3. Inflation Developments

In the last quarter of 2015, consumer inflation increased by approximately 0.86 points compared to the previous quarter and reached 8.81 percent, exceeding the uncertainty band around the inflation target. The uptick in inflation in the last quarter is mainly attributed to the surge in core goods prices due to the lagged effects of the cumulative depreciation in the Turkish lira in the first three quarters. Moreover, annual energy inflation increased due to the base effect. The realization of inflation above the uncertainty band was also caused by food price hikes. Despite the surplus in agricultural production in 2015 after the contraction in the previous year, food prices did not decelerate as expected and inflation in food prices closed the year at 10.9 percent, remaining slightly below the 2014 readings. Particularly, unprocessed food prices soared notably in the last three years by an average 13 percent in annual terms. Food inflation was passed through to services inflation as well, through the prices of catering services. Additionally, price increases in items sensitive to exchange rates, besides the persistence in inflation as well as developments in wages, also had an effect on the high course of services inflation. On the other hand, falling import prices, oil prices in particular, had a limited effect on consumer price inflation due to exchange rate developments. Moreover, the deterioration of inflation expectations since the second quarter of 2013 continued throughout the year owing to high levels of inflation in consumer prices. Thus, the underlying trend of core inflation remained elevated despite recording a slight quarter-on-quarter decline.

In the last quarter of 2015, price changes in all subcategories except core goods remained below historical averages (Chart 3.1). Core goods prices increased faster than the general price level in this period mainly due to the lagged effects of the depreciation in the Turkish lira. Accordingly, the contribution of core goods prices to headline inflation increased by 0.7 percentage points compared to the third quarter (Chart 3.2). In the last quarter, the contribution of services and energy prices to inflation crept up by 0.1 percentage points each, while that of tobacco and gold edged down by 0.1 percent. In the meantime, the contribution of food prices to inflation remained virtually unchanged.

Chart 3.1.
CPI by Subcategories
(Fourth-Quarter, Quarterly Percent Change)

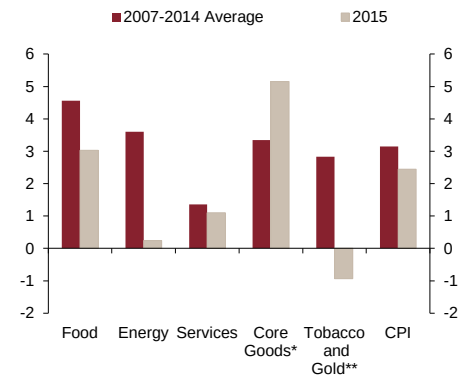
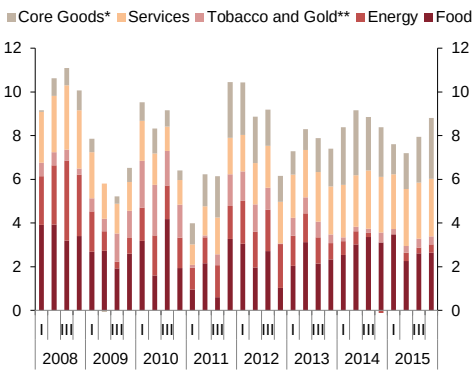


Chart 3.2.
Contributions to Annual CPI
(Percentage Points)



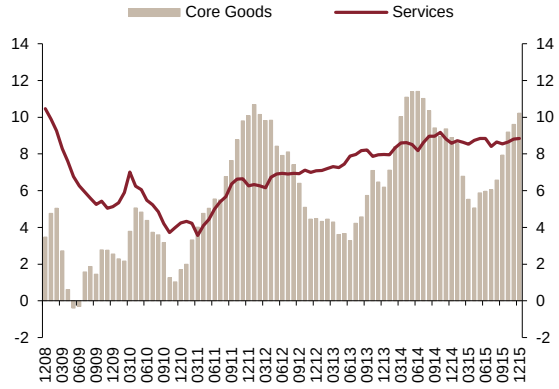
* Tobacco and Gold: Alcoholic beverages, tobacco and gold.
** Core Goods: Goods excluding food, energy, alcoholic beverages, tobacco and gold.
Source: TURKSTAT, CBRT.

In sum, inflation in food prices failed to decelerate as much as expected in the last quarter of the year. Despite the positive effects of energy prices, cumulative exchange rate movements continued to deteriorate consumer inflation. In the upcoming period, adjustments in administered prices, acceleration in the minimum wage increase and inflation expectations are the major factors to shape the inflation outlook. The direct impact of the January price hikes on inflation in certain products with administered prices, tobacco products and electricity in particular, is estimated to be around 0.7 percentage points. In addition, despite the sharing of the burden between employers and the state, the 30 percent rise in the net minimum wage in 2016 will inevitably pose an upward pressure on consumer inflation, especially via prices of services and food. Under these circumstances, inflation may hover above the target for a while, which necessitates close monitoring of inflation expectations as well.

3.1. Core Inflation Outlook

Annual core goods inflation rose by 2.28 points to 10.22 percent in the last quarter (Chart 3.1.1 and Table 3.1.1). This was driven by the lagged effects of the exchange rate and clothing prices, the annual inflation of which surged by around 4.7 points to 9 percent due to pass-through from cost factors that increased amid rising headline inflation as well as positive expectations regarding domestic demand following elections. Cumulative exchange rate effects were also manifested in durable goods, which are included among core goods, and durable goods inflation remained on the rise, albeit decelerating slightly. Inflation in core goods excluding clothing and durable goods displayed a relatively limited increase in this period (Chart 3.1.2).

Chart 3.1.1.
Prices of Core Goods and Services
(Annual Percent Change)



Source: TURKSTAT, CBRT.

The sharp depreciation of the Turkish lira against the USD and euro in the third quarter had remarkable effects on core goods prices in October. Clothing prices registered the highest October rise in the history of the index, while inflationary pressures in durable goods remained strong after September. In fact, in addition to prices of white goods and automobiles, furniture prices also exhibited hikes in October. Price increases continued to some extent in clothing and furniture in November, while inflationary pressures on core goods alleviated in December.

Chart 3.1.2.
Core Goods Prices
(Annual Percent Change)

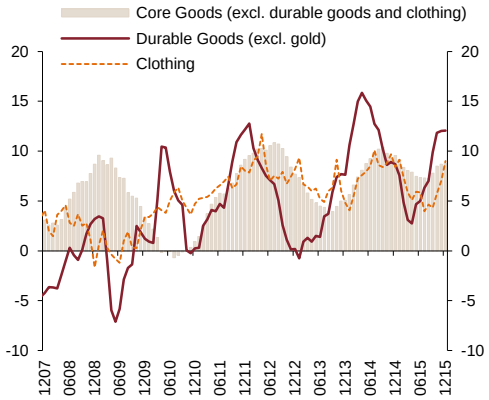
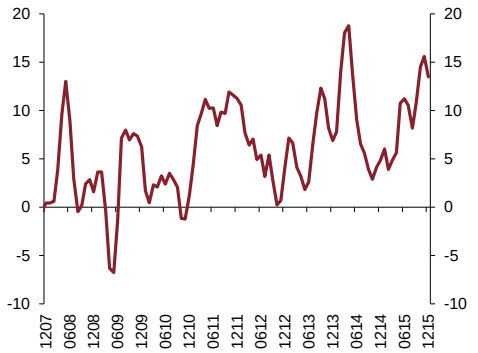


Chart 3.1.3.
Core Goods Prices
(Seasonally Adjusted, 3-Month Moving Average, Annualized)



Source: TURKSTAT, CBRT.

