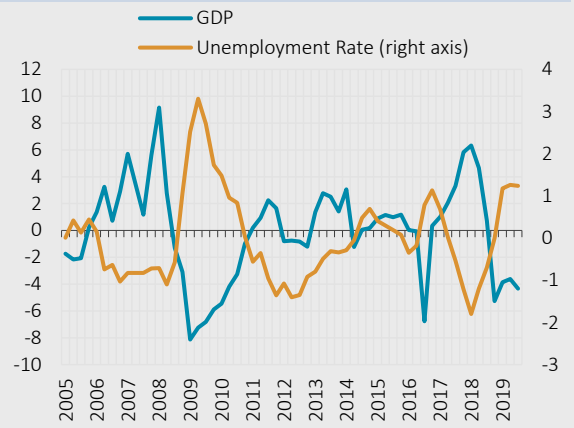
Box 4.1

Nowcasting for Labor Market Data

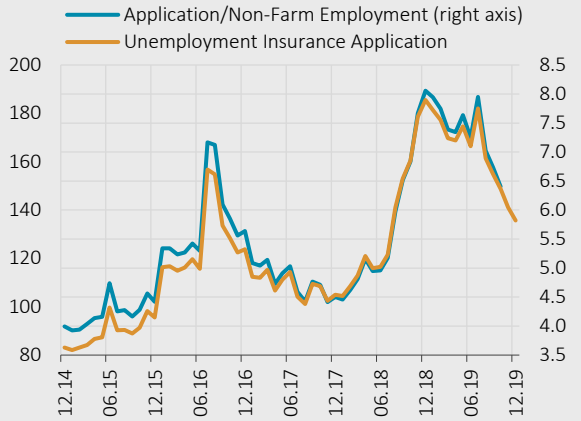
The unemployment rate (UR) is one of the main macro indicators for economic activity, demand developments, wages, inflation, consumer confidence and general welfare (Chart 1). In this box, nowcasting models for the total unemployment rate and non-farm employment growth, and the comprehensive data set used in these models and high-frequency variables (Kariyer.net, Google trends) are introduced.

Chart 1: GDP and Unemployment Rate (Cyclical Component, %)



Source: CBRT, TURKSTAT.

Chart 2: Unemployment Insurance Application (Thousand) **and Application/Non-Farm Employment** (Seasonally Adjusted)

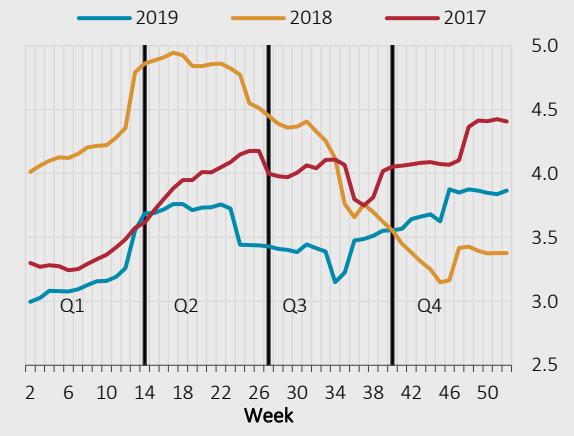


Source: CBRT, ISKUR, TURKSTAT.

Data

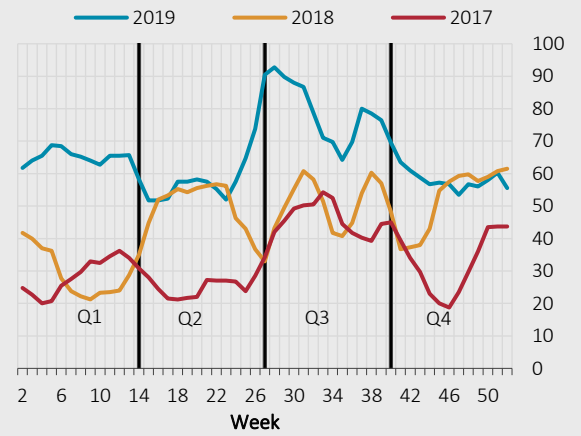
A comprehensive data set is constructed by using daily, weekly, monthly and quarterly variables for estimating the nowcast models for the labor market. Similar to Gunay and Yavuz (2017), candidate variables for the analysis are selected from group of variables, which are the Social Security Institution (SSI) monthly insurance statistics, Turkish Employment Agency (TEA) statistics, Kariyer.net website statistics, non-performing loans ratio (NPL), established/liquidated company statistics, number of foreign visitors, the Business Tendency Survey (BTS), 73 Google

Chart 3: New Job Posting (Thousand, 13-Weeks Moving Averages)



Source: CBRT, Kariyer.net.

Chart 4: CV Preparation (Google Trends Index, Relative, 4-Weeks Moving Averages)



Source: CBRT, Google.

trends statistics related to the labor market, PMI Turkey, MÜSİAD PUMAX, industrial production index (IPI), import volume index, real domestic industrial turnover indices, real tax revenues, central government real budget expenditures[1], export climate index and construction materials industry index (CMII) (Charts 2, 3 and 4).

