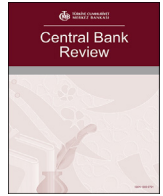


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ABSTRACT

Asymmetric volatility is a widely encountered concept particularly in financial series. It refers to the case that “bad news” generates more volatility than “good news” of equal magnitude. In an inflationary environment “bad news” is disclosed as increasing inflation that is expected to generate higher volatility. The present article examines whether unexpected price changes affect the volatility of prices asymmetrically for 90 retail food items of the Turkish consumer price index. These 90 food items have a weight of approximately 20 percent in headline consumer price index (CPI). We employ exponential generalized autoregressive conditional heteroscedastic (EGARCH) model to extract asymmetric volatility, using monthly data between January 2003 and January 2017. Our results reveal that volatility of food prices respond asymmetrically to unexpected price shocks for 62 percent of the retail food items.

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1. Introduction

Food price volatility has become one of the hot topics for researchers and policy makers within the last decade due to its detrimental effect on macroeconomic stability, productivity of food prices and general well-being of consumers. It is well documented that increase in price volatility, which has distortionary effects on the welfare of both consumers and producers, affects the ability of market participants to forecast prices. In an inflationary framework, modelling price volatility inevitably translates into having proper information about inflation uncertainty, where the concept of “uncertainty” is proxied by volatility. There is a vast literature on the relation between inflation and inflation uncertainty, which has gained momentum with the increasing number of central banks implementing inflation targeting regime. The pioneering study in this field is that of [Friedman \(1977\)](#) designating a positive causality between the

level of inflation and inflation uncertainty, with higher inflation leading to greater uncertainty. [Ball \(1992\)](#) formalizes Friedman's argument in the context of an asymmetric information game between the public and the policy maker.¹

Majority of the literature on the relation between inflation and inflation uncertainty employs both symmetric and asymmetric GARCH models. The impact of the news on volatility is captured by asymmetric GARCH models. While most of the studies on asymmetric news impacts in economic literature are on financial markets and other areas of macroeconomics, i.e. foreign exchange markets, there are some major studies that apply symmetric and asymmetric volatility models to inflation and one of those studies is by [Kontonikas \(2004\)](#) who analyses the inflation and inflation uncertainty in UK. His results support the Friedman-Ball hypothesis and he shows that inflation decreases with inflation

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uncertainty which is asymmetric after the implementation of the inflation-targeting regime in UK. Another study is by [Fountas et al. \(2004\)](#), who analyze inflation and inflation uncertainty for the six European Union countries for the period 1960–1999, taking asymmetry in inflation uncertainty into consideration. While Friedman's hypothesis holds for countries except Germany, the asymmetric terms in their volatility equations are found to be significantly positive and authors discuss that such a result stems from the tough commitment of German monetary authority to price stability.²

Univariate and multivariate GARCH type of models are used in economic literature very frequently to model the agricultural price volatility. [An et al. \(2016\)](#) use a multivariate GARCH model to analyze the volatility, asymmetry and spillovers among wheat and flour prices. [Minot \(2014\)](#) uses GARCH(1,1) model to examine the volatility of 167 food price series from 15 African countries. [Rezitis and Stavropoulos \(2010\)](#) employ several different symmetric, asymmetric and non-linear GARCH models to estimate volatility for the Greek beef market. [Gardebroeck et al. \(2016\)](#) use multivariate GARCH approach to evaluate the time evolution and volatility transmission across corn, wheat and soybean price returns on a daily, weekly and monthly basis. [Ait Sidhoum and Serra \(2016\)](#) employ a multivariate GARCH model to study price transmission between consumer, producer and wholesale prices in the Spanish tomato market.³

The effect of news on volatility is motivated by the pioneering works of [Pagan and Schwert \(1990\)](#) and [Engle and Ng \(1993\)](#). In their study, [Engle and Ng \(1993\)](#) define the news impact curve which measures how new information is incorporated into volatility estimates. The news impact curve depicts the impact of an unexpected shock on next period's volatility such that the impact of good and bad news are reflected on either sides of the curve with different slopes. The closest study to our paper is by [Zheng et al. \(2008\)](#), who analyze the volatility and the news impact with a particular focus on asymmetric news effects for the US food market. Across 45 retail food items, they find that price news destabilizes about a third of the markets such that unexpected price increases contribute more to the price volatility compared to unexpected price decreases.

