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The Relationship between Inflation and Inflation Uncertainty: Evidence from the Turkish Economy

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Abstract

In the present study, we examine the relationship between inflation and inflation uncertainty in Turkey from 2002 to 2011 using two-step procedure. At first step, ARMA-GARCH model of monthly inflation data is estimated and the conditional variance from these estimates is indicated as the monthly inflation uncertainty series. Then, the Granger causality tests between primarily inflation and generated inflation uncertainty series are performed. Empirical results of our study provided strong evidence in favor of the Friedman-Ball hypothesis that inflationary period result in high inflation uncertainty in Turkish case. These results present significant implications for the relationship between inflation and inflation uncertainly in developing countries as much as monetary policy adopted Inflation Targeting in Turkey.

Keywords: Inflation Rate; Uncertainty; GARCH; Monetary Policy; Turkey.

1. Introduction

Inflation is a significant phenomenon for every economy and also a subject of substantial interest in macroeconomics. Indeed, different aspects of inflation have been widely attracted the attention of the

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economists. Especially, there has been a huge debate on the relationship between inflation and its uncertainty since inflation uncertainty represents one of the major cost of inflation for real economy. Given the fact that expected inflation is a significant factor in an economic decision, economists need specially to focus on the relation between inflation and uncertainty about inflation. There exit different views about the route of this relation in economic literature although it is widely accepted that high level of inflation is harmful for all kinds of economic activities.

The main purpose of this study is to examine the relationship between inflation and inflation uncertainty in Turkey over the period 2002-2011. Following the study of Grier and Perry (1998) and Nas and Perry (2000), we have used the two-step methodology where in the first step GARCH models are estimated to generate a measure of inflation uncertainty and in the second carry out Granger causality test. After the collapse of the stabilization policy based on a Crawling Exchange Rate Peg, Turkey has adopted Inflation Targeting (IT) as a monetary regime after 2001. Thus, results of this study have significant implications for Turkish Inflation Targeting Regime as well as the literature focusing on the relationship between inflation and inflation uncertainly in developing countries.

The rest of the paper proceeds as following plan. Section 2 tries to determine the different hypothesis connecting between inflation and inflation uncertainty and indicate the related empirical results in literature. Section 3 presents data, methodological issues and empirical results. Final section concludes with summarizing the findings and offering the some policy implications.

2. Literature Review

Inflation uncertainty is a significant fact effecting the decision making of economic agents. Uncertainty about future levels of inflation may distort saving and investment decisions of economic units due to the value of future nominal payments to be unknown. Therefore, inflation uncertainty as the either reason or result of the inflation negatively affects economic variable like consumption, investment and growth. Accordingly, the relationship between inflation and inflation uncertainty has received substantial attention in economic literature. Okun (1971) firstly argued that inflation is positively associated with its standard deviation using annual cross-section data on 17 OECD countries for the period 1951 to 1968. According to Okun there is a positive correlation between inflation and inflation variability since monetary policy becomes more unpredictable during the period of high inflation. After Okun's study, Friedman (1977) outlined an informal argument regarding how an increase in inflation raises inflation variability in the case of unpredictable or stop-and-go monetary policy that accompanies inflationary periods. According to Friedman, high inflation produces political pressure to reduce it, but policy makers may be reluctant to disinflate because they fear the recessionary effects of contractionary monetary policy. Thus, since future monetary policy is more difficult for the public to predict in high inflationary periods, higher average inflation results in greater uncertainty about future inflation.

One of the significant corner stone of related literature, Ball (1992) constructed an economic model in a much more formal way to support Friedman's argument by using an asymmetric game perspective among the monetary authority and the public. Ball's model assumes two policy makers; one is willing to tolerate a recession to reduce inflation, and the other is not. For the low levels of inflation observed in the economy, both types of policy makers will attempt to keep inflation low. However, for the high levels of inflation, only the anti-inflation policy maker will bear the economic costs of disinflation. Thus, during the periods of high inflation, the public is uncertain about future monetary policy since they do not know whether their policy maker is an anti-inflation policy maker or not. After this contribution of Ball's Model to Friedman's argument, the positive relation from inflation to inflation uncertainty is called **Friedman-Ball Hypothesis.**

Considering the reverse linkage arguing that inflation variability leads to higher inflation, Cukierman and Meltzer (1986) run the causality from inflation uncertainty to inflation. They assume that policy makers have two different objectives determined stochastically over time. Central Banks prefer to either expanding output by making monetary surprises or keeping inflation at low levels. The money supply process is then assumed to be random due to imprecise monetary control mechanism. Moreover, policy makers may not always choose the most appropriate policy instrument available when they are free to determine the accuracy of monetary control. Especially, during periods of increased uncertainty, monetary policy is discretionary due to lack of a commitment mechanism and has increased incentive for acting opportunistically in order to stimulate output growth by making monetary surprises. Thus, inflation uncertainty leads to higher money growth rates and inflation than what is expected by economic agents due to opportunistic central bank behavior. This analysis arguing that higher inflation uncertainty leads to more inflation called **Cukierman and Meltzer Hypothesis**.

