https://doi.org/10.17221/261/2017-AGRICECON

Macroeconomic impacts of global food price shocks on the economy of Turkey

Ayhan KAPUSUZOGLU[1], Xi LIANG[2], Nildag Basak CEYLAN[1]*

[1]*Department of Banking and Finance, Faculty of Business, Ankara Yildirim Beyazit University, Turkey*
[2]*Department of Accounting and Finance, Business School, The University of Edinburgh, United Kingdom*

*Corresponding author: nbceylan@ybu.edu.tr

Kapusuzoglu A., Liang X., Ceylan N.B. (2018): **Macroeconomic impacts of global food price shocks on the economy of Turkey**. Agric. Econ. – Czech, 64: 517–525.

Abstract: The purpose of this study is to examine the impact of food prices on the macroeconomic variables of Turkey. The effects are investigated using monthly data for the period January 1980–January 2016. A structural vector autoregressive (SVAR) model is employed for the analysis. Impulse response functions are obtained to assess the impact of food price shocks on the macroeconomic variables of Turkey. To this end, SVAR model is employed as suggested by Cushman and Zha (1997). The impulse responses gathered suggest that the food price causes Turkish Lira (TRY) to appreciate and inflation to increase contemporaneously. This study provides an important contribution to the literature in terms of determining the factors and presenting the measures to be taken against these factors for Turkey which is a developing country and sensitive to macroeconomic factors.

Keywords: agricultural commodity, economic variables, global market, structural vector autoregressive model (SVAR)

The volatility in food prices is a result of shocks in the supply and demand levels, market manipulations and higher prices. As stated by Gilbert and Morgan (2010), it is generally assumed that high price levels lead to high volatility.

The volatility of food prices has considerable influence on food producers and consumers. The high price of food and the fact that prices are on the rise will lead the food producers to increase food production levels and as long as the sales price is above the input price, the producers will profit from this and will make producers increase their investment. In addition, volatility within food prices is important in the decision making process of risk-averse consumers (Braun and Tadesse 2012).

High volatility in the commodity markets of countries arises mainly from three factors. The first factor is that the quantity of agricultural products varies due to natural factors such as disasters, droughts and this makes it difficult to always ensure stability in production levels. The second is that the demand elasticity is low with respect to the low supply and price elasticities of the agricultural products. The last factor is that since the production of agricultural products requires a considerable amount of time, the supply level cannot respond to the changes that might occur in prices (OECD 2011). There is little sense of the size of the cost of the fluctuations that occur in the price of goods and the mitigating effects of the fluctuations in applied fiscal policies. Some of the researchers, such as Newbery and Stiglitz (1981), Williams and Wright (1991) and Jha and Srinivasan (1999) have mentioned that the distributional effects of price fluctuations may be significant, but the loss it will create in the economy is low, so it is difficult to control the economy with price stabilization plans. Other researchers (McGregor 1998; Timmer 2000; Dawe 2001) reported that the results of welfare analysis neglected the stability of food prices and its contribution to economic growth and food security (Myers 2006).

When Figure 1 is examined, although the prices of agricultural products show volatilities both up and down, when looked at as a whole, it is possible to observe that there is a tendency to decline. When prices of food, raw materials and beverages are taken into account, it can be seen that food prices are the highest, and raw material prices which were at the bottom in terms of price level and which were decreasing until the first quarter of 2014, showed a significant increase after this time.

https://doi.org/10.17221/261/2017-AGRICECON

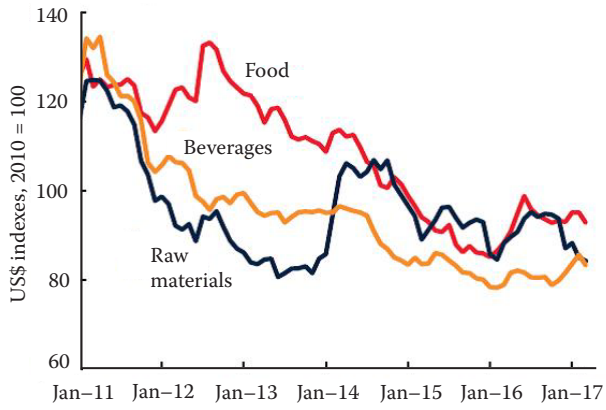

Figure 1. Agricultural products price index (January 2011 to January 2017; last observation is March 2017)

Source: World Bank (2017)