Against this background, the contribution of core goods to consumer price inflation increased approximately by 0.7 points to 2.79 percent in the last quarter (Chart 3.2). The underlying trend of inflation in core goods prices also soared notably in this period (Chart 3.1.3). In the last two years, the depreciation of the Turkish lira against foreign currencies led to higher-than-average increases in core goods prices. Moreover, customs duty hikes to some durable goods were also influential in rising inflation in 2015. Despite weaker inflationary pressures in December across core goods, upward risks to inflation are brisk amid these factors.

Table 3.1.1.
Prices of Goods and Services
(Quarterly and Annual Percent Change)

	2014		2015				
	IV	Annual	I	II	III	IV	Annual
CPI	**1.63**	**8.17**	**3.03**	**1.68**	**1.39**	**2.44**	**8.81**
1. Goods	**1.99**	**7.99**	**3.34**	**1.37**	**0.81**	**3.02**	**8.79**
Energy	**-0.74**	**-1.54**	**1.96**	**1.44**	**-0.70**	**0.24**	**2.96**
Food and Non-Alcoholic Beverages	**2.90**	**12.73**	**8.82**	**-3.85**	**2.85**	**3.03**	**10.87**
Unprocessed Food	3.53	12.24	16.40	-9.27	3.56	4.07	13.83
Processed Food	2.36	13.16	2.30	1.45	2.22	2.11	8.33
Core Goods	**2.98**	**8.89**	**-1.10**	**6.60**	**-0.57**	**5.15**	**10.22**
Clothing and Footwear	10.38	8.40	-12.43	22.37	-11.81	15.34	9.00
Durable Goods (excl. gold)	-0.29	8.70	3.91	1.43	4.57	1.66	12.05
Furniture	1.56	7.73	3.55	1.24	3.20	2.32	10.70
Electrical and Non-Electrical Appliances	-0.31	1.64	2.44	0.98	4.00	1.96	9.69
Automobile	-1.19	13.72	5.14	1.62	5.60	1.13	14.10
Other Durable Goods	1.07	7.02	1.38	3.19	2.69	2.94	10.59
Core Goods (excl. clothing and durable goods)	1.38	9.57	1.78	2.16	2.25	2.32	8.79
Alcoholic Beverages, Tobacco and Gold	**0.00**	**7.73**	**4.49**	**0.61**	**2.32**	**-0.94**	**6.56**
2. Services	**0.81**	**8.59**	**2.32**	**2.40**	**2.76**	**1.10**	**8.85**
Rent	1.78	7.34	1.47	1.77	2.38	1.90	7.73
Restaurants and Hotels	2.02	13.98	3.42	3.59	4.29	1.34	13.23
Transport	-0.38	7.76	0.10	2.06	1.41	0.56	4.17
Communication	0.14	2.50	2.26	-0.11	1.53	0.63	4.36
Other Services*	0.21	8.64	2.95	3.00	2.87	0.92	10.09

* Services excluding rent, restaurants and hotels, transport and communication.
Source: TURKSTAT, CBRT.

Prices of services registered a lower-than-average increase by 1.10 percent, yet the annual inflation in services prices edged up by 0.31 points to 8.85 percent in the last quarter (Charts 3.1.1 and 3.1.4). The rise in annual inflation was driven by prices of transport and communication services as well as prices of other services that were subject to the lagged effects of the depreciation in the Turkish lira (Chart 3.1.5). On the other hand, the prices of restaurants and hotels, which mainly determine the high course of services inflation, increased well below historical averages and annual inflation recorded a

decline in this quarter (Charts 3.1.4 and 3.1.5). Meanwhile, rent inflation displayed a slight increase in the last quarter.

Chart 3.1.4.
Prices of Services by Subcategories
(Fourth-Quarter, Quarterly Percent Change)

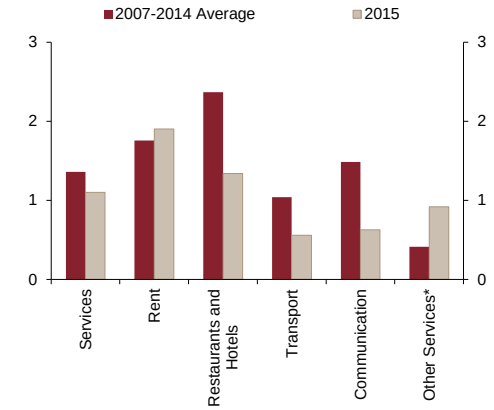
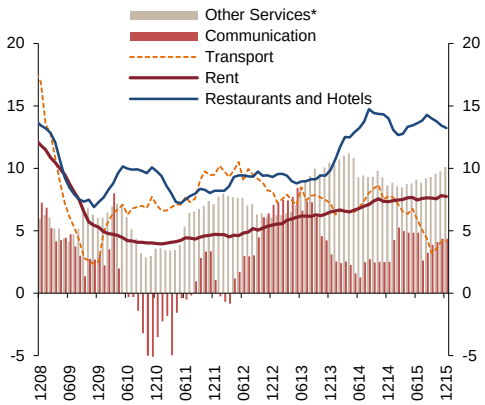


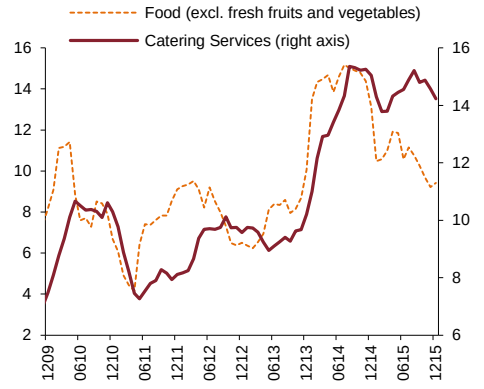
Chart 3.1.5.
Prices of Services by Subcategories
(Annual Percent Change)



* Services excluding rent, restaurants and hotels, transport and communication.
Source: TURKSTAT, CBRT.

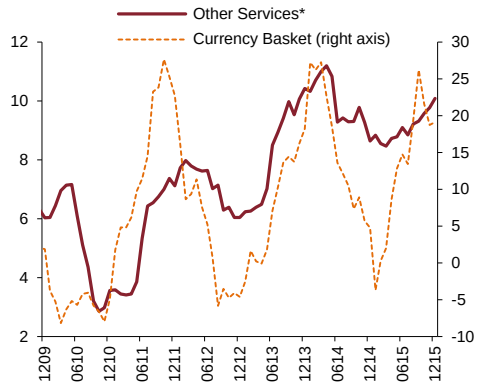
Cost pressures continue to dominate prices of services. Prices of catering services, which soared throughout the year due to high annual inflation in prices of food excluding fresh fruits and vegetables, remained elevated in this quarter, albeit less notably, and annual inflation stood at 14.23 percent (Chart 3.1.6). The cumulative impact of the depreciation in the Turkish lira remained influential in prices of other services. Annual inflation in prices of other services trended upwards across the year and hit 10.09 percent at the end of 2015 (Chart 3.1.7). Another domestic cost factor determining services prices is wages. Wages increased faster than CPI in recent years, which had an adverse effect on the services inflation. Accordingly, the minimum wage adjustments for 2016 will have even more adverse effects on prices of services, which is a labor-intensive sector.

