough security holdings, they can adjust their balance sheets in reply to contractionary monetary shocks by liquidating these securities in the market. This, in turn, may dilute the operation of lending channel as banks can pass off the impact of monetary policy shocks without changing their credit volume. In this sense, securities reflect the ability of banks to smooth their loan volume over time even after a monetary policy shift. For that reason, securities are considered in the analysis together with the volume of deposits and loans to assess effectiveness of transmission mechanism through bank lending channel.

Before estimations, all credit market variables, namely deposits, securities and loans are transformed by taking their logarithm to provide convenience among variables. Also, each of these series is purified from seasonal effects by using Census X12 procedure to obtain more reliable data.

The results of ADF unit root test indicate that except monthly inflation change and overnight rate, all remaining variables in the model contain unit root. Hence, during estimations, series of deposits, securities and loans are used in first differences to ensure stationarity condition. The variables in the model are ordered as follows: MOINF, RECRE, RESEC, REDEP and ON. This ordering is specified by assuming monetary policy shocks can only be effective on banks' balance sheets and on general price level after a certain period of time. In other words, it implies that banks and other agents in the economy can only adjust their balance sheets with a lag after a policy innovation due to existence of market rigidities that restraint their ability to reallocate their portfolios instantaneously. For instance, banks cannot liquidate their loans immediately in an urgent situation as they are subject to contracts. Also, depositors may not be so enthusiastic about drawing their money after a policy shock if they had invested their money in long-term time deposits. Therefore, such an ordering is quite convenient to estimate impact of monetary policy shifts on banks' balance sheets.

Due to suggestion of AIC, the VAR model constructed for bank-lending channel is estimated by using two lags of each variable. The Figure 13 and 14 exhibit the reactions of each variable to given respective ON and RECRE shocks. Evidence shown in Figure 13 implies that monetary policy shocks are effective on banks'

balance sheet items. According to results, a positive ON shock leads to an immediate decline in bank deposits as expected. After a policy innovation, deposit volume of banks fall away for three consecutive months. In the second month, reduction in deposits hits its rock bottom by approximately -0.25%. A month hence, the impact of a given ON shock on deposits begins to wear off and reduction in deposits comes to an end with the forth month. The asset side items of the banks give almost same reactions to contractionary policy actions. As such in response of deposits, both securities and credits fall immediately after a positive ON shock. However, the reactions of each variable reveal that monetary tightening has more influence over securities. The figure shows that after a given ON shock, the decline in the volume of securities is more than two times of the reduction in loans in the second month. This implies that after a monetary tightening, banks try to use their securities primarily to meet their liquidity needs. Another interesting finding in this figure is that the volume of securities recovers faster compared to loans even though they decline more strikingly than loans initially. While the volume of loans continue to decline until seventh month, the initial drop in securities dies out around fifth month. This finding suggests that monetary policy actions have prolonged impact on loans compared to securities.

The differences between the responses of securities and loans in return for contractionary monetary action are due to characteristic distinctions among these variables. As stated before, marketable securities are more liquid assets compared to loans. In this respect, banks are inclined to sell their marketable security holdings firstly to meet their urgent liquidity needs. Also, as loans are based on long-term contracts, recalling and liquidating them in a market environment is much more costly for banks. Hence, the initial rapid drop and the fast recovery in securities are quite plausible because it is difficult for banks to adjust their volume of loans as quickly as securities. For that reason, sluggish and less dramatic reaction of loans to tightening of policy stance is in accordance with the expectations. On the other hand, despite the fact that monetary policy shifts are effective on banks' ability to produce loans, they have no significant implication on monthly inflation changes. As Figure 13 shows, monthly changes in price level move independent from policy innovations.

Figure: 13: Responses of Inflation, Loans, Securities, Deposits and Overnight Interest Rate to a Monetary Policy Shock

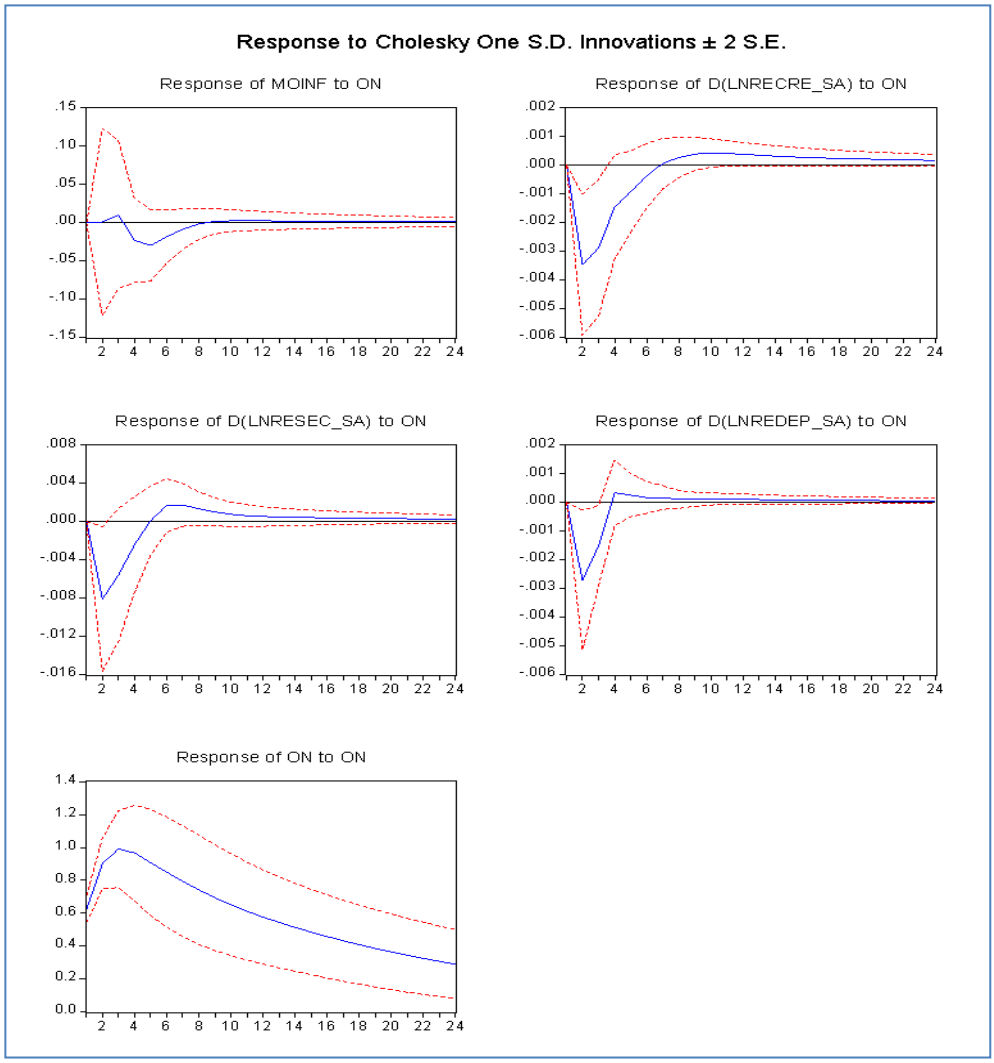
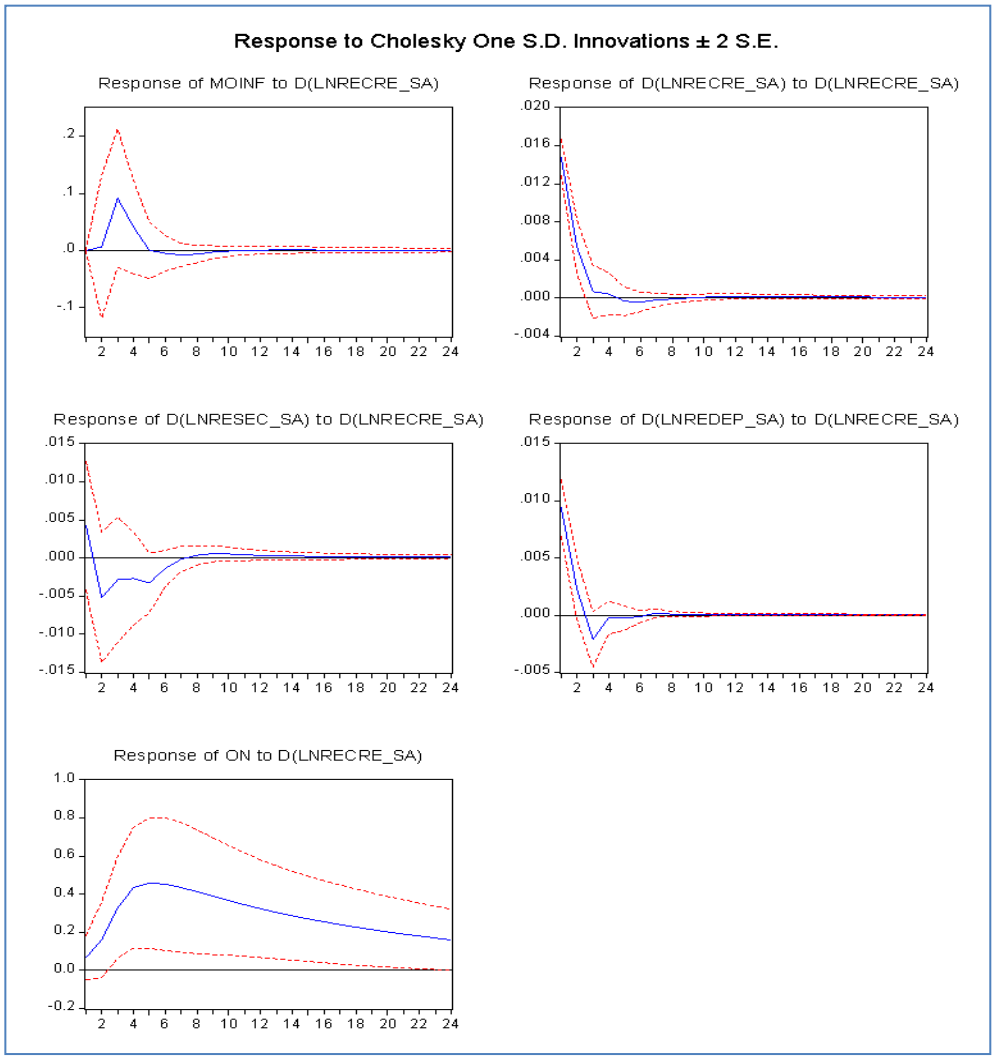


Figure 14 presents the dynamic response of variables to a given positive credit shock. Results imply that similar to monetary policy shock, credit expansion has no direct influence over general price level. The reaction of monthly inflation to given credit shock is temporary and insignificant. This indicates that credit expansions have very limited influence over aggregate demand and prices during the sample period. However, Figure 14 points out that increases in credit supply have positive effects on deposits and overnight rate. After a given positive credit shock, deposits increase temporarily, which implies that created money in the economy returns back to banking sector in a short span of time. On the other side, the impact of credit expansion on monetary variable is much more notable. According to Figure

14, overnight rate increases quickly following the boom in credits and remains significantly higher than its baseline for almost two years. This reaction of overnight rate indicates that monetary authorities begin to tighten monetary policy to forestall accelerating economic activity that may stimulate inflationary dynamics in the economy.