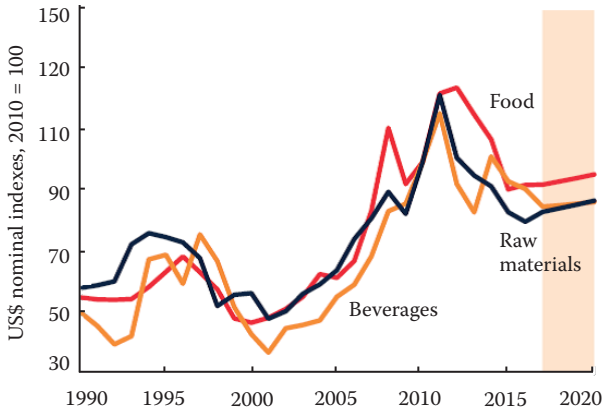

Figure 2. Agricultural products price index (1990–2020) shaded area (2017–25) represents forecast

Source: World Bank (2017)

When the estimates in Figure 2 are evaluated, and the prices of agricultural products are examined as a whole, it is expected that there will be an increase in food prices between 2017–2020. In addition, when agricultural products are sub-divided and examined, it can be stated that the price of food and raw materials will increase more than the price of beverages, and the price level of food products will continue to be the highest while the price of raw materials and beverages will approach break-even level.

At the beginning of 2006, the prices of most basic agricultural products reached the levels which had not been seen for about 30 years. When the global financial and economic crisis occurred in 2008, many developing countries were under the influence of this food crisis which was caused by a set of social and economic factors. The grain prices in 2008 were 2.8 times higher than in 2000 and 1.9 times greater than in July 2010. When Tables 1–2 are analysed, it is possible to see that the prices index in the year 2008, the year that crises occurred, showed an increase of 24.78% compared to the year 2007. The average price index in the 10-years period between 2007–2016 is 187.8. In addition, in the same period, the average

Table 1. Annual food price index (nominal, 2002–2004 = 100)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Price index	161.4	201.4	160.3	188.0	229.9	213.3	209.8	201.8	164.0	161.5
Meat	130.8	160.7	141.3	158.3	183.3	182.0	184.1	198.3	168.1	156.2
Diary	219.1	223.1	148.6	206.6	229.5	193.6	242.7	224.1	160.3	153.8
Cereals	163.4	232.1	170.2	179.2	240.9	236.1	219.3	191.9	162.4	146.9
Vegetable oils	172.0	227.1	152.8	197.4	254.5	223.9	193.0	181.1	147.0	163.8
Sugar	143.0	181.6	257.3	302.0	368.9	305.7	251.0	241.2	190.7	256.0

Source: FAO (2017)

Table 2. Food price index nominal growth rate (annual, %)

	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2015–2016
Price index	24	–20	17	22	–7	–1	–3	–18	–1
Meat	23	–12	12	16	–1	1	8	–15	–7
Diary	2	–33	39	11	–16	25	–8	–28	–4
Cereals	42	–27	05	34	–2	–7	–12	–15	–10
Vegetable oils	32	–33	29	29	–12	–14	–6	–19	11
Sugar	27	42	17	22	–17	–18	–4	–21	34

Source: by authors based on Table 1

https://doi.org/10.17221/261/2017-AGRICECON

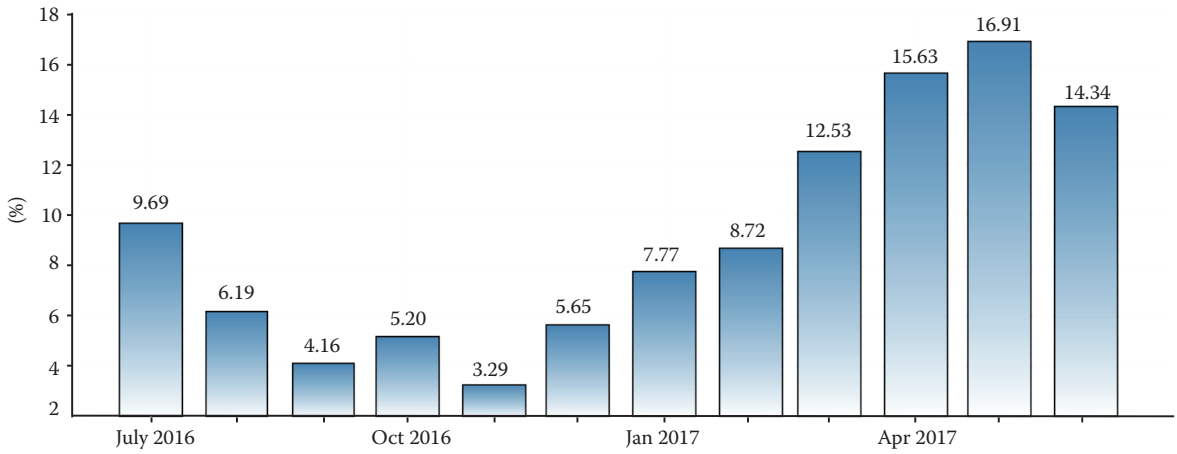

Figure 3. Turkey food inflation (July 2016–June 2017)

Source: Trading Economics (2017)

meat price index is 166.31, milk 200.14, grain 194.24, fat 191.26 and sugar 249.74.

