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MEASURING OF THE ECONOMIC CYCLE ON THE LABOUR MARKET IN THE CZECH CONSTRUCTION SECTOR BY THE MEANS OF NAIRU

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ABSTRACT

The paper is concerned with the economic cycle on the labour market in the whole national economy and in the construction sector of the Czech Republic, working with NAIRU. This variable is estimated with the use of the consumer price index and the construction work price index. By comparing the obtained NAIRU values with the real unemployment rates we determine the phase of the economic cycle. We verify the localised phases of the cycle on the labour market in the national economy and in the construction sector with the development of the real unemployment rate and the added value. Thanks to this approach we get the insight into the development of unstable periods on the labour market.

KEYWORDS

Economic cycle, Phillips curve, NAIRU, HP filter, Kalman filter, Stochastic trend, Unemployment gap

INTRODUCTION

The present article expands on and extends analyses published in past years [1] and [2] in this journal. The initially studied time interval from the 1st quarter of 1994 to the 2nd quarter of 2007 is extended by this paper to the 4th quarter of 2012. The analysis thus covers not only the period in which the Czech economy was hit by the financial and economic recession, but now also the period which immediately followed. At first we used two variants of price indicators (deflators and price indexes) and subsequently we applied only deflators. Now we use price indexes – at the level of the national economy it is the consumer price index, at the level of the construction sector it is the construction work price index. As for the previously used methods for the NAIRU estimation, we continue in working with the Hodrick-Prescott filter (hereinafter the HP filter) and the Kalman filter and we supplement them by the method of the Stochastic trend.

In the theoretical framework we build on the already presented theoretical approaches and we apply findings of economists that analyse economy from the perspective of sectors [3], [4], [5], [6], [7], [8]. These are sectors that have forces which dynamize the economy. In our previous analyses the objectives of the researches were volatility in the development of NAIRU and the economic cycle, confirmation of substitution between the unemployment rate and inflation, indication of the unstable period in the development at the national economy level and in selected sectors, finding reasons of the creation of instability and ways of its manifestation. Now we make

verification of the development of NAIRU and the economic cycle on the labour market, using data from the real economy. We also strive to determine the most suitable method for estimating NAIRU and phases of the economic cycle under the conditions of the national economy and in the construction sector in the Czech Republic.

The basis for understanding and mapping the relation between unemployment, inflation and economic performance are two theoretical concepts: the Phillips curve (hereinafter PC) and the non-accelerating inflation rate of unemployment (hereinafter NAIRU). A. W. Phillips is generally regarded as the founder of the modern version of the PC. [9] He statistically confirmed that there is a substitution relation between the rate of change in nominal wages and the rate of change of unemployment and that economic policy makers can make use of them. One of the followers of the PC concept is J. Tobin. [10] He defines NAIRU as a long-time unemployment rate, which reflects the result of the macroeconomic balancing of pressures on the inflation growth from markets with excess demand and pressures on the inflation decline from markets with excess supply. To find out which phase of the economic cycle the labour market belongs to in the observed period, we have to subtract the defined NAIRU from the real unemployment rate. When the real unemployment rate is lower than NAIRU, we talk about a positive unemployment gap. In the opposite case it is a negative unemployment gap. The derived gap, in other words the negative unemployment gap, provides information about the presence of inflation or deflation pressures coming from the labour market.

1. DEVELOPMENT OF NAIRU AND THE ECONOMIC CYCLE IN THE WHOLE NATIONAL ECONOMY AND IN THE CONSTRUCTION SECTOR WITH THE USE OF PRICE INDEXES

We used the consumer price index and the construction work price index to obtain the values of the invisible variable NAIRU. The time series of price indexes are modified in order to reflect the adaptive forming of the expectation (year-on-year change in time t - year-on-year change in time t-1). To describe the development on the labour market we use the registered unemployment rate according to the Ministry of Labour and Social Affairs in % and our own specific unemployment rate in the construction sector in %. [11] Other explanatory variables are the registered unemployment rate without a delay and the specific unemployment rate in the construction sector with a delay in %, year-on-year changes of the exchange rate in % and year-on-year changes in import prices in %. Unemployment rates have been seasonally adjusted with the multiplicative moving average. All the data used was tested by the Augmented Dickey–Fuller test for stationarity.

1.2. Application of the HP filter for the NAIRU estimation and conclusions for the development of the economic cycle

The first method applied to estimate the time-varying NAIRU is the HP filter.

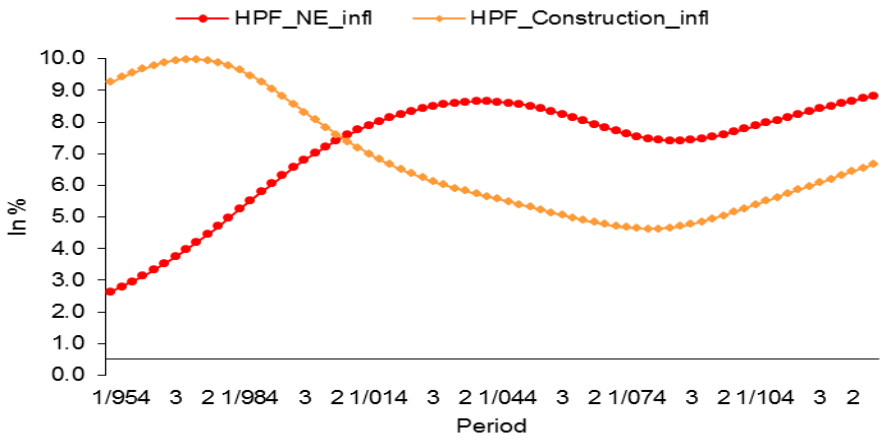

Fig. 1: Development of NAIRU according to the HP filter in the national economy and in the construction sector (Source: Our own calculation based on data from the Ministry of Labour and Social Affairs and the Czech Statistical Office)

From the analysis of results obtained by the **HP filter** follows that:

1) In the **whole national economy** in the Czech Republic NAIRU estimated by the HP filter ranged in the interval of 2.6 to 8.8% and in the **construction sector** in the interval of 4.6 to 10.0%.

