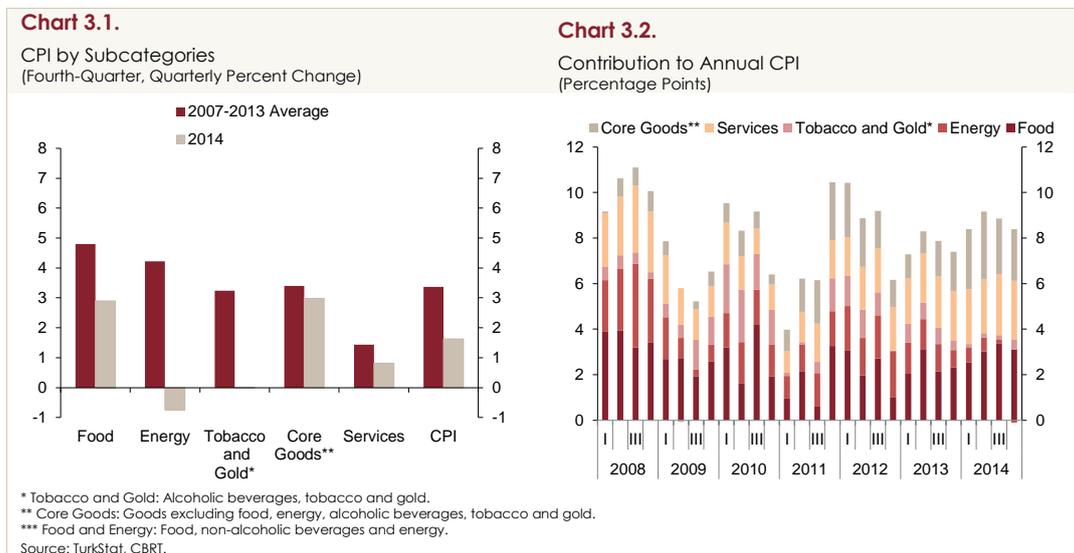


3. Inflation Developments

In the fourth quarter of 2014, annual consumer inflation increased by 0.8 points year-on-year to 8.17 percent, rising above the uncertainty band around the inflation target. This increase was mostly due to the upsurge in prices of core goods caused largely by the depreciation of the Turkish lira. The main drivers of the inflation to surpass the uncertainty band were the exchange rate pass-through as well as the sharp increase in food prices due to drought and adverse weather conditions. Food prices also had a negative impact on services inflation through catering services. The deterioration in inflation expectations that started in mid-2013 continued over the year because of the elevated level of consumer inflation, also causing services inflation to rise. Although the annual growth rates of core inflation indicators remained high throughout 2014, the underlying trend in seasonally adjusted terms followed a downward path during the second half of the year.

In the fourth quarter of 2014, annual consumer inflation fell by 0.7 points quarter-on-quarter to 8.17 percent. Inflation was down across all subcategories in this period, with energy prices recording the most marked decline in line with plunging international oil prices (Chart 3.1). In the final quarter, although electricity and natural gas prices picked up following the price adjustments due to the cumulative cost increases from the previous period, the course of oil prices has especially played a major role in falling energy prices through domestic fuel and bottled gas prices. The decline in fuel prices also caused the relevant services prices to slow. In addition, despite the ongoing upsurge in processed food inflation over the final quarter, the partial correction in unprocessed food prices brought food inflation down slightly.

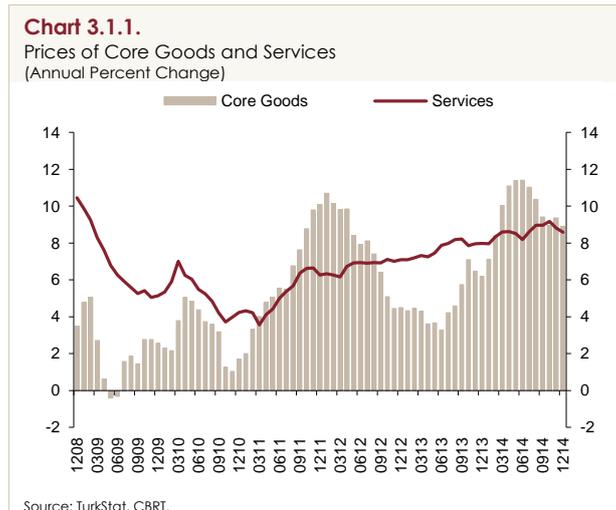


In sum, the fourth quarter was marked by the direct influence of plummeting oil prices through the energy prices and by the slowing food inflation owing to the partial correction in unprocessed food prices. Accordingly, the contribution of energy and food prices to annual inflation edged down by 0.42 and 0.25 points, respectively (Chart 3.2). Meanwhile, among other underlying trend components, inflation in core goods and services saw a limited decrease as well.

As of end-2014, adding 3.11 points, food prices have provided the highest contribution to inflation among all other subcategories. The elevated level of food prices driven by adverse weather conditions and exchange rate pressures suggests that there is room for inflation to slow down in the upcoming period. In fact, especially with the cumulative exchange rate effects tapering off and due to the base effects, the core goods inflation is estimated to decrease significantly in the first quarter. Additionally, the downtrend in import prices, particularly in international oil prices, and the envisioned moderate course of economic activity are also expected to drive inflation down. Hence, consumer inflation is projected to be on a downward trajectory in the upcoming period, more significantly in the first quarter.¹ However, it should be highlighted that the Turkish lira volatility is a major upside risk to this outlook.

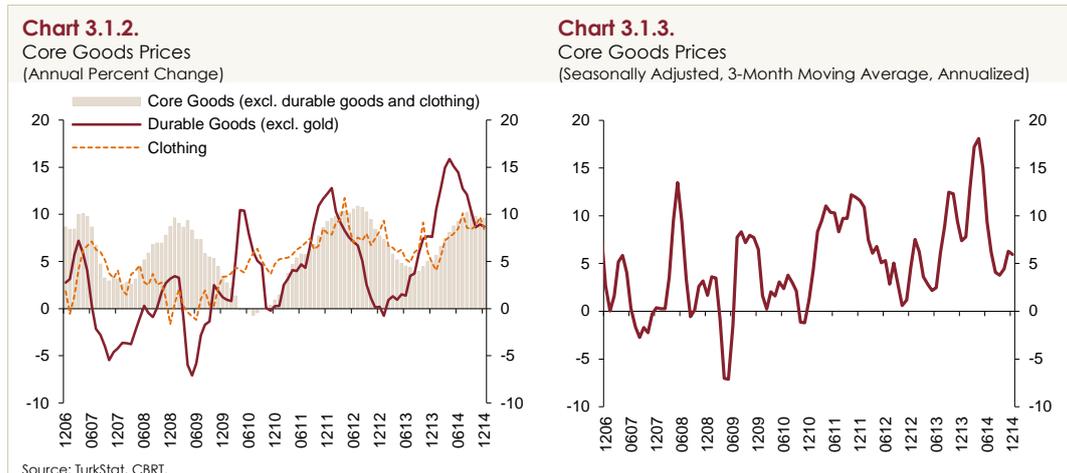
3.1. Core Inflation Outlook

Having remained elevated throughout the year due to exchange rate effects, annual core goods inflation fell by 0.5 points in the final quarter and ended 2014 at 8.89 percent (Chart 3.1.1 and Table 3.1.1). Exchange rate pressures on core goods inflation continued to wane during the fourth quarter. Durable goods inflation, which has been slowing since May, remained on the decrease due to the relatively steady course of the Turkish lira against the currency basket and the weak domestic consumption demand, and declined to 8.70 percent at the end of 2014 (Chart 3.1.2). Annual inflation in core goods excluding durables and clothing, which shows a lagged response to exchange rate changes, returned to a downtrend in the final quarter after peaking in the third quarter. Despite following a fluctuating course, annual inflation in clothing prices remained relatively flat during the last two quarters and ended the year at 8.40 percent (Chart 3.1.2). Having exerted upward pressure over 2014, the contribution of core goods to inflation decreased slightly in the fourth quarter. Yet, considering current domestic demand conditions and the high base effect from the first quarter of 2014, core goods inflation may post a substantial decline in the first quarter.



¹ Box 3.3 presents an analysis about the base effects affecting inflation over 2015.

The improvement in the underlying trend of core goods inflation observed since the second quarter halted in the final quarter (Chart 3.1.3). Yet, it should be noted that the seasonally adjusted underlying trend may occasionally follow a fluctuating course. Currently at 6 percent, the underlying trend is expected to slow further in the upcoming period, but the recent exchange rate volatility poses a risk to core goods inflation.

