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Estimating Money Demand Function by a Smooth Transition Regression Model: An Evidence for Turkey

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Abstract

The money supply process is assumed to be fixed in economic literature or at least there is a central bank trying to control the liquidity in the economy. On the other hand, the demand side is more volatile and more uncertain. This situation hinders the homogenous and symmetric information assumptions of the monetary models. The amount of money demanded is a dynamic process and changes depending on the transition variable in concern. The money demand increases in the boom periods of the economy but may diminish in the recessions gradually. Therefore the money demand function indicates an asymmetric behavior and nonlinearity. This paper estimates the money demand function by including the inflation uncertainty, that is assumed to be a transition variable for a small-open economy, Turkey by using the monthly data spanning from January, 1990 to May, 2012. The parameters of the money demand function are estimated by the Smooth Transition Regression (STR) models. While modelling the nonlinearity, an appropriate logistic function is determined. The dependent variables that are used to estimate the money function are gold, interest rate, inflation uncertainty, share prices, exchange rate and income. The inflation uncertainty data is gathered from the conditional variances of a specified EGARCH model. The results of the paper have several policy implications for the monetary authorities. First, the behavior of the money demand and its determinants are crucial at the times of adopting the inflation targeting regime. The stability of money demand is also related to the stability of inflation. So the results of the paper may be beneficial for the policy makers and monetary authorities during their decision making process.

Key Words: Money Demand; Inflation Uncertainty; Smooth Transition Regression; Nonlinearity.

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I. Introduction

It is assumed in economic theory that money demand motives of agents are classified under transaction, precautionary and speculative purposes, and analyzing its determinants are crucial for monetary policy (Lovell, 2006, p. 471). Some of these determinants are well known and widely discussed in books on macroeconomics and monetary economics. There are well known facts about the signs of some elasticities. Transaction and precautionary motives increase by income and speculative motive and diminish by an increase in interest rate. Some papers also include other assets such as gold prices and share prices. These attempts are for representing the substitutes for money and elaborating their other possible positive wealth effects.

On the other hand, the discussion continues on the magnitudes of the elasticities, specifications of the models and estimation methods. In an empirical sense, there are two main category of methodology for measuring the determinants of money demand. These are linear and nonlinear methods. Gujarati (1968) for India; Goldfeld (1973), Buscher and Frowen (1993) for England; US, Germany and Japan; Boughton (1981) for Canada; Hetzel and Mehra (1989, p. 459), Friedman (1994, p. 118-119), Dreger and Wolters (2010), Ball (2001) for the US; Yashiv (1994) for Israel; Wang (2011), Hasan (2011), Slavova (2003) for Bulgaria were some of the past attempts for estimating the linear money demand functions.

The recent literature focuses more on the nonlinear methods to estimate the money demand function. Wolters, Terasvirta and Lütkepohl (1998), Granger and Terasvirta (1993, chp. 7), Lin and Terasvirta (1994), Lütkepohl, Terasvirta and Wolters (1999) for Germany; Sarno (1999) for Italy; Chen and Wu (2005), Ordonez (2003) for Spain; Austin and Ward (2007) for China are some of these studies using nonlinear methods to estimate money demand functions.

There are also plentiful of papers for Turkey trying to estimate the money demand function. Dönmez (2007) by using monthly Turkish data for the 1986-2003 period constructs a VECM model. He benefits from M1 and finds a negative effect of inflation. Korap and Yıldırım (2012) by using quarterly narrow money data for the years 1998-2010 include the share price index and the exchange rate to the equation. They use a correction term, a first lagged interest rate and lagged share prices index as transition variables and fail to reject the nonlinearity for money demand function and benefit from a linear error correction model. Tunay (2001) uses a parametric nonlinear method for the years 1987-2000. According to Keyder (2008, p. 378), inflation expectations are effecting the money demand negatively. Altıntaş (2008), by using quarterly M2 data for the period 1985-2006 benefits from the ARDL cointegration method and finds a positive exchange rate elasticity of money demand. Özdemir (2011) uses the M2Y definition and benefits from an economic uncertainty variable.

Second section provides the data and methodology. Third section presents the results and the fourth section is for the discussion. The last section is for the conclusion.

