# 3. Inflation Developments

Consumer inflation fell by 1.69 points quarter-on-quarter to 10.23 percent in the first quarter of 2018 (Chart 3.1). Annual inflation slowed across all subcategories. Food inflation was driven lower by prices of fruits and vegetables amid favorable weather conditions despite the uptrend in food prices excluding fresh fruits and vegetables. Energy inflation went down due to relatively moderate oil prices and exchange rates. Core goods inflation inched down on the back of base effects. High inflation continued to weigh on categories with strong indexation behavior, particularly services. Having registered a sharp increase for the second quarter in a row, producer-price-driven cost pressures on consumer prices remained strong. Energy costs were on the rise, particularly for electricity. In addition, the robust economic activity added to the cost pressures on inflation. Meanwhile, the tourism rebound fed price hikes across items strongly linked with tourism. After a relatively flat first quarter, medium-term inflation expectations returned to an upward trajectory in April and remained elevated.

**Chart 3.1: CPI and D Index** (Y-o-Y % Change)
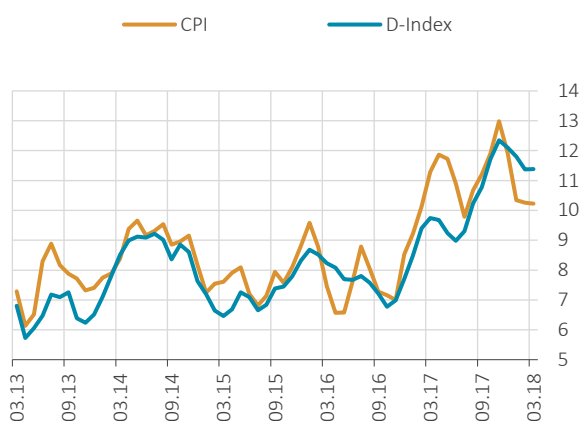


Source: TURKSTAT.

**Chart 3.2: Contributions to Annual CPI*** (% Point)
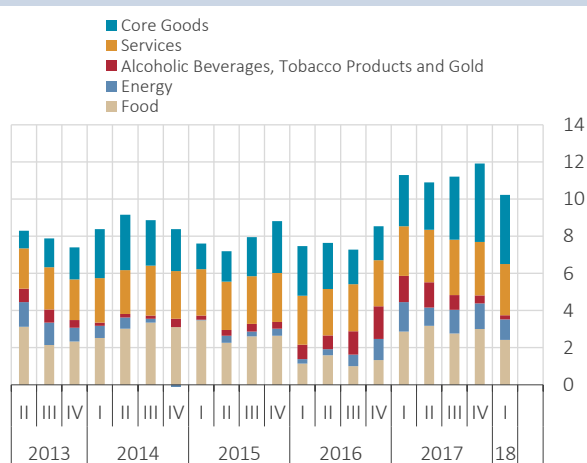


Source: CBRT, TURKSTAT.

* Core goods exclude food, energy, alcoholic beverages, tobacco products and gold.

Among subcategories, annual food inflation declined on the back of unprocessed food whereas processed food inflation climbed. In this period, red meat prices soared while the inflation outlook for milk and dairy products remained negative due to raw milk purchase prices. Other highlights for this quarter include bread prices that went up due to accumulating cost pressures and the weight adjustment in the Bread Regulation, and prices of non-alcoholic beverages that were driven higher by the new SCT tax of 10 percent applied to some beverages. Despite the price hike to electricity at the beginning of 2018, energy inflation edged lower in the first quarter thanks to moderate oil prices and exchange rate changes. Core goods inflation slowed only modestly due to cumulative exchange rate effects and strong demand conditions. Annual services inflation declined somewhat, yet remained high. Against this background, there has been no notable improvement in the annual inflation of core indicators. With regard to contributions to annual consumer inflation, there is a quarterly decline of 0.6 and 0.5 points from food and core goods, respectively, and a relatively smaller drop of 0.3, 0.2 and 0.1 points from energy, alcohol-tobacco-gold and services, respectively (Chart 3.2).

In short, the annual inflation and the underlying trend of core indicators registered only a slight fall in the first quarter, while the tendency to increase prices remained strong as captured by diffusion indices. Thus, consumer inflation remained high, albeit somewhat more subdued thanks to base effects. The current levels of inflation and inflation expectations continue to pose risks to pricing behavior. Moreover, the recent Turkish lira depreciation and the widespread upsurge of producer prices put upward pressure on

the inflation outlook. These developments amplify the risks to the core inflation outlook, particularly for core goods.

# 3.1 Core Inflation Outlook

Annual core goods inflation decreased by 1.52 points to 13.93 percent in the first quarter (Chart 3.1.1). This has been largely due to base effects despite ongoing cumulative exchange rate effects and strong demand conditions. Annual inflation was down across all subcategories, albeit more modestly for clothing (Chart 3.1.2).

**Chart 3.1.1: Prices of Core Goods and Services** (Y-o-Y % Change)
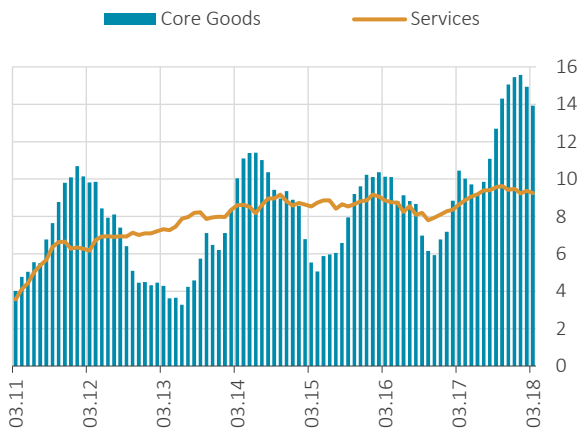
**Chart 3.1.2: Core Goods Prices** (Y-o-Y % Change)
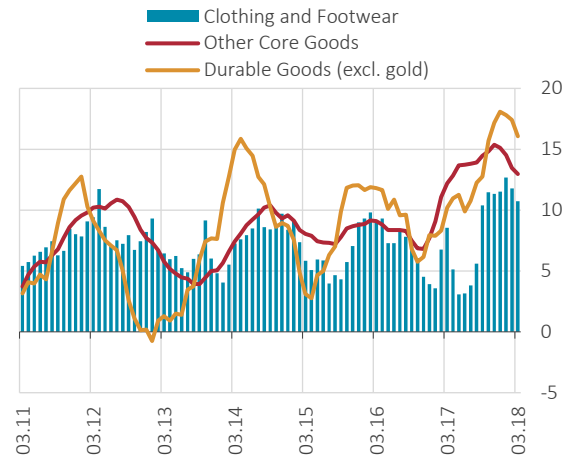
Source: TURKSTAT.

Source: TURKSTAT.

Across subcategories of core goods, prices of durable goods jumped by 4.09 percent in the first quarter, yet annual durable goods inflation fell by 2 points to 16.08 percent (Chart 3.1.2). This is mainly because of cumulative exchange rate effects via products with high import content, such as automobiles and home appliances. Meanwhile, buoyant demand also pushed prices higher (Chart 3.1.3). In addition, after last year's tax incentives, furniture prices soared by a striking 7.35 percent in this period (Table 3.1.1).