**Table 3.1.1.**

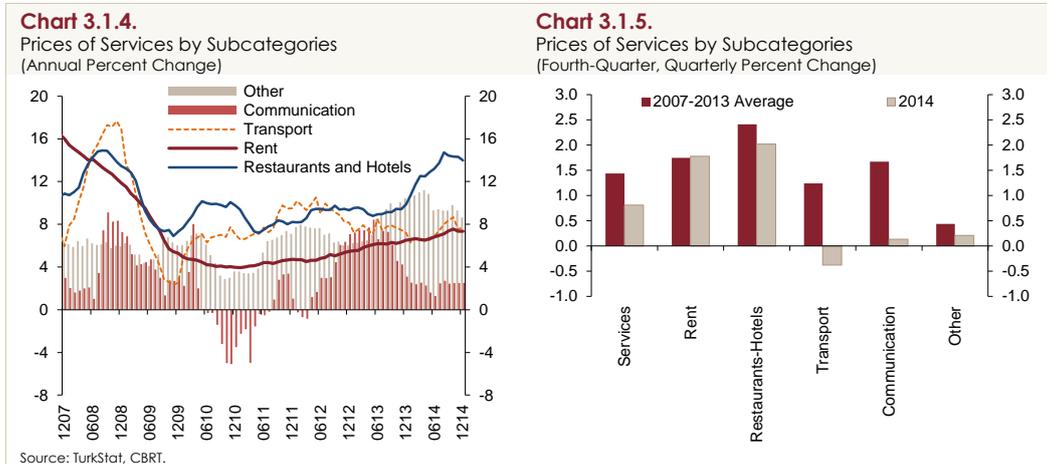
Prices of Goods and Services
(Quarterly and Annual Percent Change)

	2013		2014				
	IV	Annual	I	II	III	IV	Annual
CPI	2.28	7.40	3.57	2.06	0.69	1.63	8.17
1. Goods	2.72	7.18	4.08	2.05	-0.30	1.99	7.99
Energy	2.20	5.15	0.21	-1.12	0.11	-0.74	-1.54
Food and Non-Alcoholic Beverages	4.01	9.67	7.50	0.41	1.50	2.90	12.73
Unprocessed Food	6.46	12.88	10.79	-2.16	0.02	3.53	12.24
Processed Food	2.04	7.11	4.57	2.82	2.82	2.36	13.16
Core Goods	3.48	6.20	2.05	6.16	-2.39	2.98	8.89
Clothing and Footwear	10.38	4.82	-10.32	22.36	-10.50	10.38	8.40
Durable Goods (excl. gold)	1.12	7.62	9.54	-0.39	-0.08	-0.29	8.70
Furniture	2.89	9.50	3.14	4.00	-1.11	1.56	7.73
Electrical and Non-Electrical	0.91	-1.48	3.86	-2.51	0.69	-0.31	1.64
Appliances	0.67	10.27	16.65	-1.24	-0.10	-1.19	13.72
Automobile	2.69	7.25	2.78	2.75	0.26	1.07	7.02
Other Durable Goods	2.13	5.05	3.21	2.85	1.82	1.38	9.57
Core Goods (excl. clothing and durable goods)	2.13	5.05	3.21	2.85	1.82	1.38	9.57
Alcoholic Beverages, Tobacco and Gold	-4.39	6.74	8.24	-0.92	0.45	0.00	7.73
2. Services	1.16	7.98	2.37	2.10	3.05	0.81	8.59
Rent	1.81	6.50	1.30	1.82	2.25	1.78	7.34
Restaurants and Hotels	2.42	9.86	4.54	2.81	3.95	2.02	13.98
Transport	0.18	7.20	1.24	2.68	4.05	-0.38	7.76
Communication	0.09	3.09	-0.14	0.02	2.48	0.14	2.50
Other*	0.82	10.43	3.10	2.42	2.67	0.21	8.64

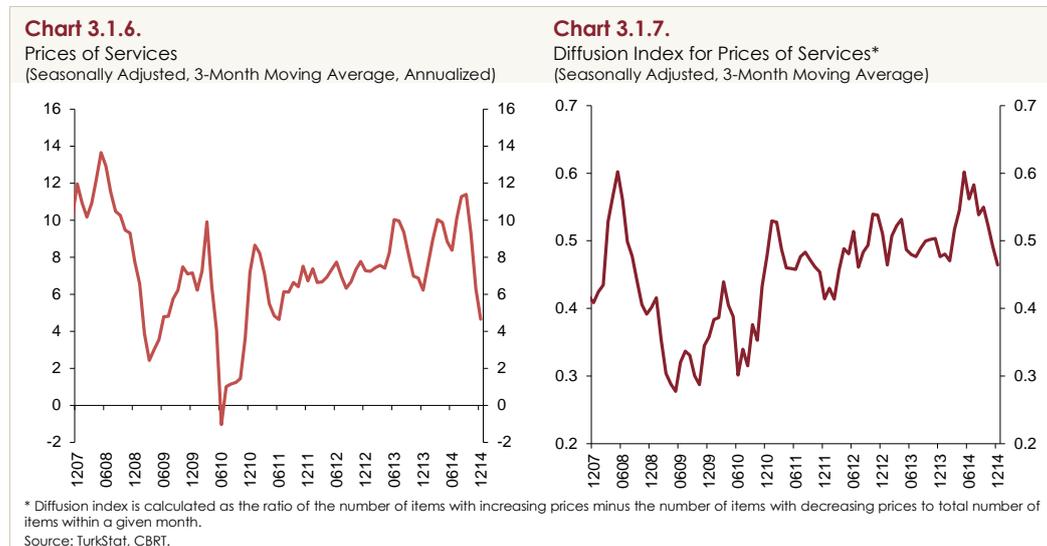
* Services excluding rents, restaurants and hotels, transport and communication.
Source: TurkStat, CBRT.

Annual services inflation remained elevated throughout 2014 and ended December at 8.59 percent, thus contributing to consumer inflation by 2.56 points. The high course of services inflation, which hit a five-year high by rising above 9 percent in October, was mainly attributed to restaurant and hotel prices as well as to prices of other services. However, the moderate course of communication services limited services inflation over the whole year (Chart 3.1.4). Plunging oil prices have been affecting fuel-related services categories significantly since November. In fact, prices of transport

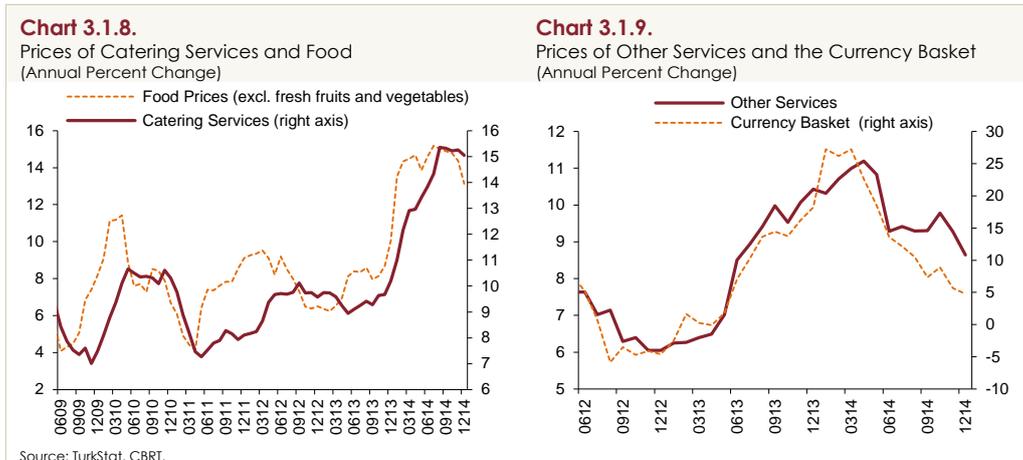
services saw a quarter-on-quarter decline during the fourth quarter. Moreover, the rate of increase in prices of restaurants, hotels, communication and other services lagged behind the historical averages, bringing annual services inflation down by 0.4 points from the third quarter (Charts 3.1.1 and 3.1.5).



Although the easing in the annual services inflation is currently marginal, seasonally adjusted data point to a notable improvement in the underlying services inflation. According to quarterly averages, the underlying inflation trend and the diffusion index were remarkably down in the last two months of the year (Charts 3.1.6 and 3.1.7).