When food inflation in Turkey is examined, it is possible to see the existence of unstable inflation in food prices. Since July 2016, the downward tendency in food inflation has shown fluctuations up and down until 2017. After March 2017 it showed an increase reaching the maximum by May 2017. In Figure 3, it can be seen clearly that the structure showed high volatile and was unstable for the period 2004–2017.

Since macroeconomic factors have the potential to affect the volatility that may occur in food prices through different channels, they can have significant effects on supply and demand levels in food markets and may create high uncertainty in food prices in the future (Apergis and Rezitis 2011).

When the transmission channels in Figure 4 are examined, the interaction between the macroeconomic factors and the price of the goods can be clearly observed. The increase in the price of food increases the cost of imports, which results in a decline in the export level and as a result, the amount of domestic output decreases. In addition, an increase in food prices will lead to a decrease in global demand, and as a result, the quantity of exports decreases. When the prices of food and oil (which interact with each other) increase, the demand for money and interest rates increase, but the opposite effect is observed in exchange rates (Alom 2011; Khan and Ahmed 2014). In addition, after the shock given by food prices, the inflation rate increases, the currency loses value, and stock prices fall (Alom et al. 2013). This study contributes to the literature as the impact of food price shocks on the economies of emerging market countries is not studied very often. In relevant literature, interactions between macroeconomic factors and the oil price have mainly been discussed, and food prices have not been investigated much. This study, therefore, examines the interaction between the food price and macroeconomic factors as well as contributes to the literature for the case of Turkey where the number of studies is very limited. Thus, this paper aims to fill this gap by considering the food price shock on an emerging market country by examining the impact of shocks to food prices on the economic indicators of Turkey by using SVAR model.

LITERATURE REVIEW

There are many studies in the literature on the interaction between macroeconomic factors and food prices. Chambers and Just (1982) have investigated the impact of monetary factors at the macro level on the market for agricultural products in the US. They report that monetary policies have decreased the prices of domestic agricultural products and increased the demand whereas foreign exchange fluctuations have damaged the United States of America (US) agricultural product export position in the international markets. Barnett et al. (1983) examined the relationship between the increases in money supply and the food prices and found that, although not the only factor, money suply is an important factor in determining of the prices of agricultural products. Ng and Aksoy (2008) investigated the effect of a rise in food prices on food importers for lower income countries and found that the shocks to the food prices