Chart 3.1.6.
Prices of Catering Services and Food
(Annual Percent Change)



Source: TURKSTAT, CBRT.

Chart 3.1.7.
Prices of Other Services and the Currency Basket
(Annual Percent Change)

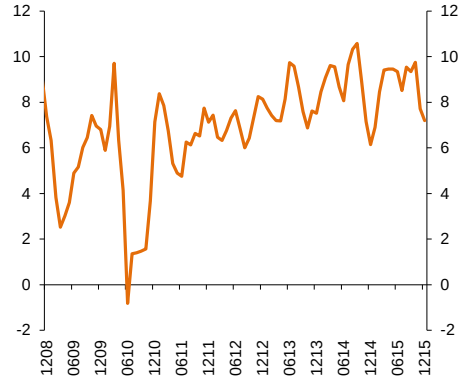


* Services excluding rent, restaurants and hotels, transport and communication.
Source: TURKSTAT, CBRT.

The underlying trend of services inflation in quarterly averages declined in the last quarter amid the decelerating increases in prices of restaurants and hotels (Chart 3.1.8). Similarly, the diffusion index for prices of services exhibited a slight improvement (Chart 3.1.9). However, an additional cost due to

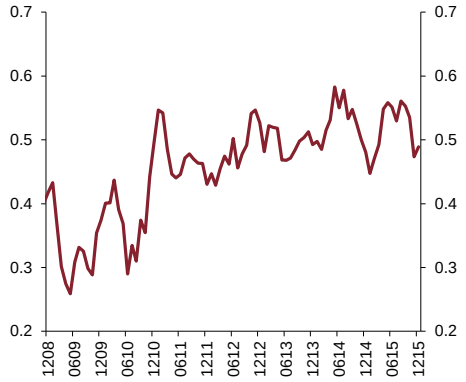
the minimum wage hike, the persistence in CPI inflation and the potential reflections of these on the medium-term expectations keep upward risks brisk on the underlying trend of services inflation.

Chart 3.1.8.
Prices of Services
(Seasonally Adjusted, 3-Month Moving Average, Annualized)



Source: TURKSTAT, CBRT.

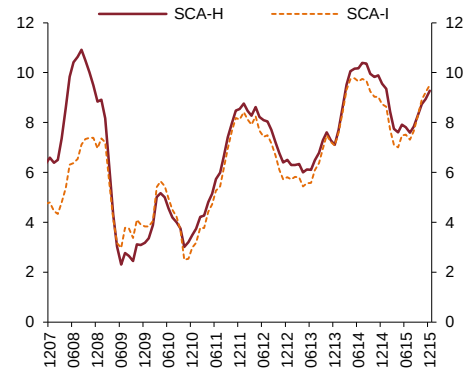
Chart 3.1.9.
Diffusion Index for Prices of Services*
(Seasonally Adjusted, 3-Month Moving Average)



* Diffusion index is calculated as the ratio of the number of items with increasing prices minus the number of items with decreasing prices to total number of items within a given month.
Source: TURKSTAT, CBRT.

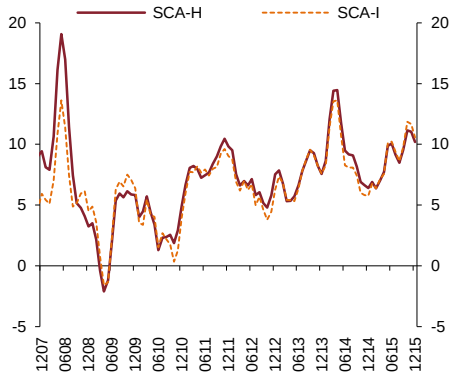
In line with the outlook for prices of core goods and services, annual inflation in SCA-H and SCA-I, which are core inflation indicators, climbed to 9.27 and 9.51 percent, respectively, in the last quarter (Chart 3.1.10). Also, the underlying trend of core inflation indicators deteriorated compared to the third quarter (Chart 3.1.11).

Chart 3.1.10.
Core Inflation Indicators
(Annual Percent Change)



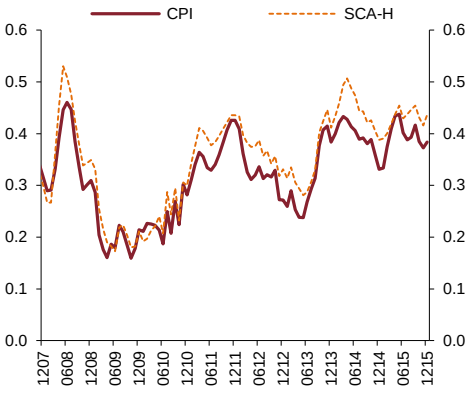
Source: TURKSTAT.

Chart 3.1.11.
Core Inflation Indicators
(Seasonally Adjusted, 3-Month Moving Average, Annualized, Percent)



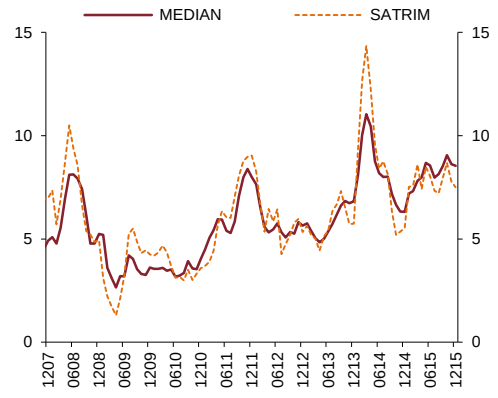
As of the end-quarter, the likelihood for prices to rise quarter-on-quarter as implied by the diffusion indices has edged down since the third quarter (Chart 3.1.12). MEDIAN and SATRIM, the alternative core inflation indices monitored by the CBRT, also imply a similar movement (Chart 3.1.13). In short, the cumulative depreciation of the Turkish lira continued to have adverse effects in the last quarter, while the favorable import prices partially contained cost pressures. Despite a slight improvement recently, the underlying indicators remained virtually unchanged quarter-on-quarter and hovered well above the target-consistent levels.

Chart 3.1.12.
Diffusion Indices for CPI and SCA-H
(Seasonally Adjusted, 3-Month Moving Average)



Source: TURKSTAT, CBRT.

Chart 3.1.13.
Core Inflation Indicators MEDIAN and SATRIM
(Annualized, 3-Month Moving Average)



Source: CBRT.

3.2. Food, Energy and Alcohol-Tobacco Prices

Having declined significantly in the second quarter by approximately 5 points to 9.28 percent, annual inflation in food prices followed a fluctuating course in the second half of the year, climbing to 10.87 percent at the year-end, remaining far above the previous Report's assumption at 8 percent (Chart 3.2.1). The boost in agricultural production in 2015 after the contraction in 2014 caused virtually no deceleration in the agricultural products inflation on the producers' side and food price inflation on the consumers' side.[1] Unprocessed food price inflation surged notably by 13 percent on average in the last three years.