Methodology

In the models, the difference in the unemployment rate compared to the previous period is taken as the dependent variable and then the level of unemployment rate is calculated by using the estimated change (Equation 1). When selecting the variables, percentage changes (SSI, TEA and IP etc.), levels (PMI, BTS etc.) or differences (Google trends etc.) are added to the models according to the characteristics of the data.

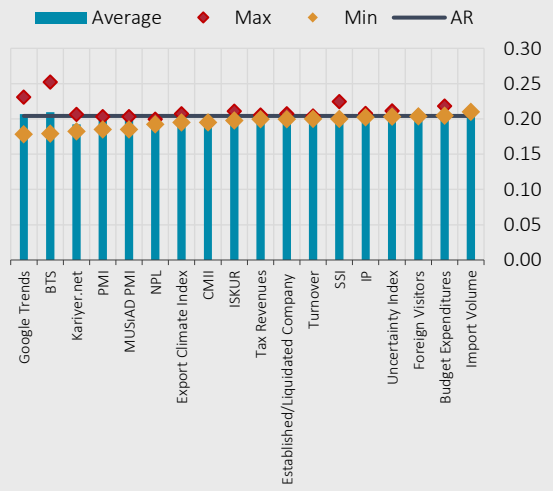
$$\Delta UR_t = \beta_0 + \Delta UR_{t-1} + \beta_1 Variable_{1,t} + \beta_2 Variable_{2,t} + \beta_3 Variable_{3,t} + u_t \quad (1)$$

Nowcasting Models at Monthly Frequency

First, the nowcasts obtained for the monthly unemployment rate are analyzed. Estimation samples of models vary depending on the availability of data, but starts from 2005 or afterwards. The evaluation of out-of-sample forecast performances in monthly models is made for the 2015M1-2019M7 period. An autoregressive (AR) model, containing only its own lagged values, is selected as a benchmark model for unemployment rate estimation. Then, univariate models are formed by adding variables, one at a time, from the master data set. The lag structure of the variables (up to three lags) is decided by the Bayesian Information Criterion.

Compared to the autoregressive (AR) model, it is observed that the nowcasting performance of the models has improved with the inclusion of the variables such as Google trends, BTS sectoral employment indicators, Kariyer.net and PMI (Chart 5). Average root mean squared error (RMSE) values for the Google trends and BTS indicators are relatively higher which indicates the importance of the careful selection of variables from the data sets.

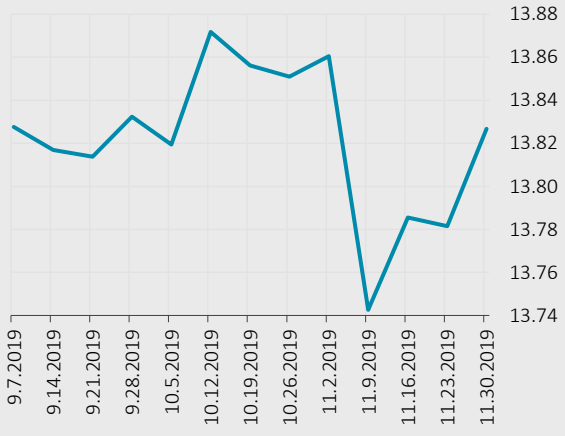
Chart 5: Root Mean Squared Errors of the Variables used in Total Unemployment Rate Models*



Source: CBRT.

*The performance of nowcasting the unemployment rate of monthly indicators from each group is evaluated. The graph presents the average of the nowcasting errors of variables and the lowest and highest nowcasting prediction errors for each group.

Chart 6: Total Unemployment Rate Estimates for October Period with Kariyer.net New Job Post on Weekly Frequency



Source: CBRT.

[1] Domestic turnover indices are deflated using Domestic Producer Price Index (D-PPI) and tax revenues and central government budget expenditures are deflated using Consumer Price Index (CPI).

Another point to be considered here is whether the unemployment rate nowcasting performance is positively affected when very high frequency indicators are used (Charts 3 and 4). Examination of the MIDAS (Mixed Data Sampling) models created through the weekly change of the 12-weeks moving averages of the Kariyer.net new job posting data, which are observed at daily and weekly frequency and have high correlations with unemployment rates, yields that estimation results are quite volatile (Chart 6). An analysis of the different frequency models created for unemployment rate reveals that the prediction performance of the models created in the lower frequency is higher than the benchmark model and the volatility decreases relatively compared to the high frequency models. Accordingly, quarterly models were preferred when creating nowcasts for the labor market.