https://doi.org/10.17221/261/2017-AGRICECON

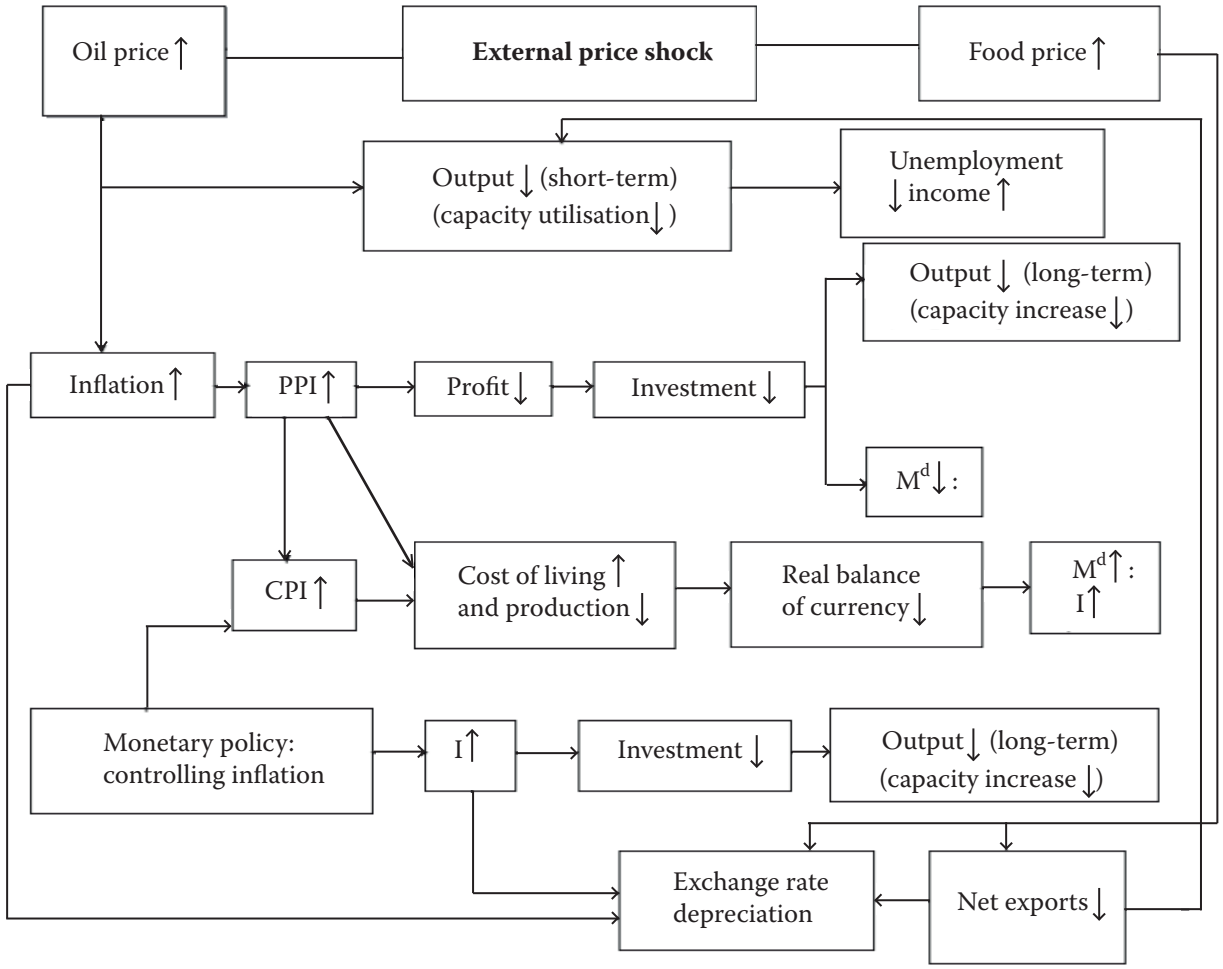

Figure 4. Transmission channels of oil and food prices

CPI – consumer price index; I – interest rate; M^d – demand for money; PPI – producer price index

Source: contructed by Khan and Ahmed (2014), following Tang et al. (2010) and Alom (2011)

have had a damaging effect in food trading for lower income countries, but the opposite effect is seen for middle income countries. Abbott et al. (2008) have reported three determining factors in food prices. These factors are the depreciation of the US dollar, changes in the levels of production, and consumption and development of bio fuel production. The study of Abbott (2008) compared the current state to previous conclusions and reported that the food prices are not only affected by these three factors but also by many other factors arising from global complex economic events. Roache (2010) investigated the low frequency volatility in food prices and reported that foreign exchange and interest rates have a significant effect in explaining the low frequency volatility. Apergis and Rezitis (2011) have studied the relationship between food prices and some macroecnomic factors and reported that there is a cointegration relationship between volativity in real gross domestic product (GDP) per capita, real money balances, the proportion of real deficit to return and real exchange rates. Hochman et al. (2014) analysed the causes of crises within food prices by considering the effect of inventory on price volatility. They stated that if the inventory level is not accounted for, the impact of many factors on food price inflation will be overestimated. Tadesse et al. (2014) investigated the factors that cause volatility in food prices, and in addition the factors that most cause volatility. Their research shows that the interactions between foreign shocks and food, energy and financial markets have an important role in explaining the volatility of food prices.

Paladines Amaiquema and Paladines Amaiquema (2017) studied the relationship between oil and food price shock in Ecuador for the period between 1980–2015. The results of their study covering an-

https://doi.org/10.17221/261/2017-AGRICECON

nual survey using the SVAR did not find evidence that the global food index affected economic growth and inflation. Kavila and Roux (2017) investigated the relationship between macroeconomic shocks and inflation. In their study, the Vector Error Correction Model (VECM) model is carried out using monthly data for the period between 2009 and 2012, and they report that an increase in food price shocks had a positive effect on inflation. Solaymani and Yusoff (2017) examined the impact of high food and agricultural prices on Malaysia's economic performance and poverty level. As a result of their research, they found that the option of generating an increase in the level of agricultural productivity is a much more effective way to reduce the negative impact of shocks on global food prices than the agricultural support option.

In the period between the end of 2006 and the middle of 2008, there has been a considerable increase in the prices of agricultural products in the world, but after mid-2008, a significant fall was observed as the global financial crisis started. There are many studies (Abbott et al. 2008; Mitchell 2008; Cooke and Robles 2009; Gilbert and Morgan 2010) explaining the causes of the price changes. In the study of Gilbert and Morgan (2010), the causes are summarized as: rapid growth in the economies of China and other Asian economies; insufficient long term investment in agriculture (World Bank 2007); inventory levels that are kept low, and especially for the case of Australia – lower harvests and the depreciation of the US dollar (Abbot et al. 2008), in the diversion of food crops to production of biofuels (Abbot et al. 2008; Mitchel 2008) and some impacts through speculation can be counted as suggested by Cooke and Robles (2009) and Gilbert (2010 a,b).