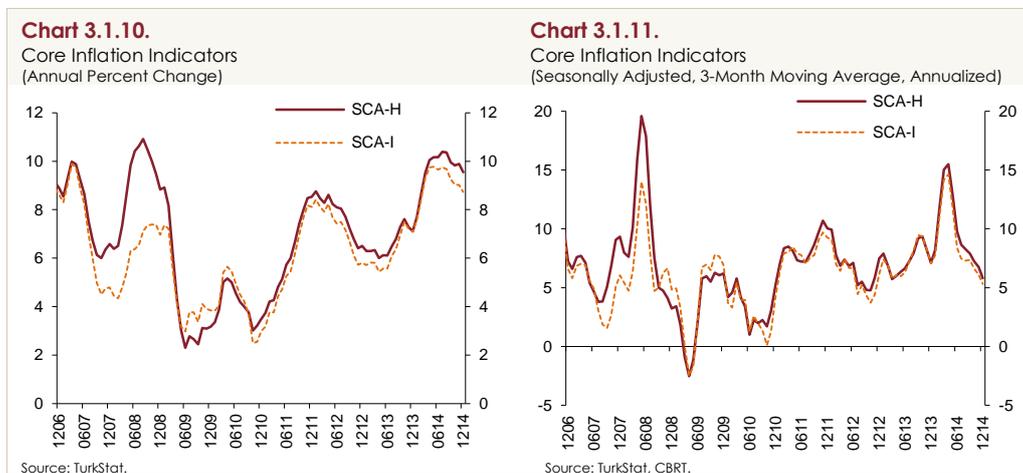


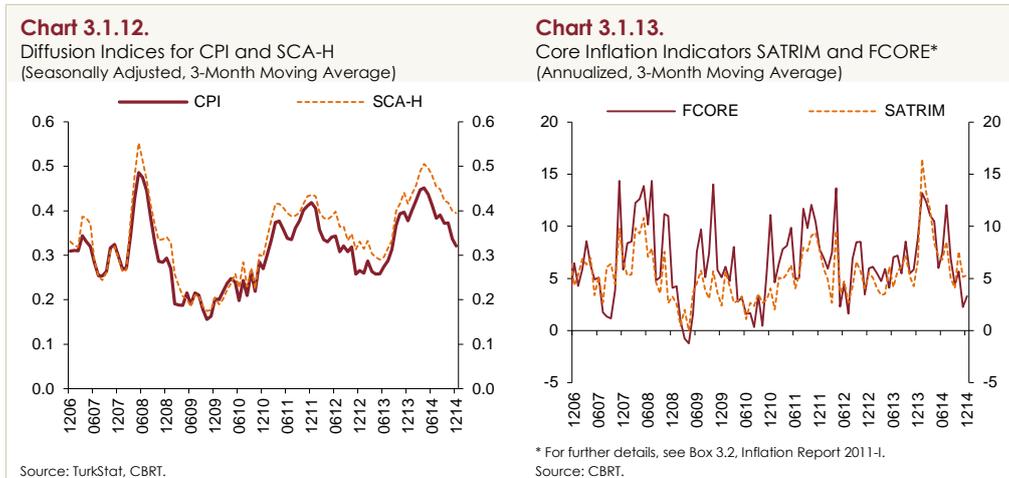
Despite this recent slowdown, cost-side pressures continue to drive services inflation higher, albeit less vigorously. Even though prices of catering services, a subcategory directly affected by food prices, increased at a slightly slower pace in the fourth quarter, the annual inflation in this subcategory remained elevated at 15 percent (Chart 3.1.8). Inflation in the other services category, which is closely related to domestic demand conditions and exchange rates, recorded a decline during November-December (Chart 3.1.9). This was largely attributed to the currently sluggish economic activity and the tapering effects of the Turkish lira depreciation as well as to the favorable course across subcategories affected by fuel prices and thus by transport costs.



In addition to international price developments that have been contributing to disinflation, the ongoing tight monetary policy stance has also supported the envisaged gradual improvement in services inflation. The recent reversal of the deterioration in inflation expectations observed since mid-2013 and the fall in headline inflation will have positive repercussions for subcategories of services with a strong indexing behavior. However, the fact that the net rate of increase in minimum wages, a major cost component for the services sector, is set at an average of 12.2 percent for 2015 is believed to limit the fall in services inflation.

In line with the outlook for prices of core goods and services, annual inflation in SCA-H and SCA-I fell slightly in the final quarter to 9.55 and 8.73 percent, respectively, as of end-2014 (Chart 3.1.10). Thanks to the macroprudential measures adopted in early 2014 and the tight monetary policy stance, the slowdown in the underlying trend of core inflation indicators has been more pronounced (Chart 3.1.11). Contrary to past quarters, the main driver of the improvement in the underlying trend was the services category, while core goods provided only a small contribution to this favorable outlook. According to the diffusion indices for CPI and SCA-H, the tendency to hike up prices waned quarter-on-quarter in the fourth quarter, while alternative core inflation indicators monitored by the CBRT pointed to a relatively lower inflation trend in this period (Charts 3.1.12 and 3.1.13). In sum, the slowdown in the trend of inflation became more evident in the final quarter of 2014 and indicators on the underlying trend of inflation approached target-consistent levels.

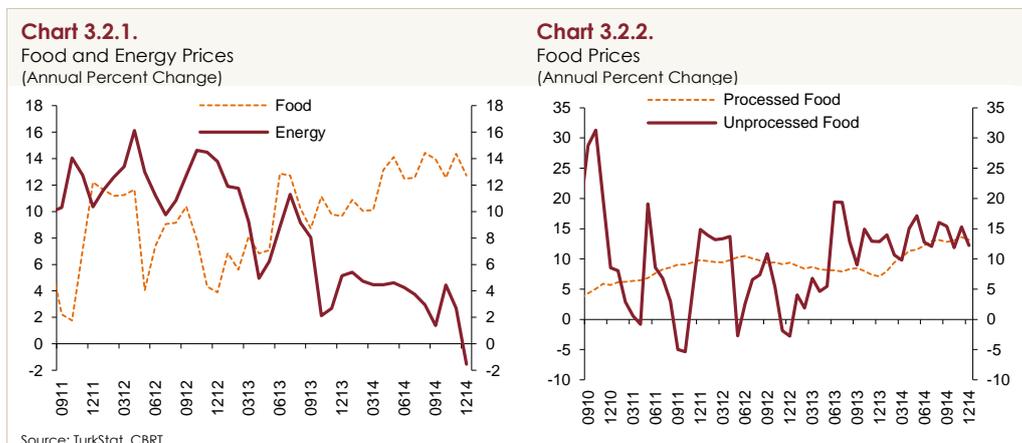




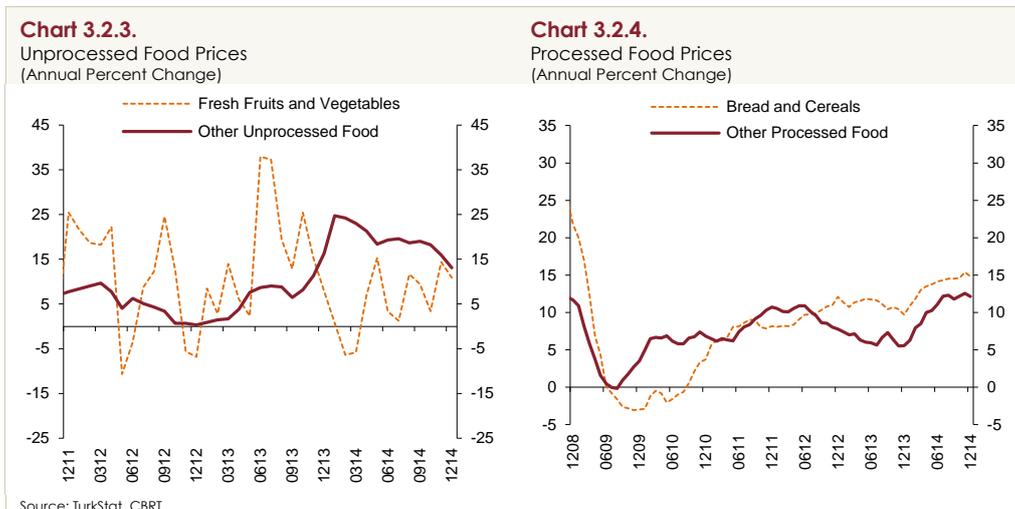
3.2. Food, Energy and Alcohol-Tobacco Prices

Having remained high over 2014 on adverse weather conditions and the depreciation of the Turkish lira, annual food inflation fell to 12.73 percent in the final quarter to a level close to the October Inflation Report assumption (Chart 3.2.1). This decline in food inflation is largely due to the partial correction in unprocessed food prices.