Annual food price inflation fluctuated in the last quarter due to unprocessed food prices (Chart 3.2.2). Amid an increased supply of fruits and vegetables, seasonally adjusted unprocessed food prices saw a correction in May and June. Yet, this was reversed due mainly to soaring fruit prices in the third quarter and vegetable prices in the last quarter. Thus, prices of fresh fruits and vegetables surged in the second half and completed 2015 with an increase of 18.28 percent (Chart 3.2.3). Inflation in unprocessed food products other than fresh fruits and vegetables remained on the decrease as in the third quarter. In particular, red meat prices remained relatively flat in the last quarter after trending upwards for a protracted period due to the subdued supply in livestock. Red meat prices soared by around 50 percent from the first quarter of 2013 to the third quarter of 2015, and registered an annual inflation by 21.23 percent in 2015. Amid the steps taken by the Food Committee, following the authorization to import carcass meat granted to the Meat and Milk Board, the uptrend in domestic meat prices was replaced by a relatively mild course. As a result, annual unprocessed food inflation rose by 0.60 points quarter-on-quarter to 13.83 percent in December.

Despite losing momentum, the annual inflation in processed food prices continued to slow down (Chart 3.2.2). Amid favorable developments in wheat production, inflation in bread and cereals decelerated further, pulling the annual inflation to 5.96 percent. Meanwhile, prices of processed food excluding bread and cereals followed a relatively mild course except for vegetable oil prices. In

[1] According to the crop production statistics of 2015, production of cereal, vegetable and fruit products rose by 18.1, 3.4 and 3.9 percent, respectively, in 2015 compared to 2014.

tandem with red meat prices, prices of processed red meat products remained almost flat. On the other hand, vegetable oil prices continued to increase in the last quarter, and olive oil and sunflower oil prices rose by approximately 70 and 20 percent, respectively, in the last 12 months. Accordingly, olive oil recorded the highest price increase among food items in 2015.

Chart 3.2.1.
Food and Energy Prices
(Annual Percent Change)

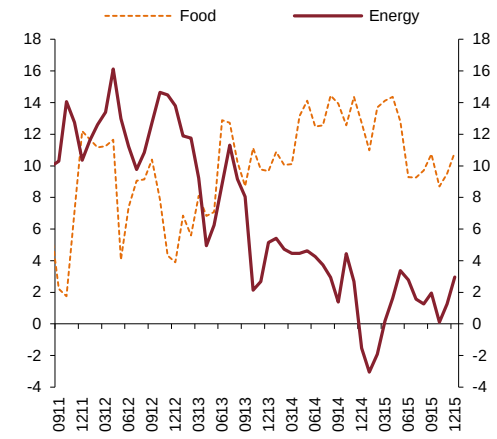
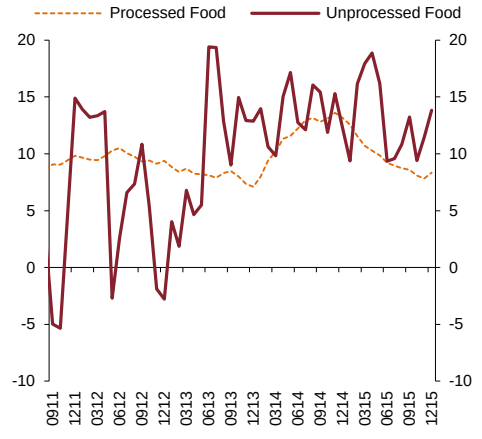


Chart 3.2.2.
Food Prices
(Annual Percent Change)



Source: TURKSTAT, CBRT.

Annual inflation in food and catering services remained unchanged at 11.55 percent, while CPI inflation excluding food and catering services reached 7.61 percent mostly due to the exchange rate and base effects in energy prices in the last quarter (Chart 3.2.4). Given the high share of food within the consumption basket, the course of food and related services can adversely affect inflation perception and expectations, especially among consumers. Thus, bringing inflation in food-related categories down to levels consistent with the consumer inflation target is of great importance. The measures to be proposed by the Committee on Monitoring and Evaluation of Food and Agricultural Product Markets are expected to provide a significant contribution in this regard.

Chart 3.2.3.
Unprocessed Food Prices
(Annual Percent Change)

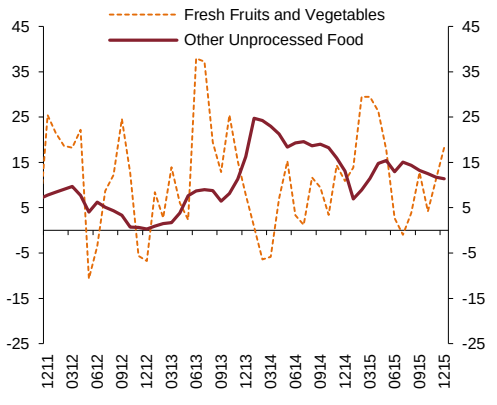
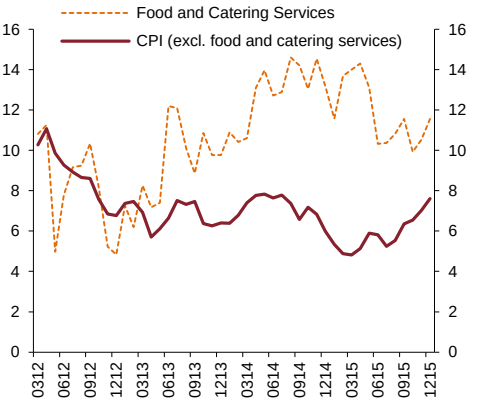


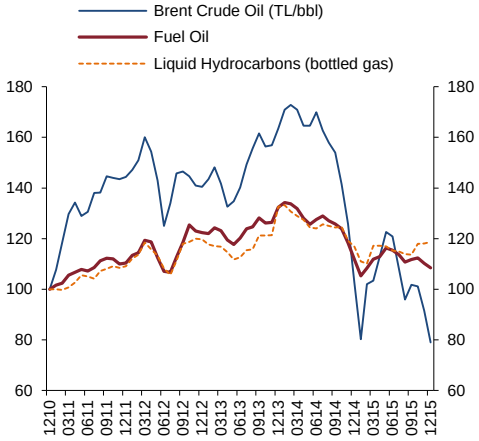
Chart 3.2.4.
Food and Non-Food Prices
(Annual Percent Change)



Source: TURKSTAT, CBRT.

