Consumer Confidence in A DSGE Model for Turkey

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Abstract

In this study, it is argued that agents, separate from the observable economic indicators, carry current and/or future time information about the economy, and that this information is already present in consumer confidence index (CCI). Moreover, it is argued that as well as consumers, this information is utilized by producers who have entrepreneurial sentiments. Producers are divided as large scale enterprises (LSEs) and small and medium scale enterprises (SMEs). SMEs are assumed to reach this entrepreneurial information (animal spirits) in the economy, but LSEs do not either because they want to stick to their business plan or they cannot due to their rigid structure. A standard small scale New Keynesian DSGE model for Turkey for the period of 2006-2012 is constructed incorporating CCI and information component. The responses of economic fundamentals to monetary policy, information and technology shocks are examined.

Keywords: New Keynesian DSGE, Monetary Policy, Consumer Confidence Index

Jel Classification: D84, E47, E52.

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1. INTRODUCTION

Since the prominent "animal spirits" argument of Keynes, economic researchers scrutinized how sentiments of agents, either consumers or firms, affect the economic fundamentals. Many years after, George Katona (1951) developed confidence measures in order to explain how income expectations affect spending/saving behavior. He argues that consumer spending depends on ability and willingness to buy. Consumer confidence/sentiment indices question the respondents about their ability and willingness to buy through a poll. Thus, these indices are established to provide information about the behavior of consumers. Curtin (2002, p.4) explains that "Katona never believed that consumers had the needed information, computational skills, or the motivation to form accurate economic expectations. Nonetheless, Katona did believe that consumer expectations were influential factors shaping their spending and saving decisions and, as such, should be measured and incorporated into forecast models". Next section summarizes some studies advocating the predictive power of consumer confidence/sentiment indices. Figures in Section 3 also depict the precedence of consumer confidence index with respect to GDP growth, consumption growth and level of consumption expenditure for Turkish data.

The main argument of this study is that consumer confidence/sentiment indices carry two types of information about the consumers: (i) the information that the consumer collects from the economic indicators; and (ii) the information that forms the unexplained "animal spirits" of the consumers independent of all economic indicators. Moreover, it is argued that as well as consumers, the second type of information is utilized by producers who have entrepreneurial sentiments.

This study is, in fact, not focused on highlighting or exaggerating the importance of consumer confidence in an economy. Rather, it is argued that agents –either consumers or producers- , separate from the observable economic indicators, carry current and/or future time information about the economy, political circumstances, potential risks and advantages, entrepreneurial knowledge, etc. that is not specified with a name; and that this information is already present in consumer confidence index. This information can be perceived as sentiments, news or "animal spirits" that direct the decisions/behaviors or consciousness of the agents. In other words, there is an unnamed determinant that specifies the behavior of the agents. The only requirement to obtain this information is to decompose consumer confidence index into observable determinants (economic indicators) and nonobservables. The latter is simply the residual -let's call this information component- of a regression model with consumer confidence index as the dependent variable, and some economic fundamentals as the explanatory variables.

Priorly, economics was dominated by pure statistical (reduced form) models analyzing the relationships between macroeconomic variables or systems of equations that neglected general equilibrium and forward looking behaviour, as mentioned in DeJong and Dave (2011). Such macroeconometric models were highly criticized for their lack of microeconomic underpinnings and for the assumption that policy variables were considered as superexogenous. Lucas criticize this in his critique suggesting that parameters such as individual preferences, resource constraint, technology etc. should be taken into account to understand the effect of a policy experiment better. Otherwise, interpretation of individual behavior will be infertile. Moreover, Sims (1972) contributed this criticism methodologically. At this point, vector autoregression (VAR) and dynamic stochastic general equilibrium (DSGE) approaches emerged as efforts to overcome these critiques. In fact, nowadays Central

Banks are fascinated with DSGE models. In DSGE modeling, there are different schools of thought, namely as Real Business Cycle (RBC) and New Keynesian schools. In standard RBC models, the market is cleared through flexible wages/prices and a competitive market system. However, in the New Keynesian school of thought, as a standard, there is monopolistic competition and sticky wages and/or prices.

This study constructs a fairly standard small scale New Keynesian DSGE model for Turkey for the period of 2006-2012. The responses of economic fundamentals to monetary policy, information and technology shocks are examined. This paper is organized as follows. Section 2 summarizes the literature. Next section explains consumer confidence index. The New Keynesian DSGE model is outlined in Section 4. Section 5 presents the empirical results. Finally, Section 5 concludes.

2. LITERATURE

Monetary policy is frequently analyzed under a DSGE model in the literature. Keen (2004) analyzes the impact of a monetary policy shock in a DSGE model with sticky prices and financial market frictions. It is observed that expansionary monetary policy shock leads to a fall in the nominal interest rate; a rise in output, consumption, and investment; and a gradual increase in the price level. This is explained under the mechanism that monopolistically competitive producers are unable to fully adjust prices in response to a monetary disturbance. Many studies are consistent with these findings (Adolfson *et al*., 2007; Dib, 2003).

There are only a few studies that utilize DSGE models for Turkey. Ortiz *et al.* (2009), following the model of Lubik and Shorfheide (2007), estimate small open economy DSGE model for many countries. In his model for Turkey, they observe that parameters on inflation are 1.19 and 1.77 for the period 1989:Q2–1993:Q4 and 1989:Q2–1998:Q1, respectively. In the same manner, output gap parameters are 0.17 and 0.20. Çebi (2012) utilizes small scale open New Keynesian DSGE model for Turkey using period between 2002 and 2009. Using Bayesian estimation, he suggests that the parameter estimates show that the monetary authority reacts to inflation but only weakly reacts to the output gap. Taylor rule of Çebi (2012) reveals that monetary policy regarding inflation is 1.75 and output gap is 0.41.

Literature on consumer confidence is vast; however the literature regarding the predictive power of consumer confidence is quite modest. Carroll *et al.* (1994), moving from the contemporaneous correlation between Index of Consumer Sentiment (ICS) and the growth of household spending, investigate whether consumer sentiment forecasts household spending and why. Their empirical analysis shows that lagged sentiment predicts current consumption growth only because it predicts current income growth. Matsusaka and Sbordone (1995) using VAR model, investigate the link between economic fluctutations and consumer sentiment. They observe a causal link from consumer sentiment to GNP. Figure from post-war period of the US reflects that recessions are preceeded by major collapses in consumer sentiment. They argue that such precedence can be intrepreted in two ways: either consumer sentiment causes GNP or it anticipates GNP. This confusion is solved by disentangling the two possibilities. After controlling for economic fundamentals and other good predictors of GNP, it is observed that consumer sentiment continues to add predictive power to the model. Following this finding, Matsusaka and Sbordone (1995, p.315) argue that "under this interpretation it appears that consumers are basing their forecasts on information that is unavailable to prefessional econometricians who specialize in forecasting GNP movements".