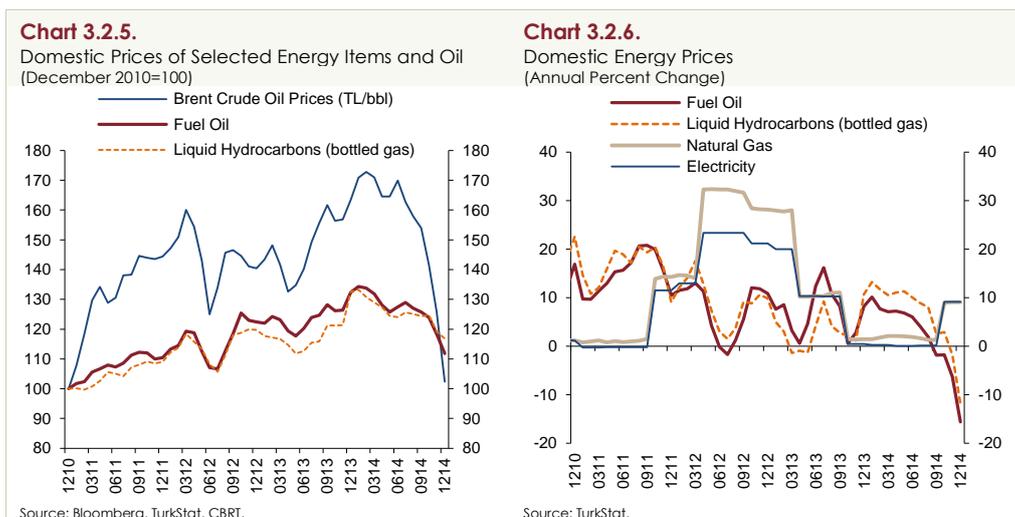
Annual unprocessed food inflation decreased by 3.18 points quarter-on-quarter to 12.24 percent (Chart 3.2.2). Annual inflation remained volatile in fresh fruits and vegetables and ended the year at a higher level than in the third quarter due to base effects from fresh fruit prices (Chart 3.2.3). Despite the rise in annual inflation, the latest data in seasonally adjusted terms pointed to a correction in fresh fruit and vegetable prices. Meanwhile, annual inflation in prices of other unprocessed food declined by 6 points to 13.08 percent in the fourth quarter (Chart 3.2.3). The uptrend in processed food prices that prevailed through 2014 continued into the fourth quarter due to adverse supply conditions (Table 3.1.1). Across this subcategory, annual inflation was higher in bread and grains than in other processed food (Chart 3.2.4).² Thus, the year-end inflation in processed food spiked to a six-year high of 13.16 percent.



² In 2014, international and domestic food prices diverged basically due to domestic supply conditions. For an analysis of this issue, see Box 3.2.



Energy prices dropped by 0.74 percent in the fourth quarter. The fall in international oil prices was more marked in this period and the price of Brent crude oil ended the fourth quarter at 56 USD per barrel, down from 93 USD in the beginning of the quarter. The first-round effects of this plunge were evident in energy prices, with fuel and bottled gas prices going down by 11.2 and 6.1 percent, respectively, in the fourth quarter (Chart 3.2.5). Accordingly, the fall in fuel and bottled gas prices during August-December made a direct contribution of about -0.76 points to consumer inflation. However, the outlook for energy items in home utilities was significantly different (Chart 3.2.6). Electricity and natural gas prices were up around 9 and 8 percent, respectively, largely due to the adjustment driven by cost pressures from cumulative effects of past depreciations in the Turkish lira. This directly added about 0.4 points to consumer inflation. Likewise, after three consecutive quarters, municipal water tariffs continued to increase dramatically in the fourth quarter as well. Hence, annual energy inflation fell by 2.92 points in the final quarter to a historically low level of -1.54 percent (Chart 3.2.1). The total indirect impact of the oil price fall on consumer inflation will depend on the course of administered prices of natural gas and electricity.³



³ For more detailed information on the effects of the oil price fall on consumer inflation, see Box 3.1.

Prices of alcoholic beverages and tobacco products remained flat in the fourth quarter. Yet, the Council of Ministers' SCT hike on tobacco products and alcoholic beverages effective as of January is projected to add about 0.25 points to the consumer inflation in January.

3.3. Domestic Producer Prices

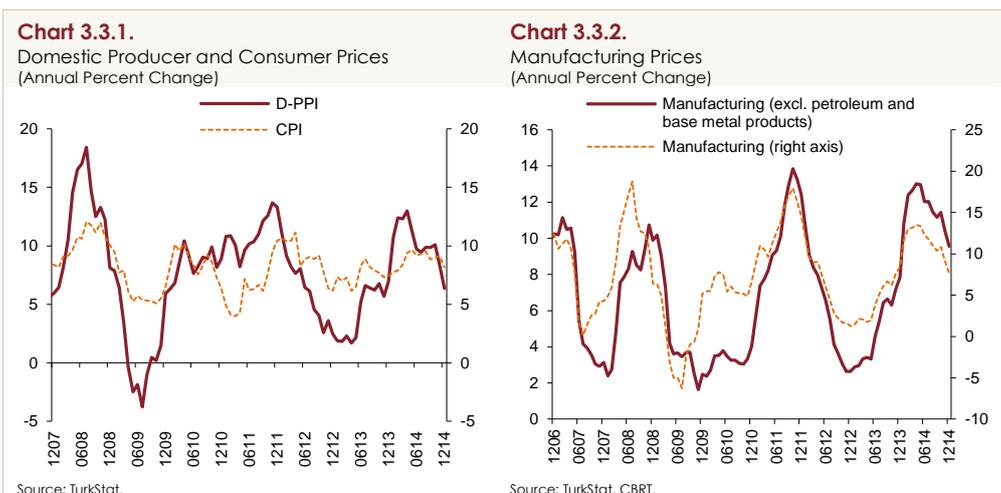
Domestic producer prices (D-PPI) decreased by 0.82 percent in the fourth quarter due to the fall in manufacturing prices (Table 3.3.1). Thus, annual D-PPI inflation declined by 3.48 points quarter-on-quarter to 6.36 percent (Chart 3.3.1).

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

	2013		2014				
	IV	Annual	I	II	III	IV	Annual
D-PPI	2.43	6.97	5.52	-0.38	2.02	-0.82	6.36
Mining	1.49	12.64	4.91	-1.77	0.92	-2.86	1.02
Manufacturing	1.50	8.45	6.29	0.11	2.18	-1.01	7.63
Manufacturing (excl. petroleum products)	1.57	8.00	6.26	0.26	2.35	-0.06	8.98
Manufacturing (excl. petroleum and base metal products)	1.63	7.85	6.27	0.55	2.37	0.16	9.56
Electricity and Gas	0.11	-11.16	-1.17	-4.85	1.01	1.53	-3.56
Water	2.28	10.77	3.66	2.29	0.95	4.54	11.90
D-PPI by Main Industry Groups							
Intermediate Goods	1.65	8.88	5.99	-0.57	1.45	-0.36	6.53
Capital Goods	1.09	11.42	6.78	-1.04	1.18	-0.88	5.97
Durable Goods	-0.15	0.51	8.47	-1.18	-0.50	0.84	7.55
Non-Durable Goods	2.23	8.24	5.79	2.18	4.79	0.49	13.82

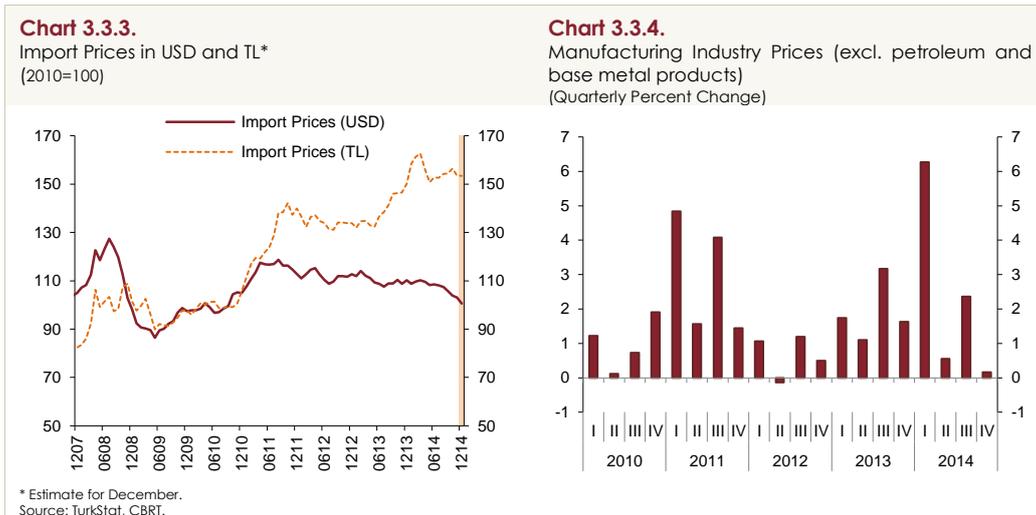
Source: TurkStat, CBRT.

