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The asymmetry of inflation adjustment in Turkey

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ABSTRACT

We investigated the dynamic behavior of the overall inflation rate, its subgroups, and inflation rates of traded and non-traded goods in Turkey between 1994:M1 and 2012:M5 by using a quantile autoregression approach developed by Koenker and Xiao (2004). This method makes no assumptions about the distribution of inflation rates and allowed us to analyze possible asymmetry in mean reversion toward the equilibrium for inflation rates. Our results revealed an asymmetric speed in the inflation adjustment process across different quantiles before and after an inflation targeting (IT) regime (implicit and explicit); persistence relatively decreased after adoption of implicit IT in 2002 or explicit IT and inflation rates became much more mean reverting.

1. Introduction

After experiencing a high level of inflation for more than 25 years, the Central Bank of the Republic of Turkey (CBRT) has had an explicit mandate to achieve and maintain low and stable inflation as its main objective since 2002, when the CBRT adopted its implicit inflation targeting (IT) regime. In the light of this mandate, many macroeconomists have paid considerable attention to analyzing the inflation process in the Turkish economy because the dynamic behavior of inflation has a number of economic implications.

To analyze the inflation process, empirical studies have generally used the unit root testing approach in addition to the vector autoregressive (VAR) model and error correction model (ECM). Two underlying assumptions characterize these studies: First, regardless of whether inflation is above or below its steady-state level and regardless of the size of the negative or positive shock that hits inflation, the speed of inflation adjustment toward its equilibrium is invariant throughout the sample period and, second, inflation has normal distribution. However, since the first assumption solely distinguishes inflation between a unit root and a stationary process, it prevents a detailed inquiry on inflation dynamics. On the other hand, inasmuch as the inflation rate frequently has non-normal distribution because of outliers, the standard unit root testing approach might result in biased estimations for the advantage of a unit root instead of robust estimation results.[2]

This research called into question these two assumptions and investigated the asymmetry of the inflation adjustment process in Turkey in line with Koenker and Xiao (2004), who made use of the quantile autoregression method. Tsong and Lee (2011) tailored this method to the inflation adjustment process for 12 Organization for Economic Co-operation and Development (OECD) countries while others employed it on real exchange rates and nominal interest rates.[3]

Several reasons to use this methodology instead of traditional equivalents exist. Previous methods have concentrated on the constant speed of inflation adjustment with conditional mean function, regardless of whether the inflation was above or below its long-run value or the size of the negative or positive shock that hits the inflation. This method, however, allows for different and asymmetric speed of inflation adjustment across different quantiles of its distribution. The existence of such a difference and asymmetry indicates that the speed of adjustment toward the long-run equilibrium may differ with the magnitude of the shock (positive or negative). In addition, this model allows the researcher to measure the tendency of mean reversion based on the size of the

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[2] Charemza and Hristova (2005) indicated that distribution of inflation which is significantly different from normal distribution has leptokurtic distribution, which means that it has a higher peak and heavier tails than the normal distribution. Koenker and Xiao (2004) indicated that when a series is distributed non-normally, commonly used unit root tests might demonstrate weak performance and might bias test results in favor of a unit root.

[3] This method was developed by Koenker and Xiao (2004) in relation to nominal interest rates and then tailored for real exchange rates by Nikolaou (2008).

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Table 1
Inflation rates and their shares in 2012 (%).

Overall inflation	100.00
Food–beverages–tobacco	31.43
Clothing–footwear	6.87
Housing	16.44
Furnishing–household equipment	7.45
Health	2.29
Transportation	16.73
Recreation–culture	2.98
Education	2.18
Hotels–cafes–restaurants	5.63
Miscellaneous goods and services	8.03
Traded goods	71.94
Non-traded goods	28.06

Obtained from TurkStat.

shock that causes inflation to deviate from its steady-state level. On the other hand, although the inflation rate is currently relatively low and stable in comparison to the past, the Turkish economy has experienced high inflation periods, especially before the adoption of IT, and inflation rates ranged from 22.01% (1994:M4) to −0.56% (2010:M5) between 1994 and 2012; this means that the inflation rate's variety is too high and it has some outliers. This method, however, produces robust estimates, particularly for misspecification errors related to non-normality and for the presence of such outliers. Finally, it also allows the researcher to focus on specific parts of the conditional distribution of inflation, which means that the quantile autoregression estimator provides one solution for each quantile. In other words, the inflation rate might have a unit root at one or more specific quantiles, but not at others.

In this study, we applied the quantile autoregression approach to Turkey, which was interesting in a number of ways. First, the Turkish economy is a good case of a small-open economy. Second, following a long experience of crises from the 1970s through 2001, the Turkish economy has attained a fairly stable structure over the last decade, after the ambitious stabilization program of 2001 fostered a considerable degree of price stability. Finally, Turkish economic policymakers enjoyed a high degree of flexibility during the 2008–2011 crisis owing to developments of the last decade. Our data set consisted of monthly consumer price index (CPI)-based inflation rates and covered the period from 1994:M1 through 2012:M5. By applying the quantile autoregression approach, we estimated persistence parameters for each specific quantile. Regarding the quantile approach, our analysis suggested that the inflation rates in general display non-unit root behavior and the speed of mean reversion in the inflation rates varies under different magnitudes and signs of shock.