Figure 14: Responses of Inflation, Loans, Securities, Deposits and Overnight Interest Rate to a Shock in Loans



In summary, the estimation results shown above reveal that bank-lending channel operates particularly over the sample period. Evidence suggests that banks' balance sheets are responsive to applied monetary policies in accordance with the expectations of bank lending mechanism. After a contraction in monetary policy, all

considered balance sheet items, namely deposits, securities and loans go into a decline. This means that monetary authorities are able to direct credit supply of banks and expenditures of bank-dependent agents in the economy by using their tools. However, analyses also point out some problems about the operation of this mechanism. First, it is found that initial drop in security holdings of banks is more severe compared to loans after a positive overnight rate shock. This finding indicates that banks use their security holdings initially when they are exposed to impact of contractionary policy shock. This behavior of banks mitigates the effect of applied monetary policies on their loan supply and ultimately weakens the operation of bank lending channel. In addition to this, results also show that neither monetary policy nor loan shocks are influential over inflation level. That is, monetary authorities cannot direct overall price level through directing volume of credits. Within the context of these findings, it can be said that transmission mechanism through lending channel is not operating completely in Turkey. Although the evidence put forth that volume of bank credits varies with policy shocks, general price level do not give any significant reaction to changes in loan volume or monetary stance.

4.2.3.2. Balance Sheet Channel

The balance sheet channel emphasizes the role of borrowers' net worth value in transmission process operating through credit markets. According to this channel, monetary policy actions that cause fluctuations in value of borrowers' net worth affect banks' willingness to supply credit. This, in turn, shifts aggregate credit volume in the market and causes variations in spending of loan-dependent agents. Consequently, both aggregate demand and general price level in the economy fluctuate due to changes in borrowers' net worth value. On that note, the balance sheet channel envisages an indirect transmission process working through alternations in net worth value of agents originated from policy shifts.

In order to examine the operation of this channel, a VAR system comprised of four variables is formed. The list of variables employed in analysis is presented in Table 6 with their brief explanations. As shown in the table, overnight rate, stock market index, volume of private sector credits and monthly inflation are the variables

involved in the model to assess effectiveness of balance sheet channel in Turkey. Raw data for each of them is obtained from EDDS. The sample period that empirical analysis based on is between February 2003 and March 2013.

Table 6: The Set of Variables Used in Balance Sheet Channel

ON	Simple Interest Rate Weighted Average (Overnight)
ISECH	Monthly Percentage Change in ISE-100 Index
REPRICRE	Monthly Volume of Real Private Sector Loans in Deposit Money Banks
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

As is the case with other channels, ON and MOINF are used as proxies to monetary policy indicator and monthly inflation respectively. In addition to them, stock market index is incorporated into model to reflect changes in net worth value of borrowers resulting from innovations in monetary policy. In theory, there are two main ways that stock prices influence economic agents' balance sheets. First, changes in stock prices can directly affect market value of net worth of firms and thereby alter their collateral value. Second, fluctuations in stocks prices may shift portfolio value of individuals and ultimately affect their financial condition and creditworthiness. In this respect, ISECH is considered to be a convenient variable to capture changes in private agents' net worth value resulting from policy shifts. The forth variable used in the analysis is REPRICRE which stands for monthly volume of real private sector credits issued by deposit money banks. This variable is included into model to observe how banks' lending attitude toward private agents changes in return for shifts in monetary stance and balance sheet conditions of borrowers.

As similar to bank lending channel, the credit market variable, namely, REPRICRE is transformed by removing seasonal effects with Census X12 method. Also, it is used in logarithmic units rather than in levels to provide consistency during interpretation of results.

According to results of ADF test, three out of four variables that are ON, ISECH and MOINF are stationary in levels. Hence, these series are used by their level values during estimations. The only series that suffer from unit root problem is private sector credits. For that reason, this variable is transformed by taking its first difference to satisfy stationarity condition in the system.

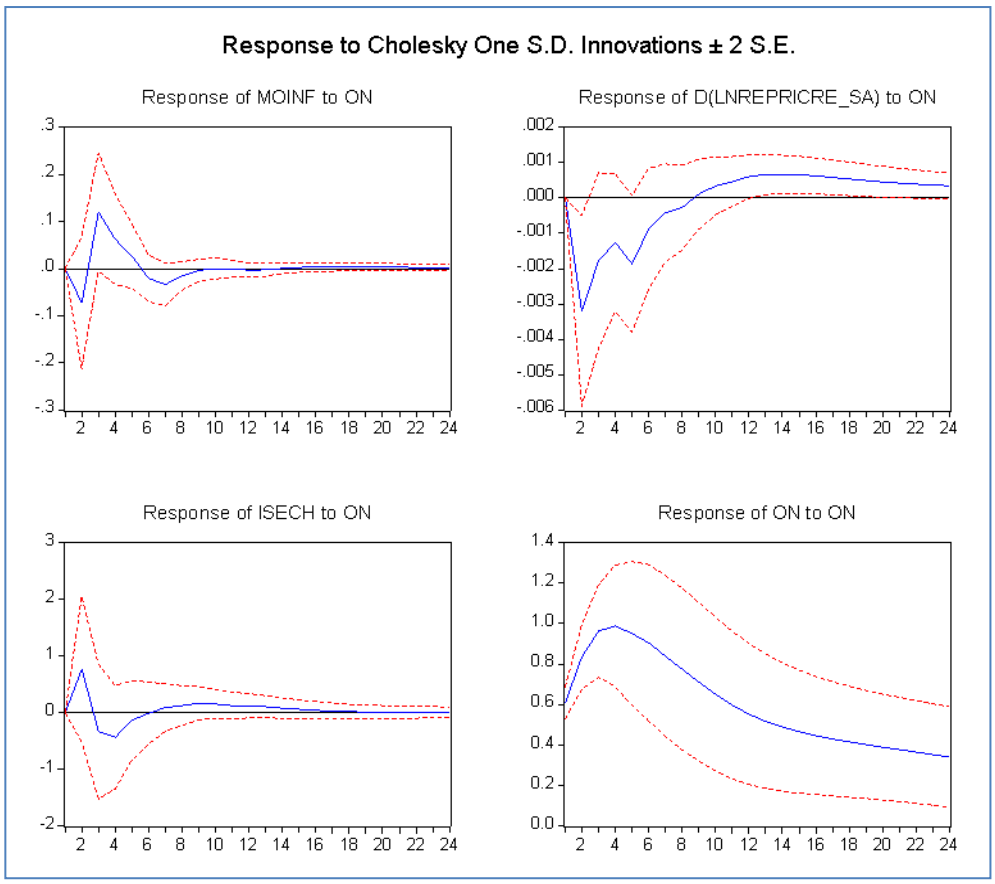
The VAR model is formed by using three lagged values for each variable based on the suggestion of AIC. In compliance with general assumptions followed in this thesis, the Choleski ordering for this channel is specified as MOINF, REPRICRE, ISECH and ON, which implies that given ON and ISECH shocks will have only lagged impacts on banks' lending behavior and inflation. Figure 15 and Figure 16 show results of VAR model estimations obtained by following above specifications.

In Figure 15, the derived impulse response functions for each variable in return for a given positive ON shock are presented. In theory, it is presumed that a contractionary monetary policy that lowers net worth value of borrowers due to its negative impact on stock prices is ultimately impairs their creditworthiness and thereby scale downs the volume of private sector credits issued by banks. Per contra, the estimation results represented in Figure 15 hardly support these theoretical expectations. According to obtained impulse response functions, it can be stated that monetary policy innovations do not cause any significant variation in other variables in the system. Neither stock prices nor inflation rate give significant reactions to monetary tightening. The only variable that is effected significantly from given shocks to overnight rate is the volume of private sector credits. The diagram at the upper right-hand corner in Figure 15 shows that after a positive, one standard deviation shock in overnight rate, private sector credit supply declines slightly by 0.3% in the second month. This reduction loses its statistical significance by the third month and at almost nine months out, the response of private credits turns back to its baseline path.

These results imply that monetary policy shifts have no direct influence over borrowers' net worth value and balance sheet condition during the sample period. Although, evidence suggests that innovations in monetary indicator have some negative impact on private sector credits supplied by banks, this does not point out for an active balance sheet mechanism because banks can lower their credit supply due to factors considered in banks lending channel such as increased liquidity need or lowered deposits volume. These two findings together with the insignificant response of monthly inflation to given shocks in overnight rate reveal that monetary policy actions are not transmitted into economy by means of balance sheet

mechanism. In other words, there is no statistical support for the operation of balance sheet channel in Turkish economy.

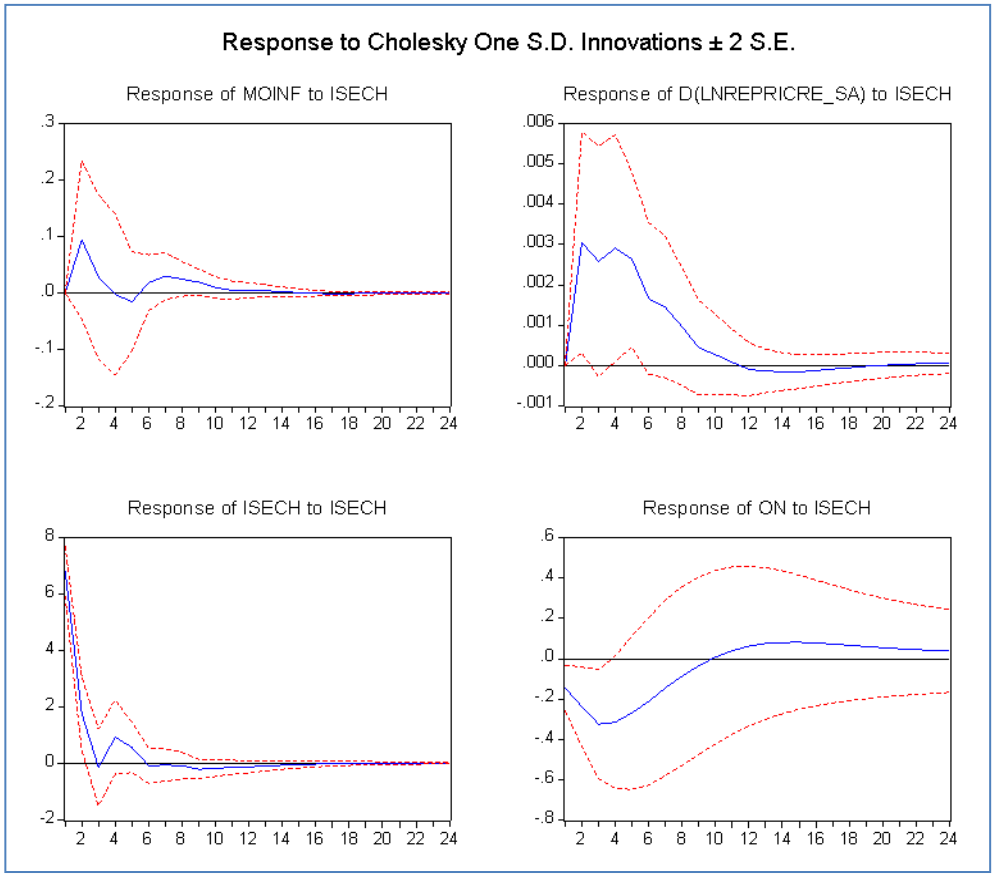
Figure 15: Reponses of Inflation, Private Sector Loans, Stock Market and Overnight Interest Rate to a Monetary Policy Shock



However, this does not mean that balance sheet conditions of borrowers are of no worth for banks. In spite of the fact that monetary policies have no direct impact on balance sheets of agents, some other factors such as changes in stock prices can alter borrowers' balance sheet condition and thereby shift banks' credit supply. This hypothesis is tested by tracing out the dynamic response of each variable to a given one standard deviation shock in ISECH. Figure 16 shows the impact of a positive change in stock prices on other variables in the system. Results suggest that stock prices have significant influence over bank's loan supply to private agents as expected. After a positive shock in ISECH, volume of bank lending increases by approximately 0.3%. The impact of stock market innovation on private

sector credits remains significantly higher than its baseline path for sixth month. Thereafter, it starts to decrease and dies out completely eleven month after the initial shock. This movement in private sector credits indicates that changes in net worth value of borrowers matter for lending desire of banks, as suggested in balance sheet literature. When stock prices rise and strengthen the balance sheet condition of borrowers, banks begin to turn on the credit taps.