Table 3.1.1: Inflation in Goods and Services (%)

| | 2017 | | | | | 2018 | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | I | II | III | IV | Annual | I | Annual |
| CPI | 4.34 | 1.49 | 1.32 | 4.31 | 11.92 | 2.77 | 10.23 |
| 1. Goods | 5.01 | 1.12 | 0.58 | 5.80 | 12.99 | 2.83 | 10.66 |
| Energy | 4.11 | -2.26 | 3.46 | 4.88 | 10.41 | 2.11 | 8.29 |
| Food and Non-Alcoholic Beverages | 9.34 | -0.39 | -1.16 | 5.70 | 13.79 | 6.06 | 10.37 |
| Unprocessed Food | 15.98 | -2.95 | -5.60 | 8.74 | 15.55 | 6.71 | 6.31 |
| Processed Food | 3.39 | 2.17 | 3.08 | 3.04 | 12.20 | 5.43 | 14.42 |
| Core Goods | 2.23 | 4.44 | 0.58 | 7.51 | 15.45 | 0.88 | 13.93 |
| Clothing and Footwear | -8.52 | 14.46 | -5.90 | 13.17 | 11.51 | -9.15 | 10.74 |
| Durable Foods (excl. gold) | 5.89 | 0.27 | 3.37 | 7.58 | 18.08 | 4.09 | 16.08 |
| Furniture | -2.54 | 1.71 | 3.88 | 7.30 | 10.49 | 7.35 | 21.70 |
| Electrical and Non-Electrical Appliance | 3.88 | -0.31 | 1.65 | 4.72 | 10.24 | 1.39 | 7.59 |
| Automobiles | 10.99 | -0,29 | 4.32 | 10.27 | 27.30 | 4.39 | 19.73 |
| Other Durable Goods | 5.78 | 2,99 | 2.58 | 0.90 | 12.77 | 3.76 | 10.62 |
| Core Goods (excl. clothing and durable goods) | 6.34 | 2,86 | 2.09 | 3.10 | 15,13 | 4.34 | 12.97 |
| Alcoholic Beverages, Tobacco Products and Gold | 4.05 | -0.18 | 0.82 | 1.18 | 5.96 | 1.37 | 3.22 |
| 2. Services | 2.83 | 2.33 | 3.06 | 0.95 | 9.47 | 2.62 | 9.26 |
| Rent | 1.89 | 1.93 | 2.75 | 2.35 | 9.21 | 1.99 | 9.32 |
| Restaurants-Hotels | 2.62 | 2.90 | 3.84 | 1.65 | 11.47 | 2.81 | 11.67 |
| Transport | 3.91 | 3.41 | 4.20 | 0.44 | 12.46 | 1.18 | 9.51 |
| Communication | 0.35 | 0.85 | 0.54 | 0.12 | 1.87 | -0.72 | 0.78 |
| Other Services | 3.87 | 2.14 | 2.93 | 0.17 | 9.39 | 4.45 | 9.99 |

Source: CBRT, TURKSTAT.

Annual clothing inflation decreased by 0.77 points to 10.74 percent in this quarter (Chart 3.1.2). The high clothing inflation was mostly driven by cumulative exchange rate effects as well as the brisk demand for clothing spurred largely by the benign domestic demand and tourism outlook. Prices across core goods excluding durables and clothing were up 4.34 percent, primarily due to the lagged effects of the exchange rate pass-through. The largest contribution to this increase came from materials for household repair-maintenance and medicine. In this period, prices of medicine soared by 15.1 percent due to the updated reference exchange rate. In sum, prices of core goods faced less pressure from cumulative exchange rate effects, and thus saw a decelerating underlying trend, which nevertheless remained high (Chart 3.1.4).

**Chart 3.1.3: Selected Durable Goods Prices** (Y-o-Y % Change)
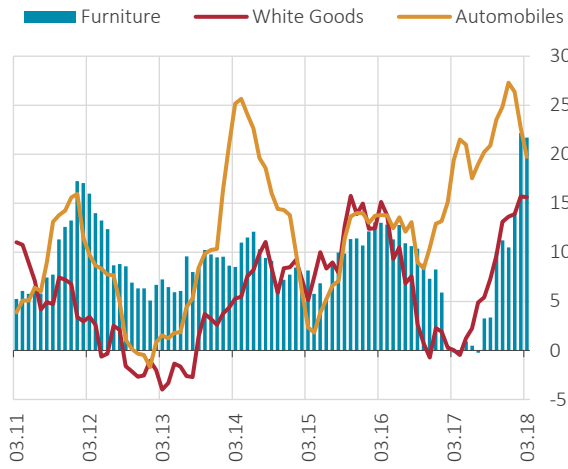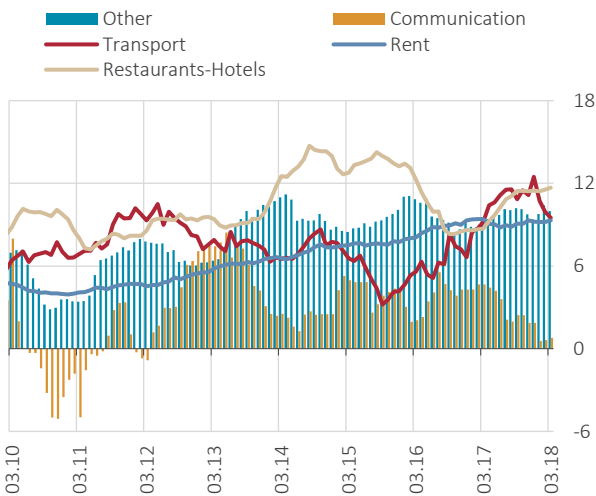


Source: TURKSTAT.

**Chart 3.1.4: Core Goods Prices** (Seasonally Adjusted, Annualized Average 3-Month % Change)
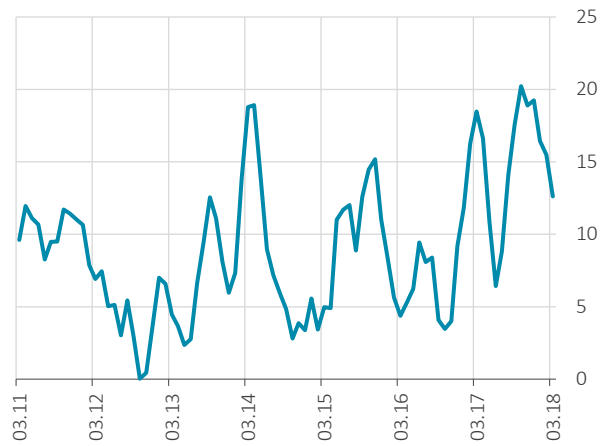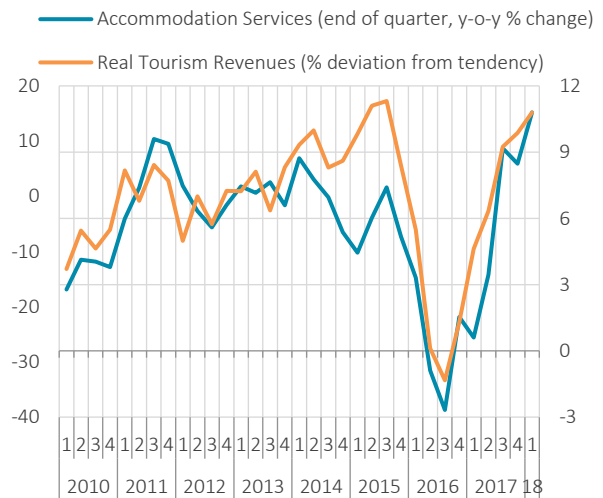


Source: CBRT, TURKSTAT.

Prices of services increased by 2.62 percent in the first quarter while annual services inflation dropped by 0.22 points to 9.26 percent (Chart 3.1.1). In this period, annual inflation was flat in rents, down in communication and transport, and up in all other subcategories (Chart 3.1.5).

**Chart 3.1.5: Prices of Services by Subcategories** (Y-o-Y % Change)
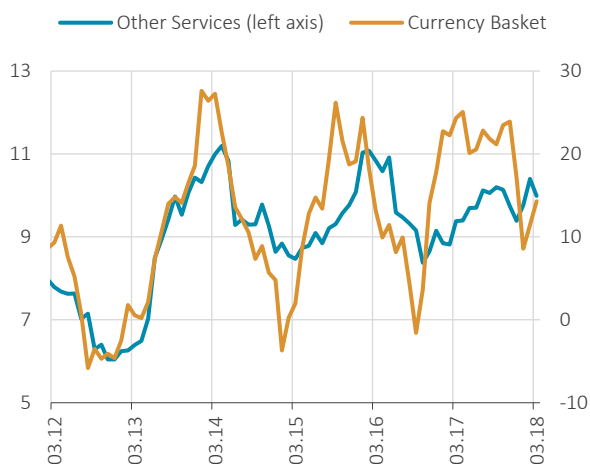


Source: TURKSTAT.

**Chart 3.1.6: Accommodation Services and Real Tourism Revenues**
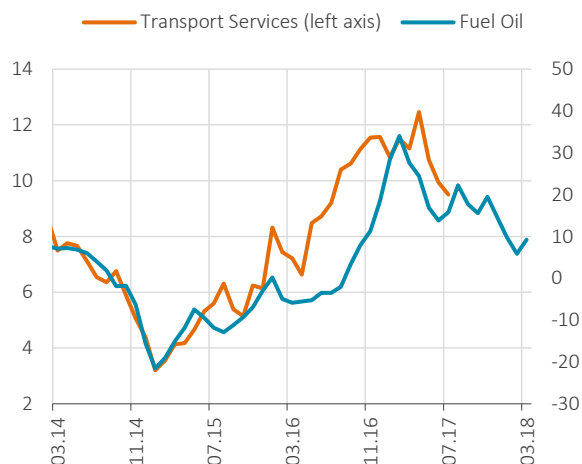


Source: CBRT, TURKSTAT.