Another significant contribution concerning to relationship between inflation and inflation uncertainty is provided by Pourgerami and Maskus (1987). They demonstrate that there is a negative relation between inflation and inflation uncertainty, rejecting the harmful effect of high inflation on predictability of prices. Against to Friedman-Ball Hypothesis, they argue that higher inflation leads economic agents to invest more in generating accurate predictions, which reduces their prediction error. Therefore, with rising inflation, agents may forecast inflation better due to invest more resources for prediction process. In literature, describing the mechanism of relation from higher inflation rate to lower inflation uncertainty called **"Pourgerami and Maskus Hypothesis"**. Later, Ungar and Zilberfarb (1993) developed this approach by constituting the theoretical modeling of the assumption that agents expend more resource in forecasting inflation when inflation increases. With this way, they advocates the view that inflation itself generates a dynamic causing to much more anticipated level of prices and so decreasing the inflation uncertainty in the future.

As another significant corner stone of related literature, Holland (1995) suggests that higher inflation variability lowers inflation due to stabilization motives of policymakers. Holland found that inflation raises inflation uncertainty in the United States and that higher inflation uncertainty leads to lower average inflation, so-called "stabilizing Fed hypothesis". Holland assumes that stabilization tendency of central bank increases in high inflation period in order to decrease the cost of inflation uncertainty for economic agents. Thus, in the centre of Holland's argument, there is a policymaker who has a strong stabilization motive. By the rejecting of Cukierman-Meltzer's assumption, Holland asserts that short term opportunistic behavior in periods of inflation uncertainty cannot be accepted as the only possible policy response by the central bank. Monetary authority generally prefers to decrease the growth rate of money supply in order to eliminate the negative welfare effect of inflation uncertainty arising from higher inflation levels. For doing this, policy makers could either have a long-term stabling motives themselves or be governed by some commitment mechanism that requires price level stability. In conclusion, central banks attempt to reduce the welfare costs of inflation by disinflationary policies when inflation uncertainty is high. Thus, there exists a negative relationship between inflation uncertainty and average inflation, which called **"Holland Hypothesis".**

In the framework of different hypothesis indicated above, empirical studies analyzing the relationship between inflation and inflation uncertainty generally focused on developed countries. In these studies, Generalized Autoregressive Conditional Heteroskedasticity (GARCH) specifications are popular in empirical investigations of the inflation uncertainty since the estimated conditional volatility can serve as a proxy for uncertainty better. According to a comprehensive survey provided by Davis and Kanago (2000), studies focusing on industrialized countries mostly support to the Friedman-Ball Hypothesis much more than Cukierman–Meltzer Hypothesis while there is also very little evidence to advocate the Pourgerami and Maskus Hypothesis and Holland Hypothesis.

Fountas (2010) used a GARCH-in-Mean (GARCH-M) model enriched with lagged inflation in the conditional variance equation for annual historical data spanning over one century for 22 industrial countries. He found significant evidence for the positive effect of inflation uncertainty on inflation supporting the Cukierman–Meltzer hypothesis. Fountas et al. (2004), using EGARCH for five European countries, found that inflation causes inflation uncertainty for France and Italy, but not Germany and they find that uncertainty causes inflation for France and Germany with a negative sign. Conrad and Karanasos (2005), using a more complex form of GARCH model for the monthly data from 1962 to 2001, examined the inflation and uncertainty nexus in USA, Japan and the UK. With the application of the ARFIMA-FIGARCH approach, they found that inflation significantly raises inflation uncertainty as predicted by Friedman-Ball Hypothesis while results from Japan support the Cukierman-Meltzer Hypothesis. Grier and Perry (1998) explored the inflation and uncertainty nexus for G7 economies from 1948 to 1993 in a two-step procedure. They first fit GARCH model to generate a measure of inflation uncertainty and then use Granger causality approach to determine the relationship between average inflation and inflation uncertainty. They showed that inflation significantly raises inflation uncertainty in all G-7 countries as predicted Friedman and Ball Hypothesis. Additionally, Fountas and Karanasos (2007) used univariate GARCH models of inflation and monthly data for the G7 covering the 1957-2000 periods. Their two-step approach that firstly proxies uncertainty by the conditional variance of unanticipated shocks to the time series of inflation and then applies causality tests strongly leads to supporting of Friedman-Ball Hypothesis.