Figure 16: Reponses of Inflation, Private Sector Loans, Stock Market and Overnight Interest Rate to a Shock in Stock Market



On the other side, it is found that increases in stock prices and accelerations in credit supply do not cause any significant change in monthly inflation. Although inflation rises following the positive shock in stock prices, this reaction is statistically insignificant. Therefore, similar to monetary policy shocks, innovations in stock prices are insufficient to influence monthly changes in price level.

Overall, results obtained from four-variable VAR model point out that balance sheet mechanism, as a transmission channel, does not operate properly in Turkey. Evidence shows that given monetary policy shocks have no significant impact on borrowers' net worth value. That is, policy changes are ineffective to alter balance sheet status of borrowers during the period between 2003 and 2013.

Although results presented above generally put forth that balance sheet channel is not an effective transmission mechanism, there is some evidence in favor of the existence of balance sheet dynamics in credit market. Estimations show that shocks in stock prices are influential over volume of supplied private sector loans. That is, banks adjust their lending volume due to changes in to private agents' balance sheets. This finding indicates that even though balance sheet channel of monetary policy is not functioning well in Turkey, direct changes in net worth value of borrowers are effective on banks' lending attitude. In this sense, it can be stated that monetary authorities have chance to increase their influence over aggregate loan supply, and thereby over demand dynamics in the economy if they find a way of altering balance sheet strength of borrowers.

4.2.3.3. Household Liquidity Channel

As discussed in previous chapters, the household liquidity channel concentrates on the link between financial status of consumers and their desire to make costly spending. Theories on liquidity hypothesis postulate that consumers are more likely to spend money on illiquid assets such as durables or housing when they have enough financial sources to meet their urgent liquidity needs. In other words, consumers' demand for durables and housing rise with increases in the value of their financial asset holdings that improve their liquidity, and thereby lower their risk of experiencing financial troubles. In this sense, this hypothesis implies that monetary policy actions can be effective on aggregate output level by changing financial status of agents in the economy. According to household liquidity channel, implemented monetary policies that shift value of financial assets are likely to change consumers' incentive to make spending on durable goods or housing due to result of changes in their liquidity position. This ultimately shifts aggregate demand level with respect to

changes in consumer durable expenditure and leads fluctuations in general price level.

In order to test the effectiveness of household liquidity channel, two different VAR models are estimated. Each of these models is comprised of following four variables: a monetary indicator, a financial asset variable, a proxy to durable or housing demand and an inflation variable. The set of variables used in estimations are introduced in Table 7. As data for credit aggregates is only available after December 2005, the analyzed period for the model is between 12:2005 and 03:2013.

Table 7: The Set of Variables Used in Balance Sheet Channel

ON	Simple Interest Rate Weighted Average (Overnight)
ISECH	Monthly Percentage Change in ISE-100 Index
REAUTORE	Monthly Volume of Automobile Loans in Deposit Money Banks
REHOUCRE	Monthly Volume of Housing Loans in Deposit Money Banks
MOINF	Monthly Percentage Change in Consumer Price Index (2003=100)

In this channel, it is assumed that consumers' liquidity level is a function of stock prices. That is, stock price movements are viewed as shifts in financial situation of consumers, which ultimately determine their demand for illiquid assets. In this respect, each of estimated VAR systems employs monthly percentage change in stock market index to capture variations in liquidity status of consumers resulting from monetary policy shocks. Besides of stock prices, both VAR models contain a proxy variable to refer changes in consumers' incentive to engage in costly spending. In this channel, volume of real automobile loans and housing loans are employed to indicate consumers demand for durable goods and housing respectively. These two variables are selected for two reasons. First, automobile purchases and housing are very costly expenditures for consumers, which typically require a loan support from banks. In this regard, variations in the volume of loans can directly reflect desire of households to make spending on durables and housing. Second, as banks only supply credits to consumers whose balance sheets are relatively strong, volume of automobile and housing loans are more responsive to changes in financial suitability of borrowers than other measures of household demand for durable goods and housing. Therefore, using automobile and housing loans is more advantageous

compared to other proxies to capture the impact of liquidity changes on consumers' willingness to make costly spending. In addition to stock prices and credit aggregates, both of the models contain ON and MOINF as usual, to refer changes in monetary policy stance and general price level respectively.

Before estimating VAR models, both automobile and housing loans are transformed by taking their logarithm. Thereafter, each of these series is purified from seasonal effects by the help of Census 12 method, as is the case in other credit channels. Due to the results of ADF unit root test, overnight interest rate and monthly inflation are used in first differences during estimations. As automobile loans and housing loans show non-stationary patterns in their level and first difference values, these variables are included in the model after taking their second difference. Only, monthly percentage change in stock market index is used without applying differencing procedure, as this series is found stationary with its level values.

In VAR models, monthly inflation comes first in ordering while policy indicator is placed at last as usual. In accordance with general approach followed in this thesis, loan aggregates come right after monthly inflation and stock market index is placed between loan variable and overnight interest rate. This sequencing indicates that policy shocks first effect stock prices and thereafter influence consumers' demand level for durables and housing. In other words, it is assumed that credit aggregates respond with a lag to policy and stock market shocks as suggested in theories on liquidity channel. Each VAR model is estimated with two lags of variables as AIC suggests two as an optimal lag length for both of the models.

Figure 17 and Figure 18 display estimated impulse-response functions for the model that includes automobile loans as a proxy to durable goods consumption. According to results in Figure 17, innovations in overnight interest rate do not have any remarkable impact on stock prices. Although stock market index fluctuates around zero line following the policy shock, this response is statistically insignificant. This shows that monetary policy shocks have no direct impact on stock prices and therefore do not have any influence over financial liquidity position of consumers. On the other side, it is observed that monetary actions matter for the volume of automobile loans supplied by banks. Two months after monetary policy shock, automobile loans decline by 0.3% approximately. This result suggests that

monetary policy shocks are still effective on banks' credit supply though they have no conspicuous influence over household liquidity. As is the case with other channels, monthly price changes do not give any statistically significant reaction to policy shifts, which point out the fact that overnight rate shocks have no direct implication for prices in the economy.

Figure 17: Responses of Inflation, Automobile Loans, Stock Market and Overnight Rate to a Monetary Policy Shock

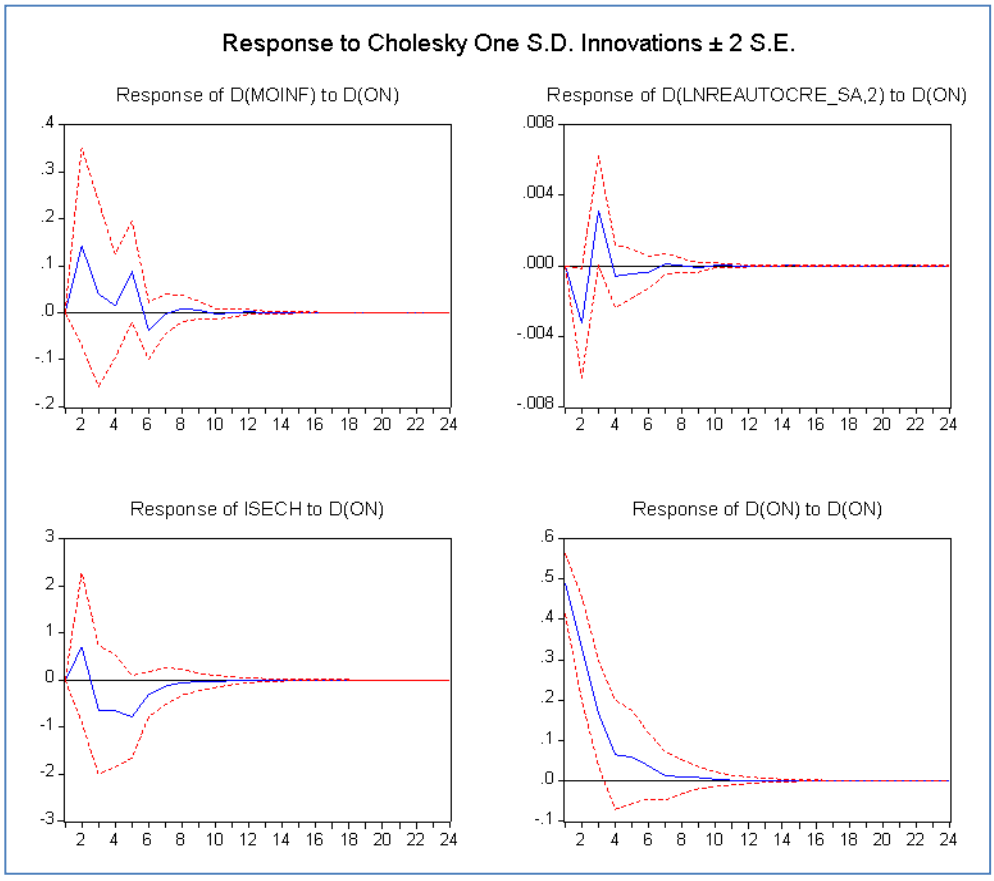
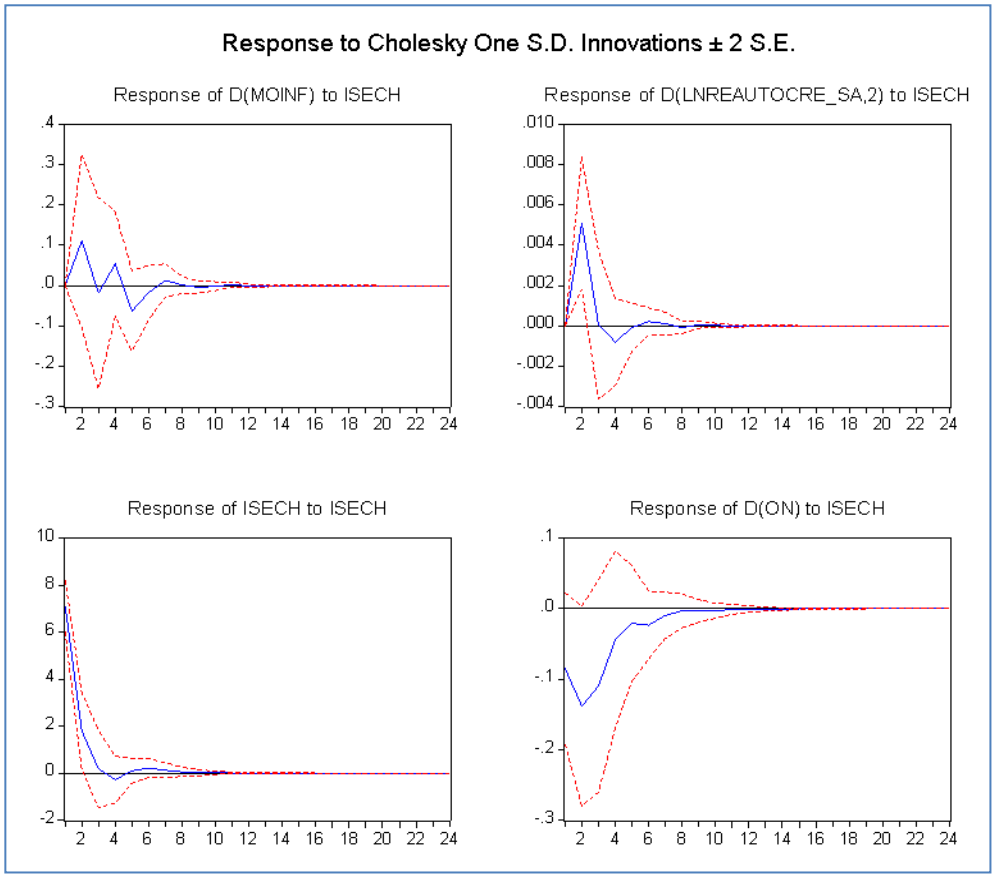


Figure 18 shows dynamic responses of variables to a given positive, one standard deviation shock in stock market variable for the same model. Results suggest that increases in stock prices have positive influence over consumers' desire to purchase automobiles, as expected. The chart representing the response of automobile loans in return for given shocks in overall stock market indicates that stock price innovations drive up automobile loans with the peak effect coming in the second month. The estimated impact of a stock market shock on automobile credits

at peak point is approximately 0.5%. Under the assumption that stock market shocks represent changes in borrowers' liquidity status, the positive response of automobile credits following an increase in stock prices is consistent with the view that demand for durable goods is a function of liquidity status of borrowers. Although monthly inflation does not react in a way that is expected before estimations, the correspondence between stock market and automobile credits implies that value of financial assets that represents liquidity position of borrowers is effective on their willingness to purchase durable goods.