2. Data and Methodology

The available monthly Turkish data employed in the study is explored from the Central Bank of the Republic of Turkey (CBRT) Electronic Data Delivery System (EDDS) for the period from January, 1990 to May, 2012. These variables employed are Gold (*G*), Interest Rate (*R*), Share Prices (*S*), Exchange Rate (*Exc*), Industrial Production Index (*Inc*), Inflation Uncertainty (*Unc*) and Money Demand (*M*). The natural logarithm of the variables is taken except for the interest rate. Following Skalin and Terasvirta (1999, p. 210), the variables are not seasonally adjusted. The sources and explanations of the variables used in the text are presented in Table 1.

Table 1. Definition and the Sources of Variables

Variable	Abbrevation	Explanation	Source	Time Interval
Gold	*G*	Real gold prices, TP. MK. CUM. YTL. 1: Cumhuriyet Gold Selling Price (TRY/Number)	CBRT, EVDS	January, 1990 – May, 2012
Interes Rate	*R*	Real interest rate. TP.PY.P06.ON.1: (ON) Simple Interest Rate Weighted Average, Overnight (%). For the post 2011:11, CBRT actual intrest rates were used.	CBRT, EVDS.	January, 1990 – May, 2012
Inflation Rate	*Inf*	New CPI index: TP.FG.J0: 0.GENEL Price Index (Consumer Prices) (2003=100) (TurkStat) (Monthly)	CBRT, EVDS	January, 1990 – May, 2012
Inflation Uncertainty	*Unc*	Calculated from *Enf*	Own calculation	January, 1990 – May, 2012
Share Prices	*S*	TP.MK.F.BILESIK.1: (FIYAT) ISE National-100 Index, According to Closing Prices (January 1986=1)	CBRT, EVDS	January, 1990 – May, 2012
Exchange Rate	*Exc*	TP.DK.REER3: CPI based Real Effective Exchange Index (1995=100)	CBRT, EVDS	January, 1990 – May, 2012
Income	*Inc*	Real income. TP.UR4.U01.1: Toplam Sanayi Industrial Production Index (1992=100) (TurkStat) (Monthly) Industrial Production Index (2005=100) (TurkStat) (Monthly) (NACE	CBRT, EVDS	January, 1990 – May, 2012

		REV.2) and TP.N2SY01.1: Total Industry		
Money Demand	*M*	Real money demand. M2	CBRT, EVDS	January, 1990 – May, 2012

According to Keyder and Ertunga (2012, p. 327), M2 monetary aggregate definition is more appropriate if the scope inherits both transaction and wealth dimension of the money. M2 has interest bearing assets and this may affect the money demand elasticity of interest rates (Boefing, 2001, p. 23). Wu and Hu (2009, p. 1636) suggest including exchange rate to money demand equation for small open economies to increase the stability of the system. Following Enders (2010, p. 131), the inflation uncertainty is measured by the conditional heteroscedasiticy model. The appropriate model is chosen as ARCH (1,3,Thr=1, GED, EGARCH, Backcast=0.7, Deriv=AA, Lags=12).

In this paper, Smooth Transition Regression (STR) model is used to explore the determinants of money demand function. When a *STAR* model is estimated by an exogenous regressor, STR is obtained (Pavlidis, 2009). There are logistic and exponential versions of the models. Skalin and Terasvirta (1999), Sensier *et al.* (2002), Deschamps (2008) can be analysed for the *LSTR* models. Exponential transition version can also be estimated.- See Luukkonen, *et al.* (1998), Terasvirta (1994), Escribano and Jorda (1999), Kapetanios, Shin and Snell (2003) and Terasvirta (2004).

The transition function in STR models is widely used in economics. It indicates a degree of mean reversion and is a probability function of transition variable, threshold variable and smoothing parameter. If the process is asymmetric then the logistic version of the model is used (see Granger and Terasvirta, 1993 and Escribano and Jorda, 2001). The gamma that is the smoothing parameter strengths the nonlinearity if it is significant.

