

Change of approach to GDP seasonal adjustment

In the April issue of the *Statistika & My* journal (Czech only) in the article titled *Seasonal adjustment and goodness of fit of quarter-on-quarter indices of the GDP* we notified that at the GDP preliminary estimate release for the Q1 2016 there will be a change in the approach to the GDP seasonal adjustment. Together with that, seasonally adjusted data of quarterly national accounts for individual quarters of 2014 and 2015 will be revised. This article focuses on a more detailed explanation of causes and impacts of the changes that took place.

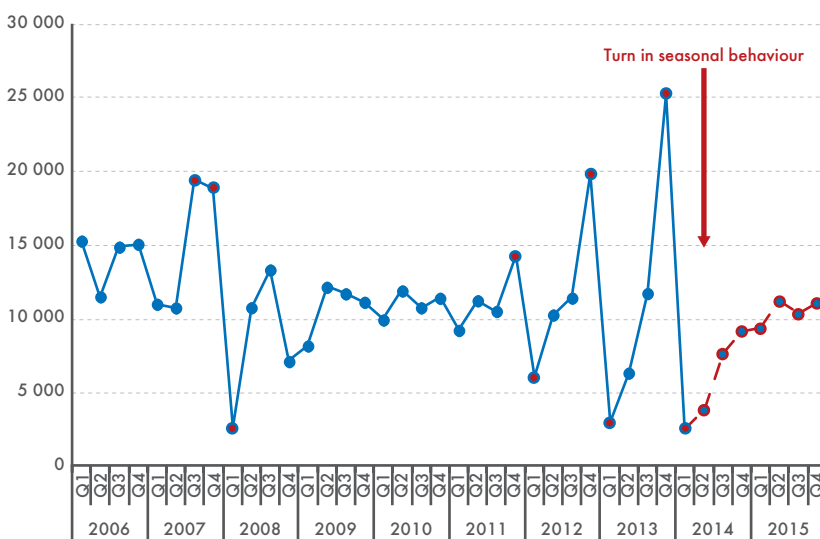
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The Czech Statistical Office provides seasonally adjusted data of quarterly national accounts in 1995–2016 time series. Up to now, the entire time series of GDP was adjusted by a single model, seasonal factors of which have been developing in time depending on how seasonal character of the GDP has been changing. This seasonal adjustment model was revised once a year together with inclusion of new background data for new quarters in the model. Seasonal adjustment in quarterly accounts is based on a direct method, in which the GDP is adjusted separately, the same as its individual components. A discrepancy between the sum of seasonally adjusted components of GDP and the seasonally adjusted GDP is allocated equally to individual components.

Behaviour of the population influences the GDP

Seasonal behaviour of the GDP as well as its components develops in time the same as behaviour of the population changes. Postponing of Christmas shopping to January is a good example of that. Traditional (seasonal) December increase of purchases thus slackens and, on the contrary, traditional (seasonal) January decrease is already not that deep. These natural gradual changes of behaviour are reflected in the development of so-called seasonal

Excise duties on tobacco products, constant prices chained (2010), CZK mil.



Source: CZSO

factors, which in the seasonal adjustment model express the ratio between seasonally adjusted data and real (non-adjusted) values of indicators. Especially previous periods influence their amount in the given year.

Thanks to the fact that seasonal adjustment models learn from the past, they have rather high inertia. Current seasonal factors thus reflect for a long time seasonal behaviour from the past. In general, during calculation of seasonal adjustment, a stable development of seasonal factors in time is expected without big jumps between individual years, because within a year the similar

seasonal behaviour is repeated steadily. However, problems occur when a significant and sudden turn in seasonal behaviour of indicators takes place, be it due to institutional or natural reasons. We can imagine such a turn, for example, like if people started to celebrate Christmas in summer. Firstly, it usually takes some time to identify a turn with certainty. A sufficient distance is necessary for the identification, so that it proves whether it was a one-time deviation or a system change in the seasonal behaviour. Secondly, since the seasonal adjustment model is based on knowledge of previous periods, the



seasonal adjustment (resulting from historical observations) may not suite to a new state after the turn.

And namely such a turn occurred in the GDP time series during 2014. It was caused by change of rules of trading with tobacco products. Here we have to remind that a production method of the GDP estimation is based on the sum of the gross value added of individual industries and net taxes on products. Taxes on products include, among others, also excise duties on tobacco products. Their value thus directly influences the total amount of the GDP. Although excise duties on tobacco products make only some 1.2% of the GDP (2015), provided that they start to develop unequally from a quarter to quarter, it will be reflected markedly especially in the q-o-q GDP rate.

Market behaviour of traders and cigarette producers

Although it was possible to observe unequal collection of excise duties in the past, too, since 2011 it was a yearly phenomenon. The tax rate was usually increased as at 1 January and traders reacted on it by stocking up by cigarettes (with still an old sticker on them with a lower tax rate that were thus cheaper) for the first months of the coming year. Market behaviour of traders and producers of cigarettes had a big influence on the collection of excise duties during the year: in the Q4 when the stocking up took place the collection of excise duties was high, while in the Q1 of the next year it was low. That behaviour intensified with time, collection of duties was more and more imbalanced and the GDP together with that, too. The seasonal adjustment model, however, gradually coped with that by accepting seasonal fluctuations in the GDP development partially as a new seasonality and it started to adjust it.

Legislative limitations by the Government of the CR

Stocking up by cigarettes during the years intensified; however, during 2014 there was a major turn in the seasonal behaviour of taxes. The Government limited by legislation the possibility to



stock up by tobacco products by reducing the number of months in which it is possible to sell cigarettes with old stickers in the next year. Therefore, together with the change of the tax rate on 1 December 2014 such a huge stocking up did not occur any more (as in previous years) and the excise duty collection has gradually stabilised. Nevertheless, it was a big change in the seasonal behaviour of both the excise duty and the GDP. The character of seasonal behaviour changed to such extent that the seasonal adjustment model, which was accustomed to yearly stocking up was not suitable in the new situation any more.

Due to that, the CZSO changed in May 2016 its approach to the GDP seasonal adjustment. The turn, which occurred after limitation of stocking up by tobacco products, was so important for the GDP seasonal behaviour that it was necessary in the period after the turn to start to adjust by a new model then that used for the period before the turn. Therefore, for the purposes of seasonal adjustment, seasonally adjusted GDP time series is newly split into two parts: before 2014 and since 2014. Data until and including 2013 are adjusted by the original model accustomed to the stocking up (which was seasonal behaviour at that time), while for the period since 2014 a seasonal adjustment model is used, which does not contain in it the historical experience with

stocking up any more. Thanks to that, year-on-year and quarter-on-quarter indices of the GDP development in the period after the turn, i.e. in the quarters of 2014 and 2015 period, were refined. This change did not influence the estimation of the GDP growth for the entire year 2014 and 2015.

Split of the time series to more parts at seasonal adjustment is a standard statistical approach in the case of seasonal turns. Thanks to that step, quarter-on-quarter comparison and goodness of fit of indicators are significantly improved. However, it is not used often (although the longer the time series the more turns may occur in it), because it has also its disadvantages. Although they are not substantial for a regular user, for analysts and projection makers it may lead to the necessity to correct their prediction models. Namely for those cases the CZSO provides seasonal factors of the new model.

Also in the new system of split time series the rule of updating of seasonal adjustment models once a year is kept, namely always during the regular revision of quarterly national accounts related to a release of new annual accounts in the end of June. This year, only due to the change in an approach to the seasonal adjustment in the national accounts, in order to keep goodness of fit of the GDP for the Q1 2016 it was necessary to make the change already in May. ■