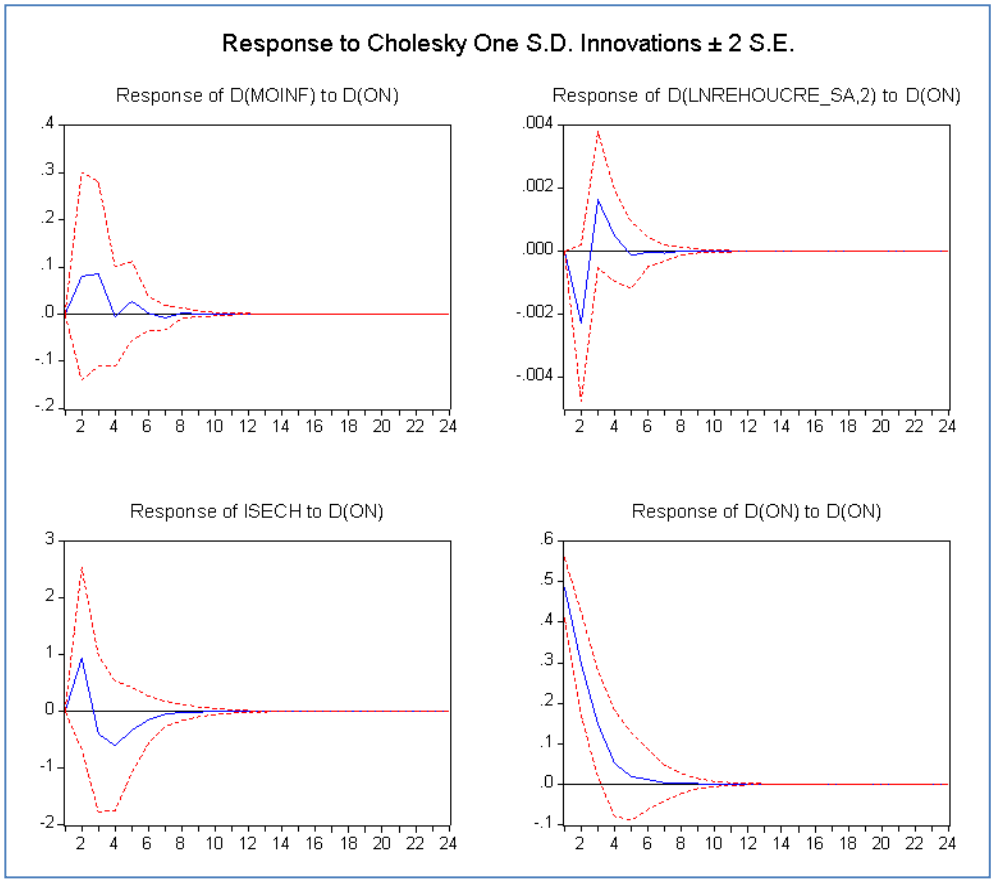
Figure 18: Responses of Inflation, Automobile Loans, Stock Market and Overnight Rate to a Shock in Stock Market



In order to examine the impact of changing liquidity condition on housing demand the impulse-response functions are reproduced after replacing volume of automobile loans with that of housing credits. The visual impression from charts in Figure 19 and Figure 20 is that these is no transmission process working through

housing loans in Turkey. According to estimated dynamic responses shown in Figure 19, monetary policy shocks do not have any statistically significant impact on remaining variables in the system. In addition to this, neither housing loans nor inflation give notable reactions to stock price innovations as indicated in Figure 20. This means that liquidity status of consumers does not effect their decision on purchasing a house. Depending on these results, it can be said that housing mechanism of liquidity channel is totally inoperative in Turkey over the sample period.

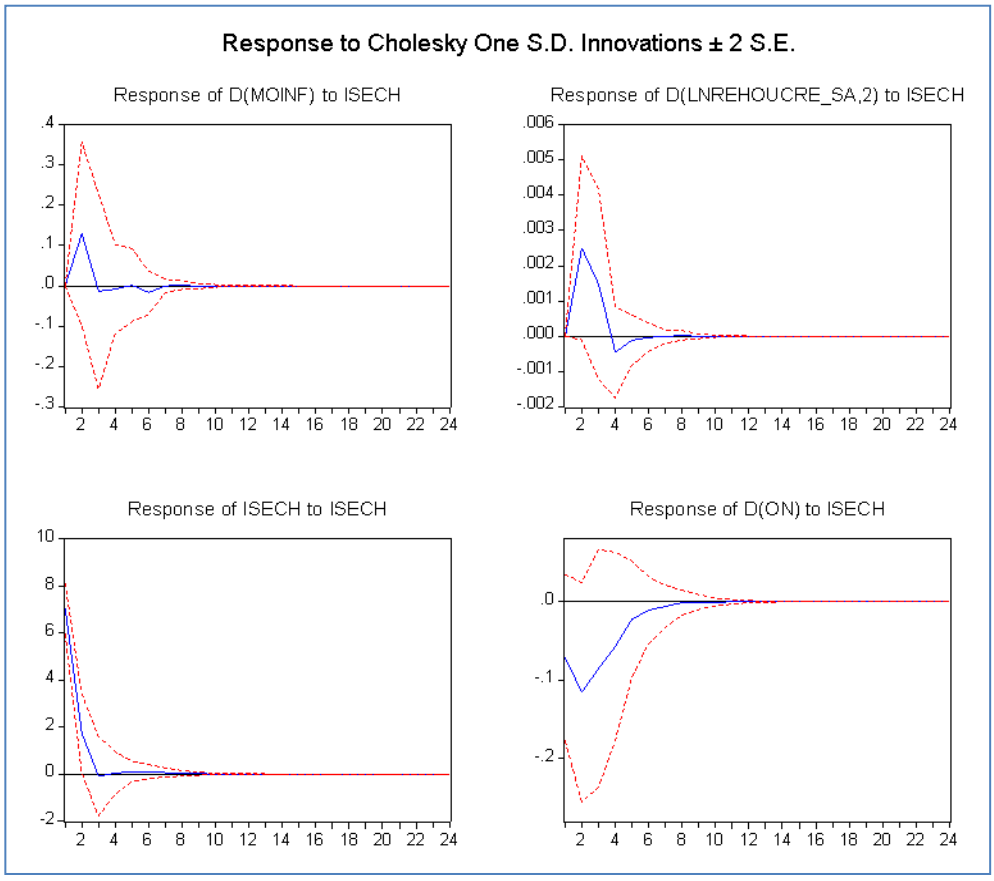
Figure 19: Responses of Inflation, Housing Loans, Stock Market and Overnight Rate to a Monetary Policy Shock



In conclusion, evidence reveals that liquidity channel is not functioning as a transmission mechanism in Turkish economy. Results obtained from two VAR models show that overnight rate shocks are ineffective on stock prices, which indicates that liquidity level of borrowers is unresponsive to changes in monetary

policy stance. In addition to this, it is found that target variable, namely inflation level, is not affected severely from monetary shocks. The reactions of loan aggregates, on the other hand, do not produce any strong evidence for the operation of liquidity channel as well. According to results, influence of policy indicator over automobile and housing loans is very little, transitory and statistically insignificant as a whole; only automobile loans give relatively meaningful reaction to policy innovations. But this evidence is not enough to conclude liquidity channel of monetary policy is in operation.

Figure 20: Responses of Inflation, Housing Loans, Stock Market and Overnight Rate to a Shock in Stock Market



When reactions of variables to given stock market shocks are analyzed, it is seen that there is a positive relationship between household liquidity and automobile consumption. The estimations imply that automobile loans supplied by deposit banks

increase after a positive shift in stock prices. This reveals that demand for automobiles is directly proportional to changes in financial status of borrowers, as it is suggested by liquidity hypothesis. On the contrary, estimation results of second VAR model that includes housing loans as a proxy to demand for housing do not support the idea that liquidity level is influential over consumers' decisions about engaging in costly expenditures. Evidence show that housing loans act independent from policy shocks. This finding stands as an objection to household liquidity hypothesis that postulates that housing expenditure of consumers is correlated with their financial position.

As a matter of fact, there is not enough empirical support for operation of household liquidity channel in Turkey. Even though stock prices have some implications for consumers demand for durable goods, monetary policy actions are impotent to alter financial position of individuals. In this regard, it is fair to say that household liquidity mechanism is not an effective channel to reflect monetary policies into real economy and prices.

CONCLUSION

This thesis investigates operation of monetary transmission channels in Turkey over the period 2003-2013. The basic motivation of doing such a research is analyzing functioning of monetary propagation mechanisms in a low inflation era and evaluating relative importance of particular channels in general transmission process. Overall, results suggest that monetary transmission mechanism does not operate properly during the sample period. Although, there is evidence of existence of some channels, analyses mostly point to an incomplete transmission mechanism in Turkey.

The main findings of this thesis are as follow. First, it is found that inflation rate is not responsive to changes in monetary policy stance. Estimations reveal that monetary policy shocks have no significant influence over inflation dynamics during the period, regardless of analyzed channels. This evidence indicates that conventional transmission mechanisms do not convey monetary policy actions into inflation dynamics lately.

Second, analyses put forth that monetary policy shocks have asymmetric impact on specific transmission channels. Results show that interest rate channel, exchange rate channel and bank lending channel are more effective transmission mechanisms compared to others. As presented above, it is found that monetary policy shocks are influential over cost of borrowing rate, real exchange rates and loan volume of banks respectively. In addition, estimations imply that induced changes in cost of borrowing rate and real exchange rate lead significant variations in investments and net exports respectively, suggesting relatively effective transmission mechanism by means of the interest rate and exchange rate channels. However, as noted before, these changes do not bring about significant shifts in inflation rate. In the light of these results, it can be said that interest rate, exchange rate and bank lending mechanism are partially operative in Turkish economy.

On the other hand, estimations denote that monetary policy shocks do not imply meaningful changes in asset prices during the sample period. Indeed, analyses indicate that monetary policy is mainly incapable to alter agent's financial status, and

in turn, their investment and consumption decisions. On that account, empirical support for operation of asset-based mechanisms such as Tobin's q channel, wealth channel, balance sheet channel and household liquidity channel is generally weak and unreliable. However, it is worth to note that these findings are compatible with the economic and financial structure of Turkey. Given the fact that banks dominate Turkish financial system and there is limited number of financial instruments in the market, the evidence on ineffective transmission process via asset price channels is a foregone conclusion.

In general, results summarized above are in accordance with evidence provided by previous studies on Turkey. As mentioned in literature, estimations indicate that traditional channels of monetary policy such as interest rate and exchange rate are relatively more active in transmission process in Turkey. In addition to this, analyses reveal that there is an evidence of partially operating transmission mechanism via bank lending channel, as suggested by many studies. Lastly, it is found that channels based upon asset price shifts do not play a vital role in transmission process, in line with predictions of majority of previous studies. In a broad sense, these results are also consistent with recently growing literature on developing countries, which mainly indicates that interest rate, and exchange rate channels together with bank lending channel are more effective than transmission mechanisms operating via asset prices.