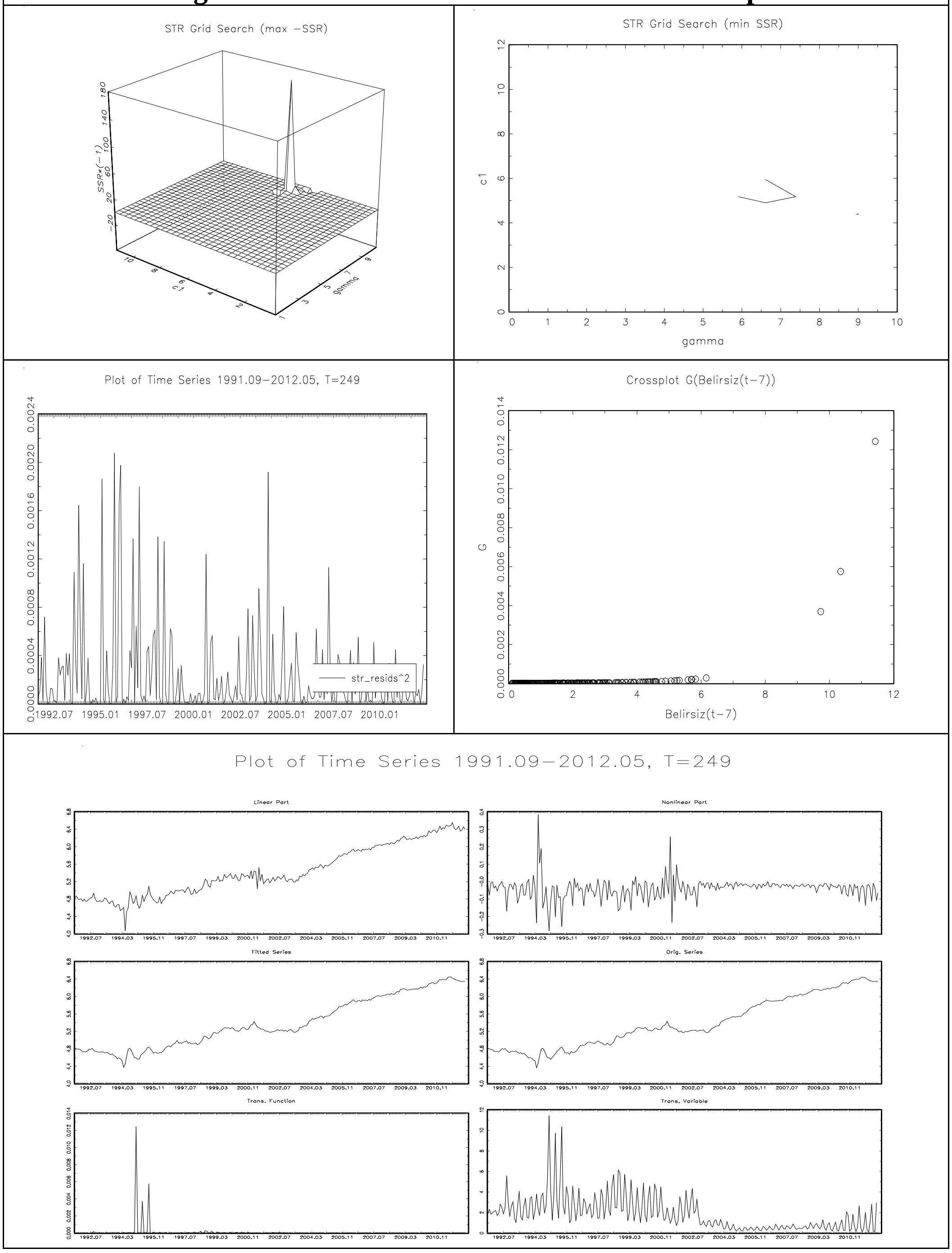
In this paper, following Lütkepohl, Terasvirta and Wolters (1999), the money demand function is estimated by the STR model given in equation (1). *JMulti* is used to estimate parameters and the systematic detailed application of the methodology can be found in literature. Terasvirta (1998) can be analyzed for the technical details of the model. Kratzig (2005) explains in detail how to apply the STR models by *Jmulti*. Below, the STR model is briefly provided following Terasvirta (2004) and Kratzig (2005).