The paper is organized as follows: Section 2 discusses the existing literature on inflation dynamics; Section 3 introduces the quantile autoregression framework; Section 4 describes the data and preliminary data analysis and presents empirical results from the quantile approach; Section 5 concludes the article.

2. Literature on inflation dynamics

Over the last two decades, important changes in inflation dynamics have occurred in Turkey. When current figures are compared to past figures, one can see that the most notable difference is relatively low and stable inflation rates, especially since 2004. Since inflation plays a key role in many macroeconomic models and inflation persistence has immediate consequences for monetary policy, understanding the patterns and determinants of inflation persistence becomes critically important for economists and policymakers. Related to the changing dynamics of inflation rates, therefore, the main goal of our paper was to understand the speed and pattern of inflation adjustment in response to shocks of different nature by using the quantile autoregression method instead of conventional counterparts.

Inflation persistence refers to the tendency of inflation to converge slowly toward its long-run level after a shock. Inflation is persistent when the speed of convergence to the equilibrium after a shock is low and inflation is not persistent when the speed is high. Various factors may lie behind such a slow adjustment of inflation, including inflationary expectations, relative price adjustments, institutional arrangements that support the indexation of wages and financial contracts, and monetary and exchange rate policy frameworks.[4] With this theoretical perspective, many empirical studies have been conducted on the inflation adjustment process for the Turkish economy and world economies.

Early literature, especially on world economies, concentrated solely on whether or not the inflation had a unit root process by using univariate unit root tests. Some studies did not consider changes in the degree of inflation persistence and failed to provide empirical evidence to support the mean reversion of inflation rate,[5] while others suggested that inflation is stationary.[6] Levin and Piger (2004) indicated that inflation persistence models that do not take into account structural breaks caused by changes in monetary policy regimes may result in biased test results that favor a unit root. Researchers have found strong evidence in favor of mean reversion in inflation rates for 12 industrialized countries when they have considered structural breaks via the Chow test. Cechette and Debelle (2006) applied the same method to consider structural breaks used in the Quandt-Andrews test and their results suggested that shocks to inflation are not persistent. Taylor (2000) and Ball and Sheridan (2003), among others, also achieved similar results.[7] In contrast, O'Reilly and Whelan (2005), Batini (2006), and Pivetta and Reis (2007) found that inflation has close to a unit root process and there is no clear reduction in inflation persistence, even if rolling window estimation methods are employed.

The empirical studies on the Turkish economy do not agree on whether or not inflation is mean reverting. Many studies have indicated that inflation has strong persistence in Turkey. By employing VAR models, Alper and Ucer (1998) suggested that Turkish inflation persistence was high from the mid-1980s until 1997. Similarly, using the ECM model, Tutar (2001) indicated that producer price inflation has a unit root process. Baum et al. (1999) found strong evidence in favor of a unit root in Turkey for both consumer and producer inflation after analysis of 27 countries' inflation data. Erlat (2001) investigated the dynamics of inflation persistence using autoregressive fractionally integrated moving average (ARFIMA) models and suggested that both consumer and producer inflation series are essentially stationary but generally have significantly long memory components. Ozcan et al. (2004) investigated the inertia in consumer inflation by using univariate techniques (namely, autoregression, unit root, and variance ratio tests) and found strong inertia in the Turkish economy. Using the spectral regression method, Altinok et al. (2009) reported that consumer inflation in Turkey is more persistent than producer inflation. Considering a structural break, Oguz (2010) demonstrated that Turkish inflation persistence declined between 1995 and 2009 in both consumer inflation and its subgroups.

Since the aforementioned studies only focused on the average behavior of the inflation rate, they could not capture the effects of

[4] Ozcan et al. (2004) indicated that the determinants of inflation persistence can be separated into two categories. The first is indexation, which is related to the wage adjustment process, and the second is the inflationary process, which is related to exchange rate-based stabilization programs.

[5] Such as Ball and Cacchetti (1990), Crowder and Hoffman (1996), Crowder and Wohar (1999), Camarero et al. (2000), Ng and Perron (2001), Clarck (2003), O'Reilly and Whelan (2005), Paya et al. (2007), and Ho (2009).

[6] Such as Baillie et al. (1996), Rose (1998), and Edwards (1998).

[7] Bilke (2005), Cogley and Sargent (2005), Capistran and Ramos-Francia (2007), Kumar and Okimoto (2007), Benati (2008), Beechey and Osterholm (2009), and Zhang and Clovis (2010).