Concerning with the studies focusing on individual country case, Bhar and Mallik (2010) have investigated that inflation uncertainty increases inflation significantly in United States from 1957 to 2007 by using EGARCH-M model and Bivariate Granger causality test. Hwang (2001) explored the link of inflation with uncertainty in US for long series of monthly data over 1926 to 1992 with various ARFIMA-GARCH-type models. He found that the inflation affected its uncertainty weakly negatively whereas the uncertainty affected the inflation insignificantly. Thus, against to Friedman-Ball hypothesis, he argued that high rate inflation does not necessarily imply a high variance of inflation. Wilson (2006) has constructed a bivariate EGARCH-M model of Japanese inflation data spanning from 1957 to 2002 in order to examine the links between inflation, inflation uncertainty and growth. He indicated that increased uncertainty is associated with higher average inflation and lower average growth in Japan. Fountas (2001) estimated GARCH type processes using a long series of UK inflation data for the period 1885-1998. His result supports the Friedman-Ball Hypothesis and has also important implication that more inflation uncertainty leads to lower output. Kontonikas (2004) examined the relationship between inflation and its uncertainty by looking at the impact of inflation targeting policy for British Data over the period 1972-2002. Empirical results indicate a positive relationship between past inflation and uncertainty proxied using the estimated conditional volatility from symmetric, asymmetric and component GARCH-M models of inflation.

Recently, some emerging market economies have also been considered much more in the analyzing of relationship between inflation and its uncertainty. There seems to be agreement that support for the Friedman–Ball hypothesis is strong for both developed and emerging markets. Thornton (2007) employed a standard GARCH model to construct a measure of monthly inflation uncertainty in 12 emerging market economies over time spans of up to 48 years. The results mostly suggest that higher inflation rates increased inflation uncertainty in all the economies, providing strong support for the Friedman hypothesis. The evidence on the effect of inflation uncertainty on average monthly inflation was mixed. Ozdemir and Fisunoğlu (2008) analyzed the Jordanian, Philippine and Turkish CPI-based inflation series from 1987 to 2003 using an ARFIMA-GARCH type model to generate a time-varying conditional variance of inflation uncertainty. Test results suggest that increase in inflation raises inflation uncertainty, confirming the theoretical predictions made by Friedman and Ball. They also found weak evidence to support the effect of inflation uncertainty on the inflation as suggested by Cukierman and Meltzer.

Neanidis and Sava (2011) examined the cases of the new EU member states and candidate countries using a GARCH-M Model. They found that inflation uncertainty increases inflation in the majority of the countries in the pre-EU accession period which supporting to the Cuikerman-Meltzer Hypothesis. Jiranyakul and Opiela (2010) explore the linkage between inflation and inflation uncertainty in the Asian Countries (Indonesia, Malaysia, Philippines, Singapore and Thailand) over the period 1970-2007. Using EGARCH model and Granger causality test, they showed that inflation can lead to inflation uncertainty and uncertainty can lead to inflation. Thus, they support both Friedman- Ball and Cukierman- Meltzer Hypothesis. Payne (2008) used ARMA-GARCH models for Caribbean Countries to estimate inflation uncertainty along with Granger-causality tests to examine the causality between inflation and inflation uncertainty. The results for the Bahamas and Barbados support the Friedman-Ball Hypothesis whereas the results for Jamaica advocate Holland Hypothesis. Thornton (2008) examined the relationship between inflation and inflation uncertainty for Argentina's annual data between 1810 and 2005. Simple GARCH model analysis suggests a positive short run relation between the mean and variance of inflation. Grier and Grier (2006) estimate augmented multivariate GARCH-M model for Mexico between 1972 and 2001. They found strong positive statistical relationship between average inflation and conditional variance of inflation.