Global food price and volatility became more remarkable especially after the effects of serious food crisis of 2008 and 2011.⁴ However, in Turkey food prices started to fall after 2011 and in February 2016 food prices dropped to a lowest value experienced after 2010. Shortly after, the food prices in Turkey reached its peak value in January 2017, deviating from historical trends and international food prices significantly. We observe a surge of 7.67 percent between January 2016 and January 2017 in food prices, while annual CPI inflation is found to be 9.22 percent. Since food items have the highest weight in the CPI basket (20.17 percent for year 2017), the path they follow has particular importance for policy makers.⁵ The divergence of domestic food prices in Turkey from international levels is documented by [Akcelik et al. \(2016\)](#). They show that the level of divergence from European Union price levels and their volatility has been

increasing since the global food crisis. [Ogunc \(2010\)](#) also shows that the volatility of the food prices in Turkey, particularly that of unprocessed food items, has been above that of CPI within the last decade.⁶

For Turkey, it is well documented that the path of the unprocessed food items is the main factor behind the quick surge of the food prices.⁷ In this vein, [Atuk and Sevinc \(2010\)](#) state that fresh fruits and vegetables in the CPI basket distinguish from others with their strong seasonality and the accompanying level of high volatility. They suggest that using constant weights would help diminish the volatility of CPI. [Orman et al. \(2010\)](#) also state that unprocessed food items exhibit a more fluctuating pattern compared to other sub-groups in the CPI basket. They attribute this observation to some structural factors such as high level of the dependency of production on climate conditions, high number of intermediaries, uncertainties around public support to agriculture, insufficient level of monitoring by the government, concentration of production in certain regions and fluctuations in external demand.⁸ They conclude that a stable path could be attained by the implementation of medium to long-run policies.

In Turkey, an evaluation committee for food prices was indeed established in 2014 to implement medium to long-run policies, while the official secretariat of the committee was transferred to the Central Bank of Republic of Turkey in December 2016. The "Food Committee" specifically examines every item with increasing price and volatility while presenting policy suggestions for different horizons. Due to their unpredictable and volatile pattern, the Committee closely tracks the prices of unprocessed food items, the prices of fresh fruits and vegetables in particular. The Committee has also designed and employed an early warning mechanism for this purpose.

In this respect, similar to [Zheng et al. \(2008\)](#), this paper examines whether asymmetric news effects exist for 90 retail food items in Turkish food market. We choose 90 food items, which have a share of 19.87 percent in total consumer price index (CPI), out of total number of 129 items under headline CPI of Turkey. These 90 items have a share of 91.3 percent within the food prices of CPI and the choice is made considering data availability, i.e. we eliminate 39 items as they have missing data.⁹ This study is essential as the existence of possible asymmetry in the behaviour of price volatility in the retail food prices of Turkey is so far unknown and such asymmetry in the retail price volatility can help policy makers to take some measures to meet the targets and also give useful information about retail market power. To the best of our knowledge, our paper is the first to observe news impact for the

⁶ [Ogunc \(2010\)](#) examines the structural problems behind price volatility in Turkey, suggesting that long chains of logistics, vastness of informal economy, structural problems in irrigation, storage and packaging capacities contribute to the high level of volatility in prices. In addition to them, absence of big producers who would not have financial problems in mitigating sudden shocks, insufficient capacity of insurance for farmers and big numbers of sellers in the retail sector are also listed as structural problems leading to highly volatile food prices.

⁷ Close examination of the Central Bank of the Republic of Turkey's (CBRT) inflation reports, summary of monetary policy meetings and open letters written to the government illustrate that the main focus has been the rapid increase in food prices and especially their volatility that are outside the control of CBRT.

⁸ Since 2016 the vulnerability of the unprocessed food items to external demand has been explicitly experienced with the restrictions imposed on Turkish exports of food products to Russia. Even though decreasing exports is considered to have favorable effects on domestic inflation, accompanying fluctuations and increase in volatility have become inevitable.

⁹ Some items like peach do not have price data available for winter as they are only produced and consumed in the summer, therefore we excluded those type of seasonal food items. There are some other items that have been included in the CPI basket just recently and those items are also excluded from the analysis.

² Other papers that have results for asymmetric effect on prices include [Zheng et al. \(2008\)](#) and [Rezitis and Stavropoulos \(2010\)](#).

³ Some other studies on price volatility include [Apergis and Rezitis \(2003a,b,c\)](#), [Fousekis and Grigoriadis \(2016\)](#), [Gouel \(2013\)](#), [Jha and Nagarajan \(2002\)](#), [Yang et al. \(2003\)](#) and [Rude and An \(2015\)](#).

⁴ See [FAO \(2016\)](#) for details.

⁵ We observe that, due to their weight in the basket, the changes in the price of certain items such as fresh fruit and vegetables and veal became more prominent in the last couple of years. The price of veal for example rose by 146 percent between January 2009 and January 2017.

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