The effect of monetary policy and several other variables is analyzed under New Keynesian DSGE models, however, incorporating CCI into these models is fairly a new concept and is examined by "early-bird" Barsky and Sims (2012) who incorporate indices from specific questions of CCI survey into a New Keynesian DSGE model. They state that there are two contrasting approaches to the role of confidence in macroeconomics, namely as "animal spirits" view and information/news view. The "animal spirits" view suggests that autonomous fluctuations in beliefs that in turn have causal effects on economic activity. Blanchard (1993), regarding the causes of the 1990-1991 recession, proposes that the cause of the recession was a powerful, long-lasting negative consumption (exogenous shift in pessimism) shock associated with an exogenous shift in pessimism that had a causal effect on overall aggregate demand. The information/news view attributes the relationship between innovations in measures of consumer confidence and subsequent macroeconomic activity to the fact that confidence measures contain fundamental information about the current and future states of the economy. At this point, Cochrane (1994) suggests that consumption surprises proxy for news that consumers receive about future productivity which is not available in econometricians' information sets. In their model, news shock is incorporated as a determinant of the technology. "Animal spirit" is also incorporated into the model as a separate equation determining expectations about technological (productivity) growth. In their model, they find that fundamental news is the main driving force behind the observed relationship between confidence and subsequent economic activity. Moreover, they find little evidence of a strong causal channel from autonomous movements in sentiment to economic outcomes which they refer as "animal spirits" interpretation. In order to explain the difference between the model in this study and the model of Barsky and Sims (2012), how CCI is incorporated in their model is shown below:

$$a_t = a_{t-1} + g_{t-1} + \varepsilon_{a,t}$$

where a_t is the log of neutral technology and $\varepsilon_{a,t}$ is the conventional surprise shock.

$$g_t = (1-\rho_a)g^* + \rho_a g_{t-1} + \varepsilon_{ga,t}$$

where g_t is the growth rate, g^* is steady state growth rate and $\varepsilon_{ga,t}$ is the shock to expected growth rate, i.e., news shock.

$$s_t = g_t + \varepsilon_{s,t}$$

where s_t is the expectation about productivity growth (technological growth rate) and $\varepsilon_{s,t}$ is the animal spirits shock. Out of 5 questions of Michigan Survey of Consumers, one question, E5Y, regarding country's future economic conditions is used. Log-linearized form about steady state with the innovation in confidence, i.e., u_t:

$$E5Y_t = (1-\rho_e)E5Y^* + \rho_e E5Y_{t-1} + u_t$$

This innovation is specified as a function of the innovation in the level of technology and perceived innovation in the expected growth rate of technology, plus a pure noise term, $\varepsilon_{c,t}$:

$$u_t = \xi_1(a_t - a_{t-1} - g_{t-1}) + \xi_2(g_t - \rho_a g_{t-1}) + \xi_3 \varepsilon_{c,t}$$

In their, animal spirit shocks are associated with temporary changes in consumption and income, but news shocks about future productivity lead to gradual movements in the oeconomic variables that is not reserved subsequently.

3. CONSUMER CONFIDENCE INDEX

There are two consumer confidence indices in Turkey. One of them is calculated by Turkish Statistical Institute (TURKSTAT) and the other one is by a private company; CNBC-e CCI. The correlation between two indices is above 90%. Both are monthly announced. CNBC-e index goes back to 2002 and TURKSTAT data starts by 2003. Moreover, the former one is announced earlier due to its practicality in the data collection process. Hence, I will employ the CNBC-e Consumer Confidence Index. The index is composed of five questions given below:

1. Can you compare your (and your family's) current financial situation with last year?

2. What do you think your (and your family's) future financial situation will be in a year?

3. Can you compare your current expectations about Turkish economy with the previous month?

4. What do you think Turkish economy's situation will be in a year?

5. Do you think that the current period is a good time to buy durable consumer goods such as TV, refrigerator and furniture or vehicles or residence?

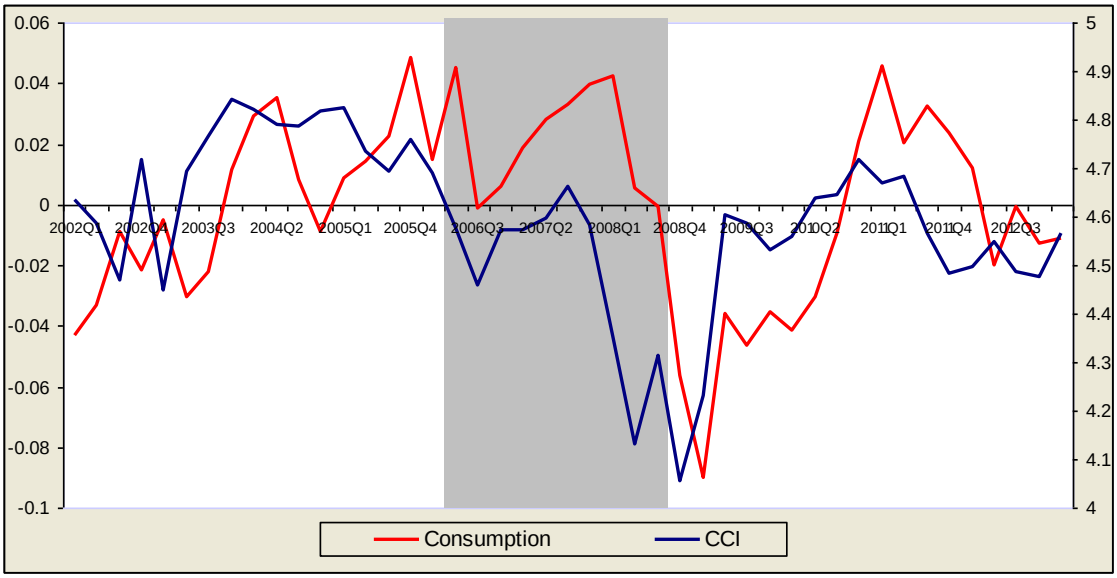
The methodology used to compile and calculate the index is adopted from consumer sentiment index of Michigan University. 3 out of 5 of these questions are about the current state compared to previous and the rest are about future. The first two questions are about personal financial situation and the rest are about Turkish economy. CCI data is constructed via surveys including such questions that aim to measure the likelihood of current/future consumption of the households.