Concerning the studies focusing specially on Turkey, Nas and Perry (2000) constructed a time series of monthly inflation uncertainty in Turkey from 1960-1998 using GARCH models. Granger causality test for inflation and uncertainty presents that increased inflation significantly raises inflation uncertainty. They also found that the evidence on the effect of inflation uncertainty on average inflation is mixed and depends on the sample. Keskek and Orhan (2010) employed various GARCH-M models on inflation data over 1984 to 2005 in Turkey, instead of using a specific type of GARCH model. They had strong evidence in favor of Freidman-Ball Hypothesis, even after accounting for the effects of high seasonality on conditional variance. Telatar and Telatar (2010) used a time-varying parameter model of inflation with heteroscedastic disturbances to generate different sources of inflation uncertainty. Then Granger methods have been employed to test for causality between inflation and inflation uncertainty. They found that there is a causative influence of inflation on its uncertainty arising due to time-varying parameters of the inflation model. To sum up, it can be argued that the articles examining the nexus between inflation and its uncertainty in Turkey until now generally support the positive relationship between the inflation and its uncertainty.

3. Data, Methodology and Empirical Results

This study explores the linkage between inflation and inflation uncertainty in the Turkey over the period 2002–2011 under the Inflation Targeting Policy adopted following the collapse of the stabilization policy based on a Crawling Exchange Rate Peg in 2001. Inflation data consider monthly frequency observations and cover the period from 2002M01 to 2011M12. The inflation data (INF) are calculated as $[(CPI_t - CPI_{t-1}) / CPI_{t-1}]$ in its linear form. The primarily inflation data is sourced from the Central Bank of Turkey. In this part, we examine the summary statistics and time series properties of primarily inflation data. Following the Grier and Perry (1998) and Nas and Perry (2000), next sections will construct a time series of monthly inflation uncertainty (INFUNC) using ARMA-GARCH Model and investigate the link between inflation and inflation uncertainty by Granger Test.

Summary Statistics of inflation series are presented in Table -1. The value of Skewness indicates quite asymmetry of the distribution of the series around its mean while the value of kurtosis indicates that the distribution would be peaked relative to the normal. Thus, the degree of skewness and kurtosis reveal deviations from the normality assumption. The deviation from normality is also confirmed by the large values of the Jarque-Bera statistics.

Table-1: Summary Statistics

Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-BeraTest
0,012413	0,008991	0,016672	2,453819	10,60022	47, 165* (0,007)

* Implies significance at 1% level

In order to test whether the inflation series is stationary or not, we employ conventional augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) unit root procedures. Table-2 shows the test results indicating that both tests of ADF and PP reject the unit root null hypothesis. Thus inflation series is stationary and integrated at level which is I (0). Consequently, we concern the monthly inflation data in our empirical analysis as a stationary process over the 2002-2012 periods. A stationary series possesses the characteristic that the effects of a given shock will die out overtime, with the series reverting to its long-run mean. This property of primarily inflation data (INF) allows us to estimate the inflation uncertainty (INFUNC) using them in the framework of ARMA-GARCH model specification.

Table-2: Unit Root Test

Augmented Dickey-Fuller (ADF)		Phillips- Perron (PP)	
Intercept	Intercept & Trend	Intercept	Intercept & Trend
-6.804*	-6.975*	-22.46*	-22.18*

* Implies significance at 1% level

3.1. Estimation of Inflation Uncertainty

Following the preliminary inflation data issues examined in the former section, we are producing the inflation uncertainty series using a general ARMA-GARCH model now. In other words, we try to estimate the conditional mean and variance equations of the inflation series for generating inflation uncertainty series following Grier and Perry (1998) and Nas and Perry (2000). Accordingly, most modern investigations of inflation uncertainty employ GARCH models. The first step in developing the GARCH Model is specifying the mean equation in the form of ARMA. In an ARMA Model, process of inflation series, **π**, is function of not only weighted aggregation of its lagged value (AR) but also current and lagged value of error term (MA). Equation (1) presents the ARMA model in general form for the inflation series as follows:

$$\pi = \delta + \sum_{i=1}^{m} \Phi_i \, \pi_{t-i} + \varepsilon_t + \sum_{i=1}^{n} \theta_i \, \varepsilon_{t-i} \qquad (1)$$

Equation *(1)* is a standard time-series model of inflation (**π**), where the conditional mean of inflation is assumed to follow an autoregressive, moving average (ARMA) process. Inflation at time t is simply a function of past values of inflation (AR terms) and past values of the error term (MA terms). In other words, an ARMA process is a stationary autoregressive-moving-average process with (m) autoregressive lags and (n) moving average lags. Using standard Box-Jenkins techniques, we specified an ARMA model for monthly Turkish inflation series over 2002M01-2011M12. In this context, all information statistics propose the Turkish inflation series in the mean equation as an AR (1) and MA (1) process.