In the final quarter, manufacturing industry prices decreased by 1.01 percent, bringing annual manufacturing inflation down to 7.63 percent (Chart 3.3.2 and Table 3.3.1). In this period, the downtrend in international oil prices was influential on the decreases across all manufacturing prices. Falling international commodity prices, particularly oil prices, drove both USD and TL-denominated import prices lower in the fourth quarter (Chart 3.3.3).



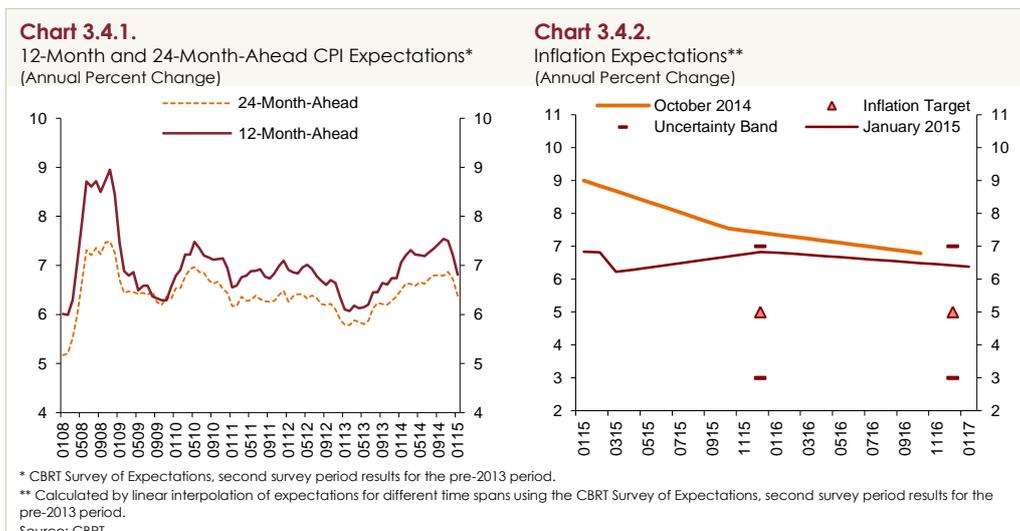
Prices of the manufacturing industry excluding petroleum and base metal products, which entail information on the underlying trend of producer prices, remained flat in quarterly terms but annual inflation in this subcategory posted a quarter-on-quarter decrease (Charts 3.3.2 and 3.3.4). In the final

quarter, easing international commodity prices brought prices of intermediate and capital goods down while the prices of durable and non-durable goods picked up moderately (Table 3.3.1). Overall, in line with the outlook for import prices, international oil prices in particular, cost-side pressures on consumer prices posed by producer prices were milder in the fourth quarter compared to the third quarter.

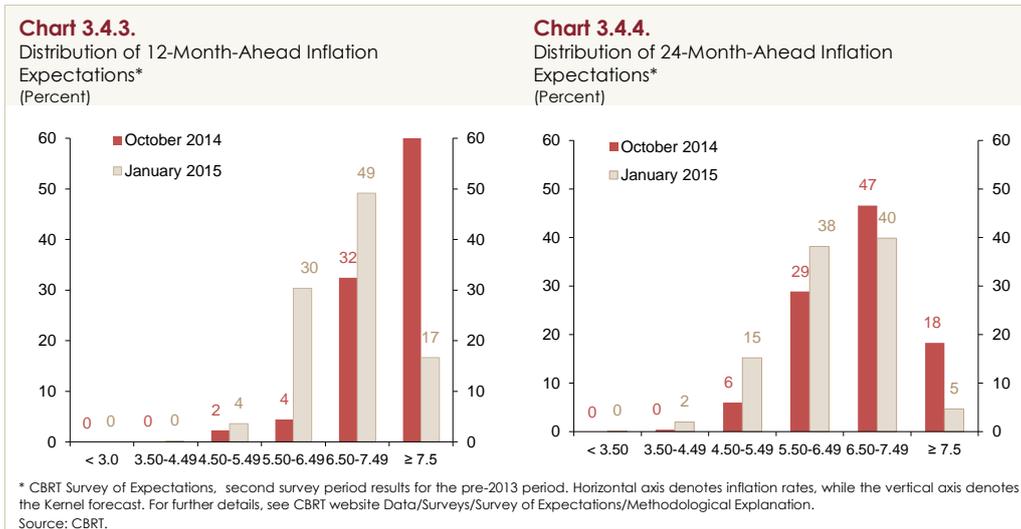


3.4. Expectations

After trending upward through 2014, medium-term inflation expectations followed a downward track in the fourth quarter on the back of falling energy prices amid plummeting international oil prices. This improvement in medium-term expectations continued more firmly into January (Chart 3.4.1). Across maturities, near-term inflation expectations were remarkably down quarter-on-quarter, but this decline was more limited for expectations over a longer term (Chart 3.4.2). Inflation expectations currently hover above the 5-percent target set for end-2015 and end-2016.



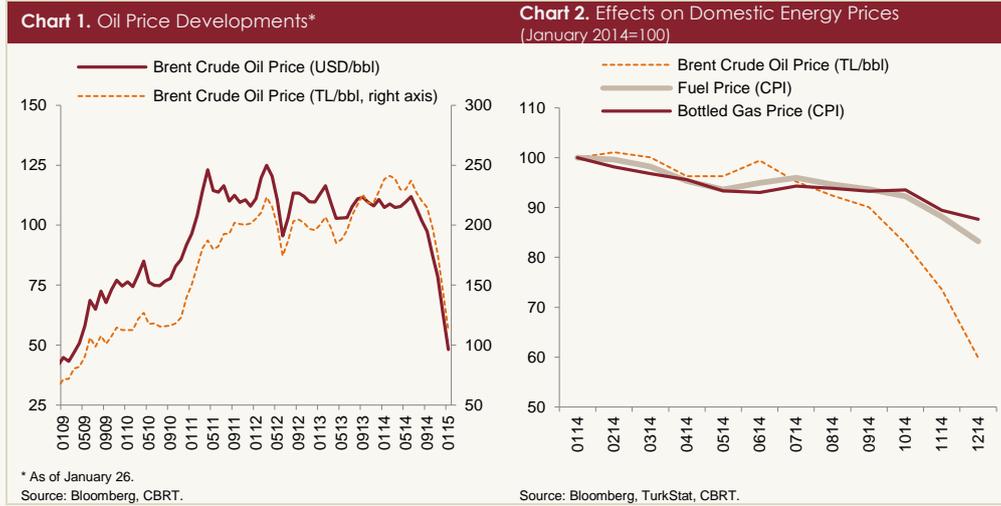
The dispersion of both 12 and 24-month-ahead inflation expectations indicates improvement in inflation expectations compared to October (Charts 3.4.3 and 3.4.4). Specifically, the percentage of respondents expecting 12-month-ahead inflation to be between 5.5 and 6.49 percent increased significantly in this period, while those expecting it to be 7.5 percent or above recorded a notable decrease.



Box
3.1

Effects of Oil Prices on Consumer Prices

International oil prices assumed a sharply declining course in the second half of 2014 (Chart 1). This box depicts how the changes in oil prices have affected consumer prices.⁴



The immediate effects of declining oil prices on energy and thus consumer inflation are observed through fuel and bottled gas prices (Chart 2). The changes in oil prices are not reflected completely in fuel prices due to shares and taxes on final prices. This can be explained better by the following formula, which specifies how prices of fuel products are set in Turkey (EMRA, 2014).