Households' tendency to consume rises in periods when the economic conditions are appropriate. Hence the delayed demand can take place. The indicators of the economic conditions can be GDP level or growth rate or the difference betweeen potential and actual GDP, inflation rate, interest rates, tax rates, etc. Increase in GDP, growth rate or rise in output gap are perceived as good signals to the household since households will be able to earn more when the economy is in a boom period. Rise in inflation is a bad signal about the economic condition since consumption will be more costly. Thus, consumption expenditure above subsistence level, e.g. luxury goods, may be delayed. Decline in interest rates and tax rates are good signals. Decline in interest rates creates an incentive especially for delayed consumption expenditure. Correlation between logarithm of consumption expenditure of residents (seasonally adjusted) in Turkey and interest rate (2002Q1-2012Q4) gives a clear negative relationship of -95%. Moving from this, it can be argued that interest rate is a determinant of consumption for Turkey. In other words, consumers are liable to increase their consumption

by loaning when rates are lower. Decline in interest rates can also be perceived as a decline in the opportunity cost of spending.

Figures 3.1 to 3.3 depict the relationship between consumer confidence index (CCI) and consumption expenditure, consumption growth, GDP growth. The figure clearly shows a positive relationship and that CCI moves before consumption indicating that CCI is a leading indicator which is consistent with the content of the poll. Figure 3.1 shows that consumer confidence index precedes consumption expenditure. This implies that consumers consume consistent to what they declare about future. If consumers do so, this implies that their expectations become real. It is observed that CCI is a proxy for consumer behavior which can be followed by firms as a prospective information about future.

Figure 3.1: Consumption and Consumer Confidence Index (2002Q1 - 2013Q1)



Note: Consumption is seasonally adjusted and HP filtered. CCI is CNBC-e CCI and in natural logarithm. Right scale belongs to log of CCI.

Figure 3.2: Consumption Growth and Consumer Confidence Index (2002Q1 - 2013Q1)

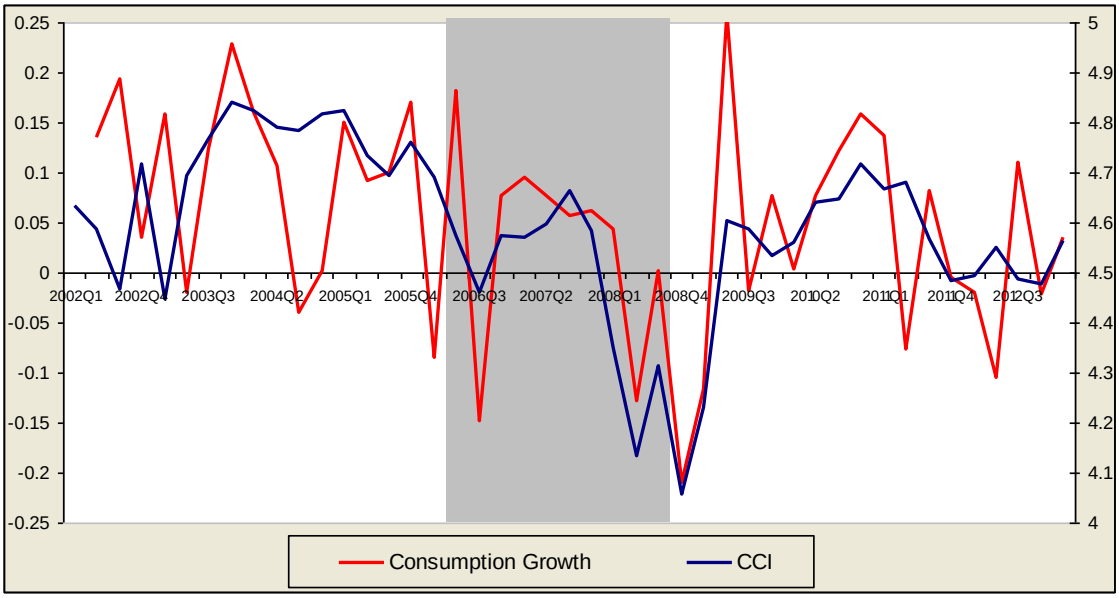
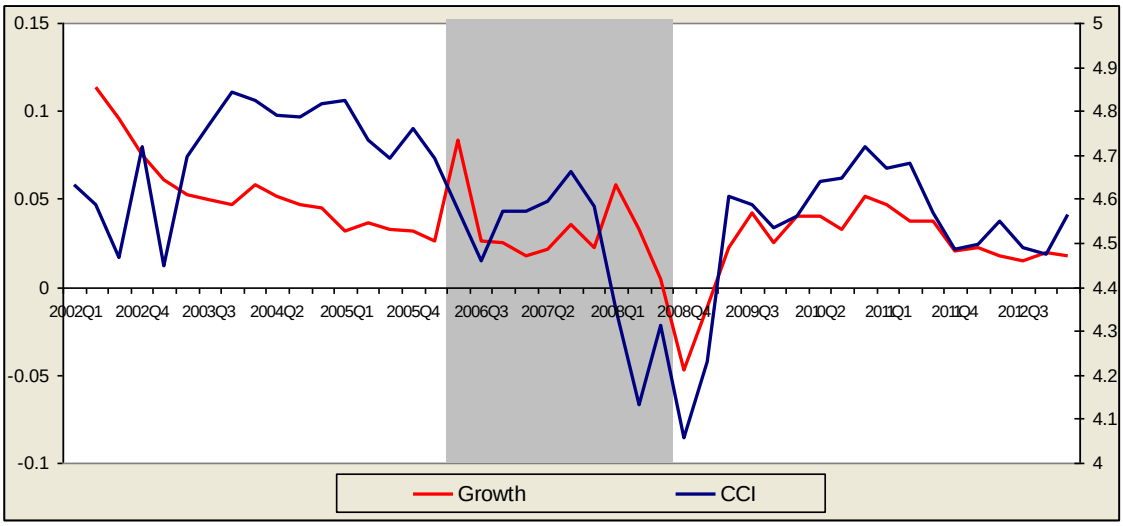


Figure 3.3: GDP Growth and Consumer Confidence Index (2002Q1 - 2013Q1)



Note: GDP growth is log difference of seasonally adjusted quarterly GDP.

4. DSGE ANALYSIS

This section of the study plans to see the impact of a monetary policy shock, technology shock and an information shock on economic variables via a small-scale New Keynesian DSGE model for Turkey. Information component is simply derived as a residual from consumer confidence index (CCI) after regressing on determinants. This information is incorporated into utility function and production function. Information shock affects consumers through utility function; and producers through production function.

4.1. Household

The representative household maximizes an additively separable utility function which is separable into consumption, labor and real money balances over an infinite lifetime horizon. However, differently from the standard utility functions, a CCI component (information component), X_t enters utility in the consumption part. It is assumed that non-economic or unusual economic events affect the utility of the consumer via her consumption behavior. For instance, assume a positive information about the economic stance of the country which will pass on the citizens. The good news will render consumers more optimistic their current and future state. This optimism contributes to their utility. More concretely, the same shopping she does or the same food she consumes will make her happier if she expects a "better world" for herself. Hence, this exogenously affects the utility she gets from her consumption[1].