Annual inflation rose by 0.21 points to 11.67 percent in restaurants and hotels, which is subdivided into catering and accommodation services. This rise is attributable to the increased accommodation services inflation due to the recovering tourism industry (Chart 3.1.6). Catering services inflation, however, declined slightly in this period. Inflation was up 0.60 points to 10 percent in other services, largely on account of subcategories with a relatively higher sensitivity to the exchange rate, such as package tours, maintenance-repair and healthcare services (Chart 3.1.7). On the other hand, transport services inflation was driven lower by the lagged effects of the slowing fuel inflation (Chart 3.1.8).

**Chart 3.1.7: Other Services and Currency Basket**
(Y-o-Y % Change)



Source: CBRT, TURKSTAT.

**Chart 3.1.8: Transport Services and Fuel Oil Prices***
(Y-o-Y % Change)



Source: CBRT, TURKSTAT.

* Inflation in transport services is backdated by 8 months.

Accordingly, both the underlying trend of services inflation and the diffusion index for services, which captures the tendency to hike prices, posted a quarter-on-quarter increase (Charts 3.1.9 and 3.1.10). High inflation and inflation expectations, price hikes across exchange-rate-sensitive items, the food inflation outlook and buoyant economic activity cause services inflation to remain elevated. Moreover, real unit labor costs driven higher by wage adjustments discourage a more positive inflation outlook for the services sector due to its labor-intensive nature.

**Chart 3.1.9: Services Prices** (Seasonally Adjusted, Annualized Average 3-Month % Change)
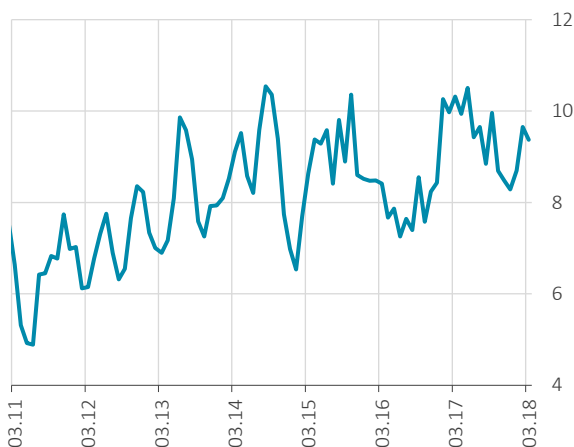


Source: CBRT, TURKSTAT.

**Chart 3.1.10: Diffusion Index for Services Prices***
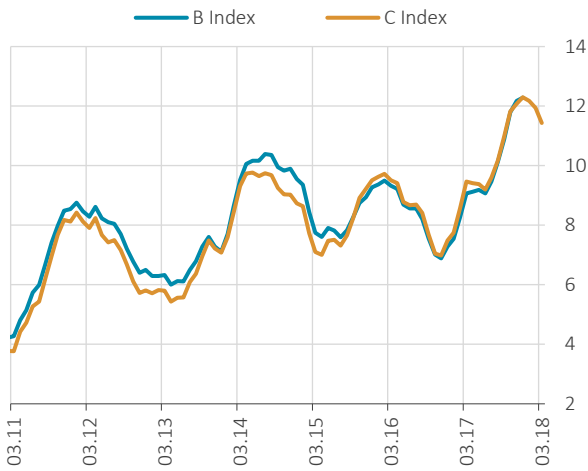(Seasonally Adjusted, 3-Month Average)



Source: CBRT, TURKSTAT.

* 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.

Among core inflation indicators, the B and C indices decreased by 0.33 and 0.86 points quarter-on-quarter to 11.95 and 11.44 percent, respectively (Chart 3.1.11). The seasonally adjusted underlying trend of core inflation indicators was also down in this period (3.1.12). Due to escalating processed food prices, the recovery in the B index was relatively small.

**Chart 3.1.11: B and C Indices** (Y-o-Y % Change)



Source: TURKSTAT.

**Chart 3.1.12: Underlying Trend of B and C Indices** (Seasonally Adjusted, Annualized Average 3-Month % Change)
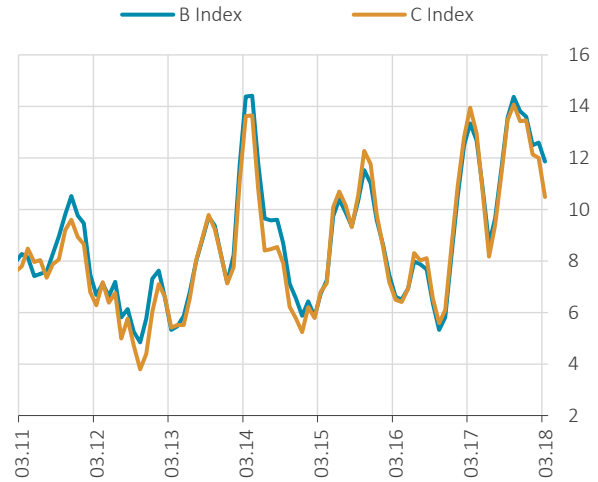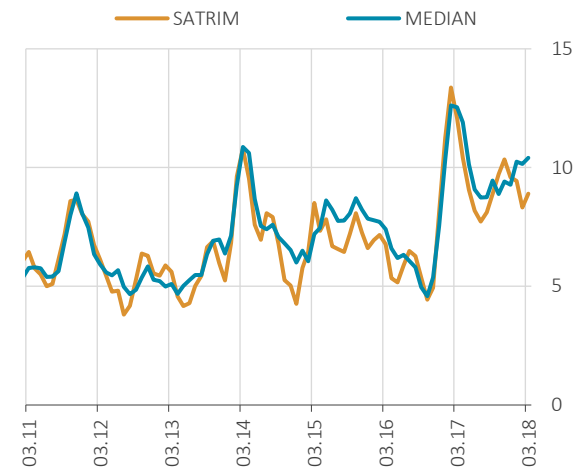


Source: CBRT, TURKSTAT.

The tendency for price hikes was higher than in the previous quarter, as captured by the diffusion indices for core indicators (Chart 3.1.13). The Median, the alternative core inflation index monitored by the CBRT, moved in tandem with the diffusion indices, while the SATRIM registered a small decline (Chart 3.1.14). Hence, as suggested by the indicators for tendency and pricing behavior, the underlying trend of inflation remained high in the first quarter.

**Chart 3.1.13: Diffusion of B and C Indices** (Seasonally Adjusted, 3-Month Average)
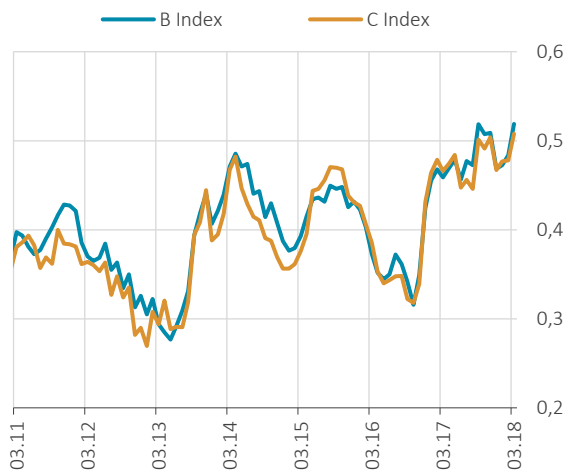


Source: CBRT, TURKSTAT.

**Chart 3.1.14: Alternative Core Inflation Indicators** (Annualized Average 3-Month % Change)



Source: CBRT, TURKSTAT.

# 3.2 Prices of Food, Energy, Alcoholic Beverages and Tobacco Products

Annual food inflation went down by 3.41 points from end-2017 to 10.37 percent in the first quarter (Chart 3.2.1). This was largely owed to unprocessed food prices whereas processed food prices sustained the uptrend (Chart 3.2.2). The effects of depreciation in Turkish lira, sectoral price shocks as well as brisk demand conditions were observed on the course of food prices.