Final Sales Price of Fuel = (Ex-refinery + Wholesaler margin + EMRA Revenue Share + Distributor and Dealer Margin + Lump sum SCT) * (1+VAT)

The 18 percent VAT on all fuel products is applied to the sum of the ex-refinery price, the revenue share, wholesalers, distributors and dealers' margin and the lump sum SCT. The lump sum SCT paid in TL per liter varies by the type of fuel. For example, currently, the lump sum SCT per liter is 2.1765 TL for 95 octane unleaded gasoline and 1.5945 TL for diesel (Table 1). As the tax burden on fuel products account for a substantial share of final consumer prices, the pass-through of changes in oil prices to fuel prices is limited (the share of excise duties in total pump rates is 54 and 62 percent for diesel and 95 octane unleaded gasoline, respectively, as of November 2014). Based on the values shown in Table 1 and the above formula, the final sales price falls by 3.2 percent in response to a 10-percent ceteris paribus decline in the ex-refinery price. Therefore, assuming that the decreases in oil prices are fully passed to the ex-refinery price, about 1/3rd of the fall in international oil prices are reflected in the final domestic sales price of gasoline.

⁴ Findings in this box are based on Akçelik and Öğünç (2015). See also CBRT (2008).

Table 1. Prices of Fuel Products*

	Ex-Refinery Prices	Wholesaler Margin	EMRA Revenue Share	Distributor and Dealer Margin	Lump sum SCT (TL/liter)**	VAT	Final Sales Price	Total Tax
Unleaded 95 (TL/liter)	1.27	0.08	0.00231	0.42	2.1765	0.71	4.66	2.89
Shares (Percent)	27.3	1.7	0.0	9.0	46.7	15.3	100.0	62.0
Diesel (TL/liter)	1.4	0.05	0.00231	0.45	1.5945	0.63	4.13	2.22
Shares (Percent)	33.9	1.2	0.1	10.9	38.6	15.3	100.0	53.9

* EMRA (2014), Istanbul prices (on the European side).

** Revenue Administration, SCT amounts and rates, list no (I), Section (A).

The following section analyzes to what extent the changes in oil prices affect fuel, import and consumer prices by VAR models.

(i) Pass-Through to Domestic Fuel Prices

To estimate the degree of pass-through from oil price changes to domestic fuel prices, a VAR model is estimated using monthly data for the period between January 2004 and September 2014. According to Cholesky ordering, the variables include risk premium (EMBI+ Turkey)⁵, currency basket (0.5*USD+0.5*Euro), Brent crude oil prices per barrel (in USD), output gap⁶ and the fuel price index.⁷ The lump sum SCT on fuel prices can vary over time. Thus, in order to determine the pass-through from oil prices to fuel prices, a lump sum SCT series is constructed for fuel products weighted by their shares in the consumer price index. This series is added to the model as an exogenous variable.⁸

The results of the impulse-response analysis are standardized for a 10-percent change in Brent crude oil prices. Accordingly, a 10-percent change in international Brent crude oil prices causes domestic fuel prices to change by 2.8, 3 and 3.3 percent at the end of the first two months, 12 months and 24 months, respectively. As expected, most of the pass-through is completed by the first two months.

(ii) Pass-Through to Consumer Prices

The first-round effects of oil price changes on consumer price inflation, which occur very rapidly, are realized through prices of energy items such as fuel and bottled gas. Meanwhile, the pass-through of oil prices to prices of other energy items such as natural gas and electricity occurs with a lag.

On the other hand, the indirect effects are defined as the pass-through of oil price changes to consumer prices via production costs, and these also occur with a lag. The pass-through of falling fuel prices to prices of transport services such as local transport, courier services and aviation are examples of indirect effects. Indirect effects also work through import prices (ECB, 2014). More specifically, imported goods,

⁵ The risk premium for Turkey is added to the model to capture exchange rate shocks.

⁶ The output gap is HP-filtered quarterly GDP series, which is converted to monthly frequency by Fernández (1981) using the seasonally adjusted monthly industrial production data as the reference series. As the latest data on GDP is available as of the third quarter of 2014, the sample covers data up to September 2014.

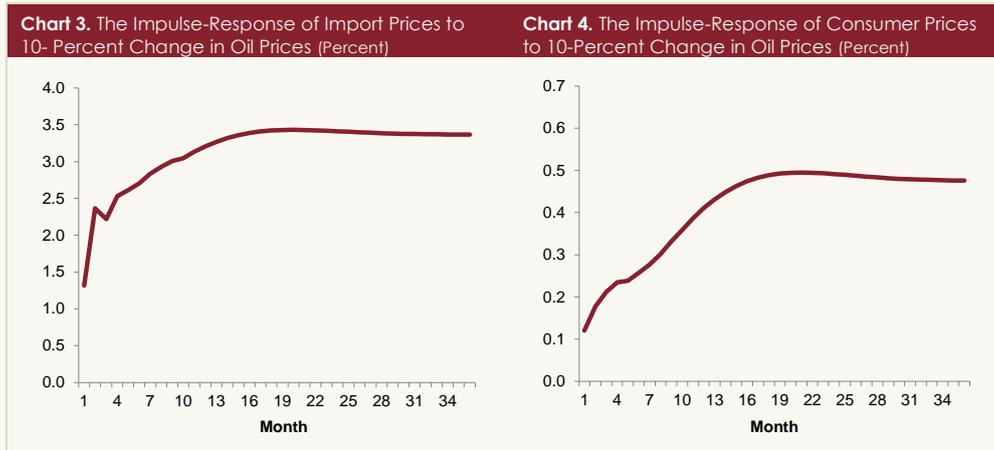
⁷ The fuel price index under the consumer price index, which comprises gasoline, diesel and LPG prices.

⁸ The models take the output gap in levels, while other variables are monthly percentage changes. The lag length is chosen to be 2 considering the lag-length selection criteria and the autocorrelation problem.

which are inputs to domestic production, have direct effects on final consumption goods. Thus, oil price changes may affect domestic inflation indirectly via their effects on the prices of the trading partners' output.

Against this background, the above VAR model was extended to estimate the degree of pass-through of oil prices to consumer prices both via direct and indirect channels. According to the Cholesky ordering of the variables, the model includes risk premium (EMBI+ Turkey), currency basket (0.5*USD+0.5*euro), Brent crude oil price per barrel (in USD), import prices (in USD), output gap, domestic producer price index and the consumer price index.⁹ Additionally, the lump sum SCT on fuel products is added to the model as an exogenous variable.¹⁰

Results of the impulse-response analysis show that a 10-percent change in international Brent crude oil prices causes import prices to change by 3.2 and 3.4 percent and consumer prices by 0.41 and 0.49 percent at the end of the first 12 months and 24 months, respectively (Charts 3 and 4).¹¹ Most of the pass-through of oil prices to import prices is completed within the first three quarters. Findings suggest that almost half of the pass-through to consumer prices takes place in the first four months. Although 85 percent of the pass-through occurs within a year, it takes about a year and a half for oil prices to fully reflect in consumer prices.



The 45-percent fall in Brent crude oil prices in USD terms during July-December pulled consumer inflation down directly by 0.76 points through fuel and bottled gas prices, despite the weakening Turkish lira. Taking into account the decreases in prices of transport services over the past two months, inflation fell by 0.81 points. The pass-through projection of the above VAR model for consumer prices at end-2014 is around -0.9 points. Considering falling oil prices together with their downward impact on other fuel-related services items, the short-term projections of this model seem consistent with inflation realizations.

⁹ The consumer price index is the seasonally adjusted CPI excluding unprocessed food, alcoholic beverages and tobacco (CPIX). Analyses have shown that oil prices had no statistically significant impact on unprocessed food, alcoholic beverages and tobacco. Therefore, the pass-through forecasts for the consumer price index are estimated by multiplying the impulse-response values for the CPIX of the relevant period by the average weight of the CPIX in the consumer basket.

¹⁰ The lag length is set at 3 considering the lag-length selection criteria and the autocorrelation problem.

¹¹ The model envisions a higher pass-through when the sampling begins with the post-2004 period.

There are certain points to consider when assessing the effects of falling oil prices on consumer inflation in 2015. The above model forecasts assume the effects of rising and falling oil prices to be similar and reflect the average effects. In case of sharp falls in oil prices, the impact on consumer inflation might be more pronounced than projected by the model. Meanwhile, the response of natural gas and electricity prices, which account for most of the indirect effects of falling oil prices on consumer inflation, remains uncertain. Assuming that there will be either no or limited pass-through to natural gas and electricity prices, the effects of declining oil prices on consumer inflation will be less marked for 2015 than implied by the VAR model.