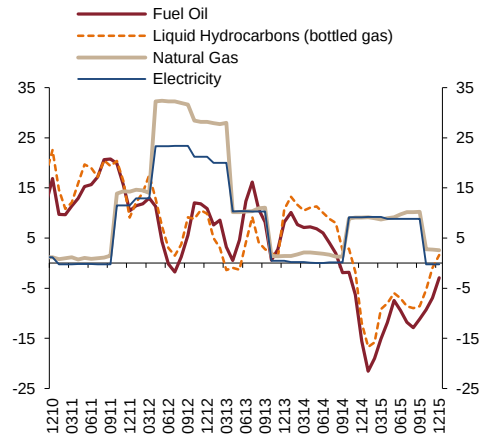
Energy prices edged up by 0.24 percent in the last quarter. The downtrend in international oil prices continued and Brent crude oil prices receded from 47 USD to 36 USD from the start to the end of the last quarter. This plunge had evident effects on fuel oil prices causing a 2.89 percent fall on a quarterly basis. However, bottled gas prices followed a reverse course in the last quarter and rose by 4.43 percent (Chart 3.2.5). Electricity and natural gas prices were unchanged in this quarter, while municipal tap water tariffs remained on an upward trend (Chart 3.2.6). Hikes in municipal water prices emerged as the leading factor to shadow a potentially better outlook in energy price inflation across the year. As a result, annual energy price inflation increased amid base effects in the last quarter to 2.96 percent, and contributed positively to CPI inflation in 2015. On the other hand, annual energy inflation is likely to surge in January owing to both the low base in 2015 and price hikes in electricity, which is an administered price item.

Chart 3.2.5.
Crude Oil and Selected Domestic Energy Prices
(December 2010=100)



Source: Bloomberg, TURKSTAT, CBRT.

Chart 3.2.6.
Domestic Energy Prices
(Annual Percent Change)



Source: TURKSTAT.

Prices of alcoholic beverages and tobacco products followed a horizontal course in the last quarter. However, as per the Decree enforced in January 2016, the SCT on alcoholic beverages and tobacco products was raised, which is expected to affect the January CPI inflation by around 0.45 points. Together with the price adjustments in other administered price items like electricity as well as taxes on mobile phones, these fiscal measures are estimated to have a direct effect by around 0.7 points on consumer price inflation.

3.3. Domestic Producer Prices

Domestic producer prices decreased by 1.94 percent amid the developments in manufacturing prices, and annual inflation dropped to 5.71 percent in the last quarter (Table 3.3.1 and Chart 3.3.1). This decline was mainly driven by the downtrend in international commodity prices, oil prices in particular. Subcategories saw falling quarterly prices in this quarter (Table 3.3.1).

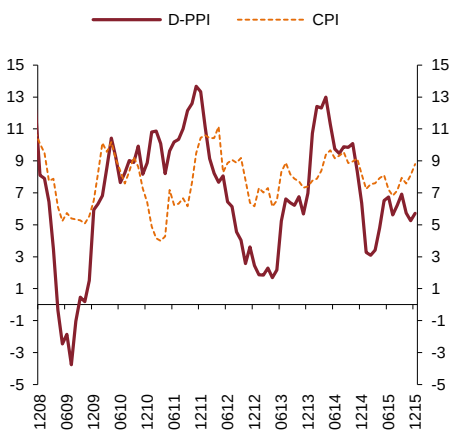
Table 3.3.1.
D-PPI and Subcategories
(Quarterly and Annual Percent Change)

	2014		2015				
	IV	Annual	I	II	III	IV	Annual
D-PPI	**-0.82**	**6.36**	**2.60**	**2.81**	**2.20**	**-1.94**	**5.71**
Mining	-2.86	1.02	0.33	3.59	-3.41	-1.08	-0.69
Manufacturing	-1.01	7.63	2.64	3.45	2.12	-1.89	6.38
Manufacturing (excl. petroleum products)	-0.06	8.98	2.65	3.12	2.70	-1.32	7.28
Manufacturing (excl. petroleum and basic metal products)	0.16	9.56	2.70	3.22	2.88	-0.57	8.44
Electricity and Gas	1.53	-3.56	1.80	-3.33	5.38	-3.39	0.19
Water	4.54	11.90	13.75	2.21	0.27	2.89	19.95
D-PPI by Main Industry Groups							
Intermediate Goods	-0.36	6.53	1.97	2.96	3.05	-2.30	5.69
Durable Goods	0.84	7.55	5.15	3.20	4.07	-0.40	12.48
Durable Goods (excl. jewelry)	1.29	7.38	2.91	2.98	2.87	2.54	11.78
Non-Durable Goods	0.49	13.82	3.24	3.31	0.60	-0.52	6.73
Capital Goods	-0.88	5.97	2.23	2.87	5.15	-0.45	10.08
Energy	-5.54	-7.64	2.29	1.33	-0.49	-5.54	-2.57

Source: TURKSTAT, CBRT.

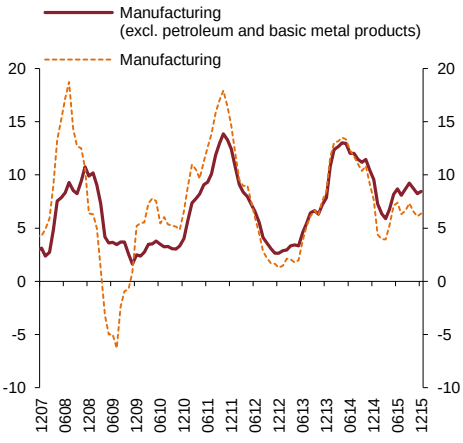
In the last quarter, manufacturing industry prices fell by 1.89 percent, and the annual inflation receded to 6.38 percent on a quarterly basis (Table 3.3.1 and Chart 3.3.2). This decline is attributed to the fall in international commodity prices and the mild course of the Turkish lira. In fact, import prices fell in both USD and TL-denominated terms in the last quarter of the year (Chart 3.3.3).

Chart 3.3.1.
Domestic Producer and Consumer Prices
(Annual Percent Change)



Source: TURKSTAT.

Chart 3.3.2.
Manufacturing Prices
(Annual Percent Change)

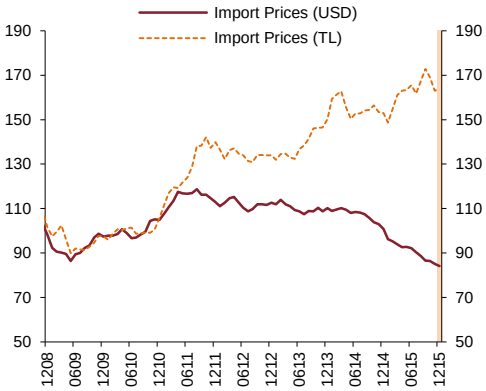


Source: TURKSTAT, CBRT.

Falling prices dominated the main industrial subcategories in this period (Table 3.3.1). Prices of intermediate goods decreased by 2.30 percent mostly owing to steel products. Prices of capital goods also declined due to metal construction products. Prices of durable goods posted a decline because of jewelry prices, while prices of durable goods excluding jewelry rose by 2.54 percent. Thus, annual durable goods inflation in the manufacturing industry reached 12 percent in 2015, which had adverse effects on consumer prices throughout the year. The fall in prices of non-durable goods in the last quarter, on the other hand, was driven by food manufacturing prices, particularly meat and meat products. Increases in the manufacturing industry prices excluding petroleum and basic metal products, which entail information on the underlying trend of producer prices, recorded a quarterly decline (Chart 3.3.4). As a result, cost pressures on consumer prices stemming from the manufacturing

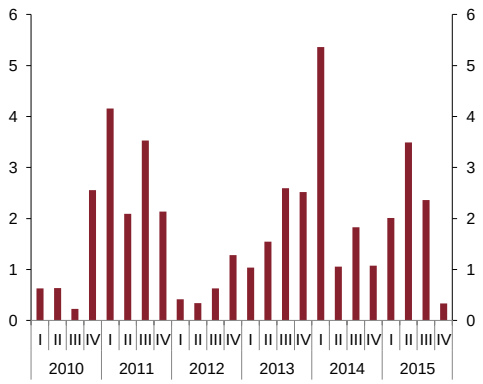
industry remained brisk in the first three quarters, but alleviated across subcategories excluding durable goods and water provision in the last quarter.