DATA AND METHODOLOGY

As a model, we used a vector autoregressive (VAR) model suggested by Kamin and Rogers (2000). In the model, the real exchange rate (RER), inflation and output growth of each country is included. The data is obtained from FRED (2017) and Global Financial Data (2017). As the output data is quoted quarterly, industrial production is used as a proxy for GDP. Turkey's macroeconomic data does not affect the food index. To this end, the SVAR model identical to Cushman and Zha (1997) is used. In this structural model, the food index, which is considered as an exogenous variable, affects the macroeconomic variables of Turkey, including the exchange rate, inflation and growth. However, the reverse is not true, i.e. Turkey's macroeconomic variables do not affect the food index. Our four variable VAR system differs from the conventional VAR model as Turkey's macroeconomic variables are affected by the current and lagged values of the food index. The descriptive statistics of the data are reported in Table 3.

We estimated impulse response functions of Turkey's macroeconomic variables using monthly data for the period January 1980–January 2016. The RER used in the model is calculated as (exchange rate × CPI_{USA})/CPI_{Turkey}, growth is the first difference of Turkey's industrial production and inflation is the first difference of Turkey's consumer price index (CPI). The model that we used in our analysis which is used by Cushman and Zha (1997) may be shown as:

$$B(L)z(t) = \varepsilon(t) \quad (1)$$

where the polynomial $B(L)$, is a $m \times m$ matrix which is in the lag operator L, the observations vector is denoted as $z(t)$ which is a observations vector of $m \times 1$, t stands for time and structural disturbances is shown as ε_t which is a vector of $m \times 1$:

$$z_t = \begin{bmatrix} z_1(t) \\ z_2(t) \end{bmatrix}, \quad B(L) = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix}, \quad \varepsilon_t = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \end{bmatrix} \quad (2)$$

where $B(0)$ is a non-singular matrix. It is considered that there is no correlation among the innovations, denoted as ε_t and $z(t-j)$ for $j > 0$, j stands for lag length.

Table 3. Descriptive statistics of the data

Variables	Mean	Standard deviation	Skewness	Kurtosis	Jarque Bera
Food	–0.124	3.597	0.053	1.092	21.665
RER	0.987	0.229	–0.163	–0.990	19.614
Growth	0.755	8.213	0.060	0.425	3.501
Inflation	2.811	2.814	2.323	12.224	3 077.973

Source: by authors based on FRED (2017) and Global Financial Data (2017)

https://doi.org/10.17221/261/2017-AGRICECON

$B_{12}(L)$ shows the exogeneity of block $z_1(t)$ and it is zero. Contemporaneously, $z_2(t)$ do not affect $z_1(t)$ and laf values of $z_2(t)$. On the contrary, $B_{21}(L)$ is not confined to zero, thus, the oil prices can affect the domestic economy both contemporaneously as well as with lags.

Our observation matrices are y_1= [food index], y_2 = [Turkey's RER, inflation, output growth]. As suggested by Bayesian Information Criteria, we chose the lag order of the identified VAR model as 1.

As mentioned previously, in the second block, denoted as y_2 the ordering of the variables is important. For example, contemporaneous shocks of inflation and growth do not affect RER; rather it is affected by its own lags. Inflation, does not affect the RER but is affected by the RER contemporaneously. Output growth is affected by exchange rate and inflation contemporaneously, but the opposite is not true. Kamin and Rogers (2000), Berument and Pasaogullari (2003), Berument et al. (2010) also used the same order.

EMPIRICAL FINDINGS

When one standard deviation shock (39.57) is given to the food index, the impulse responses of the macroeconomic variables of Turkey in Figures 5–7 are calculated. We used Bayesian inference method of Zha (1999) for calculating the confidence interval bands for 2 500 iterations. The significance level of the confidence bands is 95%. The impulse responses are shown in Figures 5–7 as middle lines, the upper and lower bands are the confidence intervals. In the case that the horizontal line is within the confidence interval, then we cannot reject the null hypothesis stating food price shocks do not affect output growth. Table 4 shows the effects of the food price index on the movement of macroeconomic variables. It shows how many macroeconomic variables increase or decrease when food price index increases by one positive standard deviation shock.