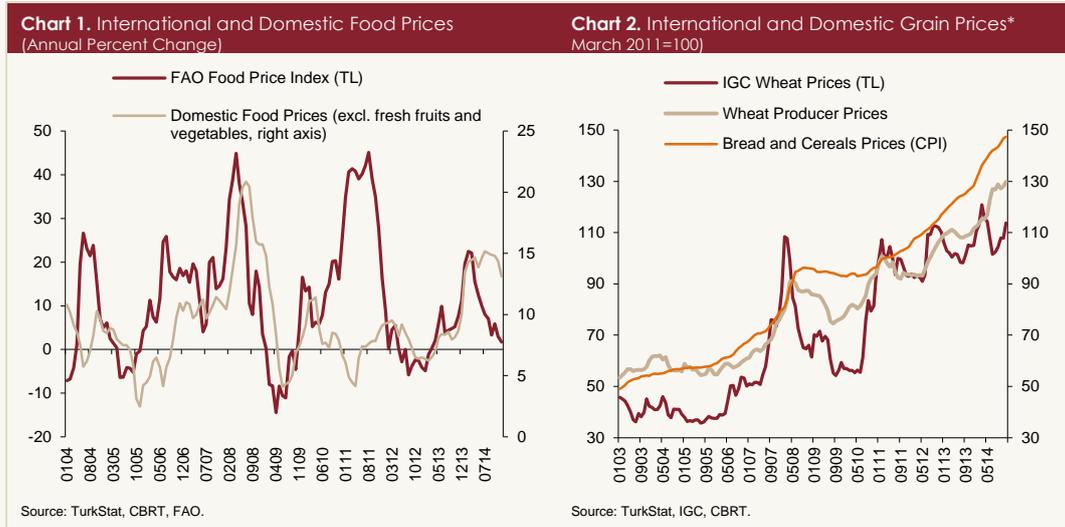
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Box
3.2

Pass-Through of International Grain Prices to Domestic Prices

The year 2014 was marked by high inflation driven mostly by food prices. On the other hand, international food prices remained moderate in this period (Chart 1). This raised the question as to whether domestic prices will be affected by international prices and also brought about the issue of external trade measures that can possibly be adopted. This study analyzes how grain-related consumer prices, which contribute largely to the food price increase, are affected by international prices (Chart 2).¹²



This study covers the January 2003- September 2014 period, utilizing monthly data on consumer prices that are affected by grain prices, the producer price for wheat and international grain prices as well as the precipitation index across Turkey and the consumer price for diesel. The following indices are constructed using the weights of the 5-digit COICOP CPI subcategories: CPI affected by wheat prices, CPI directly affected by grain prices (Grains-1) and CPI directly or indirectly affected by grain prices (Grains-2). The composition of these indices is shown in Table 1.

Index	Composition	CPI Weight (2014,Percent)
CPI affected by wheat prices	Regular bread, the municipality's bread, baby and plain biscuits, pretzel sticks, wafers, cakes, pound cakes, baklava, filo and noodle	4.85
CPI directly affected by grain prices (Grains-1)	CPI affected by wheat prices, canned and bottled beer, baldo and imported rice, cornflakes and chicken, red and green lentils	6.45
CPI directly or indirectly affected by grain prices (Grains-2)	Grain-1 and catering services including rice pilaf, chicken skewers, doner kebab, pastry, roll, beer etc.	12.31

¹² Findings in this box are based on Akçelik and Tuğer (2015).

The purchasing power parity theorem is applied to analyze whether there is a long-term relation between international prices and domestic prices. According to the law of one price on which the absolute purchasing power parity theorem is based, unless there are natural or government-imposed external trade barriers, any product is expected to be sold at the same price everywhere (Obstfeld and Rogoff, 1996). Accordingly, y_t^{TL} (the TL international commodity prices in logarithms, which is the sum of the (USD/TL exchange rate in logarithms and the USD-denominated international prices in logarithms) is expected to be statistically related to consumer prices in logarithms (x_t) as follows:

$$y_t^{TL} = \alpha_0 + \alpha_1 x_t + \varepsilon_t \quad (1)$$

According to the absolute purchasing power parity, if y_t^{TL} and x_t are integrated of the same order, they are expected to be cointegrated. Moreover, the cointegration coefficient α_1 is expected to converge to unity. In order to test the statistical significance of this theory, unit root tests were performed on the three main product groups (wheat, grains-1 and grains-2). The existence of a long-term relation among the series is examined in case the series are found to be integrated of order one after applying unit root tests to levels or in first differenced series. The cointegration tests were performed using the single-equation method by Engle and Granger (1987) as well as a bivariate VAR model based on Johansen (1988).

The null hypothesis that the first differenced series contains a unit root was rejected for wheat, grains-1, grains-2 and TL-denominated international grain prices. The null hypothesis that the series in levels contains a unit root was not rejected at the 1 percent level for TL-denominated international grain prices and the domestic prices. Having found that the TL-denominated series in levels are integrated of order 1, Table 2 presents the results of the Engle-Granger cointegration test, which is performed by checking for the unit root in residuals of regression in which the domestic price level is the dependent variable and international grains price denominated in TL is the independent variable.¹³ Accordingly, the null hypothesis of the presence of a unit root in the residuals of regression was not rejected at the 1 percent level. Hence, it was concluded that there is no long-term relation between international prices and domestic prices.

Table 2. Results of the Engle-Granger Cointegration Test

	Equation Dependent variable	Criterion	Lag value	P-value (tau statistics)	P-value (z-statistics)
1	Log(International Wheat-TL) Log(Wheat-PPI)	AIC	4	0.1495	0.0126
	Log(Wheat-PPI) Log(International Wheat-TL)	AIC	4	0.3026	0.0460
2	Log(Grains-1-CPI) Log(International Grain-TL)	AIC	1	0.7819	0.5133
	Log(International Grain-TL) Log(Grain1-CPI)	AIC	2	0.3286	0.0942
3	Log(Grains-2-CPI) Log(International Grain-TL)	AIC	1	0.8173	0.5802
	Log(International Grain-TL) Log(Grains-2-CPI)	AIC	1	0.3686	0.1183

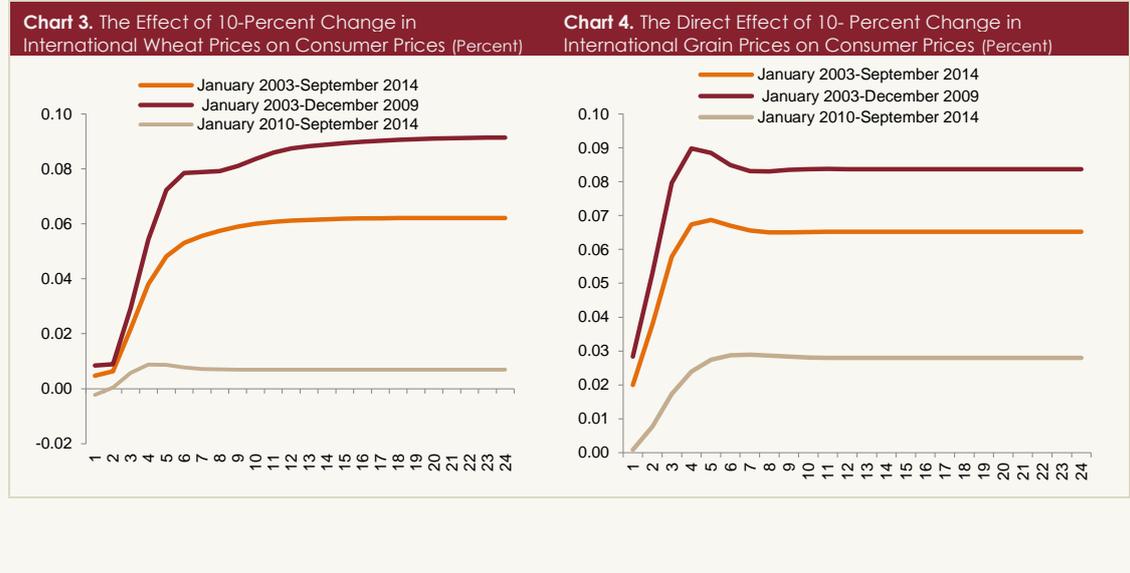
¹³ The lag length is set according to the Akaike Information Criterion (AIC). After the result of hypothesis is determined, the process is repeated by changing the dependent variable.