Chart 3.3.3.
Import Prices in USD and TL*
(2010=100)



* Forecast for December.
Source: TURKSTAT, CBRT.

Chart 3.3.4.
Manufacturing Industry Prices Excluding Petroleum and Basic Metal Products
(Seasonally Adjusted, Quarterly Percent Change)



Source: TURKSTAT, CBRT.

3.4. Expectations

Having trended upwards across 2015, medium-term inflation expectations continued to deteriorate in the last quarter in view of the developments in inflation. In addition, January price hikes to certain administered items, particularly alcoholic beverages, tobacco products and electricity as well as the depreciation of the Turkish lira and the high minimum wage increase caused medium-term inflation expectations to worsen further (Chart 3.4.1). Across maturities, short-term inflation expectations were revised considerably upwards on a quarterly basis, while expectations with longer terms recorded a more limited rise (Chart 3.4.2). Accordingly, inflation expectations currently hover above the 5-percent year-end target set for 2016 and 2017.

Chart 3.4.1.
12-Month and 24-Month-Ahead Inflation Expectations*
(Annual Percent Change)

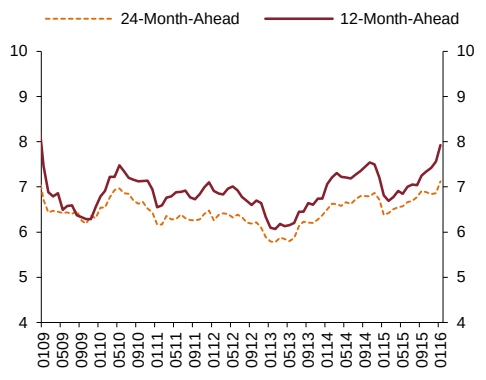
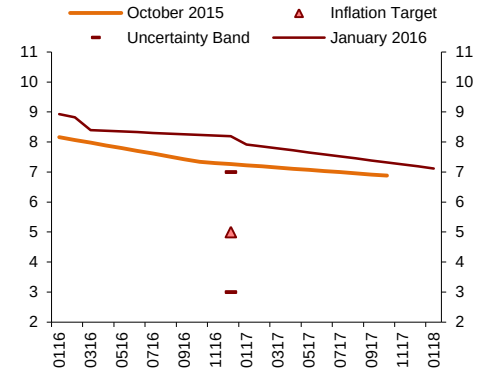


Chart 3.4.2.
Inflation Expectations**
(Annual Percent Change)



* CBRT Survey of Expectations, second survey period results for the pre-2013 period.
** Calculated by linear interpolation of expectations for different time spans using the CBRT Survey of Expectations, second survey period results for the pre-2013 period.
Source: CBRT.

The dispersion of medium-term inflation expectations indicates deterioration in inflation expectations in January compared to October (Charts 3.4.3 and 3.4.4). Particularly, the percentage of respondents expecting 12-month-ahead inflation to be 7.5 percent or above increased notably.

Chart 3.4.3.
Distribution of 12-Month-Ahead Inflation Expectations*
(Percent)

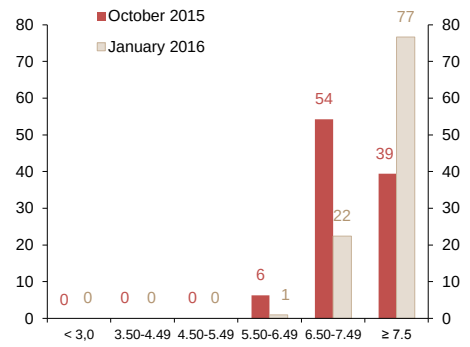
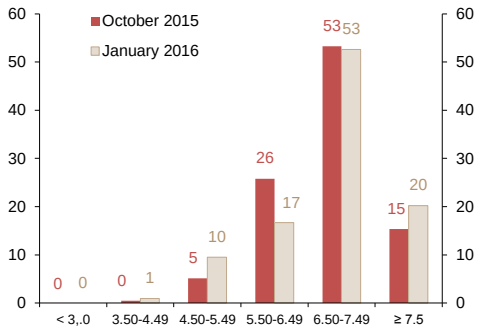


Chart 3.4.4.
Distribution of 24-Month-Ahead Inflation Expectations*
(Percent)



* CBRT Survey of Expectations, second survey period results for the pre-2013 period. Horizontal axis denotes inflation rates, while the vertical axis denotes the Kernel forecast. For further details, see CBRT website Statistics/Tendency Surveys/Survey of Expectations/Methodological Information.
Source: CBRT.

Box 3.1 Impacts of Base Effects on the CPI Inflation in 2016

Exchange rate developments and food prices proved influential in the course of annual inflation in 2015. The Turkish lira depreciated throughout the year due to the volatility in global markets and domestic uncertainties. This caused not only an uptick in core goods and services inflation, but also restricted a possible fall in domestic energy prices amid lower international oil prices. Despite the evident correction in unprocessed food prices in the second quarter, food prices trended upwards across the year. In turn, the high course of food prices pushed services inflation via catering services prices. As a result, the annual CPI inflation exceeded the uncertainty band in 2015, while core inflation indicators remained unfavorable as their annual inflation and the underlying trend saw no noticeable recovery compared to the previous year. This box analyzes the contribution of base effects to annual inflation in CPI and core inflation indicators in 2016 by subcategories.

The base effect stems from the deviation of the month-on-month change in the previous year from the typical monthly change in the respective month.[2] Thus, in addition to current price developments, annual inflation may also be affected by the base effect.

The contribution of base effects to expected changes in annual CPI inflation in 2016 by subcategories is displayed in Chart 1.[3] Accordingly, the biggest contribution across the year may come from prices of core goods, energy and food, unprocessed food in particular. Base effects emanating from core goods are expected to bring inflation down throughout the year, while those arising from energy prices are expected to push inflation upwards especially in the second half. High monthly changes in food prices in the first quarter of 2015 may result in negative base effects in the first quarter of 2016. Meanwhile, unless shadowed by current price changes, base effects stemming from food prices may lead to upside fluctuations in the annual CPI inflation in May and October.

On a cumulative basis, base effects may pull the end-2016 consumer inflation by 0.8 points downwards compared to the end of 2015 (Chart 2).[4] Cumulative contributions of the base effects from food, core goods and services prices may prove negative across the year, while those from energy, alcohol and tobacco, which are excluded from the core indicators, are expected to be positive. Accordingly, cumulative base effects may have more favorable contributions to the annual inflation of core indicators than that of the CPI. In fact, in year-on-year terms, these effects are estimated to reduce annual inflation in SCA-H and SCA-I by 2.3 and 2.9 percentage points, respectively, by December 2016.