Representative household's problem is to maximize her utility by optimizing the intertemporal welfare function:

$$V = E_0 \sum_{t=0}^{\infty} \beta^t u_t \left(X_t, C_t, N_t, \frac{M_t}{P_t} \right)$$

[1] Since utility is not cardinal but ordinal, the magnitude of the information component is not of importance in the utility function.

Utility function is:

$$u_t = \frac{X_t C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi} + \frac{\left(\frac{M_t}{P_t}\right)^{1-\nu}}{1-\nu}$$

The utility is maximized with respect to the budget constraint of a Ricardian household[2]:

$$P_t C_t + M_t + Q_t B_t \leq M_{t-1} + B_{t-1} + w_t N_t + T_t$$

where β is a discount factor between 0 and 1, showing how impatient the household about the future, i.e., the higher β is, the more patient she is regarding future. C_t is an index of consumption goods, N_t is labor services, σ is the coefficient of relative risk aversion, φ is the elasticity of marginal disutility with respect to labor supply. Money is introduced in the utility function as real balances. Other than its role as a unit of account, holding money brings an additional utility to the agent. v_t is the elasticity of marginal utility with respect to real money holdings. Utility is additively separable in CCI component, consumption, labor supply and real balances. First and second derivatives of utility with respect to C_t, N_t, $\frac{M_t}{P_t}$:

$$u_C > 0,\ u_{CC} < 0,\ u_N < 0,\ u_{NN} < 0,\ u_M > 0,\ u_{MM} < 0,\ u_{CN} = u_{CM} = u_{NM} = 0$$

Consumption brings utility to consumer at a decreasing rate, since second derivative is negative as the superscript, σ, is positive. Likewise, holding money brings utility at a decreasing rate. However, labor brings disutility to the consumer at an increasing rate. In other words, labor gets more and more undesirable, irresistible for the consumer.

First order conditions with respect to consumption, labor, real money balance and bonds via Lagrangian[3]:

$$y_t = E_t y_{t+1} - \frac{1}{\sigma}\left(i_t - E_t \pi_{t+1} - \rho + \Delta x_{t+1}\right)$$

where $i_t = -logQ_t$ is the short term nominal interest rate and $\rho = -log\beta$ is the discount rate. Lowercase letters denote natural logarithms of the original variables. Above equation is transformed into dynamic IS equation in gap form after defining steady state and taking the difference between actual equation and its steady state counterpart. Output gap is $\tilde{y} = y_t - y^n$, where y_t^n denotes steady state value of output in logaritmic form. It is assumed that in steady state, there is no change in the information component, i.e., $\Delta x_t = 0$. Forward looking IS equation is as follows:

$$\tilde{y}_t = E_t \tilde{y}_{t+1} - \frac{1}{\sigma}\left(i_t - E_t \pi_{t+1} - r_t^n + \Delta x_{t+1}\right)$$

[2] Simply, Ricardian households can own company shares and hold bonds. Thus, they can receive income from dividends and from bonds in the maturity date. Reversely, non-Ricardian households only receive income through supplying their labor.

[3] To keep the model simple, it is assumed that there is no capital and government sector. Hence, all the income income is consumed.

Finally, y_t^n and r_t^n denote natural level of output and interest rate, successively. Natural output level refers to the maximum level of goods and services an economy can produce on a sustained basis with existing resources without generating inflation pressures (BOC, 2010). In other words, it is the equilibrium level under full price flexibility. Likewise, natural rate of interest rate is the interest rate under full price flexibility, which are given below:

$$y_t^n = \Psi_y^n\left[(1+\varphi)\omega.a_t + \left((1-\omega)(1+\varphi)+1\right)(1-\alpha)x_t\right] + \nu_y^n$$

where $\Psi_y^n = \dfrac{1}{\sigma(1-\alpha)+\varphi+\alpha}$ and $\nu_y^n = \dfrac{\left[\log(1-\alpha)-\mu\right](1-\alpha)}{\sigma(1-\alpha)+\varphi+\alpha}$

$$r_t^n = \rho + \sigma.\Psi_y^n\left[(1+\varphi)\omega.E_t\Delta a_{t+1} + \left((1-\omega)(1+\varphi)+1\right)(1-\alpha)E_t\Delta x_{t+1}\right]$$

where natural rate of interest rate, i.e., r_t^n, is $r_t^n = \rho + \sigma.E_t\Delta y_{t+1}^n$

a_t is the technological component, x_t is the information component.

4.2. Monetary Authority

A standard monetary policy rule is defined in order to examine the impact of a monetary policy shock. A rise in output gap, $\tilde{y}_t$, increases nominal interest rate, i_t, i.e., $\gamma_1 > 0$. Also inflation, π_t, affects interest rate positively, i.e., $\gamma_2 > 0$. Residual from this equation, υ_t, is the exogenous component of the monetary policy rule.

$$i_t = \rho + \gamma_1\tilde{y}_t + \gamma_2\pi_t + \upsilon_t$$

Also an ad-hoc log-linear money demand equation is given as:

$$m_t - p_t = y_t - \eta i_t$$

4.3. Firm Behavior and Price Setting

There is a continuum of firms indexed by $i \in [0,1]$ and each firm has the same production technology with decreasing returns to scale Cobb-Douglas production function of labor and technology but no capital[4], assuming that capital stock is fixed and there is no investment in the short term.

The design of production function is based on the seminal paper of Blinder (1982). He states that monopolistic firm with inventories may absorb demand shocks by using their inventories, however, firm with no inventories responds to demand shocks with higher price and output

[4] McCallum and Nelson (1999) argue that capital do not play a critical role in most monetary policy analysis. Hence, capital stock is left out to keep the model simple.

adjustments. In other words, firms with no inventories do not have the "freedom" to stay inert. Moreover, it is known that production does not occur instantaneously but takes time. These two information lead us to the conclusion that firm with no inventories have to foresee the future demand so as to launch the production process on time. Otherwise, each information shock they cannot foresee may be destructive. In this study, a distinction to the standard production function is carried out regarding holding inventory or not. This distinction, in fact, bears a resemblance to firms with different scales; as small and medium scale enterprises (SMEs) and large scale enterprises (LSEs).