**Chart 3.2.1: Food and Energy Prices** (Y-o-Y % Change)
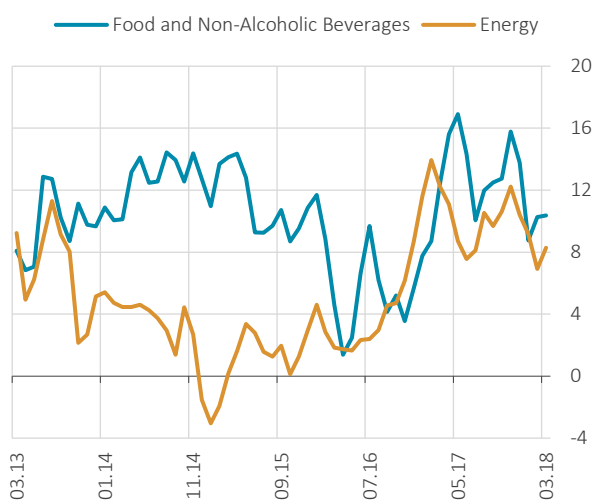


Source: TURKSTAT.

**Chart 3.2.2: Food Prices** (Y-o-Y % Change)



Source: TURKSTAT.

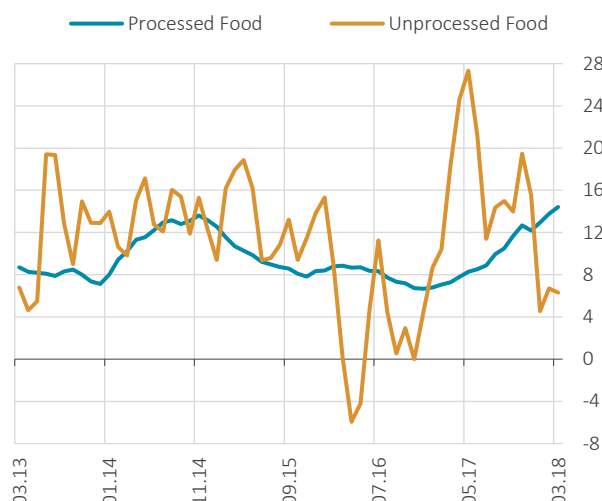Annual unprocessed food inflation declined by 9.24 points to 6.31 percent in the first quarter (Chart 3.2.2). In this period, annual inflation was substantially lower in fresh fruits and vegetables thanks to favorable weather conditions, whereas other unprocessed food products saw a higher inflation rate owing to red meat prices and milk prices that registered an annual inflation rate of about 30 percent due to rising raw milk purchase prices (Charts 3.2.3 and 3.2.4). After falling in the second half of 2017 following new import measures, red meat prices jumped by 8.05 percent in the first quarter of 2018.

**Chart 3.2.3: Fresh Fruits and Vegetables and Other Food Prices** (Y-o-Y % Change)
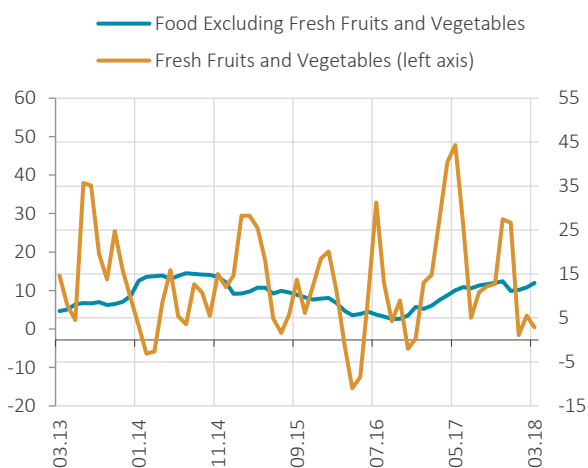


Source: CBRT, TURKSTAT.

**Chart 3.2.4: Selected Food Prices** (Y-o-Y % Change)
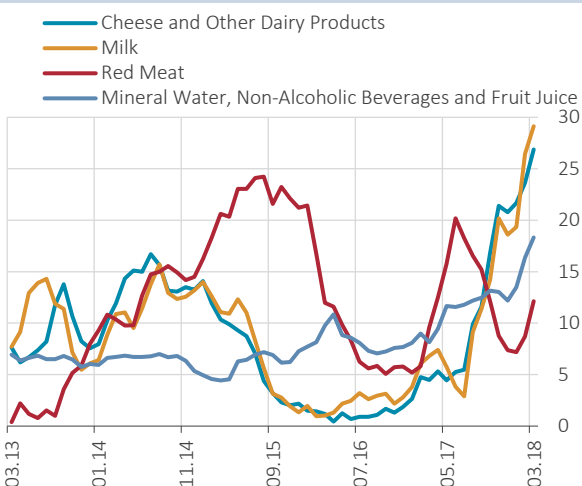


Source: CBRT, TURKSTAT.

Annual processed food inflation was up 2.22 points quarter-on-quarter to a nine-year high of 14.42 percent, imposing the largest constraint on food price disinflation in this period (Chart 3.2.2). The key drivers of this increase were prices of cheese and other dairy goods that went up due to higher milk prices and the January SCT hike in prices of non-alcoholic beverages (Chart 3.2.4). Moreover, the weight adjustment in the Bread Regulation and accumulating cost pressures pushed annual inflation higher in bread and cereals. As a result, inflation excluding fresh fruits and vegetables increased by 1.84 points to 13 percent in the first quarter (Chart 3.2.3).

Energy prices soared by 2.11 percent in the first quarter (Table 3.1.1). This is mainly due to the electricity price adjustment of 8.79 percent in January and the rise in municipal tap water tariffs, which present high degree of backward indexation (Chart 3.2.5). Among administered prices, natural gas prices remained virtually constant. After ending the fourth quarter at 67 USD/bbl, Brent crude oil prices fluctuated through the first quarter, reaching 69 USD/bbl in January, and fell back in February and March before ending the quarter again at 69 USD/bbl. On the other hand, bottled gas prices posted a small quarter-on-quarter decline amid moderate exchange rates in January and February whereas fuel prices were unchanged (Chart 3.2.6). Meanwhile, solid fuel prices rose by 1.70 percent. Accordingly, annual energy inflation decreased by 2.13 points quarter-on-quarter to 8.29 percent (Chart 3.2.1). After the January climb, electricity prices were up 2.89 percent to be effective as of 1 April 2018. Given the recent Turkish lira depreciation, energy inflation is expected to continue its upward trajectory, particularly for fuel and electricity prices.

**Chart 3.2.5: Domestic Energy Prices** (Y-o-Y % Change)
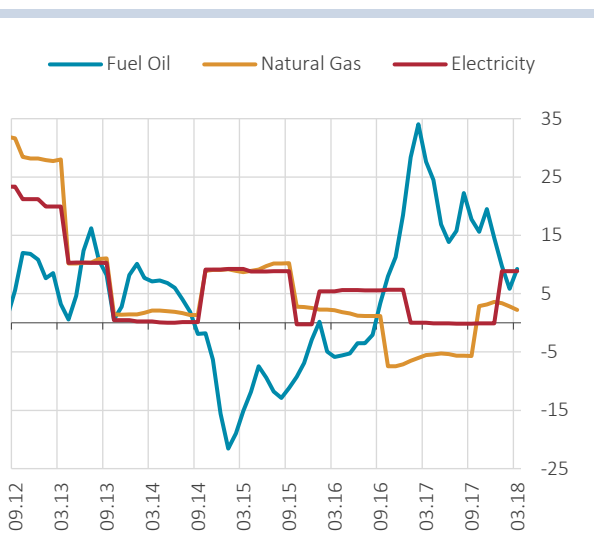


Source: TURKSTAT.

**Chart 3.2.6: Brent Crude Oil and Selected Domestic Energy Prices** (December 2010=100)
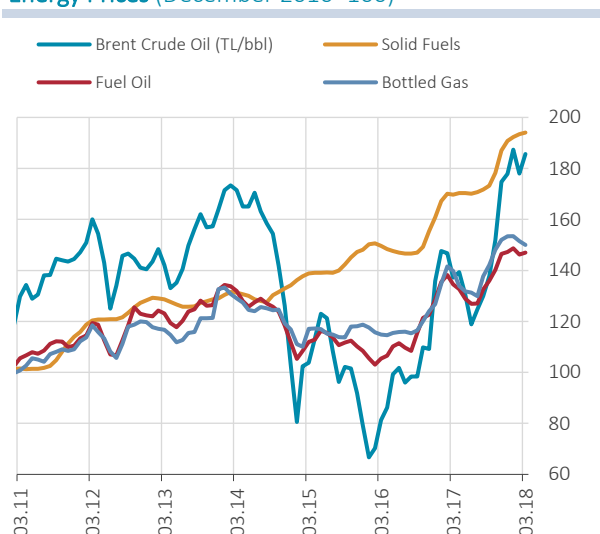


Source: Bloomberg, CBRT, TURKSTAT.