[2] Typical monthly change reflects the overall course of price movements in the respective period. However, there is no standard way to calculate this normal change. Accordingly, the average monthly inflation in subcategories in the respective month during the 2008-2014 period constitutes the typical change in this analysis. On the other hand, the ECB uses an alternative measure for typical change by adding seasonal factors to seasonally adjusted average monthly changes since mid-1990s (ECB, 2015).

[3] In this box, base effects are calculated by using CPI subcategory weights in 2015 and in the spirit of CBRT (2012).

[4] The contribution of base effects to changes in annual inflation may vary depending on the measurement of the typical monthly change. However, the direction and the course of this contribution are similar regardless of the measurement method. In this context, it should be noted that the course and direction of the total cumulative contribution is more informative than the magnitude thereof regarding the change in the annual inflation.

Chart 1. Contribution of Base Effects to Expected Monthly Changes in Annual CPI Inflation in 2016 (Percentage Points)

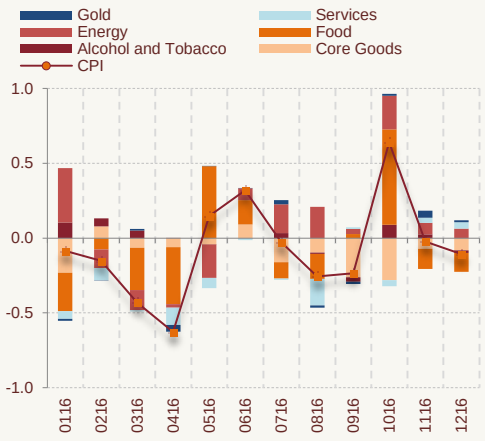
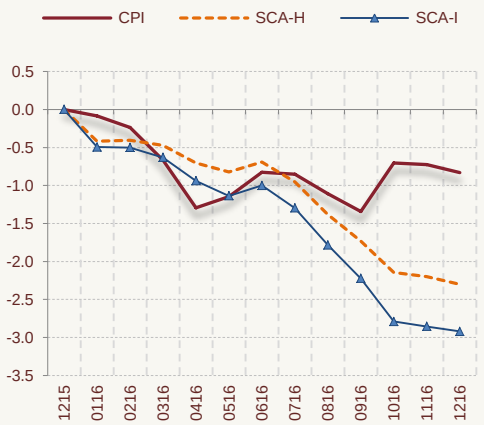


Chart 2. Cumulative Contribution of Base Effects to Changes in Annual Inflation in CPI and Core Inflation Indicators (Percentage Points)



Source: CBRT.

In sum, the course of annual CPI inflation will be subject to base effects from subcategories in 2016 and these effects may have a downside impact on annual CPI inflation. However, besides base effects, the course of annual inflation is also shaped by current price developments. Factors such as the course of the exchange rate, weather conditions, public price adjustments, wage increases and aggregate demand developments may affect inflation through current prices in the upcoming period. Yet, understanding the contribution of base effects to the changes in annual CPI inflation is crucial for true measurement of the underlying trend.

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ECB, 2015, The role of base effects in the projected path of HICP inflation, Box 3 in ECB Economic Bulletin Issue 8/2015.

CBRT, 2012, The Role of Base Effects on the CPI Inflation in 2012, Box 7.2 in Inflation Report 2012-I.

Box 3.2 A Bayesian Approach to Analyzing Inflation Dynamics in Turkey[5]

Understanding the effects of macroeconomic variables on inflation with respect to their speed and size is crucial for inflation-targeting central banks. The question of how inflation reacts to changes in its major determinants, such as exchange rates, international prices, GDP growth and wages is one of the most frequently debated issues in the Turkish economy. Against this background, this box aims to contribute to the analysis of inflation dynamics in Turkey and explores the effects of these variables on inflation.

In order to understand these effects with respect to their speed and size, the study utilizes a 5-variable VAR model, which includes currency basket (0.5*USD+0.5*Euro), USD-denominated import prices, GDP, consumer prices excluding unprocessed food, alcohol and tobacco products (CPIX) and non-farm wages per hour worked as endogenous variables. The study uses quarterly data in the post-2005 period. In addition, the model employs exogenous variables, which are the EMBI-global (the global risk indicator), global GDP, tax rate on domestic fuel prices and unprocessed food prices excluding fresh fruits and vegetables.[6]

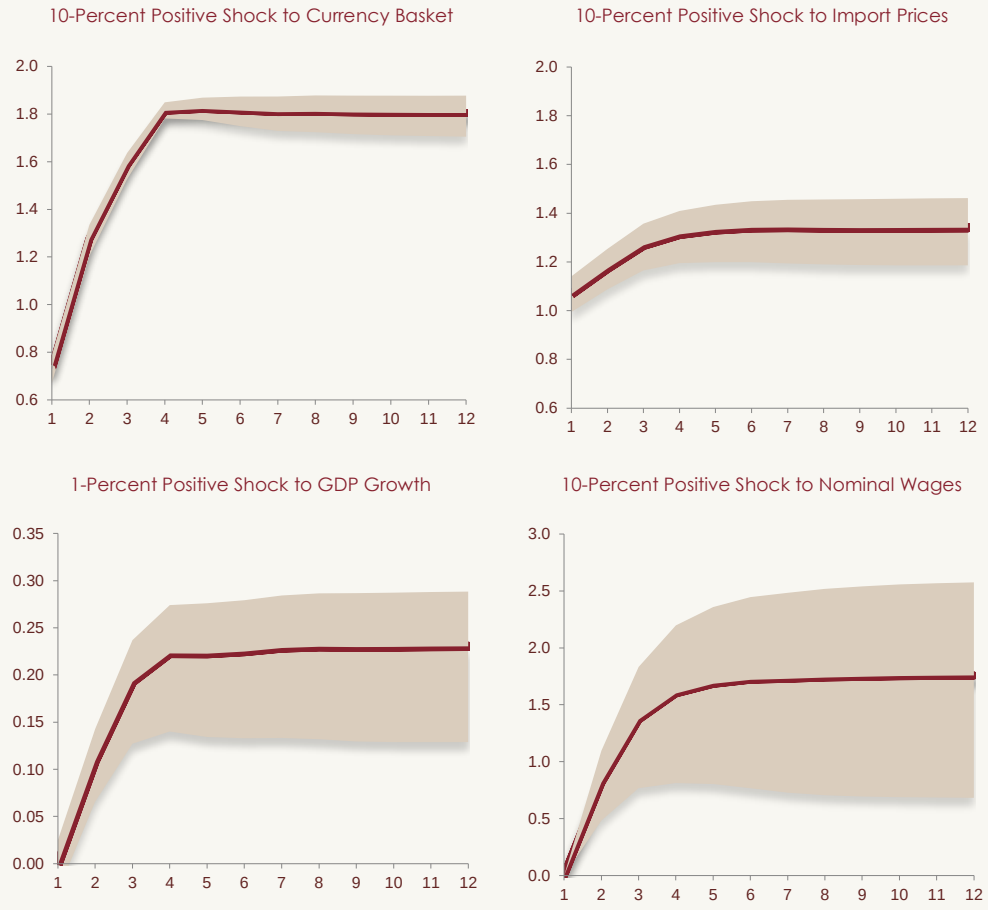
It should be underlined that some of these control variables carry some country-specific traits. More specifically, fluctuations in fuel prices that cannot be explained by import prices and exchange rates can be attributed to the occasionally changing lump-sum tax rate. Hence, the relevant tax variable is included as an exogenous variable to the model in order to capture these movements in energy prices that cannot be represented by model dynamics. Meanwhile, to control the effect of domestic supply shocks, unprocessed food prices excluding fresh fruits and vegetables are included in the model also as an exogenous variable.[7]