JMulti allows using the two different types of logistic transition functions. See also Lundbergh and Terasvirta (2002, pp. 486-509), Dijk, Terasvirta and Franses (2002). One type of them is the LSTR1 and the other is the LSTR2.

$$y_t = \left(w_t', x_t'\right)\left\{(\phi + \theta G\left(\gamma, c, s_t\right)\right\}' + u_t;\ \ u_t \sim iid(0, \sigma^2) \qquad t = 1, ..., T \qquad (1)$$

$$G\left(\gamma, c, s_t\right) = \frac{1}{1 + e^{-\gamma\left(s_t - c_1\right)}},\ \gamma > 0 \qquad (2)$$

Figure 1. Grid Search Results for the *Full*-Sample



The transition function that is provided in the equation (2) is written for LSTR1. The explanatory variables are given by $w_t' = \left(1, y_{t-1}, ..., y_{t-7}\right)$ and $x_t' = \left(x_{1t}, x_{2t}, ..., x_{7t}\right)$. The ϕ and θ parameters are linear and nonlinear parts of the model respectively where $\phi = (\phi_0, \phi_1, ..., \phi_7)'$ and $\theta = (\theta_0, \theta_1, ..., \theta_7)'$. If $K = 1$ then it is assumed that the specification allows to capture the asymmetry and the parameter change increases by the transition parameter monotonically from zero to one (Lundbergh and Terasvirta, 2002, p. 487).

The model is estimated by the dependent and the independent variables. The estimation is done for all the lags from 1 to 12. The most appropriate model is chosen by 7 lags. The estimation is also repeated for the nominal and the real variables and the seven monetary measures.

The specifications that reject the linearity for inflation uncertainty are considered. During the specification phase, several linearity tests are applied and the most appropriate transition variable and LSTR model are determined. The linearity is rejected for most of these models. These selected models also gave the lowest *p*-value for the specified inflation uncertainty variable and suggested as the strongest transition variable by the linearity tests. The unit root hypothesis is rejected by the ADF tests. The best model is selected by analyzing the significance and selection criteria. The model with the M2 monetary aggregate is selected as the best model. Unc_{t-7} is perceived as the transition variable. The suggested model is selected by the *F* (0.0140), *F4* (0.6639), *F3* (0.0451) and *F2* (0.0000) statistics. Conditional maximum likelihood method is made use for the parameter estimations.

The estimated starting values for the gamma and the location parameters are 7.3352 and 5.5732 respectively and determined by the nonlinear optimization algorithm provided by *Jmulti*, which is called the grid search (Franses and Dijk, 2003, p. 108). The sum of squared residual is -171.0368 and it is used for the grid search to account for thresholds (Martens, Kofman and Vorst, 1998, p. 252). According to Enders (2010, p. 446), the sum of squared residuals is minimized when it approximates to the true value. Figure 2, Panel A indicates that the transition variable gives the minimum SSR. The graph is for the sum of squared residuals as a function of c and γ.

When the linear and nonlinear sections are graphed, we can gather interesting information. The nonlinear part can be drawn if the transition function is different than zero and can be interpreted as adjustment values for the high inflation uncertainty periods. When we control the values of transition function, its high values also match with the high inflation uncertainty and inflation values. The sum of linear and nonlinear parts of money demand is equal to the values of fitted series. Although the linear part is positive, nonlinear part is negative when the transition function is above zero. Besides during the *post*-2002: 07, the transition function's value is zero. This also increases the possibility that during the *post*-2002: 07, the money demand is linear.

The estimation results are provided in Table 2 for the full sample. Gamma coefficient that is related by the transition between regimes is 1.2210 with the *p*-value 0.0001. The transition value is 17.5218 with *p*-value 0.0000 and that is inflation uncertainty indicating that if the monthly inflation uncertainty exceeds seven month's lagged inflation than the economy transits from one regime to another. The regime is called as low if it is under this value and high if it is over. The value of the transition function in Turkey during the *post*-2002: 07 is zero and can be interpreted as low inflation uncertainty years.

The AIC criteria with -7.4717 and adjusted R^2 with 0.9993 determines one of the best fitting models as suggested by Franses and Dijk (2003, p. 39). Test of parameter constancy rejects for *H1* with *p*-value of 0.0725. ARCH-LM test with 8 lags rejects the null with the *p*-value of 0.0113. Jarque Bera statistics rejects the null with the *p*-value of 0.0422.