# 3.3 Domestic Producer Prices

Domestic producer prices surged by 5.29 percent in the first quarter owing to prices in manufacturing as well as electricity, gas generation and distribution (Table 3.3.1). The first quarter's acceleration also continued into this quarter. While down 1.19 points quarter-on-quarter on the back of base effects, annual D-PPI inflation remained high at 14.28 percent (Chart 3.3.1). Among subcategories, the prices of intermediate inputs, such as wood and cork, base metals, paper, plastics-rubber, non-metallic minerals and chemicals, have been increasing sharply for some time.

Table 3.3.1: Inflation in D-PPI and Subcategories (%)

| | 2017 | | | | | 2018 | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | Annual | I | Annual |
| **D-PPI** | **6.38** | **1.35** | **1.82** | **5.18** | **15.47** | **5.29** | **14.28** |
| Mining | 9.53 | -2.60 | 1.85 | 6.88 | 16.13 | 6,52 | 12.94 |
| Manufacturing | 6.70 | 1.43 | 2.13 | 5.52 | 16.64 | 4,98 | 14.77 |
| Manufacturing (excl. petroleum products) | 6.68 | 1.76 | 1.86 | 5.04 | 16.16 | 5,01 | 14.33 |
| Manufacturing (excl. petroleum and base metal products) | 6.10 | 2.03 | 1.08 | 4.21 | 14.04 | 4,88 | 12.72 |
| Production and Distribution of Electricity and Gas | 0.64 | 2.27 | -2.37 | -0.07 | 0.41 | 9,43 | 9.18 |
| Water Supply | 6.40 | 1.71 | 1.26 | 1.56 | 11.30 | 0,02 | 4.63 |
| **D-PPI by Main Industrial Groupings** | | | | | | | |
| Intermediate Goods | 8.21 | 0.90 | 3.15 | 7.21 | 20.75 | 5,38 | 17.58 |
| Durable Goods | 6.49 | 3.47 | 2.02 | 3.47 | 16.31 | 3,57 | 13.13 |
| Durable Goods (excl. jewelry) | 6.17 | 3.91 | 2.07 | 2.91 | 15.89 | 3,53 | 13.01 |
| Non-Durable Goods | 4.58 | 2.86 | -0.88 | 1.00 | 7.69 | 4,32 | 7.42 |
| Capital Goods | 5.96 | 1.27 | 3.07 | 6.26 | 17.52 | 5,81 | 17.36 |
| Energy | 4.00 | -1.36 | 1.73 | 6.59 | 11.23 | 7,61 | 15.09 |

Source: CBRT, TURKSTAT.

Manufacturing prices rose by a quarterly 4.98 percent to 14.77 percent year-on-year (Table 3.3.1, Chart 3.3.2). Likewise, the inflation in manufacturing prices excluding petroleum and base metal products remained high (Chart 3.3.2). Meanwhile, import prices were somewhat lower in USD and TL terms in this period; yet this had a limited effect on producer inflation (Chart 3.3.3).

Chart 3.3.1: Domestic Producer and Consumer Prices (Y-o-Y % Change)
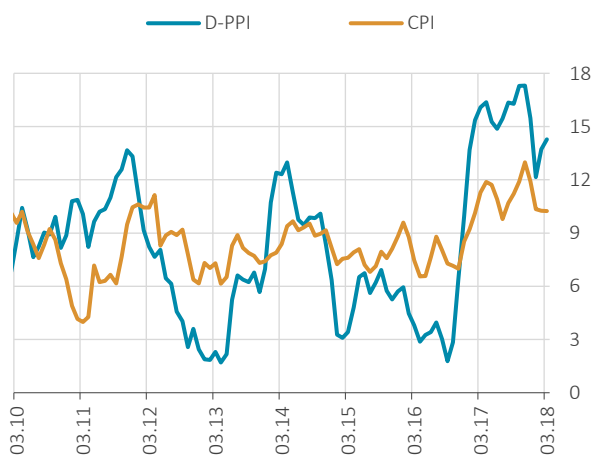


Source: TURKSTAT.

Chart 3.3.2: Manufacturing Prices (Y-o-Y % Change)
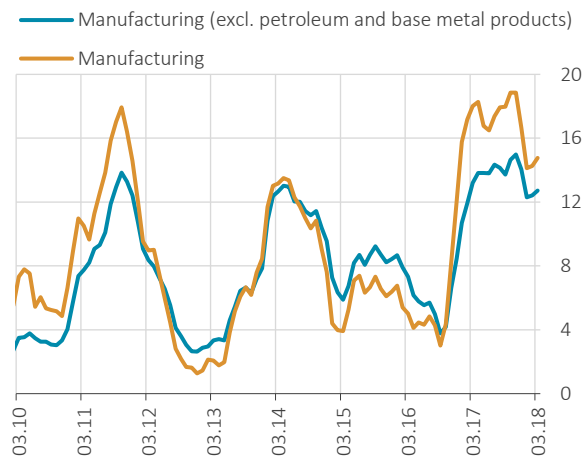


Source: CBRT, TURKSTAT.

According to the main industrial groupings, price hikes prevailed in all subcategories in the first quarter (Table 3.3.1). Widespread price increases, especially for iron-steel, plastics, concrete, cement, wood and paper, were the key drivers of the sharply rising prices of intermediate goods, while energy prices picked up due to prices of gas generation, electric power generation, transmission and distribution, petroleum products and lignite. Prices of capital goods were pushed up by motor vehicles, spare parts and accessories, metal construction materials and machines. Prices of durable goods were driven higher by furniture and home appliances, while meat and meat products, dairy products, fruits-vegetables and medicine accounted for the price increases in non-durable goods. Accordingly, the underlying inflation of manufacturing prices excluding petroleum and base metal products continued its uptrend, albeit at a more modest pace than in the previous quarter (Chart 3.3.4). Accordingly, producer-driven cost pressures on consumer prices remained strong.

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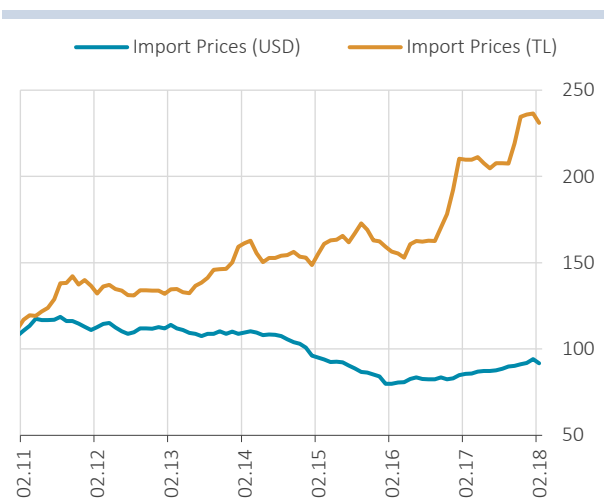


Source: CBRT, TURKSTAT.

Chart 3.3.4: Manufacturing Prices Excluding Petroleum and Base Metal Products (Seasonally Adjusted, Annualized Q-o-Q % Change)
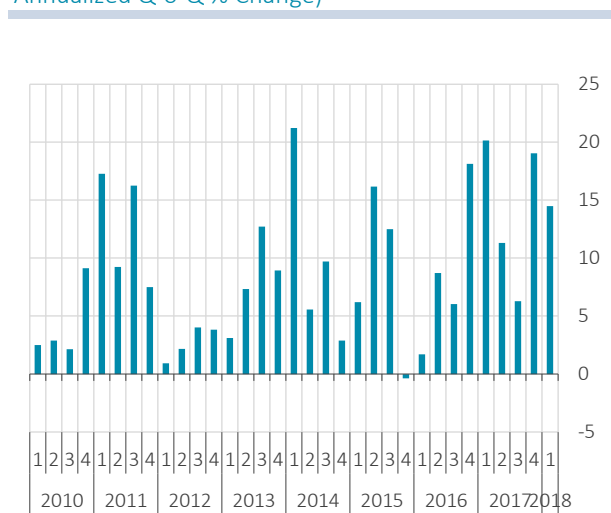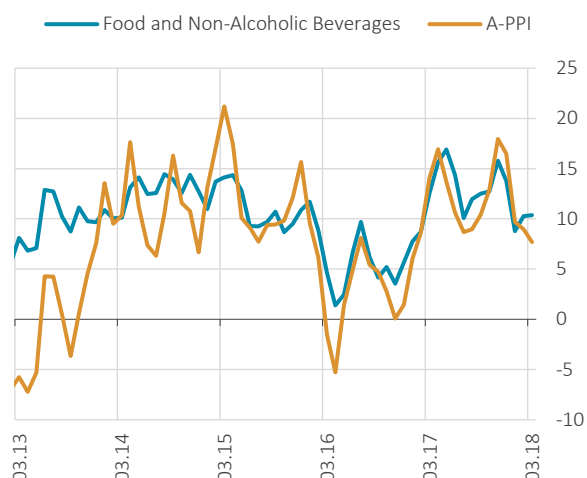


Source: CBRT, TURKSTAT.