The other exogenous variables (global growth and global risk) are incorporated in the model in compliance with the theory asserting the direction of the macroeconomic relations. In particular, periods of increased global growth and risk appetite coincide with periods of rising commodity prices and accelerating capital inflows, which lead to brisk economic activity in emerging economies. This channel causes import prices and domestic growth to move in the same direction, thereby restricting the effect of an internationally driven cost shock on the domestic economic activity. In order to better gauge the relationship between import prices and domestic growth, the common drivers of these two variables, which are global growth and global risk, are added as control variables to the model. Including these two control variables will also eliminate a possible distortion in the relationship between exchange rate and domestic growth through a similar transmission, which can be formulated as global growth → capital inflows → domestic growth and appreciation of the TL.

[5] For further details, see Öğünç et al. (2016).
[6] The VAR model is estimated with 2 lags by using stationary forms of the variables. The shocks are identified through the Cholesky decomposition.
[7] Prices of restaurants and hotels have been elevated in recent years, remaining slightly above the general price level. In order to better capture the dynamics of CPIX, the prices of some unprocessed food items, in particular supply-driven red meat prices, which account for the uptrend in prices of restaurants and hotels, are included as exogenous variables.

The relatively small sample size due to data constraints is a challenge against an accurate estimation of multiple parameters. To overcome this problem, the VAR model is treated via a Bayesian perspective, which enables the inclusion of prior information to the model on some estimated parameters. Furthermore, the Bayesian approach also allows imposing some restrictions on the model for cases where a macroeconomic variable is expected to have no simultaneous or lagged effects on other variables. For example, assuming that international prices are not influenced by domestic variables in small open economies, the mean of the prior distributions of the relevant parameters is taken as 0, while their prior variances are assumed to be quite low. The imposed exogeneity restrictions (the 0 restriction for the parameter) for accurate identification of shocks are as follows: (i) external variables are not affected by domestic variables (but are affected by import prices, global risk and global growth); (ii) wages remain unaffected by global risk and global growth as well as fuel tax and unprocessed food prices excluding fresh fruits and vegetables (these variables do not have an effect on wages from another channel except growth and inflation).

Chart 1. Cumulative Response of CPIX Inflation to Selected Variables by Quarters
(Percentage Points)



Source: Öğünç et al. (2016).

The main findings regarding inflation dynamics in Turkey are summarized in Chart 1 via cumulative impulse-response functions by quarters. This helps to illustrate the speed and the size of the response of CPIX inflation to major shocks. Moreover, impulse-response distributions obtained from the Bayesian approach provide information regarding the uncertainty of the estimation. The dark lines denote the median response corresponding to the 50th percentile, while the light-colored interval shows the response range corresponding to 35th and 65th percentiles. Accordingly, the main findings based on median responses are summarized as follows:

A 10-percent depreciation of the Turkish lira against the currency basket increases inflation by 1.8 percentage points at the end of two years. The pass-through of the exchange rate shock to inflation is completed within a year. The 40 percent of the pass-through is completed within 3 months, while 70 and 88 percent of the pass-through are completed in six and nine months, respectively. These results are mostly consistent with previous studies.[8]

A 10-percent positive shock to USD-denominated import prices increases inflation by 1.3 percentage points at the end of two years. The pass-through from import prices is faster in the short-term compared to that from the exchange rate. The completion of import price pass-through takes longer but a major portion of the pass-through is completed within a relatively shorter time (in three months).

A 1-percent positive shock to quarterly GDP growth increases inflation by 0.23 percentage points at the end of two years. Changes in the exchange rate and import prices have a contemporaneous effect on inflation, while the effect of growth is observed with a lag. The pass-through from economic activity to inflation is finalized within a year, where about half of the pass-through takes place within the first six months, and 84 percent of it is completed within the first nine months.

A 10-percent positive shock to non-farm nominal wages per-hour worked increases inflation by 1.8 percentage points at the end of two years. Similar to economic activity, the effect of wages on inflation is observed with a lag. The completion of the pass-through from wages to inflation takes longer (about two years), where 50, 78 and 90 percent of the pass-through are completed in the first six months, nine months and one year, respectively.

The uncertainty interval around the median estimate is quite sizeable for wage pass-through. The distributions of the estimates for the effect of the exchange rate and import prices on inflation indicate a rather low level of uncertainty. For a 10-percent positive shock, the lower and upper limits corresponding to 35th and 65th percentiles indicate a pass-through between 1.7 and 1.9 percentage points for the exchange rate, and between 1.2 and 1.5 percentage points for import prices. The response of inflation to a 1-percent growth shock for the same percentiles ranges from 0.1 to 0.3 percentage points. On the other hand, the distribution of estimates for wage pass-through indicates that the effect of a 10-percent wage shock on inflation may vary between 0.7 to 2.6 percentage points. Therefore, the information content of the median estimate for wage pass-through to inflation is viewed to be limited.

[8] Kara and Öğünç (2012) show that the exchange rate pass-through during 2002-2011 is around 15 percent on average within one-year, and 17 percent within two years. In this context, the findings presented in box also imply that the exchange rate pass-through in Turkey remained virtually unchanged in recent years.

The high level of uncertainty in estimates for wage pass-through to inflation requires caution in making policy inferences. The effect of the minimum wage rise on inflation for 2016 will primarily depend on how general level of wages will be affected by this increase. Employment and the wage policy of firms, which will primarily be shaped by their tendency to resort to unregistered (informal) activities, will be a major determinant of costs to employers. Any increase above 12 percent in wages, which corresponds to the average increase in non-farm nominal wages per-hour worked during 2011-2015, may impose an additional burden on current inflation. Therefore, when analyzing the additional contribution of the recent minimum wage rise to inflation, the effect of the extra part (the rise over the trend growth in wages) should be taken into account. For example, according to the median estimates for the pass-through, an additional increase by 5 percentage points in non-farm nominal wages per hour worked in 2016 (17 percent instead of 12 percent) may lead to an additional inflation of 0.9 percentage points on the CPIX. However, this effect may vary between 0.3 and 1.3 percent as per the uncertainty band. On the other hand, the final effect on consumer inflation should be evaluated also considering the reflections of this increase on the prices of unprocessed food as well as alcohol and tobacco.

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Öğünç, F., U. Özmen and Ç. Sarıkaya, 2016, A Bayesian Approach to Inflation Dynamics in Turkey, work in progress.