When the results of the impulse response functions are considered, one standard deviation shock to food index has statistically significant contemporaneous and negative effects on the RER (Figure 5). The impulse responses show that the Turkish Lira appreciates following an increase in the food index. A shock to the food index does not have any statistical effects on growth (Figure 6). The shock has a positive and statistically significant contemporaneous effect on inflation (Figure 7). However, the effect

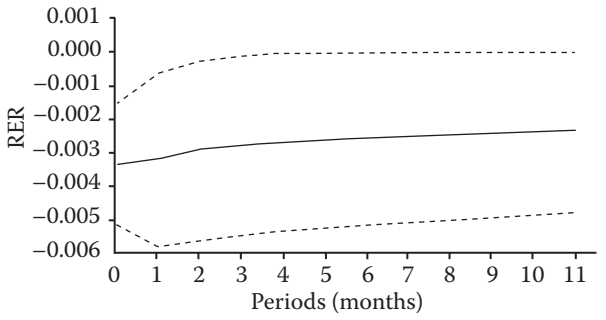

Figure 5. Effect of one standard deviation shock to food prices on real exchange rate (RER)

the vertical axis (y) shows the magnitude of response to shocks; middle line – impulse-response function; upper and lower dashed lines – the confidence intervals

Source: impulse-response function is obtained from the Bayesian procedure, based on Cushman and Zha (1997)

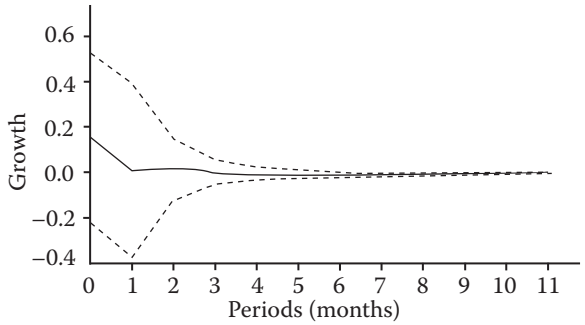

Figure 6. Effect of one standard deviation shock to food prices on growth

the vertical axis (y) shows the magnitude of response to shocks; middle line – impulse-response function; upper and lower dashed lines – the confidence intervals

Source: impulse-response function is obtained from the Bayesian procedure, based on Cushman and Zha (1997)

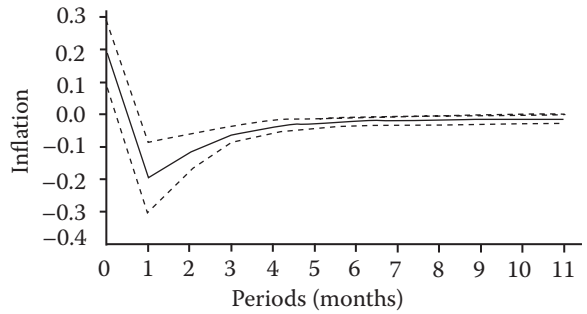

Figure 7. Effect of one standard deviation shock to food prices on inflation

the vertical axis (y) shows the magnitude of response to shocks; middle line – impulse-response function; upper and lower dashed lines – the confidence intervals

Source: impulse-response function is obtained from the Bayesian procedure, based on Cushman and Zha (1997)

https://doi.org/10.17221/261/2017-AGRICECON

Table 4. Impact of the food prices on macroeconomic variables for ten periods (months)

Period	Inflation	Growth	RER
0	0.19013*	0.17076	–0.00340*
1	–0.19492*	–0.00054	–0.00322*
2	–0.11711*	0.02164	–0.00295*
3	–0.06348*	–0.00101	–0.00280*
4	–0.03774*	0.00232	–0.00271*
5	–0.02564*	–0.00148	–0.00264*
6	–0.02003*	–0.00097	–0.00259*
7	–0.01731*	–0.00163	–0.00255
8	–0.01594*	–0.00153	–0.00251
9	–0.01518*	–0.00163	–0.00247
10	–0.01471*	–0.00160	–0.00243

*indicates the level of significance at 5%; RER – real exchange rate; the values reported in the table show how many macroeconomic variables increase or decrease when food price index increases by one positive standart deviations shock

Source: by authors based on FRED (2017) and Global Financial Data (2017)

becomes negative after period one and dies out after the eighth period.

When the findings which are statistically significant are taken into consideration, the shocks that occur in the global food price have a negative effect on the RER during a certain period and appreciates the value of the Turkish Lira. In the case that this adverse effect is short term, it can be compensated, but as it spreads to longer periods and speculative operations increase, it can be affected positively. For this reason, it may be beneficial for the country's economy to take precautions on the substitutional side of the global food price, which affects Turkey. When the effect of the food price is considered in terms of inflation, the shocks may have greater impacts for the food importer countries, because as mentioned previously, price increases may trigger both inflation, causing the domestic currency to weaken the purchasing power as well as the effects created by the exchange rate, which may lead to bigger losses in the domestic country's economy. However, although a food price shock does not seem to have a direct effect on the output, the interaction among the macroeconomic variables such as the RER and inflation, may cause negative effects on the country's output growth.