# 3.4 Agricultural Producer Prices

Agricultural producer prices rose by 3.03 percent quarter-on-quarter, whereas annual A-PPI inflation went down by 8.77 points to 7.70 percent (Chart 3.4.1). In this period, the annual producer inflation in fruits and vegetables and some legumes, such as tomatoes, eggplants, potatoes, chickpeas, cucumbers, green beans, kidney beans, oranges, rice, and green peppers, dropped dramatically amid favorable weather conditions. This decline in the A-PPI inflation had positive implications for the first quarter's fresh fruits and vegetables inflation under the CPI index (Charts 3.4.1 and 3.2.3). However, the rising food prices excluding fresh fruits and vegetables caused the underlying trend of food and agricultural prices to diverge (Chart 3.4.2). This divergence was largely the result of the new SCT tax of 10 percent imposed on some non-alcoholic beverages in January, rising bread prices led by accumulating cost pressures after the weight adjustment in the Bread Regulation, and the widespread price upswings for milk and dairy goods due to increased raw milk purchase prices. Overall, the fall in the producer price inflation of some items related to unprocessed food helped bring food inflation down but price hikes across processed food-related items prevented food inflation from declining further.

Chart 3.4.1: Prices of Food, Non-Alcoholic Beverages and A-PPI (Y-o-Y % Change)

Chart 3.4.2: The Underlying Trend of Food and Non-Alcoholic Beverage Prices and A-PPI (Seasonally Adjusted, Annualized 3-Month Average % Change)
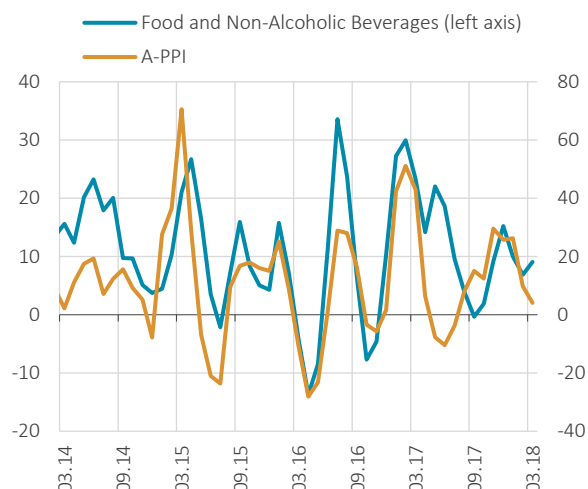


Source: TURKSTAT.



Source: CBRT, TURKSTAT.

## 3.5 Expectations

After having deteriorated due to cost shocks and the general inflation outlook in the fourth quarter of 2017, expectations remained relatively flat in the first quarter of 2018. Nevertheless, with the Turkish lira depreciation in April, expectations began to drift back upward, hitting 9.62 and 8.63 percent for the next 12 and 24 months, respectively (Chart 3.5.1). Five-year and 10-year-ahead inflation expectations have also increased and continue to hover above the inflation target (Chart 3.5.1).

Chart 3.5.1: Inflation Expectations* (%)
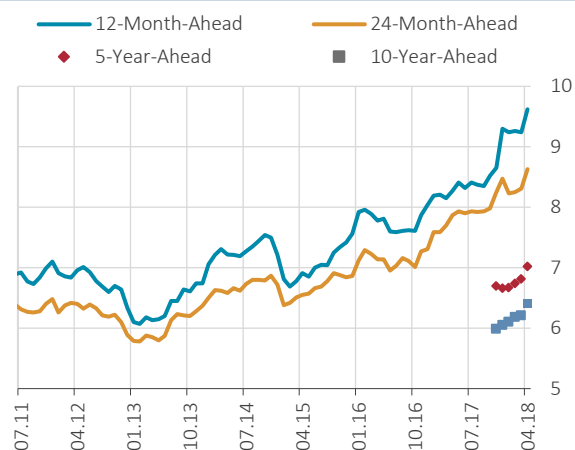


Source: CBRT.

* CBRT Survey of Expectations, second survey period results for the pre-2013 period.

Chart 3.5.2: Medium-Term Inflation Expectations* (%)
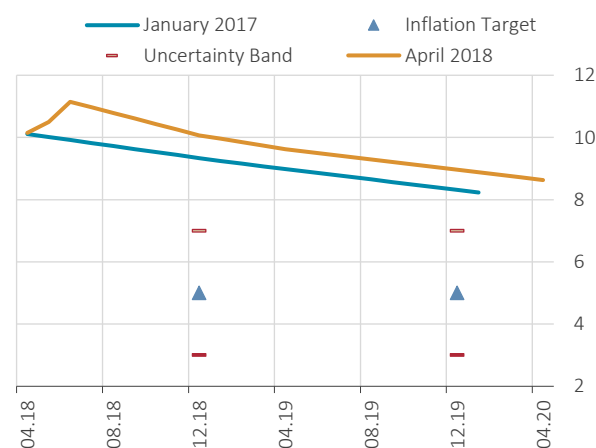


Source: CBRT.

* 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.

Inflation expectations were up quarter-on-quarter across all maturities, more markedly for the shorter term (Chart 3.5.2). The probability distribution of inflation expectations also deteriorated compared to January (Charts 3.5.3 and 3.5.4). Medium-term inflation expectations have yet to improve, which poses upside risks to the inflation outlook through wage adjustments and pricing behavior.

Chart 3.5.3: Probability Distribution of 12-Month-Ahead Inflation Expectations* (%)
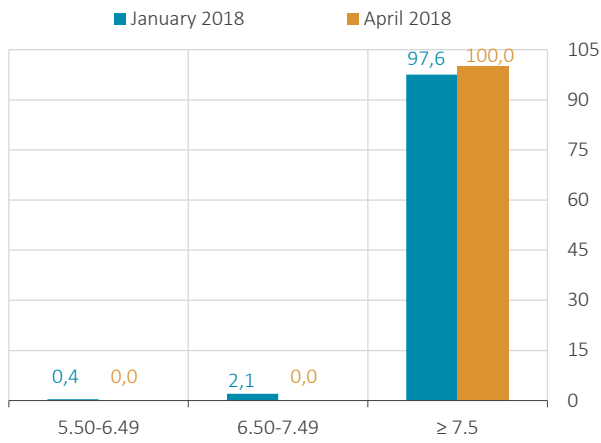
■ January 2018    ■ April 2018

| 5.50-6.49 | 6.50-7.49 | ≥ 7.5 |
|-----------|-----------|-------|
| 0,4   0,0 | 2,1   0,0 | 97,6   100,0 |

Source: CBRT.

* Horizontal axis denotes the expected inflation rate, while the vertical axis denotes the respective probability. For further details, see Statistics/Tendency Surveys/Survey of Expectations/Metadata at CBRT's website at http://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN.

Chart 3.5.4: Probability Distribution of 24-Month-Ahead Inflation Expectations* (%)
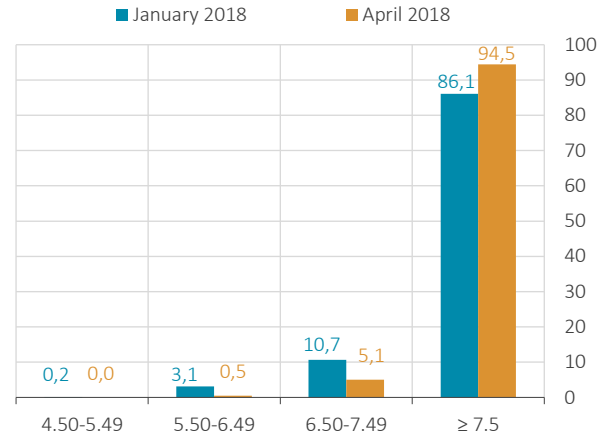
■ January 2018    ■ April 2018

| 4.50-5.49 | 5.50-6.49 | 6.50-7.49 | ≥ 7.5 |
|-----------|-----------|-----------|-------|
| 0,2   0,0 | 3,1   0,5 | 10,7   5,1 | 86,1   94,5 |

Source: CBRT.