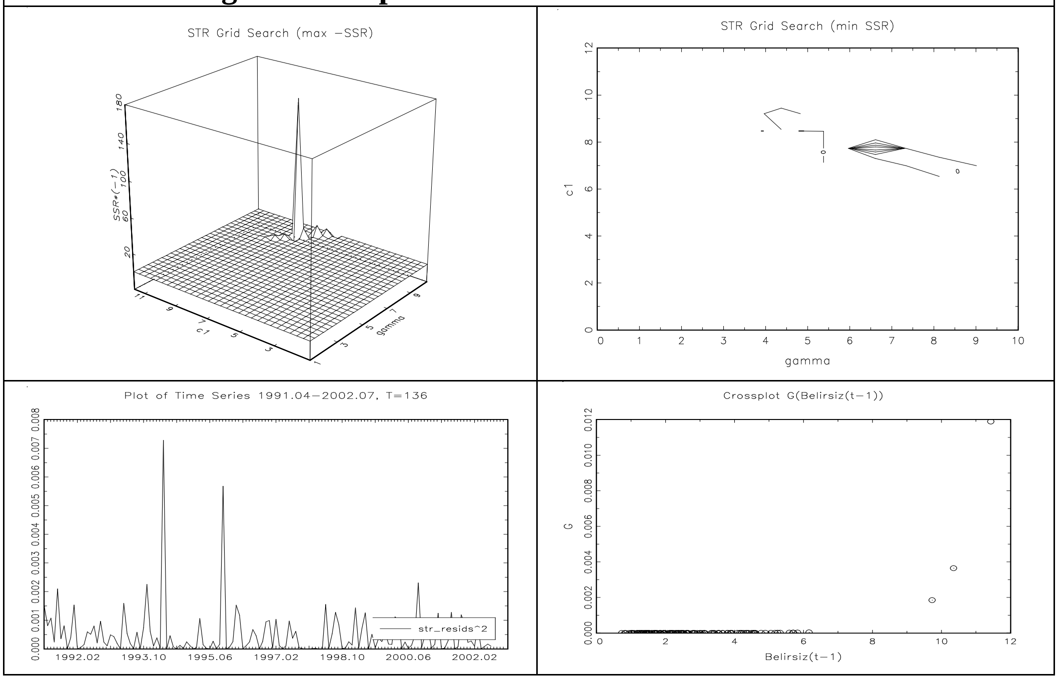
It is seen from the Figure 1 that the transition function for the *post*-2002: 07 period seems to exhibit a structural change. *Post*-2002: 07 period is a lower volatility period compared to the *pre*-2002: 07. To give some results for the STR estimation that is conducted by splitting the data into two sub-sections, 1990: 01 – 2002: 07 and 2002: 08 – 2012: 05: When the parameters are estimated by M2 for the *pre*-2002: 07 Unc_{t-1} is chosen as a transition variable with *F* (0.0000), *F4* (0.0000), *F3* (0.4004) and *F2* (0.0000) statistics and suggests the LSTR1 type model. Gamma variable is 1.9091 (0.0005) and location parameter is 15.4510 (0.0000). The *AIC* and adjusted R^2 statistics are -6.9274 and 0.9915 respectively. *SSR*, *gamma* and *c* are -156.4819, 6.6153 and 7.7398 respectively. *p*-values of the ARCH-LM test with 8 lags and Jarque-Bera statistics are 0.7710 and 0.0000. The suggested models for the *post*-2007: 07 are all linear.