SMEs are located as relatively smaller areas. The production facility is of smaller-size. Hence, they do not or cannot generally hold inventory. It is vice versa for LSEs. Being located at relatively larger areas enables holding inventory. SMEs, which may be defined[5] as non-subsidiary, independent firms, are characterized to have dynamism and entrepreneurial activity (OECD, 2002). Exit and entry[6] as a SME is relatively easier which creates dynamism depending on the entrepreneurial knowledge. Hence, "adjustment to demand shocks" is higher in SMEs as mentioned in Blinder (1982). On the other hand, LSEs have their own business plan which is assessed annually or more. Any information (including demand shocks) shock they do not foresee will only lead to a change in the inventory. Its large scale production renders LSEs rigid and static and these firms do not change their business plan unless there is a highly critical information.

Share of SMEs in production is increasing worldwide, so do their importance. Together with the dynamic and flexible production structure, SMEs can adapt varying economic and social conditions[7]. Hence, dynamic production system is essential for an SME in order to survive and compete with the rivals. In this sense, forecasting information (opportunities and risks) is of upmost importance. Consumer confidence index, which is used as a proxy for current and future consumer behavior, is perceived as a "barometer". There are certainly some economic variables that explain CCI since consumers follow the economy. However, there will still be some other information not defined (but waiting to be defined). Because consumer confidence/sentiment includes everything the consumer perceives regarding economy in current time and future.

The dynamic and entrepreneurial structure of the SMEs leads them to "smell" the opportunities and risks. Hence, such an 'animal spirit' can best be proxied by CCI since it contains the likely behavior of the consumer, i.e., the opportunities and risks to be followed by entrepreneurs. LSEs generally specify their own marketing strategies covering the behavior of the consumers. Hence, in the distinction of firms holding/not holding inventories, firms with different scales can be used as a proxy. On the other hand, the data for production share of firms holding/not holding inventory is not available but the data for production share of firms with different scales can be accessed.

[5] There are different descriptions regarding SME. Definitions consider revenue, amount of capital and number of labor. Firms are referred as SMEs if any or all of these measures are below some certain values. In Turkey, it is argued that the best definition for SMEs is firms with employees less than 250 (KOSGEB, 2011).

[6] "The OECD work showed that the process of entry and exit of firms involves a proportionally low number of workers" (OECD, 2002, p.33).

[7] These firms need to confront liquidity restrictions since there are generally limits to long term credit and that their revenue and profit is low. Liquidity restriction generates a risk for production in the way firm needs to sell the goods produced in the prior production period and obtain revenue sufficient enough in order to produce in the next period. Likewise, Pissarides et al. (2003, p.504) state that SMEs often face economic, institutional and legal obstacles, including limited access to working capital and long term credit, legal and regulatory restrictions, inadequate infrastructure, and limited managerial and technical expertise.

In this model, CCI definitely needs to include information, so as to incorporate CCI into the model. This argument is supported in the Quarterly Bulletin of Bank of England (Autumn 2004, p.284) which splits CCI into explained and unexplained components where the former refers to the standard economic determinants of consumption, whereas the unexplained component may reflect how consumer confidence reacts to non-economic factors, such as wars and terrorist attacks" or unusual economic events.

Assume a Cobb-Douglas technology where there is a continuum of two different scale of firms in the economy. Each firm produces a differentiated good and production function is different in each scale type. It is assumed that large scale production is a function of technology and labor, whereas small scale production is a function of labor and information. ω is the share of production in large scale production, whereas 1- ω is the share of small scale production.

SMEs play a critical role in the world economy. Latest figures available show that the ratio of SMEs out of all establishments is 99% in Turkey[8] and in many central economies[9] such as the US, the UK, Germany, Brazil, South Korea. Ratio of number of people employed in SMEs is 78% in Turkey; 58% in the US, 54% in the UK; 60% in Germany; 67% in Brazil. SMEs account for 55% of value added in Turkish economy, 40% of the manufacturing sector. The ratio of value added is 50% in the US; 51% in the UK; 53% in Germany; 49% in Japan. Firms with number of workers less than 250 are referred as SMEs according to Turkish Statistical Institute. Some data regarding SMEs in Turkey are given in Table 5.1. Construction sector accounts for 5%, manufacturing sector 13%, trade 40% and other sectors 42% of 2.5 million SMEs. The most striking finding is that even if 99% of all enterprises are of small and/or medium scale, the value added constitutes only around 55% of the economy. The ratio is even lower considering manufacturing sector.

Table 4.1: Ratio of SMEs in several economic indicators in Turkey

	No of enterprises	**No of workers**	**Production***	**V.A.***	**Production in Manufacturing Sector***	**V.A. in Manufacturing Sector***	**Investment****
<250	2,580,075	7,865,403	64,872	149,347	212,577	38,070	50,787
Total	2,583,099	10,087,751	1,019,306	270,493	477,136	93,803	101,645
Share of SMEs	99.8%	77.9%	55.4%	55.2%	44.5%	40.5%	49.9%

Note: 2003-2008 dataset available in TURKSTAT online database. V.A. refers to Value Added. Values in (*) are in Turkish lira in millions. (**) refers to gross investment in tangible goods.

Another striking finding is the ratio of number of SMEs out of all enterprises. According to KOSGEB[10] (2011), SMEs should not be interpreted as firms that are unable to grow. Rather, they are referred as the engines of growth since SMEs are dynamic and can adapt to the varying economic conditions. KOSGEB (2011) also denotes that SMEs avoid information[11]

[8] TURKSTAT database, 2013.
[9] OECD. SMEs, Entrepreneurship and Innovation, 2010.
[10] The Turkish Small and Medium Industry Development Organisation (KOSGEB) was established in 1990. The objective of KOSGEB is to encourage entrepreneurship, assist and promote small and medium scale enterprises.
[11] This is for sure not the information mentioned throughout the study.

technology in the production process due to the permament costs of R&D facilities. SMEs provide production differentiation due to their scale of production and fulfill the supply chain of intermediate goods to large scale firms. Thus, governments focus on SMEs in specifying their growth and development strategies.

The government acknowledges that the growth of the overall economy depends on the growth of SMEs. Young SMEs have difficulty obtaining financing through traditional banks when compared with larger firms, established for a longer period. The federal government has taken steps to make investment in SMEs more attractive. Although most small firms usually do not undertake formal research and development activities, they are known to be incremental innovators in both the commercialisation of existing technologies and the customisation of products and services to meet the needs of consumers and market demand. (OECD, 2002, p.92)

In this model, SMEs are assumed to reach the information in the economy, but LSEs do not either because they want to stick to their business plan or they cannot due to their rigid structure. In single firm notation, a firm can be either a LSE or a SME. Following all these information, production function of the economy[12] is expressed below.

Production function for an LSE:

$$Y_t(i) = A_t N_t(i)^{1-\alpha}$$

Production function for an SME:

$$Y_t(i) = \left(X_t N_t(i)\right)^{1-\alpha}$$

where A_t is the technology parameter, N_t is the labor, and X_t is the CCI parameter.