In the light of these discussions, it can be stated that low-inflation era does not lead any significant improvements in monetary transmission mechanism yet. Instead, estimations demonstrate that most of the conventional channels of monetary influence operate ineffectively during this period. However, considering recent developments in Turkish economy and, in particular, in monetary policy applications, this result can be considered as quite controversial. Because during the last decade, it is observed that monetary policy applications succeed in lowering inflation rate to one-digit levels and reducing price volatility to reasonable levels, suggesting an effective transmission mechanism from policy actions to prices. Therefore, estimation results do not coincide with recent economic developments in Turkish economy. But, this fact can be explained by operation of some alternative channels that are not mentioned in this thesis. For instance, growing literature on

monetary policy emphasizes the role of Central Bank credibility and communication channels in transmission mechanism. According to this view, central banks that have high credibility can directly influence economic activity via informing economic agents about their policies and thereby managing their expectations. That is, communication and expectation channels can effectively convey policy actions into prices and real activity if authorities are credible enough in the eyes of economic agents. In this regard, this view postulates a direct transmission mechanism in which conventional channels play relatively limited role in price level changes. Given the fact that CBRT attach great importance to communication and transparency issues over the past several years, this approach partially explains the weak empirical support for traditional transmission channels and the unresponsive nature of inflation rate to given policy shocks. Accordingly, the results of this thesis imply that monetary authorities should continue giving more importance to expectation and communication channels rather than conventional channels to be able to control and direct inflation dynamics.

REFERENCES

Akay, H. K. ve Nargeleçekenler, M. (2009). Para Politikası Şokları Hisse Senedi Fiyatlarını Etkiler mi? Türkiye Örneği. *Marmara Üniversitesi İ.İ.B.F. Dergisi*. 27(2): 129–152.

Aklan, N. A. and Nargeleçekenler, M. (2008). Para Politikalarının Banka Kredi Kanalı Üzerindeki Etkileri. *İ.Ü. Siyasal Bilgiler Fakültesi Dergisi*. 39: 109-132.

Aktaş, C. and Taş, B. K. O. (2007). The Bank Lending Channel In Turkey: Effect of Capital Adequacy Ratio. *Journal of BRSA Banking and Financial Market*. 1(1): 61-76.

Aktaş, Z., Alp, H., Gürkaynak, R., Kesriyeli, M. and Orak, M. (2008). Türkiye'de Para Politikasının Aktarımı: Para Politikasının Mali Piyasalara Etkisi. *Türkiye Cumhuriyet Merkez Bankası Çalişma Tebliği*. 08/11: 1-16.

Altissimo, F., Georgiou, E., Sastre, T., Valderrama, M. T., Sterne, G., Stocker, M., Weth, M., Whelan, K. and Willman, A. (2005). Wealth and Asset Price Effects on Economic Activity. *ECB Occasional Paper Series*. 29: 1-64.

Altunbas, Y., Gambacorta, L. and Marques-Ibanez, D. (2009). Securitisation and the Bank Lending Channel. *European Economic Review*. 53(8): 996-1009.

Ando, A. and Modigliani, F. (1963). The "Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests. *The American Economic Review*. 53(1): 55-84.

Angeloni, I., Kashyap, A. K., Mojon, B. and Terlizzese, D. (2003a). Monetary Transmission in the Euro Area: Does the Interest Rate Channel Explain All?. *NBER Working Paper Series.* 9984: 1-41.

Angeloni, I., Kashyap, A. K., Mojon, B. and Terlizzese, D. (2003b). The Output Composition Puzzle: A Difference in the Monetary Transmission Mechanism in the Euro Area and United States. *Journal of Money, Credit and Banking*. 35(6): 1265-1306.

Arabacı, Ö. and Baştürk, M. F. (2013). Türkiye'de Döviz Kuru Kanalı: 2002-2008 Dönemi. *Uluslararası Yönetim İktisat ve İşletme Dergisi*. 9(18): 111-131.

Arena, M. Reinhart, C. and Vazquez, F. (2006). The Lending Channel in Emerging Economics: Are Foreign Banks Different?. *NBER Working Paper Series*. 12340: 1-62.

Arslan, İ. and Yapraklı, S. (2008). Banka Kredileri ve Enflasyon Arasındaki İlişki: Türkiye Üzerine Ekonometrik Bir Analiz. *Ekonometri ve İstatistik*. 7: 88-103.

Ashcraft, A. B. and Campello, M. (2007). Firm balance sheets and monetary policy transmission. *Journal of Monetary Economics*. 54(6): 1515-1528.

Aslan, M. H. (2009). *Para Teorisi ve Politikası*. Bursa: Alfa Aktüel.

Aydın, H. İ. (2007). *Interest Rate Pass-Through in Turkey. The Central Bank of the Republic of Turkey Working Paper*. 07/05: 1-40.

Bacchetta, P. and Ballabriga, F. (2000). The Impact of Monetary Policy and Banks' Balance Sheets: Some International Evidence. *Applied Financial Economics*. 10(1): 15-26.

Barran, F., Coudert, V. and Mojon, B. (1996). The Transmission of Monetary Policy in European Countries. *CEPII Document de travail*. 96-3: 1-42.

Barth, M. J. III. and Ramey, V. A. (2002). The Cost Channel of Monetary Transmission. *NBER Macroeconomics Annual Volume 16* (pp. 199-255). Editors Ben S. Bernanke and Kenneth Rogoff. Cambridge: MIT Press.

Başçı, E., Özel, Ö. and Sarıkaya, S. (2008). The Monetary Transmission Mechanism in Turkey: New Developments. *BIS Papers No 35 Transmission Mechanisms in Monetary Policy in Emerging Market Economies* (pp. 475-499). Basel: Bank for International Settlements.

Bernanke, B. S. (1993). Credit in the Macroeconomy. *Federal Reserve Bank of New York Quarterly Review*. 18: 50-70.

Bernanke, B. S. and Blinder, A. S. (1988). Credit, Money and Aggregate Demand. *NBER Working Paper Series*. 2534: 1-13.

Bernanke, B. S. and Blinder, A. S. (1992). The Federal Funds Rate and the Channels of Monetary Transmission. *The American Economic Review*. 82(4): 901-921.

Bernanke, B. S. and Gertler, M. (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*. 9(4): 27-48.

Bernanke, B. S. and Gertler, M. (1999). Monetary Policy and Asset Price Volatility. *Federal Reserve Bank of Kansas City Economic Review*. 84(4): 17-51.

Bernanke, B. S. and Kuttner, K. N. (2005). What Explains the Stock Market's Reaction to Federal Reserve Policy?. *The Journal of Finance*. 60(3): 1221-1257.

Bhattacharya, R., Patnaik, I. and Shah, A. (2011). Monetary Policy Transmission in an Emerging Market Setting. *IMF Working Paper*. 11/5: 1-25.

Bjornland, H. C. (2009). Monetary Policy and Exchange Rate Overshooting: Dornbusch Was Right After All. *Journal of International Economics*. 79(1): 64-77.

Blaes, B. (2009). Money and Monetary Policy Transmission in the Euro Area: Evidence from FAVAR- and VAR Approaches. *Deutsche Bundesbank Discussion Paper Series 1: Economic Studies*. 18: 1-35.

Bondt, G. de. (2002). Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area level. *ECB Working Paper Series*. 136: 1-42.

Bosworth, B., Hymans, S. and Modigliani, F. (1975). The Stock Market and the Economy. *Brookings Papers on Economic Activity*. 1975(2): 257-300.

Boughrara, A. (2009). Monetary Transmission Mechanisms in Morocco and Tunisia. *ERF Working Paper Series*. 460: 1-29.

Brady, R. R. (2011). Consumer Credit, Liquidity, and the Transmission Mechanism of Monetary Policy. *Economic Inquiry*. 49(1): 246-263.

Brooks, C. (2008). Introductory Econometrics for Finance. New York: Cambridgre University Press.

Brunner, K. and Meltzer, A. H. (1988). Money and Credit in the Monetary Transmission Process. *The American Economic Review*. 78(2): 446-451.

Büyükakın, F., Bozkurt, H. and Cengiz, V. (2009). Türkiye'de Parasal Aktarımın Faiz Kanalının Granger Nedensellik ve Toda-Yamamota Yöntemleri ile Analizi. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 33: 101-118.

Ca'Zorzi, M., Hahn, E. and Sanchez, M. (2007). Exchange Rate Pass-Through in Emerging Markets. *ECB Working Paper Series*. 739: 1-31.

Cecchetti, S. G. (1995). Distinguishing Theories of the Monetary Transmission Mechanism. *Federal Reserve Bank of St. Louis Review*. 77(3): 83-97.

Cengiz, V. (2008). Keynesyen ve Monetarist Görüşte Parasal Aktarım Mekanizması: Bir Karşılaştırma. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 22(1): 115-127.

Cengiz, V. and Duman, M. (2008). Türkiye'de Banka Kredi Kanalının Önemi Üzerine Etki Tepki Fonksiyonlarına Dayalı Bir Değerlendirme (1990-2006). *H.Ü. İktisadi ve İdari Bilimler Fakültesi Dergisi*. 26(2): 81-104.

Chowdhury, I., Hoffmann, M. and Schabert, A. (2006). Inflation Dynamics and the Cost Channel of Monetary Transmission. *European Economic Review*. 50(4): 995-1016.

Christiano, L. J. and Eichenbaum, M. (1991). Identification and the Liquidity Effect of a Monetary Policy Shock. *NBER Working Papers Series*. 3920: 1-28.

Christiano, L. J., Eichenbaum, M. and Evans, C. (1994). The Effects of Monetary Policy Shocks: Some Evidence from the Flow of Funds. *NBER Working Paper Series*. 4699: 1-52.

Cushman, D. O. and Zha, T. (1997). Identifying Monetary Policy in a Small Open Economy Under Flexible Exchange Rates. *Journal of Monetary Economics*. 39(3): 433-448.

Çatik, A. N. and Karaçuka, M. (2012). The Bank Lending Channel in Turkey: Has it Changed After the Low-Inflation Regime. *Applied Economics Letters*. 19(13): 1237-1242.

Çavuşoğlu, A. T. (2002). Credit Transmission Mechanism in Turkey: An Empirical Investigation. *ERC Working Paper*. 02/03: 1-30.

Dale, S. and Haldane, A. G. (1995). Interest rates and the Channels of Monetary Transmission: Some Sectoral Estimates. *European Economic Review*. 39(9): 1611-1626.

Dedola, L. and Lippi, F. (2005). The Monetary Transmission Mechanism: Evidence from the Industries of Five OECD Countries. *European Economic Review*. 49(6): 1543-1569.

Devereux, M. B., Lane, P. R. and Xu, J. (2006). Exchange Rates and Monetary Policy in Emerging Market Economies. *The Economic Journal*. 116(511): 478-506.

Diaz, R. A. and Olivero, M. P. (2010). On the Firm-Level Implications of the Bank Lending Channel of Monetary Policy. *Journal of Economic Dynamics & Control*. 34(10): 2038-2055.

Disyatat, P. and Vongsinsirikul, P. (2003). Monetary Policy and the Transmission Mechanism in Thailand. *Journal of Asian Economics*. 14(3): 389-418.

Dornbusch, R. (1976). Expectations and Exchange Rate Dynamics. *Journal of Political Economy*. 84(6): 1161-1176.

Drake, L. and Fleissig, A. R. (2010). Substitution Between Monetary Assets and Consumer Goods: New Evidence on the Monetary Transmission Mechanism. *Journal of Banking & Finance*. 34(11): 2811-2821.

Duran, M., Özlü, P. and Ünalmış, D. (2010). TCMB Faiz Kararlarının Hisse Senedi Piyasaları Üzerine Etkisi. *Central Bank Review*. 10(2): 23-32.