* Horizontal axis denotes the expected inflation rate, while the vertical axis denotes the respective probability. For further details, see Statistics/Tendency Surveys/Survey of Expectations/Metadata at CBRT's website at http://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN.

# Box 3.1
# The Impact of Administered Prices and Tax Adjustments on Inflation

Administered items in the consumer price index are goods and services items whose prices are directly set by the state or state-affiliated entities (municipalities, SEEs, etc.) and/or established by public consent. This box analyzes how the public sector affects consumer inflation through administered prices and tax adjustments from a historical perspective.

### Table 1: Administered Items and Items Subject to Frequent Tax Adjustments

**1. Items subject to tax adjustments**

Alcoholic Beverages and Tobacco Products

Automobiles

Fuel

|  | Total Weight: 17.0 |
|---|---|

**2. Administered Items**

Electricity

Water (Tap Water)

Municipal Urban Passenger Transport (Metro, Tram, Bus, Ferry Prices, etc.)

Tea (Food and Catering Services Combined)

City Gas and Natural Gas

Private Education Services Affected by the State Regulation of Private Schools (Private Primary and High School Tuition)

Miscellaneous Public Education Services (Distant Learning Student Fees, State University Housing Fees, State Pre-School Tuition)

Medicine

Miscellaneous Public Services (Driver's License Fees, Court Documents, Notary Fees, Passport Fees, Compulsory Earthquake Insurance, Compulsory Traffic Insurance, Vehicle Inspection Fees, Emissions Testing Fees, etc.)

Sugar

Costs for Hajj and Umrah Visits

Miscellaneous Healthcare Services (Consultation Fees at State Hospitals, General Practitioner's Consultation Fees, etc.)

Municipal Bread

Games of Chance (Horse Racing, National Lottery, Powerball, etc.)

TCDD Train Fares (Intercity, High Speed Train, Suburban)

Highway and Bridge Tolls

Other (PTT Delivery Costs, State Theater Tickets)

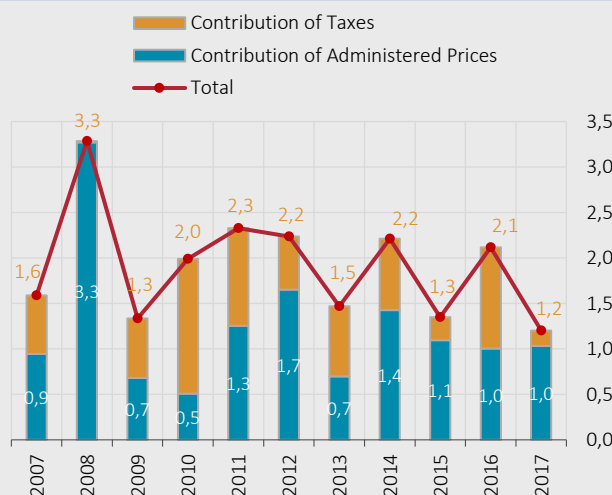|  | Total Weight: 13.3 |
|---|---|
|  | Overall: 30.3 |

Source: CBRT, TURKSTAT.

Table 1 shows a list of administered items and items subject to tax adjustments. These items, which are directly controlled by the public sector, account for as much as 30 percent of the CPI as of 2018. This underlines the key role of the public sector in inflation dynamics. In fact, as shown in Chart 1, administered prices and taxes added 1.9 points to consumer inflation, which was 8.4 percent on average between 2007 and 2017. Of this 1.9 points, 1.2 points stemmed from administered prices and 0.7 points came from taxes.

Besides their direct impacts, price or tax adjustments to energy items such as fuel, electricity and natural gas affect inflation also indirectly through production costs. For example, fuel prices have an economy-wide impact on costs primarily through transport services, and their indirect impact can be about 1.5 times as strong as their direct impact on inflation. The indirect impact of a price increase is not confined to the cost channel; the signaling effect as well as the pass-through to inflation expectations are equally important. Strong indexation mechanisms in the revaluation rate or wages are examples of such practices which affect expectations and create inflation inertia. In short, the role of the public sector on inflation can be more clearly assessed when indirect effects are also taken into account besides the direct effects.

The effect of the public sector on inflation can be analyzed in three parts: level, volatility and pricing behavior. First, the administered price index has been increasing at a much faster pace than the CPI since 2007 on a cumulative basis (Chart 2). The level discrepancy is much more striking when alcoholic beverages and tobacco products, which are subject to frequent tax adjustments, are also included in the analysis (Chart 2). In particular, administered prices and alcohol-tobacco posted an annual growth rate of 10 percent between 2008 and 2017, whereas the CPI excluding these items rose by an annual 8 percent on average.

**Chart 1: Contribution of Administered Prices and Taxes to Inflation** (% Point)

**Chart 2: Price Indices** (January 2007=100)



Source: CBRT, TURKSTAT.
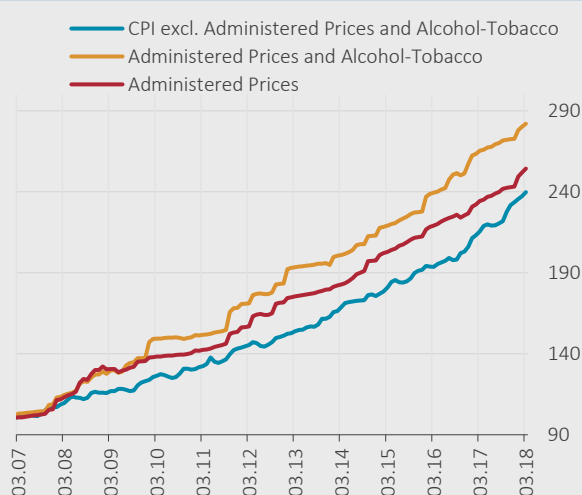
Source: CBRT, TURKSTAT.

Apart from their effects on the level of inflation, administered prices and tax adjustments also increase inflation volatility, thus distorting expectations and causing these unforeseen price movements to create inflation uncertainty and deteriorate pricing behavior. Another impact of administered prices on inflation is through the backward indexation mechanism, which is basically the indexing of prices to past inflation and exchange rates. As mentioned above, adjustment of public prices in line with the revaluation rate, which is based on past D-PPI inflation, is a price-setting behavior that leads to inflation inertia.

In 2017, taxes proved to be less inflationary compared to previous years due to the stronger coordination between monetary and fiscal policies. With no visible tax-driven inflationary pressure, inflation increased at a slower rate while administered prices added only 1 point to annual CPI inflation (Chart 1).

In sum, administered prices and indirect tax adjustments have considerable influence on inflation dynamics. The majority of administered prices increase at a faster pace than inflation, which suggests that there is enough room to support disinflation through these items. It is critical for the internal consistency of macroeconomic policy design that administered prices and tax adjustments be set in view of their possible effects on inflation. Lastly, adopting a continuous and systematic framework for the recently enhanced coordination between monetary and fiscal policies will provide major contribution to permanent price stability in the medium term.

# Box 3.2

## The Use of Imported Inputs and Pass-through Effects

In emerging economies, the exchange rate pass-through can be affected by factors such as the degree of openness of the economy, the inflation outlook, exchange rate volatility, the current account deficit and the direction and size of exchange rate movements. Moreover, the extent of the exchange rate pass-through to price indices can also vary across subcategories. For example, the exchange rate pass-through to prices can be relatively lower for services products, non-tradable goods or products with relatively low import content, compared to tradable goods or products with higher import content. Therefore, analysis of pass-through using general price indices might mask some crucial information hidden in the details.

Import prices can affect final consumer prices both directly and indirectly through imported final consumer goods and imported intermediate goods. As far as direct effects are concerned, a rise in import prices would be fully passed through to prices of imported consumer goods, while the pass-through of imported input prices to producer prices is expected to be proportional to the share of imported inputs in total costs. However, the extent of the pass-through can be affected by market conditions and competition, and also may differ across countries. For instance, according to Ahn et al. (2017) in their analysis of the short and medium-term pass-through of imported input prices to producer prices by sectors, the pass-through of imported input price shocks to producer prices is lower than the share of imported inputs in cost in Korea, but equals this share in European countries. On the other hand, in a study by Auer and Mehrotra (2014), which demonstrates that the use of imported inputs affects the sensitivity of costs to exchange rates, it was found that the share of imported inputs in total cost increased between 1998 and 2008 in Asia Pacific countries and the impact of the exchange rate depreciation on producer prices varied depending on the use of imported inputs.