Nowcasting Models at Quarterly Frequency

In order to estimate models for the unemployment rate at a quarterly frequency, 50 indicators that are highly correlated with the change in the unemployment rate were selected. A total of 19,600 models consisting of all three-variable combinations of these 50 indicators were estimated. Similar to the case of monthly models, estimation samples of the models vary depending on the availability of data, but starts from 2005 or afterwards. The evaluation of out-of-sample forecast performances in quarterly models is made for the 2012Q1-2019Q2 period. In terms of considering time-varying dynamics, it is thought that using the average of the estimates of the top 10 models that perform best instead of the individual models with the lowest nowcasting errors will provide a good nowcasting performance. After sorting the three-variable models according to the lowest nowcasting errors, the diversification among variables and performances of the models in different periods were taken into account in order to capture the time-varying dynamics as mentioned above. The most frequently used variables in the total unemployment rate and the non-farm employment nowcast models are listed in Table 1. When the selected variables are considered, it is seen that it may be useful to use indicators from different data groups in short-term forecasts and analyses of unemployment rates.

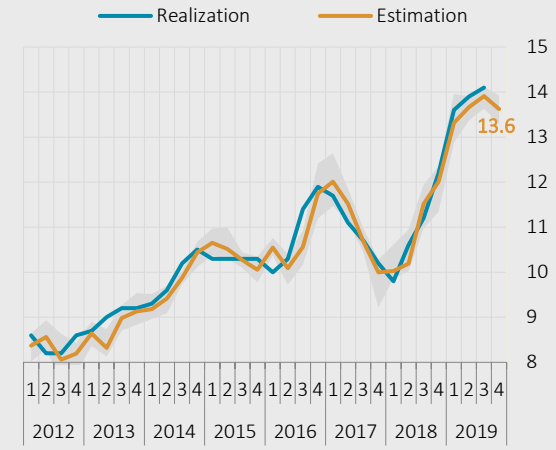
Table 1: The Most Frequently Used Variables in the Total Unemployment Rate and Non-Farm Employment Nowcast Models

Domestic Industrial Turnover Index (DITI)	Kariyer.net- Job Application per Vacancy	SSI- Employment in Construction Related Sectors
DITI- Manufacture of Fabricated Metal Products	Kariyer.net- New Job Posting	SSI- Total Construction Employment
IPI- Manufacture of Paper	Kariyer.net- Total Job Application	İşkur Application- Google Trends
TEA- Unemployment Insurance Beneficiary	Kariyer.net- Total Job Posting	Unemployment- Google Trends
TEA- Vacant Jobs	Import Volume Index (Excluding Gold)	Download CV- Google Trends
TEA- Vacant Jobs (Private)	PMI Backlogs of Work	İşkur Unemployment Benefits- Google Trends
TEA- Unemployment Insurance Application	Total Tax Revenues	

Model results indicate that the total unemployment rate will decrease in the last quarter (Chart 7). An important point to be mentioned in terms of model nowcasts is that the variables selected above do not reflect the trend of participation rate. During an economic recession, the labor force participation rate tends to fall because many laid-off workers become discouraged and give up looking for jobs. Thus, it should be taken into consideration that predictions of the models may be biased upwards and that estimates near the lower band of the models may be observed.

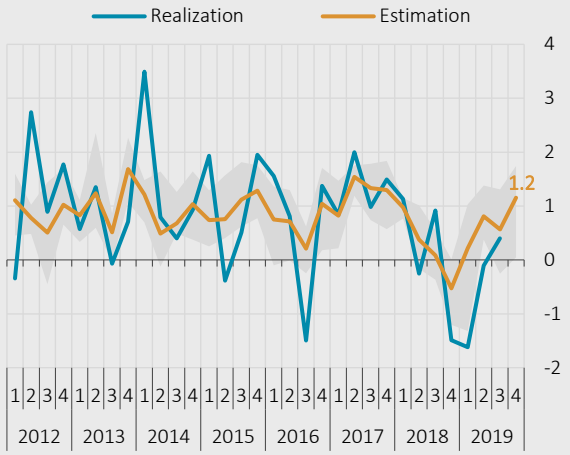
In addition to unemployment rates, nowcast models for employment growth are estimated as well. It is thought that quarterly changes in employment are quite volatile, and their nowcast models have difficulty in predicting this volatility, but represent the main trend well. In this respect, according to the model nowcasts for non-farm employment, the rate of increase in non-farm employment in the last quarter of 2019 compared to the previous quarter may be closer to the upper band (Chart 8).

Chart 7: Total Unemployment Rate Nowcast Models (Seasonally Adjusted)



Source: CBRT.

Chart 8: Non-Farm Employment Nowcast Models (Quarterly % Change)



Source: CBRT.

In sum, this box includes an evaluation on whether the use of high frequency data in the unemployment rate and the non-farm employment growth nowcasts enhances the nowcasting performance. It is concluded that the information content of daily, weekly, or monthly data did not significantly improve the estimation range compared to quarterly models. Against this background, quarterly nowcast models have been constructed, and given the averages of the top 10 models, the non-farm employment is predicted to increase in the last quarter of 2019, while the total unemployment rate is predicted to decrease by nearly half a point in the last quarter of 2019 compared to the previous quarter.

References

Günay, M. ve Yavuz, A. A. (2017). "Revising the Short-Term GDP Forecast Models with New National Income Series (in Turkish)", CBRT Research Notes in Economics No:17/08.