The test results of Turkish inflation modeling with ARMA (1,1) are presented in Table-3. The coefficients of autoregressive, AR (1), and moving average, MA (1), satisfy the stationary and invertibility conditions. The model exhibits predictive power with the statistical significance of the overall F-statistics at the 1 percent level. The residuals are free of serial correlation based on the statistical insignificance of the Ljung-Box Q-statistics at one, four and eight lags Q (1), Q (4) and Q (8). The absence of serial correlation in the mean equation is important in order to adequately test whether the residuals do exhibit time-varying variance. However, given the statistical significance of the chi-square test statistics at one, four and eight lags, LM (1), LM (4) and LM (8), the presence of autoregressive conditional heteroscedasticity in the residuals is very clear.

Table-3: ARMA Model Results for Inflation Series

Mean Equation	Coefficient	Std. Error	Prob.
C	0.312	0.071	0.0040*
AR (1)	0.889	0.013	0.0000*
MA (1)	- 0.911	0.032	0.0000*
Model Diagnostics	R-squared	F-statistic	Prob. (F-statistic)
	0.653066	114.7911	[0.0000] *
Q Test	Q(1)	Q(4)	Q(8)
	0.714 [0.623]	1.3762 [0.445]	3.357 [0.301]
LM Test	ARCH (1)	ARCH (4)	ARCH (8)
	77.56 [0.003] *	84.148 [0.000] *	93.451 [0.000] *

* Implies significance at 1% level

ARMA Model Results for Inflation Series shows that the residuals exhibit no serial correlation, but they do exhibit heteroskedasticity, the latter of which characterizes ARCH effects. Under these data characteristics, the GARCH specification is deemed suitable to generate a conditional variance series as a measure of inflation uncertainty. Bollerslev (1986) presents the GARCH model in general form as follows:

$$\sigma_t^2 = \omega_0 + \sum_{i=1}^{p} \alpha_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_i \, \sigma_{t-j}^2 \qquad (2)$$

In GARCH (*p,q*) model indicated by the equation (2), there are *p* lagged forms of the squared error term and *q* terms of the lagged conditional variances. The coefficients α_i and β_i are all assumed to be positive to ensure that the conditional variance σ^2 is always positive. Thus, the conditional variance σ^2 in a GARCH model is defined as a function of the past squared error terms ε_{t-i}^2 and the conditional variance of past periods σ_{t-j}^2. If the sums of α_i and β_i have values close to one, the volatility is highly persistent and has a mean reverting property. Accordingly, after considering other representation of GARCH process we find that GARCH (1,1) is the best. The mean equation is augmented to incorporate the presence of time-varying in the residuals using the GARCH (1,1) specification as follows:

$$\sigma_{\varepsilon t}^2 = \omega_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{\varepsilon t-1}^2 \qquad (3)$$

In Equation *(3),* the conditional variance of inflation, $\sigma_{\varepsilon t}^2$, is our GARCH measure of inflation uncertainty. Thus, the GARCH (1,1) model of $\sigma_{\varepsilon t}^2$ implies that the conditional error variance of inflation at time *t* depend on the squared error from the inflation equation in time period *t-1* and the conditional variance from time period *t-1*. Thus GARCH model estimates a time-varying residual variance as a measure of inflation uncertainty (Nas and Perry, 2000:172).

The test results of the GARCH (1,1) specification are shown in Table 4. The models exhibit productive power with the statistical significance of the overall F-statistics at the 1 percent level. Furthermore, the residuals are free of both serial correlation and autoregressive conditional heteroskedasticity in terms of Q Test and LM Test, respectively. The stationary and invertibility conditions for the respective autoregressive and moving average coefficients are satisfied in the mean equations. The coefficients for the ARCH and GARCH terms in the conditional variance equations are also statistically significant at the 1 percent level. The sum of the coefficient for the ARCH (0.133) and GARCH (0.744) terms equal nearly one (0.877), which exhibits a high degree of volatility persistence in response to inflationary shocks. Thus, GARCH Model of inflation was properly estimated and the conditional variance from this estimate can be used inflation uncertainty.