This box, in the spirit of Auer and Mehrotra (2014) and Ahn et al. (2017), estimates the effect of imported input price increases on domestic producer prices by sectors in Turkey. However, unlike the above studies, the analysis separates USD-denominated import prices and the USD/TL exchange rate, which together determine the import prices in local currency.[1] We compare the pass-through coefficients calculated for each of these variables with the intensity of sector-level imported input use[2], and then examine if the degree of pass-through effects is proportional to their shares in cost.

### Empirical Analysis Method

The empirical framework for estimating pass-through is based on a Vector Autoregression (VAR) model. The variables are USD-denominated import prices, the USD/TL exchange rate, the output gap and the D-PPI. The model is estimated separately for each sector utilizing monthly data between 2010:01 and 2017:12. The import price index in USD and the output gap are estimated on a sectoral basis.[3] D-PPI and import prices are seasonally adjusted. Except the output gap, all the variables are in monthly changes.

The ordering of the variables and the identification of shocks in the impulse-response analysis

---

[1] Previous pass-through studies carried out at the CBRT have shown that the degree and speed of the pass-through to prices might be different for import prices and exchange rates, and therefore, combining them would cause an aggregation bias in coefficients (Yüncüler, 2011; Kara and Öğünç, 2012, Özmen and Topaloğlu, 2017). Thus, decomposition of these effects is deemed to be useful for enriching the information content.

[2] The intensity of imported input use is calculated by dividing the value of imported inputs in the domestic use table for 2012 by the sum of total intermediate consumption and compensation of employees.

[3] For each sector, the imported input price index is calculated by weighting sectoral import unit value indices with the relevant shares in the imported input use table from the input/output tables for 2012. Sectoral output gap is obtained by applying the Hodrick-Prescott filter to sectoral production indices.

are based on Cholesky decomposition. Accordingly, import prices are assumed to be the most exogenous variable, which is followed by the USD/TL exchange rate, the output gap and D-PPI, respectively. The shock for the variable at a particular stage is the part of that variable that cannot be explained by shocks of previous stages and information at period t-1. In the model, the variables that are in the lower stages do not affect the preceding variables contemporaneously but only with a lag. Against this background, the model can be stated as follows:

$$IMP_{i,t} = E_{i,t-1}\left(IMP_{i,t}\right) + \varepsilon_{i,t}^{IMP} \tag{1}$$

$$EXC_t = E_{i,t-1}(EXC_t) + \alpha_{1,i}\varepsilon_{i,t}^{IMP} + \varepsilon_{i,t}^{EXC} \tag{2}$$

$$GAP_{i,t} = E_{i,t-1}\left(GAP_{i,t}\right) + \beta_{1,i}\varepsilon_{i,t}^{IMP} + \beta_{2,i}\varepsilon_{i,t}^{EXC} + \varepsilon_{i,t}^{GAP} \tag{3}$$

$$PPI_{i,t} = E_{i,t-1}\left(PPI_{i,t}\right) + \delta_{1,i}\varepsilon_t^{IMP} + \delta_{2,i}\varepsilon_t^{EXC} + \delta_{3,i}\varepsilon_t^{GAP} + \varepsilon_{i,t}^{PPI} \tag{4}$$

Here, **IMP** denotes the import price index; **EXC** is the USD/TL rate, **GAP** represents the output gap and **PPI** stands for the D-PPI. $E_{t-1}$ (.) denotes the expected value of the respective variable based on the information set available at the end of period t-1. $\varepsilon_{i,t}^{IMP}$, $\varepsilon_{i,t}^{EXC}$, $\varepsilon_{i,t}^{GAP}$ and $\varepsilon_{i,t}^{PPI}$ represent shocks to import price index, the exchange rate, output gap and D-PPI, respectively. Finally, $i$ stands for the relevant industrial sector and $t$ denotes time.[4]

## Empirical Findings

The estimation results show that the long-term pass-through coefficients for import prices and exchange rates differ drastically across industrial sectors. The import price pass-through coefficient may reach as high as 70 percent, while the exchange rate pass-through can range from 5 to 107 percent. The manufacture of coking coal and refined petroleum products has the highest values for both pass-through coefficients, while it has the highest intensity of imported input use.

The diversification of the degree of import price and exchange rate pass-through across sectors seem to be positively related to the intensity of imported input use (Chart 1). Given only the cost channel, the pass-through of both exchange rate and USD-denominated import prices should be proportional to the share of imported inputs in total cost. Thus, the pass-through from import prices has a linear relationship with the use of imported inputs, whereas the pass-through from exchange rate is higher than the share of imported input use.

As shown in Chart 1, the exchange rate pass-through is much higher than the import price pass-through in many sectors. This can be attributed to the presence of factors other than production costs, such as FX liabilities and investment costs, which affect pricing and a firm's balance sheet. Moreover, the persistence and volatility of shocks are key determinants of the pass-through of cost shocks to prices (Taylor, 2000). In the analyzed period, commodity prices were more moderate than before the financial crisis of 2008; thus, another reason for the higher pass-through from exchange rate than that from import prices could be the gradual weakening of the Turkish lira, especially with the heightened uncertainty about global monetary policies and when the US Federal Reserve signaled a tapering of its asset purchases after May 2013. Lastly, the level of competition and the resulting profit margins are among other factors that may affect this relationship. In sum, the findings reveal that exchange rates affect inflation not only through the cost channel but also through expectations, type of financing, market structure, etc.

---

[4] The shocks are assumed to be serially uncorrelated and orthogonal across equations. The model can be estimated by VAR after replacing expected values of each variable with the linear projections of the lagged values of all variables. The lag length is set individually for each sector by lag length selection tests.

**Chart 1: Use of Imported Inputs and Pass-Through Coefficients by Sectors\*** (%)
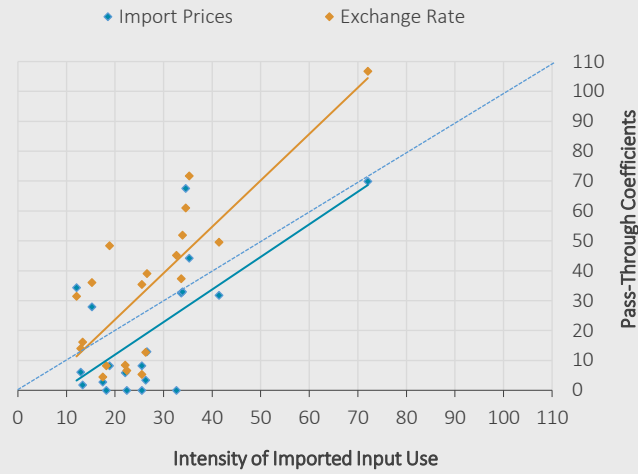


\* The dotted line is the 45-degree line while the solid lines show the linear relationship between the intensity of imported input use and pass-through coefficients.

To sum up, this study finds empirical evidence that the domestic producer prices are more likely to be exposed to exogenous shocks as the use of imported inputs increases. Estimations based on input/output tables show that the use of imported inputs has increased over years in Turkish manufacturing industry. This suggests that the cost pressure from exchange rates and import prices has increased over time. Adopting policies to reduce the share of imported inputs is critical to narrowing the structural current account deficit as well as to enhancing the effectiveness of monetary policy and creating more room for maneuver to fight against inflation.

## References

Ahn, J., Park, C. G. and C. Park, 2017, Pass-through of imported input prices to domestic producer prices: evidence from sector-level data, The BE Journal of Macroeconomics, 17(2): 1-14.

Auer, R. and A. Mehrotra, 2014, Trade linkages and the globalisation of inflation in Asia and the Pasific, BIS Working Paper No. 447.

Kara, H. and F. Öğünç, 2012, Döviz kuru ve ithalat fiyatlarının yurt içi fiyatlara etkisi (in Turkish), İktisat İşletme ve Finans, 27(317): 9-28.

Özmen, M. U. and M. Topaloğlu, 2017, Disaggregated evidence for exchange rate and import price pass-through in the light of identification issues, aggregation bias and heterogeneity, CBRT Working Paper No. 17/08.

Taylor, J. B., 2000, Low inflation, pass-through, and the pricing power of firms. European Economic Review, 44(7): 1389-1408.

Yüncüler, Ç., 2011, Pass-through of external factors into price indicators in Turkey. Central Bank Review, 11(2): 71-84.