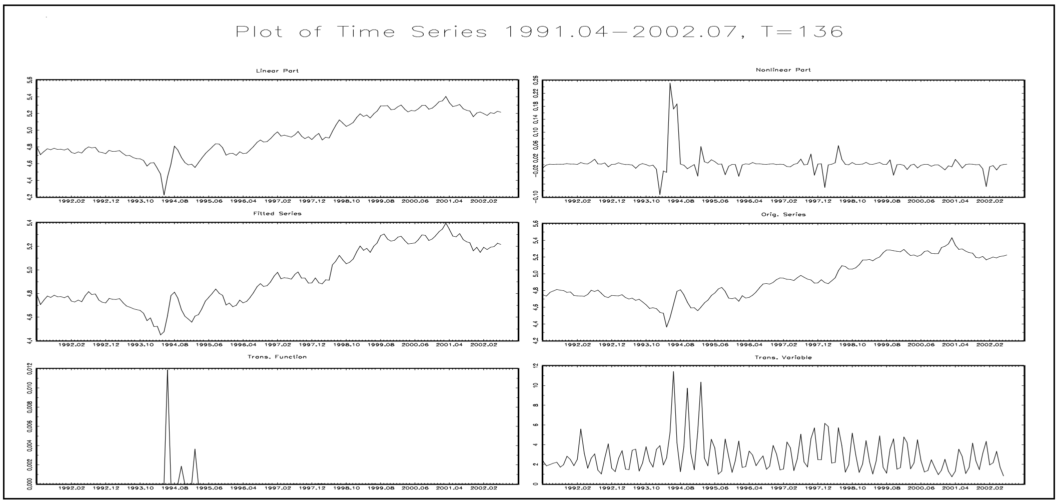
Table 2. STR Estimation Results

	Full Sample				*Pre* 2002:07 Sample			
Variables	Linear Part		Non Linear Part		Linear Part		Non Linear Part	
	Estimation	*p*-value	Estimation	*p*-value	Estimation	*p*-value	Estimation	*p*-value
CONST	-0.3210	0.1751	17516.7208	0.3571	2.2816	0.0032	683680.3408	0.0464
$M_{(t-1)}$	1.4651	0.0000	-28413.7111	0.2563	1.1000	0.0000	5306.3502	0.9016
$M_{(t-2)}$	-0.5229	0.0018	39638.8652	0.2599	-0.2351	0.0090	-25136.0199	0.5141
$M_{(t-3)}$	0.4865	0.0083	-29656.2583	0.2521				
$M_{(t-4)}$	-0.9218	0.0000	34791.6687	0.2522				
$M_{(t-5)}$	0.4679	0.0152	-36902.6868	0.2530				
$M_{(t-6)}$	0.3107	0.0798	12613.4692	0.3396				
$M_{(t-7)}$	-0.3217	0.0008	9458.8617	0.2943				
$Unc_{(t)}$	0.0030	0.6152	-381.9462	0.3760	-0.0057	0.0549	527.6552	0.6408
$G_{(t)}$	0.0029	0.9620	-310.8729	0.9438	0.0703	0.4499	-46216.4257	0.2192
$Exc_{(t)}$	-0.2772	0.2324	10273.2834	0.5875	-0.0908	0.7806	-185963.2428	0.1502
$R_{(t)}$	-0.0001	0.4657	18.2306	0.3548	0.0000	0.5943	-138.4011	0.0343
$Inc_{(t)}$	0.0192	0.5889	-7569.1043	0.2928	-0.1586	0.0001	18887.3251	0.3426
$S_{(t)}$	0.0274	0.3416	-1900.8713	0.3651	-0.0096	0.7004	8162.0178	0.4107
$Unc_{(t-1)}$	0.0020	0.6882	378.2535	0.4518	-0.0026	0.5325	-981.9055	0.2725
$G_{(t-1)}$	0.0744	0.4121	-9881.5558	0.3547	-0.2671	0.0433	-3244.7624	0.9545
$Exc_{(t-1)}$	1.1405	0.0002	-82271.0166	0.2700	0.0043	0.9927	-96274.4594	0.7022
$R_{(t-1)}$	0.0002	0.1793	-32.8057	0.2540	-0.0001	0.2135	-198.9753	0.0006
$Inc_{(t-1)}$	0.0369	0.3403	9693.9528	0.2545	0.0755	0.1189	-12045.8442	0.4956
$S_{(t-1)}$	-0.0693	0.1151	5184.5580	0.2826	0.0182	0.6761	-10190.2911	0.4301
$Unc_{(t-2)}$	-0.0027	0.5947	-253.8971	0.3324	-0.0043	0.1573	-461.9896	0.6888
$G_{(t-2)}$	-0.0919	0.3096	7265.9937	0.3496	0.0624	0.5087	1720.6589	0.9684
$Exc_{(t-2)}$	-1.0215	0.0024	77202.9775	0.2731	-0.1189	0.6618	142124.0848	0.3472
$R_{(t-2)}$	-0.0002	0.2849	9.0689	0.5876	-0.0003	0.0023	202.5166	0.0000
$Inc_{(t-2)}$	-0.1129	0.0031	9510.7786	0.2588	-0.0068	0.8540	-6385.3838	0.5848
$S_{(t-2)}$	0.0747	0.1068	-4947.5532	0.3081	0.0049	0.8553	1510.1518	0.8060
$Unc_{(t-3)}$	-0.0008	0.8915	23.9740	0.9054				
$G_{(t-3)}$	0.0375	0.6830	-1301.3314	0.8303				
$Exc_{(t-3)}$	0.3402	0.3770	-29359.3313	0.3626				
$R_{(t-3)}$	-0.0007	0.0027	107.3496	0.2379				
$Inc_{(t-3)}$	0.1173	0.0001	-14707.9225	0.2227				
$S_{(t-3)}$	-0.0173	0.7021	3350.3961	0.3507				
$Unc_{(t-4)}$	-0.0110	0.0457	659.9747	0.2795				
$G_{(t-4)}$	-0.1738	0.0689	6730.3452	0.4671				