As is the case of many commodities, agricultural commodities are being traded in the international markets in US dollars. The depreciation of the US dollar leads to an increase in agricultural commodity prices, while the appreciation of the US dollar causes prices to fall. This effect appears faster than the other effects such as cost or substitution effects. When the food price of 16 products reached their highest level in history in 2008, the US dollar was at its lowest level. Moreover, the change in exchange rates for different currencies has adversely affected the competitiveness of some markets such as China's soybean meal (Abbott et al. 2008).

CONCLUSION

In recent years, the rise in world food prices has been one of the major concerns for policymakers. In addition, some of the sources of macroeconomic fluctuations may be attributed to the change in food prices. Employing SVAR models, this study investigates the macroeconomic impacts of the global food price shocks on the economy of Turkey for the period January 1980–January 2016 using monthly data. In particular, the effects of the global food price shocks on the macroeconomic fundamentals, such as RER, inflation and growth are analysed for Turkey. The result of the impulse responses shows that a shock to the food price makes Turkish Lira to appreciate and inflation to increase contemporaneously. Thus, the empirical findings of this study imply that global food prices mainly lead to changes in the macroeconomic environment. In this context, risk management systems should be developed and strengthened against food price shocks that may arise, and more emphasis should be given to the derivative markets. In addition, in the production of agricultural products, production efficiency should be improved, efficient use of production areas should be ensured, and warehouses should be constructed to provide long-term conservation of the products. The active exchange of relevant stock exchanges should be provided for food products. Finally, it should be noted that an appropriate balance between import and export income/expenditure should be provided so that the food supply process does not have a negative impact on the country's economy. The inflation and exchange rate, which are the macroeconomic variables in the study, are closely related to this balance and it is important in terms of contributing to or harming the economy. This is because a surplus in the level of imports can have a significant impact on countries such as Turkey, which imports on a dollar basis and exports on a euro basis. An imbalance that may arise

https://doi.org/10.17221/261/2017-AGRICECON

in the export-import balance may increase the foreign exchange deficit of the country, and as a result, it triggers the interest rates and inflation negatively.

To sum up, the processes mentioned above aiming to protect against the food crisis should be implemented, but a balance should be maintained between the advantages and disadvantages of each process. The findings suggest that policy makers should consider the effects and changes of the world food prices and policies. Investors, who trade globally, can predict the prices of food via changes/fluctuations in macroeconomic factors.

Acknowledgement

This study was oral presented at the International Academic Conference on Business & Economics held between April 11–13, 2016 in Vienna – Austria and only the abstract is published in the conference proceedings.

REFERENCES

Abbott P.C., Hurt C., Tyner W.E. (2008): What's driving food prices? Issue Reports 37951. Farm Foundation, Oak Brook.

Alom F. (2011): Economic effect of oil and food price shocks in Asia and Pacific countries: an application of SVAR model. In: Proceedings NZARES Conference. New Zealand Agricultural and Resource Economics Society, New Zealand, Aug 25–26, 2011.

Alom F., Ward B.D., Hu B. (2013): Macroeconomic effects of world oil and food price shocks in Asia and Pacific economies: Application of SVAR models. OPEC Energy Review, 37: 327–372.

Apergis N., Rezitis A. (2011): Food price volatility and macroeconomic factors: Evidence from GARCH and GARCH-X Estimates. Journal of Agricultural and Applied Economics, 43: 95–110.

Barnett R.C., Bessler D.A., Thompson R.L. (1983): The money supply and nominal agricultural prices. American Journal of Agricultural Economics, 65: 303–307.

Berument H., Pasaogullari M. (2003): Effects of the real exchange rate on output and inflation: Evidence from Turkey. Developing Economies, 41: 401–435.

Berument H., Ceylan N.B., Dogan N. (2010): The impact of oil price shocks on the economic growth of selected MENA countries. The Energy Journal, 31: 149–176.

Braun J.V., Tadesse G. (2012): Global Food Price Volatility and Spikes: An Overview of Costs, Causes and Solutions. ZEF Discussion Papers on Development Policy No: 161. University of Bonn, Bonn.

Chambers R.G., Just R.E. (1982): An investigation of the effect of monetary factors on agriculture. Journal of Monetary Economics, 9: 235–247.

Cooke B., Robles M. (2009): Recent Food Price Movements: a Time Series Analysis. IFPRI Discussion Papers 942. International Food Policy Research Institute (IFPRI), Washington.