Duran, M., Gülserim, Ö., Özlü, P. and Ünalmış, D. (2012). Measuring the Impact of Monetary Policy on Asset Prices in Turkey. *Economic Letters*. 114(1): 29-31.

Ehrmann, M., & Fratzscher, M. (2004). Taking Stock: Monetary Policy Transmission to Equity Markets. *Journal of Money, Credit, and Banking*. 36(4). 719-737.

Ehrmann, M., Gambacorta, L., Martinez-Pagez, J., Sevestre, P. and Worms, A. (2001). Financial System and the Role of Banks in Monetary Policy Transmission in the Euro Area. *ECB Working Paper Series*. 105: 1-59.

Eichenbaum, M. and Evans, C. L. (1995). Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates. *The Quarterly Journal of Economics*. 110(4): 975-1009.

Els, P. van., Locarno, A., Mojon, B. and Morgan, J. (2003). New Macroeconomic Evidence on Monetary Policy Transmission in the Euro Area. *Journal of the European Economic Association*. 1(2/3): 720-730.

Enders, W. (1995). *Applied Econometric Time Series*. New York: Wiley.

Erdoğan, S. and Beşballı, S. G. (2009). Türkiye'de Banka Kredileri Kanalının İşleyişi Üzerine Ampirik Bir Analiz. Doğuş Üniversitesi Dergisi. 11(1): 28-41.

Erdoğan, S. and Yıldırım, D. Ç. (2008). Türkiye'de Döviz Kuru Kanalının İşleyişi: VAR Modeli ile Bir Analiz. *İ.Ü. Siyasal Bilgiler Fakültesi Dergisi*. 39: 95-108.

Erdoğan, S. and Yıldırım, D. Ç. (2008). Türkiye'de Faiz Kanalı ile Parasal Aktarım Mekanizması. *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*. 4(2): 57-72.

Eroğlu, N. (2009). Türkiye'de 1990'lı ve 2000'li Yıllarda Para Politikaları. Marmara Üniversitesi İ.İ.B.F. Dergisi. 26(1): 23-42.

Favero, C. A., Giavazzi, F. and Flabbi, L. (1999). The Transmission Mechanism of Monetary Policy in Europe: Evidence from Banks' Balance Sheets. *NBER Working Paper Series*. 7231: 1-22.

Friedman, M. (1966). Interest Rates and the Demand for Money. *Journal of Law and Economics*. 9: 71-85.

Friedman, M. and Schwartz, A. (1963). *A Monetary History of the United States, 1867-1960*. New Jersey: Princeton University Press

Funke, N. (2004). Is There a Stock Market Wealth Effect in Emerging Markets?. *Economics Letters*. 83(3): 417-421.

Gaiotti, E. and Secchi, A. (2006). Is There a Cost Channel of Monetary Policy Transmission? An Investigation into the Pricing Behaviour of 2000 Firms. *Journal of Money, Credit and Banking*. 38(8): 2013-2037.

Gambacorta, L. (2005). Inside the Bank Lending Channel. *European Economic Review*. 49(7): 1737-1759.

Garretsen, H. and Swank, J. (2003). The Bank Lending Channel in the Netherlands The Impact of Monetary Policy on Households and Firms. *De Economist*. 151(1): 35-51.

Gertler, M. and Gilchrist, S. (1994). Monetary Policy, Business Cycles, and the Behaviour of Small Manufacturing Firms. *Quarterly Journal of Economics*. 109(2): 309-340.

Gilchrist, S. and Leahy J. V. (2002). Monetary Policy and Asset Prices. *Journal of Monetary Economics*. 49(1): 75-97.

Goyal, V. K. and Yamada, T. (2004). Asset Price Shocks, Financial Constraints, and Investment: Evidence from Japan. *The Journal of Business*. 77(1): 175-199.

Grill, V. and Roubini, N. (1995). Liquidity and Exchange Rates: Puzzling Evidence from the G-7 Countries. *New York University Working Papers*. 95-17.

Giuliodori, M. (2005). The Role of House Prices in the Monetary Transmission Mechanism Across European Countries. *Scottish Journal of Political Economy*. 52(4): 519-543.

Gujarati, D. N. and Porter, D. C. (2009). *Basic Econometrics* New York: McGraw-Hill Education.

Gündüz, L. (2001). Türkiye'de Parasal Aktarım Mekanizması ve Banka Kredi Kanalı. *İMKB Dergisi*. 5(18): 13-30.

Haan, W. J. den, Sumner, S. W. and Yamashiro, G. M. (2007). Bank Loan Portfolios and the Monetary Transmission Mechanism. *Journal of Monetary* Economics. 54(3): 904-924.

Haan, W. J. den, Sumner, S. W. and Yamashiro, G. M. (2010). Bank Loan Portfolios and the Canadian Monetary Transmission Mechanism. *Canadian Journal of Economics*. 42(3): 1150-1175.

Hosono, K. (2006). The Transmission Mechanism of Monetary Policy in Japan: Evidence from Banks' Balance Sheets. *Journal of the Japanese and International Economies*. 20(3): 380-405.

Huang, Z. (2003). Evidence of a Bank Lending Channel in the UK. *Journal of Banking & Finance*. 27(3): 491-510.

Hubbard, R. G. (1995). Is there a "Credit Channel for Monetary Policy?. *Federal Reserve Bank of St. Louis Review*. 77(3): 63-77.

Hülsewig, O., Mayer, E. and Wollmershauser, T. (2006). Bank Loan Supply and Monetary Policy Transmission in Germany: An Assessment Based on Matching Impulse Responses. *Journal of Banking & Finance*. 30(10): 2893-2910.

İnan, E. A. (2001). Parasal Aktarım Mekanizmasının Kredi Kanalı ve Türkiye. *Bankacılar Dergisi*. 39: 3-20.

Ireland, P. N. (2005). The Monetary Transmission Mechanism. *Federal Reserve Bank of Boston Working Papers*. 06-1: 1-13.

Ivanovic, M. and Lovrinovic, I. (2008). Monetary Transmission Mechanism and Behaviour of Asset Prices: The Case of Croatia. *Review of Business Research*. 8(2): 1-17.

Jimborean, R. (2009). The Role of Banks in the Monetary Policy Transmission in the New EU Member States. *Economic Systems*. 33(4): 360-375.

Kakes, J. and Sturm, J. E. (2002). Monetary policy and bank lending: Evidence from German banking groups. *Journal of Banking & Finance*. 26(11): 2077-2092.

Kalyvitis, S. and Michaelides, A. (2001). New Evidence on the Effects of US Monetary Policy on Exchange Rates. *Economics Letters*. 71(2): 255–263.

Kara, H. and Öğünç, F. (2011). Döviz Kuru ve İthalat Fiyatlarının Enflasyona Etkisi. *Türkiye Cumhuriyet Merkez Bankası Ekonomi Notları*. 14: 1-11.

Karim, Z. A. and Azman-Saini, W. N. W. (2013). Firm-Level Investment and Monetary Policy in Malaysia: Do the Interest Rate and Broad Credit Channels Matter?. *Journal of the Asia Pacific Economy*. 18(3): 396-412.

Kashyap, A. K. and Stein, J. C. (1994). Monetary Policy and Bank Lending. *Monetary Policy* (pp. 221-261). Editor N. Gregory Mankiw. Chicago: The University of Chicago Press.

Kashyap, A. K. and Stein, J. C. (2000). What Do a Million Observations on Banks Say About the Transmission of Monetary Policy?. *The American Economic Review*. 90(3): 407-428.

Kashyap, A. K., Stein, J. C. and Wilcox, D. W. (1993). Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance. *The American Economic Review*. 83(1): 78-98.

Kaufmann, S. and Scharler, J. (2009). Financial Systems and the Cost Channel Transmission of Monetary Policy Shocks. *Economic Modelling*. 26(1): 40–46.

Kearl, J. R. and Mishkin, F. S. (1977). Illiquidity, the Demand for Residential Housing, and Monetary Policy. *The Journal of Finance*. 32(5): 1571-1586.

Keyder, N. and Ertunga, E. İ. (2012). *Para Teori, Politika Uygulama*. Ankara: Seçkin Yayıncılık.

Kim, S. (2001). Effects of Monetary Policy Shocks on the Trade Balance in Small Open European Countries. *Economics Letters*. 71(2): 197-203.

Kim, S. and Roubini, N. (2000). Exchange Rate Anomalies in the Industrial Countries: A Solution with a Structural VAR Approach. *Journal of Monetary Economics*. 45(3): 561-586.

King, S. R. (1986). Monetary Transmission Through Bank Loans or Bank Liabilities?. *Journal of Money, Credit and Banking*. 18(3): 290-303.

Kishan, R. P. and Opiela, T. P. (2000). Bank Size, Bank Capital, and the Bank Lending Channel. *Journal of Money, Credit and Banking*. 32(1): 121-141.

Kishan, R. P. and Opiela, T. P. (2006). Bank Capital and Loan Asymmetry in the Transmission of Monetary Policy. *Journal of Banking & Finance*. 30(1): 259-285.

Koivu, T. (2012). Monetary Policy, Asset Prices and Consumtion in China. *Economic Systems*. 36(2): 307-325.

Kontonikas, A. and Ioannidis, C. (2005). Should Monetary Policy Respond to Asset Price Misalignments?. *Economic Modelling* 22(6):1105-1121.

Köhler, M., Hommel, J. and Grote, M. (2006). The Role of Banks in the Transmission of Monetary Policy in the Baltics. *ZEW Discussion Paper*. 06-005: 1-35.

Kuttner, K. N. and Mosser, P. C. (2002). The Monetary Transmission Mechanism: Some Answer and Further Questions. *Federal Reserve Bank of New York Economic Policy Review*. 8(1): 15-26.

Litterman, R. B. and Weiss, L. (1985). Money, Real Interest Rates, and Output: A Reinterpretation of Postwar U.S. Data. *Econometrica*. 53(1): 129-156.

Ludvigson, S. (1998). The Channel of Monetary Transmission to Demand: Evidence from the Market for Automobile Credit. *Journal of Money, Credit and Banking*. 30(3): 365-383.

Ludvigson, S., Steindel, C. and Lettau, M. (2002). Monetary Policy Transmission Through the Consumprion-Wealth Channel. *Federal Reserve Bank of New York Economic Policy Review*. 8(1): 117-133.

Mateut, S., Bougheas, S. and Mizen, P. (2006). Trade Credit, Bank Lending and Monetary Policy Transmission. *European Economic Review*. 50(3): 603-629.

Matousek, R. and Sarantis, N. (2009). The Bank Lending Channel and Monetary Transmission in Central and Eastern European Countries. *Journal of Comparative Economics*. 37(2): 321-334.

McCarthy, J., & Peach, R. W. (2002). Monetary Policy Transmission to Residential Investment. *Federal Reserve Bank of New York Economic Policy Review*. 8(1): 139-158.

Mello, L. de. and Pisu, M. (2010). The Bank Lending Channel of Monetary Transmission in Brazil: A VECM Approach. *The Quarterly Review of Economics and Finance*. 50(1): 50-60.

Meltzer, A. H. (1995). Monetary, Credit and (Other) Transmission Processes: A Monetarist Perspective. *The Journal of Economic Perspectives*. 9(4): 49-72.

Minella, A. and Souza-Sobrinho, N. F. (2013). Monetary Policy Channels in Brazil through the Lens of a Semi-Structural Model. *Economic Modelling*. 30: 405-419.

Mishkin, F. S. (1976). Illiquidity, Consumer Durable Expenditure, and Monetary Policy. *The American Economic Review*. 66(4): 642-654.

Mishkin, F. S. (1995). Symposium on the Monetary Transmission Mechanism. *The Journal of Economic Perspectives*. 9(4): 3-10.