Table-4: GARCH Model Results for Inflation Series

Mean Equation	Coefficient	Std. Error	Prob.
C	0.278	0.917	[0.004]*
AR (1)	0.931	0.029	[0.000]*
MA (1)	-0.817	0.054	[0.000]*
Variance Equation	Coefficient	Std. Error	Prob.
C	0.049	0.048	[0.003]*
ARCH (1)	0.133	0.036	[0.001]*
GARCH (1)	0.744	0.042	[0.000]*
Model Diagnostics	R-squared	F-statistic	Prob. (F-statistic)
	0.68491	48.96341	[0.000]*
Q Test	Q(1)	Q(4)	Q(8)
	1.408 [0.533]	3.322 [0.447]	4.022 [0,377]
LM Test	ARCH (1)	ARCH (4)	ARCH (8)
	1.25 [0.470]	3.41 [0.303]	5.34 [0.283]

* Implies significance at 1% level

3.2. Granger Causality Test

In this section we carry out Granger-causality test within the bivariate vector autoregression (VAR) model for the relation between inflation and inflation uncertainty. For this aim, we use primarily inflation series and the conditional variance series estimated from the GARCH model as proxy for inflation uncertainty. The bi-variety regression function for testing the Granger Causality between inflation (INF) and inflation uncertainty (INFUNC) is as follows.

$$INF_t = C_0 + \sum_{i=1}^{n} INF_{t-i} + \sum_{i=1}^{n} INFUNC_{t-i} + \varepsilon_t \tag{4}$$

$$INFUNC_t = C_0 + \sum_{i=1}^{n} INFUNC_{t-i} + \sum_{i=1}^{n} INF_{t-i} + \mu_t \tag{5}$$

Where (Co) denotes the constant term in the Granger regression, (n) represents the lag length chosen for the causality analysis. The Granger causality test determines whether one variable is useful in forecasting the other or not. The null hypothesis in equation *(4)* is that inflation uncertainty does not granger cause inflation. Likewise the null hypothesis in equation *(5)* is that inflation does not granger cause inflation uncertainty.

The results of Granger-causality Tests are reported in Table -6. Probability values are reported in the brackets while (+) and (-) signs indicate the values concerning with the sum of the coefficients in Granger equations. The null hypothesis that inflation does not Granger-cause inflation uncertainty is rejected at the 1 percent level across 4 and 8 lags and 5 percent level at 12 lags. These results support the Friedman-Ball Hypothesis that an increase in inflation causes an increase in inflation uncertainty. Concerning the impact of inflation uncertainty on inflation, the null hypothesis that inflation uncertainty does not Granger-cause inflation is not rejected across all signs and lags. These results show that, in spite of the Inflation Targeting Commitment of Central Bank of Turkey during the period of 2002-2011, the causality relationship from inflation to inflation uncertainty strongly exits. Therefore, it is clear that Inflation Targeting commitment of Central Bank of Turkey has not decreased the policy-regime uncertainty as well as the inflation uncertainty enough.

Table-6: Granger-causality Tests

Null Hypothesis: Inflation does not Granger-cause inflation uncertainty		
4 lags	8 lags	12 lags
17.32 (+) [0.000]*	11.48 (+) [0.003]*	9.33 (+) [0.040]**
Null Hypothesis: Inflation uncertainty does not Granger-cause inflation		
4 lags	8 lags	12 lags
0.586 (+) [0.411]	0.314 (+) [0.873]	0.682 (-) [0.391]

*, ** denotes significance levels at 1% and 5% respectively.

4. Conclusion

This study explores the linkage between inflation and inflation uncertainty in Turkey over the period 2002:01–2011:12 by using the “two-step methodology”. Accordingly, in the first step inflation uncertainty is estimated as a conditional variance in an ARMA-GARCH model. Secondly, we carry out Granger causality tests between primary inflation series and generated inflation uncertainty. Granger causality tests show that rising inflation increases inflation uncertainty, providing empirical support for Friedman's hypothesis.

These results can be compatible with the studies on industrialized countries, which often show strong support for the Friedman hypothesis. Thus, our study provides a new contribution from Turkish case to the general agreement that Friedman–Ball hypothesis is strong for both developed and emerging markets.

These results also show that inflation is still a significant factor determining the inflation uncertainty although inflation rates decrease under Inflation Targeting Monetary Policy Commitment after 2001 in Turkey. It seems that inflation targeting commitment of central bank of Turkey cannot decrease the policy-regime uncertainty in the eyes of economic units enough. Given the our empirical result concerning relationship between inflation and its uncertainty, Turkish monetary authorities should attempt much more to keep inflation stable and low than the performance they have made until now.

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