Moreover, after applying the Johansen cointegration test, no cointegrating vector was found in the estimated VAR(2) models. Thus, according to both the Engle and Granger and the Johansen methods, there is no long-term cointegration between the price indices.

A VAR model was developed using monthly data to estimate the degree of pass-through from international wheat prices to domestic consumer prices. According to Cholesky ordering, the model includes international wheat prices, the producer price for wheat and the CPI affected by wheat.¹⁴ Meanwhile, domestic food prices are affected by transport costs and weather conditions. Therefore, the lagged values of the consumer price for diesel and of the index for precipitation across Turkey are added as exogenous variables to control for transport costs and weather conditions, respectively.¹⁵ This VAR model is estimated for the January 2003-December 2009, January 2010-September 2014 and January 2003-September 2014 periods.¹⁶

The results of the impulse-response analysis are standardized by a 10-percent change in international wheat prices. Accordingly, the 10-percent change in international wheat prices causes consumer prices to change by 0.062, 0.091 and 0.007 percent for January 2003-September 2014, January 2003-December 2009 and January 2010-September 2014, respectively, at the end of the first two years.¹⁷ Most of the pass-through is completed by the end of the first year and a half (Chart 3).

The above VAR model's impulse-response analyses are repeated for international grain prices and for directly affected consumer prices and directly or indirectly affected consumer prices. Accordingly, a 10-percent change in international grain prices causes consumer prices to change directly or indirectly by 0.084, 0.114 and 0.022 percent for January 2003-September 2014, January 2003-December 2009 and January 2010-September 2014, respectively, at the end of the first two years (Chart 5).



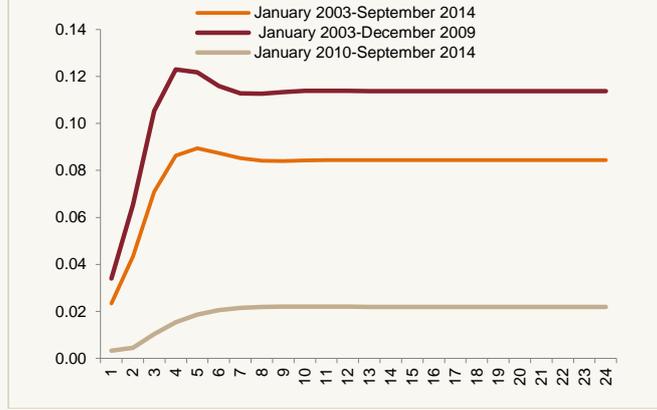
¹⁴ International wheat prices are denominated in TL and seasonally adjusted.

¹⁵ The monthly precipitation index across Turkey is obtained from the State Meteorological Service and is seasonally adjusted.

¹⁶ The lag length is chosen to be 2 considering the lag-length selection criteria and the autocorrelation problem.

¹⁷ The pass-through into consumer prices is estimated by multiplying the response values by the latest weight (2014) of the relevant index in the consumer basket.

Chart 5. The Total Effect of 10-Percent Change in International Grain Prices on Consumer Prices (Percent)



To conclude, international grain prices and the domestic grain prices are not cointegrated. Furthermore, the VAR model results suggest that lately, the short-term relation has also weakened substantially. In this regard, the recent price increases driven by grain prices are evaluated to be caused by mainly domestic supply and demand conditions.

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Box
3.3

The Role of Base Effects on Consumer Inflation in 2015

In 2014, annual inflation hovered above the upper end of the uncertainty band due to food, services and core goods prices. Annual services inflation soared in the first three quarters amid cost-side pressures and inflation expectations but declined in the last two months on the back of falling oil prices. In the first quarter of 2014, the depreciation of the Turkish lira caused by ongoing uncertainties over global monetary policies and domestic uncertainties drove core goods inflation higher in the first half of the year. In the second quarter, the Fed's announcement to keep policy rates low in the medium term and the reduction of long-term interest rate expectations, as well as the ECB's policy rate cuts and the adoption of the new quantitative easing program helped to improve global liquidity conditions, while financial conditions in the same period have also recovered amid lessened domestic uncertainty. In addition, with the macroprudential measures adopted in early 2014 and the tight monetary policy stance, the adverse effects of exchange rate changes on core goods tapered off, and annual core goods inflation decreased in the second half of the year also owing to the moderate domestic demand. In this regard, core inflation indicators that remained elevated over the entire year followed a downward track in the second half. The aim of this box is to show the effects of the changes across CPI subcategories over 2014 on the annual consumer inflation for 2015 through the base effects channel.

Base effect is observed on annual inflation after 12 months if a monthly change in an index of a certain month deviates from the normal monthly change of the respective month.¹⁸ Therefore, when assessing the change in annual inflation, base effects should also be taken into consideration along with current monthly price developments.

Chart 1 shows the expected contributions from the base effects of CPI subcategories to the changes in the annual consumer inflation for 2015.¹⁹ Accordingly, the highest contribution over the year will come from the base effects in core goods, energy and food prices driven by the unprocessed food. To be more specific, core goods will impose marked base effects in the first half of the year. In January 2015, base effects from alcohol-tobacco, food and core goods will drive annual inflation lower. Base effects are expected to put downward pressure on annual inflation until August, while they are expected to pose upward pressure in the remaining months. In cumulative terms, base effects will cause the end-2015 consumer inflation to fall by a mere 0.2 points year-on-year (Chart 2).²⁰ Throughout the year, the cumulative contributions of base effects will be negative for food, core goods and services and positive for energy. In particular, by August, energy prices will play a major role in the decline of the negative contribution from cumulative base effects

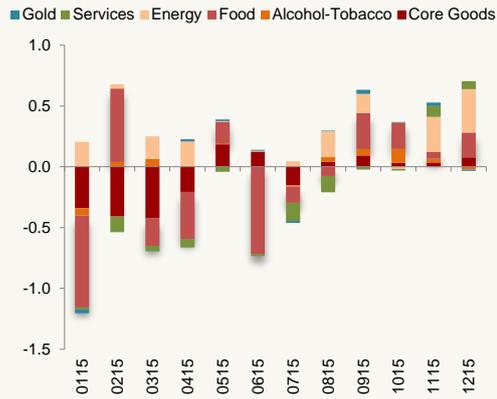
¹⁸ Normal monthly change reflects the overall trend in price movements for the respective period. Yet, there is no standard method to measure this typical change. This analysis uses the average monthly inflation rates of the subcategories for the respective month during 2008-2013 as the normal change.

¹⁹ Base effect estimations in this Box depend on the 2014 weights of CPI subcategories and CBRT (2012).

²⁰ The size of the contribution of base effects to annual inflation may vary depending on the method for estimating the normal monthly change. As the course and the direction of the total cumulative contribution are independent from the method used, it may entail more information regarding the change in annual inflation rather than the size of the change.

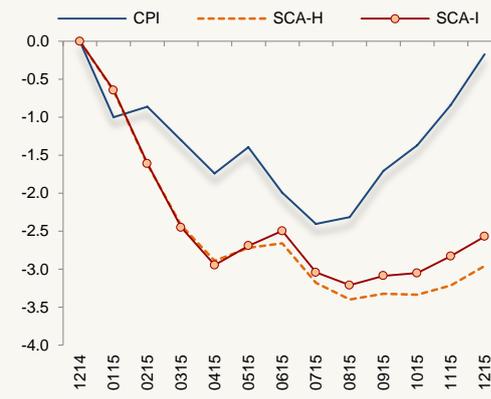
to headline inflation. Meanwhile, the contribution of these effects to the change in annual core inflation excluding energy will be more pronounced. In fact, cumulative base effects are expected to bring annual SCI-H and SCI-I inflation down by 3 and 2.6 percent, respectively, by December 2015 (Chart 2).

Chart 1. Expected Contributions of the Base Effects from Subcategories to Monthly Changes in Annual CPI Inflation in 2015 (Percentage Points)



Source: TurkStat, CBRT.

Chart 2. Cumulative Contribution of the Base Effects to Monthly Changes in Annual Inflation in CPI, SCA-H and SCA-I (Percentage Points)



In sum, base effects from CPI subcategories will have a major impact on annual inflation in 2015. However, it should be underlined that another factor affecting annual inflation is the current price developments, and thus base effects will not be the sole determinant of inflation realizations in 2015. In the forthcoming period, factors such as exchange rate and oil price developments, weather conditions and aggregate demand conditions may affect inflation through current prices. Nevertheless, acknowledging the contribution of base effects to the changes in annual consumer inflation is crucial for an accurate understanding of the inflation trend.

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