Methodological summary on the break correction for the Norwegian LFS

In 2021 The Norwegian LFS has gone through a substantial redesign in accordance with the new regulation for integrated European social statistics (IESS). To ensure coherent labour market time series for the main indicators, the redesign's impact is modelled to make back-calculated estimates adjusted for possible breaks due to the 2021 LFS-redesign.

The Norwegian LFSs are characterized by rotation sampling, which gives rise to 8 waves according to how many times or following quarters a respondent shall answer on survey-questions.

In the tradition of van den Brakel et al. (2020) and Elliott and Zong (2019), we pursue a structural time series approach. Breaks are estimated for the number of employed and unemployed persons.

In addition to the 8 waves with monthly LFS data for employed and unemployed persons, we also include auxiliary time series for registered number of employees and unemployed respectively in the preferred models.

The time series for register employees are pre-adjusted for discontinuity related to a transition of registers in 2015. The auxiliary variable based on the unemployed register at the employment office is “layoff-harmonized” by subtracting temporarily laid off for less than 90 days from the number of persons that are registered unemployed. We use a 2-month moving average of this auxiliary variable. By making these two adjustments, the auxiliary variable better predicts the monthly average of the LFS-unemployment in our models, particularly during the COVID-19 pandemic.

The structural time series model contains unobserved components for trend, seasonality and irregularity, all which are assumed to be the same for all waves. A smooth trend model is used. In addition, we account for rotation group bias and the autocorrelation structure brought about by the rotating panel design, as well av sampling error heterogeneity caused by changes in the (net) sample sizes over time, due to changing nonresponse rates, whether the month contains 4 or 5 survey weeks and a change in the allocation of the sample for different groups gradually rolled in quarter by quarter in 2021.

The auxiliary time series are decomposed in components for trend, seasonality and irregularity. Information from the auxiliary variables is used to obtain better break estimates by allowing the two trend components' error terms be correlated.

To correct for the effect of the COVID-19 pandemic, we allow the hyper parameters for the trend to be higher during the pandemic. We do this to counteract the contaminating effects the epidemy has on the estimate of the structural break following the redesign of the LFS.

The effect of the redesign is modelled as separate level shifts for each wave. The final break estimates are based on modelling time series from 2006M1-2021M10. Information from a parallel survey with the new questionnaire carried out in the last quarter of 2020 for a small sample is also utilised in combination with the time series model. Technically, the break parameter related to wave 1 is initialized exactly utilizing information from the parallel survey.

The time series are modelled for four main domains: age cross-classified by age 24 and below/25 and above. The domain-specific break estimates are given as the average of the estimates of the break parameters for the 8 waves. These break estimates are divided into sub-groups using a monthly time-varying sub-group splitting factors assuming a proportional distribution of the breaks.

The break estimates relative to the population are used to produce back-calculated monthly and quarterly time series for main indicators for the years 2006-2020.

References:

van den Brakel, J., Zhang, X. (M)., and Tam, S.-M. (2020): Measuring Discontinuities in Time Series Obtained with Repeated Sample Surveys. *International Statistical Review*, 88: 155– 175. https://doi.org/10.1111/insr.12347.

Elliott, D. J. and Zong, P. (2019): Improving timeliness and accuracy of estimates from the UK labour force survey, *Statistical Theory and Related Fields, 3:2, 186-198, https://doi.org/10.1080/24754269.2019.1676034*