Mishkin, F. S. (1996). The Channels of Monetary Transmission: Lessons for Monetary Policy. *NBER Working Paper Series*. 5464: 1-27.

Mishkin, F. S. (2001). The Transmission Mechanism and the Role of Asset Prices in Monetary Policy. *NBER Working Paper Series*. 8617: 1-21.

Mishkin, F. S. (2007a). *The Economics of Money, Banking and Financial Markets*. Boston: Pearson Addison Wesley.

Mishkin, F. S. (2007b). Housing and the Monetary Transmission Mechanism. *NBER Working Paper Series*. 13518: 1-54.

Mishra, P., Montiel, P. J. and Spilimbergo, A. (2012). Monetary Transmission in Low-Income Countries: Effectiveness and Policy Implications. *IMF Economic Review*. 60(2): 270-302.

Mizen, P. and Yalçın, C. (2006). Monetary Policy, Corporate Financial Composition and Real Activity. *CESifo Economic Studies*. 52(1): 177-213.

Modigliani, F. (1966). The Life Cycle Hypothesis Of Saving, The Demand For Wealth And The Supply Of Capital. *Social Research*. 33(2): 160-217.

Mohantly, M. S. and Turner, P. (2008). Monetary Policy Transmission in Emerging Market Economies: What is New?. *BIS Papers No 35 Transmission Mechanisms in Monetary Policy in Emerging Market Economies* (pp. 1-59). Basel: Bank for International Settlements.

Mojon, B. (2000). Financial Structure and the Interest Rate Channel of ECB Monetary Policy. *ECB Working Paper Series*. 739: 1-45.

Mojon, B., Smets, F. and Vermeulen, P. (2002). Investment and Monetary Policy in the Euro Area. *Journal of Banking & Finance*. 26(11): 2111-2129.

Mora, N. (2013). The Bank Lending Channel in a Partially Dollarized Economy. *Journal of Applied Economics*. 16(1): 121-151.

Moreno, R. (2008). Monetary Policy Transmission and the Long-Term Interest Rate in Emerging Markets. *BIS Papers No 35 Transmission Mechanisms in Monetary Policy in Emerging Market Economies* (pp. 61-79). Basel: Bank for International Settlements.

Mundell, R. A. (1963). Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates. *The Canadian Journal of Economics and Political Science*. 29(4): 475-485.

Oliner, S. D. and Rudebusch, G. D. (1996). Is There a Broad Credit Channel for Monetary Policy?. *Federal Reserve Bank of San Francisco Economic Review*. 1: 3-13.

Olivero, M. P., Li, Y. and Jeon, B. N. (2011). Consolidation in Banking and the Lending Channel of Monetary Transmission: Evidence from Asia and Latin America. *Journal of International Money and Finance*. 30(6): 1034-1054.

Orhan, O. Z. and Erdoğan, S. (2008). *Para Politikası*. Ankara: Yazıt Yayın Dağıtım.

Örnek, İ. (2009). Türkiye'de Parasal Aktarım Mekanizması Kanalları İşleyişi. *Maliye Dergisi*. 156: 104-125.

Özçiçek, Ö. (2006). Türkiye'de 1980 Sonrası Para Aktarım Mekanizmasında Kredi Kanalının Yeri. *Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi*. 15(1): 257-268.

Özlü, P. and Yalçın, C. (2010). The Trade Credit Channel of Monetary Policy Transmission: Evidence from Non-Financial Firms in Turkey. *Central Bank of the Republic of Turkey Working Paper*. 10/16: 1-29.

Öztürkler, H. and Çermikli, A. H. (2007). Türkiye'de Bir Parasal Aktarım Kanalı Olarak Banka Kredileri. *Finans Politik & Ekonomik Yorumlar*. 44(514): 57-68.

Peltonen, T. A., Sousa, R. M. and Vansteenkiste, I. S. (2012). Wealth Effects in Emerging Market Economies. *International Review of Economics and Finance*. 24: 155-166.

Rabanal, P. (2007). Does Inflation Increase After a Monetary Policy Tightening? Answers Based on an Estimated DSGE Model. *Journal of Economic Dynamics & Control*. 31(3): 906-937.

Rabin, A. A. and Yeager, L. B. (1997). The Monetary Transmission Mechanism. *Eastern Economic Journal*. 23(3): 293-299.

Ramey, V. (1993). How Important is the Credit Channel in the Transmission of Monetary Policy?. *NBER Working Paper Series*. 4285: 1-42.

Rigobon, R. and Sack, B. (2004). The Impact of Monetary Policy on Asset Prices. *Journal of Monetary Economics*. 51(8): 1553-1575.

Romer, C. D. and Romer, D. H. (1989). Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz. *NBER Macroeconomics Annual Volume 4* (pp. 121-184). Editors Olivier Jean Blanchard and Stanley Fischer. Cambridge: MIT Press.

Romer, C. D. and Romer, D. H. (1990). New Evidence on the Monetary Transmission Mechanism. *Brookings Papers on Economic Activity*. 1990(1): 149-213.

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*. 48(1): 1-48.

Sims, C. A. (1992). Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy. *European Economic Review*. 36(5): 975-1011.

Smets, F. (1997). Measuring Monetary Policy Shocks in France, Germany and Italy: The Role of the Exchange Rate. *BIS Working Papers*. 42: 1-18.

Smets, F. and Wouters, R. (1999). The Exchange Rate and the Monetary Transmission Mechanism in Germany. *De Economist*. 147(4): 489-521.

Spencer, R. W. (1974). Channels of Monetary Influence: A Survey. *Federal Reserve Bank of St. Louis Review*. 56(11): 8-26.

Stock, J. H. and Watson, M. W. (2001). Vector Autoregressions. *The Journal of Economic Perspectives*. 15(4): 101-115.

Şahinbeyoğlu, G. (2001). Monetary Transmission Mechanism: A View from a High Inflationary Environment. *The Central Bank of the Republic of Turkey Discussion Paper*. 2001/1: 1-39.

Şengönül, A. and Thorbecke, W. (2005). The Effect of Monetary Policy on Bank Lending in Turkey. *Applied Financial Economics*. 15(13): 931-934.

Tarı, R. (2010). *Ekonometri*. Kocaeli: Umuttepe Yayınları.

Taş, S., Örnek, İ. and Utlu, S. (2012). Banka Kredi Kanalı ve Türkiye Uygulaması. *Ç.Ü. Sosyal Bilimler Enstitüsü Dergisi*. 21(1): 53-74.

Taylor, J. B. (1995). The Monetary Transmission Mechanism: An Empirical Framework. *The Journal of Economic Perspectives*. 9(4): 11-26.

Tease, W. (1993). The Stock Market and Investment. *OECD Economic Studies*. 20: 42-63.

Tillmann, P. (2008). Do Interest Rates Drive Inflation Dynamics? An Analysis of the Cost Channel of Monetary Transmission. *Journal of Economic Dynamics & Control*. 32(9): 2723-2744.

Tobin, J. (1969). A General Equilibrium Approach To Monetary Theory. *Journal of Money, Credit and Banking*. 1(1): 15-29.

Tobin, J. (1978). Monetary Policies and the Economy: The Transmission Mechanism. *Southern Economic Journal*. 44(3): 421-431.

Vithessonthi, C. and Techarongrojwong, Y. (2012). The Impact of Monetary Policy Decisions on Stock Returns: Evidence from Thailand. *Journal of International Financial Markets, Institutions & Money*. 22(3): 487-507.

Yue, Y. and Zhou, S. (2007). Empirical Analysis of the Monetary Transmission Mechanism through Interest Rate Channel in China. *Chinese Business Review*. 6(3): 8-13.

APPENDICES

APPENDIX 1: ADF Unit Root Test Results

Appendix Table 1: ADF Results for Interest Rate Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-1.474297	-3.524233	-2.902358	-2.588587	0.5409
D(ON)	-4.237026*	-3.524233	-2.902358	-2.588587	0.0011
CRERATE	-1.613926	-3.524233	-2.902358	-2.588587	0.4704
D(CRERATE)	-7.344316*	-3.524233	-2.902358	-2.588587	0.0000
INVESTCH	-3.710606*	-3.525618	-2.902953	-2.588902	0.0059
MOINF	-2.362869	-3.540198	-2.909206	-2.592215	0.1564
D(MOINF)	-5.787670*	-3.540198	-2.909206	-2.592215	0.0000

* refers to stationarity at 1% level.

Appendix Table 2: ADF Results for Exchange Rate Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-4.157534*	-3.485586	-2.885654	-2.579708	0.0012
RER	-6.535317*	-3.486551	-2.886074	-2.579931	0.0000
COVRATIO	-2.944243**	-3.485586	-2.885654	-2.579708	0.0433
MOINF	-3.471769*	-3.491345	-2.888157	-2.581041	0.0106

*,** refer to stationarity at 1% and 5% level respectively.

Appendix Table 3: ADF Results for Tobin's Q Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-1.474297	-3.524233	-2.902358	-2.588587	0.5409
D(ON)	-4.237026*	-3.524233	-2.902358	-2.588587	0.0011
ISECH	-3.558509*	-3.525618	-2.902953	-2.588902	0.0091
INVESTCH	-3.710606*	-3.525618	-2.902953	-2.588902	0.0059
MOINF	-2.362869	-3.540198	-2.909206	-2.592215	0.1564
D(MOINF)	-5.787670*	-3.540198	-2.909206	-2.592215	0.0000

* refers to stationarity at 1% level.

Appendix Table 4: ADF Results for Wealth Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-1.440096	-3.493747	-2.889200	-2.581596	0.5599
D(ON)	-5.419311*	-3.493747	-2.889200	-2.581596	0.0000
GOLD	-8.615959*	-3.493129	-2.888932	-2.581453	0.0000
DOLLAR	-5.533211*	-3.495021	-2.889753	-2.581890	0.0000
CONSACH	-4.757616*	-3.495021	-2.889753	-2.581890	0.0001
MOINF	-2.900277**	-3.500669	-2.892200	-2.583192	0.0490

*,** refer to stationarity at 1% and 5% level respectively.

Appendix Table 5: ADF Results for Bank Lending Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-4.157534*	-3.485586	-2.885654	-2.579708	0.0012
LNREDEP_SA	-1.852205	-3.491345	-2.888157	-2.581041	0.3537
D(LNREDEP_SA)	-3.169562**	-3.491345	-2.888157	-2.581041	0.0245
LNRESEC_SA	-2.783254***	-3.485586	-2.885654	-2.579708	0.0637
D(LNRESEC_SA)	-7.268098*	-3.485586	-2.885654	-2.579708	0.0000
LNRECRE_SA	-2.090360	-3.491345	-2.888157	-2.581041	0.2490
D(LNRECRE_SA)	-3.782170*	-3.491345	-2.888157	-2.581041	0.0041
MOINF	-3.471769**	-3.491345	-2.888157	-2.581041	0.0106

*,**,*** refer to stationarity at 1%, 5% and 10% level respectively.

Appendix Table 6: ADF Results for Balance Sheet Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-4.157534*	-3.485586	-2.885654	-2.579708	0.0012
ISECH	-4.819209*	-3.486064	-2.885863	-2.579818	0.0001
LNREPRICRE_SA	-1.902746	-3.491345	-2.888157	-2.581041	0.3300
D(LNREPRICRE_SA)	-3.688428*	-3.491345	-2.888157	-2.581041	0.0055
MOINF	-3.471769**	-3.491345	-2.888157	-2.581041	0.0106

*,** refer to stationarity at 1% and 5% level respectively.