If the production is completely perfomed by an LSE, the production function in natural logarithm[13] form becomes:

$$y_t = a_t + (1-\alpha)n_t$$

If the production is completely perfomed by an SME, the production function becomes:

$$y_t = (1-\alpha)(n_t + x_t)$$

Given the production share of LSE, i.e., ω, the production function expressing the distinction between scale of production is as follows:

$$y_t = \omega\left(a_t + (1-\alpha)n_t\right) + (1-\omega)\left[(1-\alpha)(n_t + x_t)\right]$$

Hence,

$$y_t = (1-\alpha)n_t + \omega a_t + (1-\omega)(1-\alpha)n_t$$

[12] In the formulation, it is assumed that production factors can be totally transferred to each production scale.
[13] Throughout the study, natural logarithms are shown in small letters.

One of the essential features of New Keynesian analysis is the price rigidity assumption. Following Calvo (1983) staggered pricing, i.e., each firm may reset its price only with probability (1-θ) and with probability θ, prices are unchanged, aggregate price index, in log form, around steady state becomes:

$$\pi_t = (1-\theta)(p_t^* - p_{t-1})$$

The distinction between LSE and SME may be reduced to firms resetting prices and firms not. Due to menu costs, one of the main contibution of New Keynesian economics, an LSE does not change prices frequently to be compatible with market conditions. On the other hand, SMEs do not have the strength to keep prices unchanged. Hence, θ is used as the ratio of LSEs and (1-θ) is used as the ratio of SMEs, rather than specifying a new parameter for the share of LSEs and SMEs.

Below is New Keynesian Phillips curve (NKPC):

$$\pi_t = \beta.E_t\pi_{t+1} + \kappa.\tilde{y}_t$$

where $\kappa = \lambda.\left(\frac{\sigma(1-\alpha)+\varphi+\alpha}{1-\alpha}\right)$

4.4. Consumer Confidence

In order to incorporate consumer confidence into the model, how CCI is determined should be defined. Given the poll questions, CCI is affected mainly by the general economy, e.g., GDP, GDP growth rate, inflation rate and interest rate. CCI is regressed on interest rate and growth via ARDL analysis[14]. Interest rate and inflation rate reflects a correlation more than 90%. In order to abstain from multicollinearity problem, the most relevant variable to explain CCI, i.e., interest rate is chosen. Below equation represents that CCI depends negatively on interest rate, i.e., $\mu_1 < 0$ and positively on GDP growth rate, i.e., $\mu_2 > 0$. Additionally, an exogenous effect with zero mean, x_t, is added which is assumed to cover exogenous effects that is not determined within the system. In Bank of England Quarterly Bulletin of Autumn 2004, it is argued that other than some economic variables, such as, income, wealth and interest rate, consumer confidence is also affected by non-economic events and may be affected by unusual economic events in a complex manner. That's why, an exogenous component to capture such effects, either non-economic or unusual economic events, is included in the equation.

$$cci_t = \mu_1 i_t + \mu_2 g(y_t) + x_t$$

April 1999 report of Monetary Policy Committee of Bank of England illustrates the transmission mechanism of monetary policy giving place to expections and confidence. The report (MPC of BOE, 1999, p.6) explains that interest rate changes can affect expectations about the future course of real activity in the economy and the confidence with which those expectations are held (in addition to the inflation expectations). However, the direction is hard to predict and can vary from time to time. For instance, a rise in interest rate can be

[14] After applying general to specific technique, ARDL model is defined. The dynamic model is transformed into long run and the final equation is obtained.

interpreted as the economy is growing faster than thought, leading to a boost to expectations of future growth rate and confidence. On the other hand, this rise may be interpreted as signalling that the monetary authority will cool off the economy not to deviate from the inflation target leading to a collapse in expectations about future growth and confidence. Hence, expectations depend on the interpretation of changes in the monetary policy stance.

4.5. Representation of the Model

$$\mathrm{i}_t = \rho + \delta_1 \tilde{\mathrm{y}} + \delta_2 \pi_t + \upsilon_t$$

$$\tilde{y}_t = E_t \tilde{y}_{t+1} - \frac{1}{\sigma}\left(i_t - E_t \pi_{t+1} - r_t^n + \Delta x_{t+1}\right)$$

$$r_t^n = \rho + \sigma.\Psi_y^n \left[(1+\varphi)\omega.E_t \Delta a_{t+1} + \left((1-\omega)(1+\varphi)+1\right)(1-\alpha)E_t \Delta x_{t+1}\right]$$

$$\pi_t = \beta.E_t \pi_{t+1} + \kappa.\tilde{y}_t$$

$$m_t - p_t = y_t - \eta i_t$$

$$CCI_t = \mu_1 i_t + \mu_2 g(y_t) + x_t$$

Output equation following information shock:

$$y_t = x_t\left[\Psi_y^n\left((1-\omega)(1+\varphi)+1\right).(1-\alpha)\left(1-\sigma(1-\beta\rho_x)(1-\rho_x)\Lambda_x\right)+(1-\beta\rho_x)(1-\rho_x).\Lambda_x\right]$$

Output equation following technology shock:

$$y_t = a_t \Psi_y^n (1+\varphi)\omega\left(1-\sigma(1-\beta\rho_a)(1-\rho_a)\Lambda_a\right)$$

And exogenous AR(1) process for monetary policy rule with a shock ε^v, for CCI with a shock ε^x and for technology with a shock ε^a.

4.6. Calibration and Simulation

4.6.1. Calibration

A DSGE model is able to mimic the reality only through calibration, which is proposed by Kydland and Prescott (1982). Based on information from studies in the literature or estimation with empirical tools such as OLS estimation, calibrated values are entered into parameters. Together with the choice of calibrated values, the model becomes able to replicate some selected moments of the data. Calibration should be country specific to as to help mimic the economic structure of the country in question. In this study, the focus is on Turkey. DSGE model is estimated over the period of 2006 April – 2012 December. Selection of the upper bound of the dataset is based on leaving high inflation period out.

Together with the inflation targeting regime of Turkish Central Bank, the main policy tool has become short run interest rates by the beginning of 2002. One of the short term interest rates; overnight interest rate has been the policy rate from 2002 to 2010. After that period, one week repo rate replaced overnight interest rate. Monthly data for overnight interest rate are obtained from TURKSTAT and Consumer Confidence Index data are from CNBC-e's CCI dataset. 3-month moving average of CCI is used in order to see the optimism/pessimisim at a longer period which will decrease its variation. In other words, a positive/negative information shock will be more precise, leading SMEs be more confident about utilizing entrepreneurial information.