Exc($_{(t-4)}$)	-0.7619	0.0366	69465.5718	0.2679				
$R_{(t-4)}$	0.0003	0.0501	-47.3645	0.2281				
$Inc_{(t-4)}$	-0.1809	0.0000	8748.3969	0.2395				
$S_{(t-4)}$	-0.0217	0.6814	-3540.1923	0.3995				
$Unc_{(t-5)}$	0.0043	0.3968	-702.1096	0.3370				
$G_{(t-5)}$	0.1850	0.0462	148.5697	0.9812				
$Exc_{(t-5)}$	1.0149	0.0011	-83456.6721	0.2448				
$R_{(t-5)}$	-0.0001	0.7327	-3.9831	0.8510				
$Inc_{(t-5)}$	0.0642	0.1131	-6579.0823	0.2504				
$S_{(t-5)}$	-0.0363	0.4304	6134.9437	0.2554				
$Unc_{(t-6)}$	-0.0009	0.8606	391.9186	0.2666				
$G_{(t-6)}$	-0.0350	0.6908	-2457.2254	0.6682				
$Exc_{(t-6)}$	0.0564	0.8762	5301.9295	0.8315				
$R_{(t-6)}$	0.0003	0.0000	-32.0523	0.2575				
$Inc_{(t-6)}$	0.0756	0.0805	-1525.8038	0.6569				
$S_{(t-6)}$	0.0369	0.3862	-5098.9596	0.2431				
$Unc_{(t-7)}$	0.0322	0.0127	-44.0827	0.8025				
$G_{(t-7)}$	0.0261	0.6996	-2720.5005	0.6018				
$Exc_{(t-7)}$	-0.3930	0.0822	26444.8657	0.3253				
$R_{(t-7)}$	-0.0001	0.2026	24.4974	0.2506				
$Inc_{(t-7)}$	0.0084	0.8116	2235.5612	0.4762				
$S_{(t-7)}$	0.0097	0.7377	741.6854	0.6072				

Figure 2. Graphs for the *Pre*-2002: 07 Estimation





3. Discussion

There are varieties of possible reasons concerning the nonlinear behavior in the money demand. For instance, Weintraub (1970, p. 251) and Chen and Wu (2005) claim that the money demand is not linear because of the transaction costs such as brokage fee. Michael *et al.* (1999) stress the role of non-convex costs for the rigidity in adjustment mechanism in money demand.

In this paper the possible effects of inflation uncertainty in terms of creating nonlinearity in money demand function is analyzed. According to Belke and Polleit (2009, p. 1), the reason of individuals using money is because of the uncertainty. They claim that if the future is certain, then the individuals would not hold money. The uncertainty may increase money demand, interest rates may increase and the bond prices may diminish (Bocutoğlu, 2011, p. 69). There are also several past theoretical and empirical considerations on the role of uncertainty. For instance Poole (1970, p. 485) stresses the role of uncertainty on the money demand and income relationship. Klein (1977) uses standard deviation to measure the inflation uncertainty and finds a positive effect for US economy. According to Klein (1977, p. 713), an increase in inflation uncertainty increases the money demand of the individuals. Khan (1982) uses inflation variability to measure the uncertainty for Pakistan economy and claims that the precautionary motive increases by the uncertainty. However according to him, the portfolio composition changes by the uncertainty and diminishes the money demand. Besides he claims that the latter channel is more dominant than the first. Asilis and Honohan (1993) explore a negative effect of inflation uncertainty that is measured by GARCH model for Bolivia. Mizrach and Santomero (1990) find a negative effect of inflationist risk measured by ARCH model on money demand for the US economy. Blejer (1979) tells that inflation uncertainty affects the money demand in two ways. Money demand may increase because of the precautionary motive and diminish because of the asset risks. According to him, high inflation increases inflation uncertainty for Argentina, Brazil and Chile and diminishes the money demand. Inflation may increase the level of inflation uncertainty therefore effects the money demand.