Cushman D.O., Zha T. (1997): Identifying monetary policy in a small open economy under flexible exchange rates. Journal of Monetary Economics, 39: 433–448.

Dawe D. (2001): How far down the path to free trade? The importance of rice price stabilization in developing Asia. Food Policy, 26: 163–175.

Food and Agriculture Organization of the United Nations (FAO 2017) (2017): Food Price Index. Available at http://www.fao.org/worldfoodsituation/foodpricesindex/en/ (accessed Aug 2, 2017).

FRED (2017): Federal Reserve Economic Data, St. Louis Fed. Available at https://fred.stlouisfed.org/ (accessed Aug 16, 2017).

Gilbert C.L., Morgan C.W. (2010): Food price volatility. Philosophical Transactions of The Royal Society B, 365: 3023–3034.

Gilbert C.L. (2010a): How to understand high food prices. Journal of Agricultural Economics, 61: 398–425.

Gilbert C.L. (2010b): Speculative Influences on Commodity Futures Prices 2006–08. UNCTAD Discussion Paper No: 197. United Nations Conference on Trade and Development, Geneva.

Global Financial Data (2017): Available at https://www.globalfinancialdata.com/ (accessed Aug 10, 2017).

Hochman G., Rajagopal D., Timilsina G., Zilberman D. (2014): Quantifying the causes of the global food commodity price crisis. Biomass and Bioenergy, 68: 106–114.

Jha S., Srinivasan P.V. (1999): Grain price stabilisation in India: Evaluation of policy alternatives. Agricultural Economics, 21: 93–103.

Kamin S.B., Rogers J.H. (2000): Output and the real exchange rate in developing countries: An application to Mexico. Journal of Development Economics, 61: 85–109.

Kavila W., Roux P.L. (2017): The Reaction of Inflation to Macroeconomics Shocks: The Case of Zimbabwe (2009–2012). Economic Research Southern Africa (ERSA) Working Paper No: 707. Economic Research Southern Africa, Cape Town.

Khan M.A., Ahmed A. (2014): Revisiting the macroeconomic effects of oil and food price shocks to Pakistan economy: A structural vector autoregressive (SVAR) analysis. OPEC Energy Review, 38: 184–215.

https://doi.org/10.17221/261/2017-AGRICECON

McGregor P. (1998): Famine: a simple general equilibrium model. Oxford Economic Papers, 50: 623–643.

Mitchell D. (2008): A Note on Rising Food Prices. Policy Research Working Paper 4682. World Bank, Washington D.C.

Myers R.J. (2006): On the cost of food price fluctuations in low-income countries. Food Policy, 31: 288–301.

Newbery D.M.G., Stiglitz J.E. (1981): The Theory of Commodity Price Stabilization. Clarendon Press, Oxford.

Ng F., Aksoy M.A. (2008): Who are the net food importing countries? The World Bank Policy Research Working Paper No: 4457. World Bank, Washington D.C.

OECD (2011): Price Volatility in Food and Agricultural Markets: Policy Responses. Available at http://www.oecd.org/agriculture/ (accessed Aug 4, 2017).

Paladines Amaiquema J.R., Paladines Amaiquema A.R. (2017): Consequences of oil and food price shocks on the Ecuadorian economy. International Journal of Energy Economics and Policy, 7: 146–151.

Roache S.K. (2010): What explains the rise in food price volatility? IMF Working Paper No: WP/10/129. International Monetary Fund, Washington D.C.

Solaymani S., Yusoff N.Y.B.M. (2017): Poverty effects of food price escalation and mitigation options: The case of Malaysia. Journal of Asian and African Studies, 53: 1–18.

Tadesse G., Algieri B., Kalkuhl M., Braun J.V. (2014): Drivers and triggers of international food price spikes and volatility. Food Policy, 47: 117–128.

Tang W., Libo W., Zhang Z. (2010): Oil price shocks and their short- and long-term effects on the Chinese economy. Energy Economics, 32: 3–14.

Timmer C.P. (2000): The macro dimensions of food security: economic growth, equitable distribution, and food price stability. Food Policy, 25: 283–295.

Trading Economics (2017): Turkey food inflation. Available at https://tradingeconomics.com/ (accessed June 26, 2017).

Williams J.C., Wright B.D. (1991): Storage and Commodity Markets. Cambridge University Press, Cambridge.

World Bank (2007): Commodity Markets Outlook April 2017. Available at http://www.worldbank.org/commodities (accessed July 26, 2017).

World Bank (2017): Agricultural Products Price Index. Available at https://data.worldbank.org (accessed July 8, 2017).

Zha T. (1999): Block recursion and structural vector autoregressions. Journal of Econometrics, 90: 291–316.

Received September 23, 2017
Accepted December 27, 2017
Published online November 6, 2018