HP trended output is considered as a proxy of output gap. Inflation is annual CPI inflation. Calibrated parameter values are expressed in Table 1. Parameters are calibrated either by OLS estimation or they are taken from previous studies.

Table 4.1: Calibration

β	σ	φ	α	ε	η	θ	γ_1	γ_2	μ_1	μ_2	ρ	ρ_v	ρ_a	ρ_x
0.99	3	2	1/3	6	3.63	0.45	0.4	1.5	-1.36	0.77	$1/\beta$ -1	0.5	0.9	0.6

4.6.2. Simulation

In order to test the performance of the model, responses of major macroeconomic variables to shocks are simulated. It is assumed that the system is initially at steady state and how the variables deviate from equilibrium after a one-time shock is observed via impulse response analysis. Figures from 4.1 to 4.6 plot the responses of selected variables to monetary policy, information and technology shock, successively.

Figures from 4.1 to 4.3 give the impulse response functions to monetary policy, information and technology shocks, given $\theta = 0.45$ as calibrated. Figures from 4.4 to 4.6 are the impulse response functions when $\theta = 0.65$ Figures from 1 depicts that a shock through an increase of 25 basis points in ε^v leads to a positive effect on nominal interest rate as expected, a decline in output gap, real balances, inflation and consumer confidence. Since a rise in interest rate can be easily perceived as rise in cost of loaning by consumers, decline in CCI is consistent with the expectations. 25 basis point information shock, i.e., ε^x leads to decline in inflation, output gap, interest rate, natural interest rate; to a rise in CCI, output and real balances, given in Figure 4.2. 25 basis point technology shock, i.e., ε^a leads to positive responses in CCI, output, real balances; and to negative responses in inflation, output gap, real interest rate and nominal interest rate, given in Figure 4.3.

A crucial finding from the model simulations is that the share of SMEs affects the magnitude of the production and the potential production level such that simulations with SME share, i.e., $(1-\theta)$, above a specific ratio lead to a decline in output gap, and hence inflation, following a positive information shock. This boundry is 0.62. Information shock simulations with $\theta < 0.62$, increases natural output more than the rise in output level, leading to a decline in gap and inflation. This finding emerges from the highly utilization of "information" in the entrepreneurship of SMEs.

On the other hand, information shock simulations with $\theta \geq 0.62$ brings about a rise in natural output less than the rise in output level. Information increases the consumption level, and hence output level, more than the natural level leading to a rise in inflation. Figures 4.4 to 4.6 give similar responses except for responses of inflation and output gap to information shock given in Figure 4.5.

Negative effect of such a shock is not problematic but also observed in Barsky and Sims (2012) and Lorenzoni (2009). Barsky and Sims (2012, p.2) state that "news that productivity will grow more rapidly for a substantial period of time into the future (the "news shock"). Theoretical response of inflation to this "news shock" is negative. Lorenzoni (2009, p.2052) mentions about to cases: (i) when consumers are optimistic, but actual productivity is even better than their expectations, producers tend to lower prices, leading to a stronger output response; (ii) when consumers are optimistic, but actual productivity has not changed; then, producers tend to increase prices, leading to a weaker output response. The model in this study is completely compatible with Lorenzoni (2009) since his first case is relevant to high SME ratio in this model ($\theta < 0.62$), whereas his second case is relevant to relatively lower SME ratio in this model ($\theta \geq 0.62$).

5. Conclusion

The effect of consumer sentiment on the economy, on the business cycles and its predictive power are being discussed in the literature (Danthine *et al*., 1998; Jaimovich and Rebelo, 2006; Beaudry and Portier, 2004, 2006). Ludvigson (2004, p.29) in his seminal paper asks whether consumer confidence surveys contain meaningful independent information about the economy or they simply repackage information already captured in other economic indicators. Ludvigson (2004, p.30) states that "the most popular survey measures contain some information about the future path of aggregate consumer expenditure growth. However, much of that information can be found in other popular economic and financial indicators, and the independent information provided by consumer confidence predicts a relatively modest amount of additional variation in future consumer spending".

The main argument of the study, consistent with Ludvigson, is that consumer confidence/sentiment indices carry two types of information about the consumers: (i) the information that the consumer collects from the economic indicators; and (ii) the information that forms the unexplained "animal spirits" of the consumers independent of all economic indicators. Moreover, it is argued that as well as consumers, the second type of information is utilized by producers who have entrepreneurial sentiments. Therefore, a high importance is attributed to consumer confidence indices. SMEs are assumed to reach this entrepreneurial information (animal spirits) in the economy, but LSEs do not either because they want to stick to their business plan or they cannot due to their rigid structure.

The paper constructs a fairly standard small scale New Keynesian DSGE model for Turkey and examines the impact of a monetary policy shock, technology shock and an information shock on economic variables. Impulse response functions reflect convenient results. This preliminary version of the paper does not include estimation results, rather only covers simulation results. Moreover, it is planned to incorporate capital in the model.

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Figure 4.1: Impulse Response Functions to Information Shock ($\theta = 0.45$)

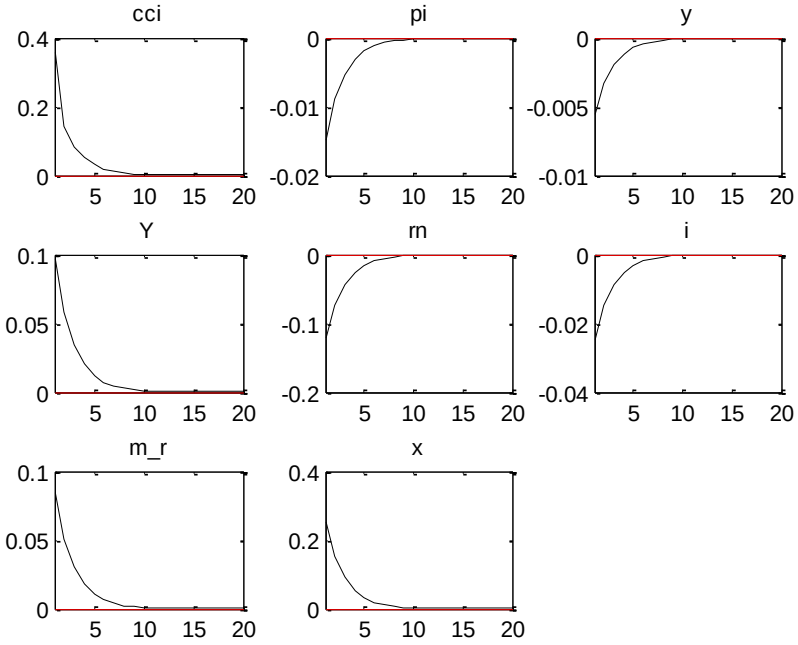

Figure 4.2: Impulse Response Functions to Monetary Policy Shock ($\theta = 0.45$)