Friedman took money as a consumption good into account and considered it under asset price theory simultaneously. According to Friedman, one time price increase pushes the money demand up but continuous price increases diminish the money demand (Belke and Polleit, 2009, s. 105). According to Tunca (2011, p. 203) inflation rate increases the transaction motive of money demand. Inguva (1978) claims that the effect of inflation on nominal money demand is positive but negative for the real money demand. Calza (2011) tells that the low inflation increases the wealth level of agents therefore effects the money demand in the US economy. According to Bailey (1956, p. 100) firms pay more frequently to the workers during the high inflation periods.

The effects of inflation expectation are also considered by several authors. Rao and Singh (2006), by using Indian M1 data, suggest to use nominal interest rate rather than the real interest rate and claim that the expected inflation should have a negative effect on money demand. According to Blanchard (2011, p. 499-500) money demand may diminish by the diminish in expected inflation.

An increase in interest rate diminishes the money demand. This is consistent with Demiralp and Carpenter (2008, p. 15) whom are claiming that when the central bank increases the interest rates in Turkey, the demand deposit diminish and the time deposits increase. Consequently, when the interest rate increases money demand diminishes.

The exchange rate is also an other variable affecting the money demand function. Calvo and Reinhart (2000) claim that an increase in exchange rate in developing countries pushes the inflation up through the import channel and increases the inflation. Consequently, an increase in the exchange rate may increase the transaction motive of the money demand. On the other hand, the investment decision of the firms may be detorated and the net effect would depend on the dominance.

The coefficients for the gold are not significant but they are positive. The positive coefficient for gold is meaningful since it is one of the wealth determinants of the Turkish households. Ingbank (2012) survey that is supervised by Alpay Filiztekin and Şengül Dağdeviren tries to determine the saving behaviors in Turkey. According to their study, Turkish Lira, time deposit account, gold, (demand deposit, foreign currency or cash) are the most important saving tools in Turkey. The gold is the second most important saving tool and this results supports why the banking sector is highly interested in gold funds in Turkey. Equity shares, individual pension fund, funds, treasury bonds are the least used ones for saving purposes in Turkey. According to the survey, the ratio of individuals' saving is nearly 10%. Nearly 60% of the survey participants answered that the reason of their not doing saving was because of their low income levels. Nearly half of the individuals claimed that they increase their savings as an assurance in terms of unexpected situations. The ratio of the ones whom are increasing their savings to earn interest rate is nearly 5%.

A possible structural change is also considered in the paper. An economic structure may change and develop by the time being. For instance, it is apparent that the financial system of 1990s is much more complicated than the years 1970s as claimed by Mayer (1993, p. 43). Following these new developments, the dynamics of monetary aggregates and their behavior may also change.[1] The changing dynamics in the economy may also create an uncertainty.[2] Therefore it is meaningful to claim that for the *post*-2002 period, the suggested models are linear.

4. Conclusion

Money demand is the tendencency of the economic actors for holding their welfare as cash and bank deposit. Precautionary motive part of this tendency increases during the periods where the inflation uncertainty goes up. During the high inflation uncertainty levels individuals may tend to save more and this may affect the long-run adjustment of the money demand to its equilibrium level. Inflation uncertainty creates an asymmetry in money demand function. It is a dynamic process and it's case sensitive. The sensitivity of money demand is asymmetric and has a nonlinear structure.

The money demand function indicates a nonlinear behavior between high and low inflation uncertainty periods. During the high inflation uncertainty period, precautionary motive of money demand increases. Considering this nonlinearity may give several advantages to the policy makers during the decision making process. When the inflation uncertainty increases the central bank generally prefers a tight monetary policy. In times like these diminishing liquidity phases of the economy, the net liquidity would be determined by the net money supply. Since the money demand may increase by the lagged inflation uncertainty, central bank may also bethink this lag and its effect while taking decisions for the liquidity adjustment.

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[1] For example according to Bofinger (2001, p. 23), velocity of money diminished in the countries such as United States and Germany.

[2] For instance, according to Issing, Gaspar, Tristani and Vestin (2005, p. 16-17), establishment of the EMU is a structural change and created an uncertainty in the economy.

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