Appendix Table 7: ADF Results for Household Liquidity Channel

Variable	ADF Test Statistic	Test Critical Value at 1%	Test Critical Value at 5%	Test Critical Value at 10%	Probability
ON	-0.923748	-3.508326	-2.895512	-2.584952	0.7763
D(ON)	-4.711713*	-3.508326	-2.895512	-2.584952	0.0002
ISECH	-3.425383**	-3.512290	-2.897223	-2.585861	0.0128
LNREAUTOCRE_SA	-2.631553***	-3.510259	-2.896346	-2.585396	0.0907
D(LNREAUTOCRE_SA)	-2.442324	-3.510259	-2.896346	-2.585396	0.1335
D(LNREAUTOCRE_SA,2)	-8.843709*	-3.510259	-2.896346	-2.585396	0.0000
LNREHOUCRE_SA	-2.100522	-3.516676	-2.899115	-2.586866	0.2451
D(LNREHOUCRE_SA)	-2.681395***	-3.516676	-2.899115	-2.586866	0.0818
D(LNREHOUCRE_SA,2)	-4.055726*	-3.519050	-2.900137	-2.587409	0.0020
MOINF	-2.706793***	-3.519050	-2.900137	-2.587409	0.0775
D(MOINF)	-6.562276*	-3.519050	-2.900137	-2.587409	0.0000

*,**,*** refer to stationarity at 1%, 5% and 10% level respectively.

APPENDIX 2: Lag Length Selection Test Results

Appendix Table 8: Lag Length Selection Test Results for Interest Rate Channel

VAR Lag Order Selection Criteria

Endogenous variables: D(MOINF) INVESTCH D(CRERATE) D(ON)

Exogenous variables: C

Sample: 2007M02 2013M03

Included observations: 67

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-503.6844	NA	44.84712	15.15476	15.28638*	15.20684
1	-474.2111	54.54771	30.02928	14.75257	15.41069	15.01299*
2	-453.2665	36.26229	26.04941*	14.60497*	15.78958	15.07372
3	-445.5912	12.37214	33.84836	14.85347	16.56457	15.53056
4	-425.8884	29.40710*	31.08587	14.74294	16.98054	15.62836
5	-413.6351	16.82539	36.25548	14.85478	17.61887	15.94854
6	-400.5085	16.45729	42.11670	14.94055	18.23114	16.24264

* 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 Table 9: Lag Length Selection Test Results for Exchange Rate Channel

VAR Lag Order Selection Criteria

Endogenous variables: MOINF COVRATIO RER ON

Exogenous variables: C

Sample: 2003M02 2013M03

Included observations: 112

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1121.964	NA	6342.336	20.10651	20.20360	20.14590
1	-816.9615	582.7735	36.39645	14.94574	15.43119	15.14270
2	-779.1115	69.61701	24.66644	14.55556	15.42937*	14.91009*
3	-760.4896	32.92098	23.60451	14.50874	15.77090	15.02084
4	-743.1970	29.33564*	23.18738*	14.48566*	16.13618	15.15533
5	-730.1859	21.14294	24.66745	14.53903	16.57791	15.36627
6	-723.4471	10.46926	29.47319	14.70441	17.13164	15.68922
7	-711.4510	17.77999	32.22202	14.77591	17.59150	15.91828
8	-697.4567	19.74188	34.19978	14.81173	18.01567	16.11167
9	-685.4528	16.07669	37.88490	14.88309	18.47539	16.34060
10	-670.4765	18.98779	40.13779	14.90137	18.88202	16.51645

* 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 Table 10: Lag Length Selection Test Results for Tobin's Q Channel

VAR Lag Order Selection Criteria

Endogenous variables: D(MOINF) INVESTCH ISECH D(ON)

Exogenous variables: C

Sample: 2007M02 2013M03

Included observations: 67

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-631.4933	NA	2035.407	18.96995	19.10157*	19.02203
1	-599.6198	58.98974	1268.663	18.49611	19.15423	18.75653*
2	-582.4014	29.81113	1229.998*	18.45974*	19.64435	18.92850
3	-576.6984	9.192800	1695.173	18.76712	20.47822	19.44421
4	-553.6986	34.32809*	1410.900	18.55817	20.79577	19.44359
5	-538.9613	20.23625	1527.933	18.59586	21.35995	19.68962
6	-525.0396	17.45405	1733.318	18.65790	21.94849	19.95999

* 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 Table 11: Lag Length Selection Test Results for Wealth Channel (Model 1)

VAR Lag Order Selection Criteria

Endogenous variables: MOINF CONSACH ISECH D(ON)

Exogenous variables: C

Sample: 2004M02 2012M12

Included observations: 96

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-710.1277	NA	33.99305	14.87766	14.98451*	14.92085
1	-675.2143	66.19015*	22.93122*	14.48363*	15.01787	14.69958*
2	-661.4255	24.99206	24.05636	14.52970	15.49133	14.91841
3	-653.7522	13.26852	28.74195	14.70317	16.09219	15.26464
4	-645.6448	13.34337	34.16443	14.86760	16.68401	15.60182
5	-638.3530	11.39339	41.52337	15.04902	17.29283	15.95600
6	-624.7288	20.15247	44.52801	15.09852	17.76971	16.17826
7	-614.3635	14.46832	51.53262	15.21591	18.31449	16.46841
8	-602.0829	16.11824	57.89298	15.29339	18.81937	16.71865
9	-582.8257	23.67026	56.93677	15.22554	19.17891	16.82355
10	-567.9438	17.05218	62.25545	15.24883	19.62959	17.01961

* 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 Table 12: Lag Length Selection Test Results for Wealth Channel (Model 2)

VAR Lag Order Selection Criteria

Endogenous variables: MOINF CONSACH GOLD D(ON)

Exogenous variables: C

Sample: 2004M02 2012M12

Included observations: 96

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-682.5916	NA	19.15350	14.30399	14.41084*	14.34718
1	-650.8475	60.18135*	13.80264*	13.97599*	14.51023	14.19194*
2	-636.6384	25.75408	14.35360	14.01330	14.97493	14.40201
3	-623.7515	22.28354	15.38425	14.07816	15.46718	14.63962
4	-613.9295	16.16536	17.64496	14.20687	16.02328	14.94109
5	-607.3711	10.24756	21.77581	14.40356	16.64737	15.31055
6	-596.7040	15.77846	24.83533	14.51467	17.18586	15.59441
7	-586.0155	14.91926	28.54933	14.62532	17.72391	15.87782
8	-568.1194	23.48867	28.53193	14.58582	18.11180	16.01108
9	-553.2389	18.29066	30.73950	14.60914	18.56251	16.20716
10	-534.0140	22.02856	30.70340	14.54196	18.92272	16.31273

* 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 Table 13: Lag Length Selection Test Results for Wealth Channel (Model 3)

VAR Lag Order Selection Criteria

Endogenous variables: MOINF CONSACH DOLLAR D(ON)

Exogenous variables: C

Sample: 2004M02 2012M12

Included observations: 96

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-644.0867	NA	8.587441	13.50181	13.60865*	13.54500
1	-608.1832	68.06698	5.674711*	13.08715*	13.62139	13.30310*
2	-593.0829	27.36934*	5.792677	13.10589	14.06752	13.49460
3	-582.1516	18.90203	6.466787	13.21149	14.60051	13.77296
4	-569.5040	20.81584	6.993061	13.28133	15.09775	14.01556
5	-559.9512	14.92631	8.108269	13.41565	15.65945	14.32263
6	-548.9992	16.19978	9.192776	13.52082	16.19201	14.60056
7	-537.8283	15.59279	10.46181	13.62142	16.72001	14.87392
8	-524.0617	18.06863	11.39477	13.66795	17.19393	15.09321
9	-507.9932	19.75082	11.97631	13.66653	17.61990	15.26454
10	-492.7583	17.45668	12.99911	13.68246	18.06323	15.45324

* 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 Table 14: Lag Length Selection Test Results for Bank Lending Channel

VAR Lag Order Selection Criteria

Endogenous variables: MOINF D(LNRECRE_SA) D(LNRESEC_SA) D(LNREDEP_SA) ON

Exogenous variables: C

Sample: 2003M02 2013M03

Included observations: 111

Lag	LogL	LR	FPE	AIC	SC	HQ
0	319.4024	NA	2.38e-09	-5.664908	-5.542857	-5.615395
1	618.7824	566.3947	1.70e-11	-10.60869	-9.876387*	-10.31162
2	661.0492	76.15627	1.25e-11*	-10.91980*	-9.577245	-10.37517*
3	675.5019	24.73887	1.52e-11	-10.72976	-8.776949	-9.937564
4	690.4172	24.18702	1.85e-11	-10.54806	-7.984989	-9.508296
5	716.0631	39.27757	1.87e-11	-10.55970	-7.386373	-9.272373
6	730.8661	21.33754	2.31e-11	-10.37596	-6.592387	-8.841079
7	751.8066	28.29800	2.61e-11	-10.30282	-5.908988	-8.520373
8	774.6688	28.83525	2.88e-11	-10.26430	-5.260216	-8.234293
9	795.2689	24.12625	3.38e-11	-10.18503	-4.570684	-7.907453
10	831.9356	39.63966*	3.05e-11	-10.39524	-4.170640	-7.870101

* 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 Table 15: Lag Length Selection Test Results for Balance Sheet Channel

VAR Lag Order Selection Criteria

Endogenous variables: MOINF D(LNREPRICRE_SA) ISECH ON

Exogenous variables: C

Sample: 2003M02 2013M03

Included observations: 111

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-564.0937	NA	0.327724	10.23592	10.33356	10.27553
1	-281.2366	540.2315	0.002676	5.427687	5.915890*	5.625737
2	-250.8636	55.82066	0.002068	5.168714	6.047480	5.525203*
3	-233.7809	30.16413	0.002034*	5.149205*	6.418534	5.664134
4	-222.5705	18.98696	0.002229	5.235504	6.895397	5.908873
5	-211.4438	18.04330	0.002455	5.323311	7.373767	6.155120
6	-195.4396	24.79927	0.002487	5.323236	7.764254	6.313485
7	-176.7062	27.67820	0.002411	5.273985	8.105566	6.422674
8	-161.7131	21.07133	0.002515	5.292128	8.514272	6.599257
9	-147.9463	18.35570	0.002703	5.332367	8.945074	6.797935
10	-126.8873	26.56099*	0.002570	5.241212	9.244482	6.865220

* 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 Table 16: Lag Length Selection Test Results for Household Liquidity Channel (Model 1)

VAR Lag Order Selection Criteria

Endogenous variables: D(MOINF) D(LNREAUTOCRE_SA,2) ISECH D(ON)

Exogenous variables: C

Sample: 2005M12 2013M03

Included observations: 80

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-233.9688	NA	0.004506	5.949221	6.068322	5.996972
1	-194.7897	73.46084	0.002526	5.369743	5.965250*	5.608499*
2	-174.8217	35.44332*	0.002295*	5.270541*	6.342453	5.700301
3	-162.1968	21.14662	0.002516	5.354920	6.903237	5.975685
4	-151.5261	16.80642	0.002917	5.488152	7.512874	6.299921
5	-137.7232	20.35918	0.003157	5.543081	8.044209	6.545854
6	-125.4756	16.84043	0.003595	5.636891	8.614424	6.830669

* 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 Table 17: Lag Length Selection Test Results for Household Liquidity Channel (Model 2)

VAR Lag Order Selection Criteria

Endogenous variables: D(MOINF) D(LNREHOUCRE_SA,2) ISECH D(ON)

Exogenous variables: C

Sample: 2005M12 2013M03

Included observations: 80

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-194.2331	NA	0.001669	4.955826	5.074928	5.003578
1	-158.8972	66.25471	0.001030	4.472430	5.067937*	4.711186*
2	-140.9393	31.87532*	0.000984*	4.423482*	5.495394	4.853242
3	-131.9462	15.06345	0.001181	4.598654	6.146972	5.219419
4	-116.8936	23.70775	0.001227	4.622341	6.647063	5.434110
5	-105.8217	16.33105	0.001422	4.745543	7.246671	5.748317
6	-92.16870	18.77293	0.001564	4.804217	7.781751	5.997996

* 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