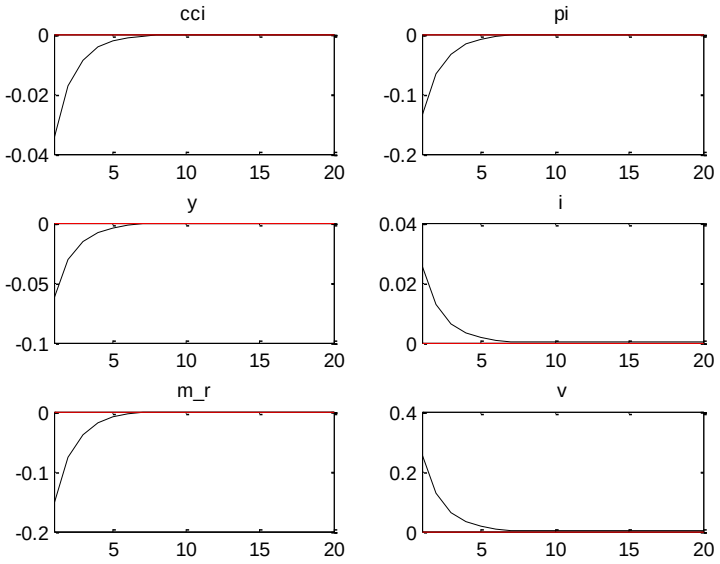

Figure 4.3: Impulse Response Functions to Technology Shock ($\theta = 0.45$)

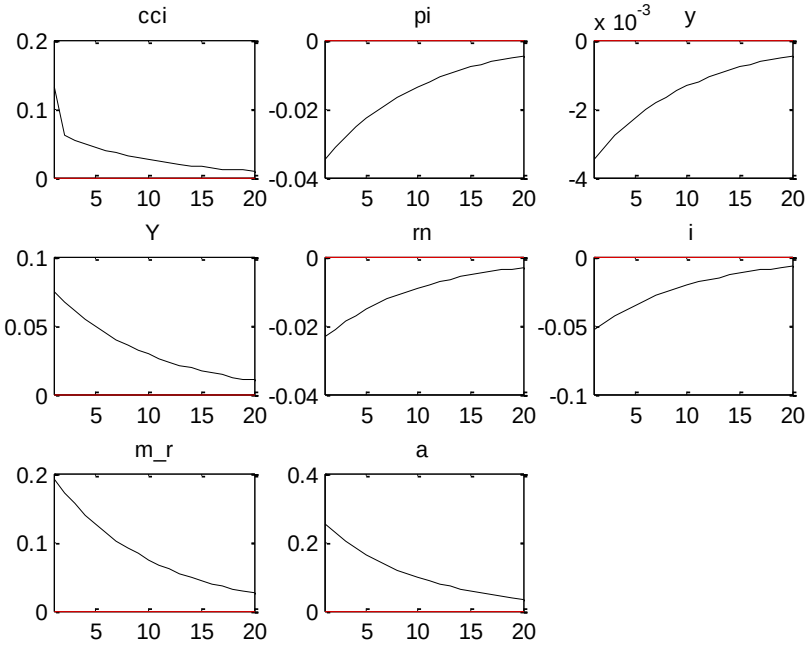

Figure 4.4: Impulse Response Functions to Information Shock ($\theta = 0.62$)

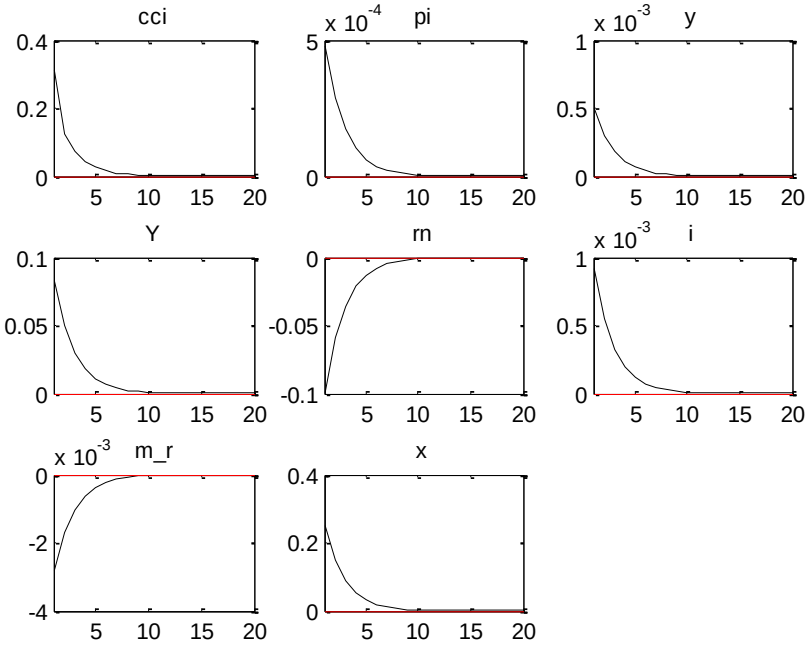

Figure 4.5: Impulse Response Functions to Monetary Policy Shock ($\theta = 0.62$)

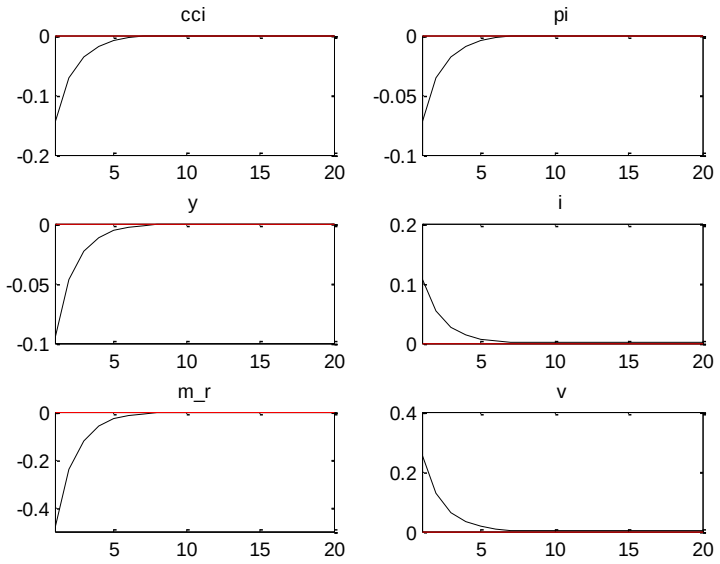

Figure 4.6: Impulse Response Functions to Technology Shock ($\theta = 0.62$)