2) In the **whole national economy** the NAIRU values mostly copied the real unemployment rate very closely . The interval in the **construction sector** was wider than in the whole national economy.

3) The longer-term and larger unemployment gap in the period from the 1st quarter of 1999 to the 1st quarter of 2000 was still a result of at that time ongoing transformation of the **Czech economy**. Thus identified recession on the labour market corresponded to the development of the real published unemployment rate and the GDP at constant prices. In the **construction sector**, this systemic and political change was apparent in the period from the 1st quarter of 1996 (3 years before the development of the whole NE) to the 4th quarter (3 years earlier than in the whole NE).

4) A large positive gap and a boom phase in the **Czech Republic** were found in the period from the 2nd quarter of 2007 to the 4th quarter of 2008. A positive gap and the boom phase in the **construction sector** were found in the period from the 2nd quarter of 2005 to the 4th quarter of 2008, which is 2 years earlier than in the whole national economy.

5) The influence of another recession on the labour market in the **Czech Republic** can be identified in the period from the 2nd quarter of 2009 and it lasted until the 1st quarter of 2011. Its influence in the **construction sector** became apparent in the 1st quarter of 2009 (just as in the whole NE) and lasted until the 4th quarter of 2012 (7 quarters longer than in the whole NE)

6) In the period from the 3rd quarter of 2001 to the 3rd quarter of 2012 there was a phase of shallow boom detected in the **Czech Republic**.

1.2 Application of the Kalman filter for the NAIRU estimation and conclusions for the development of the economic cycle

We used the Kalman filter as another method for estimation of the phases of the cycle. The Kalman filter uses the year-on-year change of the consumer price index and of the construction work price index in % as a dependant variable. The fixed regressors registered the unemployment rate in the NE (without a delay in %) and the specific unemployment rate in the construction sector (with a delay in %), year-on-year changes of the exchange rate in % with a delay (in the construction sector this variable wasn't significant) and year-on-year changes of import prices in % without a delay (in the construction sector this variable wasn't statistically significant).

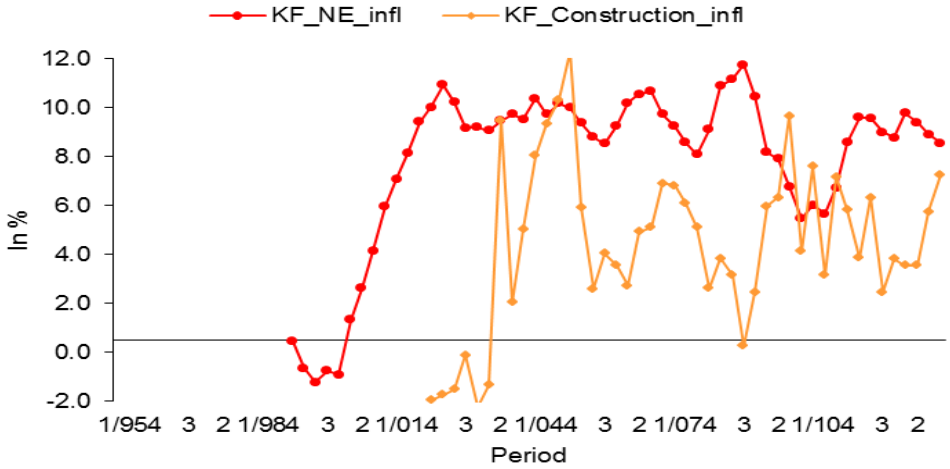

Fig. 2: NAIRU according to the Kalman filter in NE and in the construction sector (Source: Our own calculation based on data from the Ministry of Labour and Social Affairs, the Czech Statistical Office and the Czech National Bank)

From the analysis of results obtained by the **Kalman filter** follows that:

1) Values of NAIRU obtained with higher smoothing than usual ranged relatively significantly far around the real unemployment rate. In the **whole national economy** NAIRU reached values between **-**1.2 and +11.8% and in the **construction sector** between **-**2.3 and +12.3%.

2) In the **Czech economy** the model with smoothing of 0.6 reacted to the process of transformation by negative and unrealistically low positive values of NAIRU. In the period from the 1st quarter of 1999 to the 1st quarter of 2000 the estimated NAIRU was negative and until the 3rd quarter of 2000 it was positive with values not corresponding with the development of the real unemployment rate. In the **construction sector**, negative and low positive values of NAIRU occurred in the period from the 4th quarter of 2001 to the 1st quarter of 2003. The **phase of recession** on the labour market **generated** by the model was in accordance with the development of real variables.

3) The reason for the creation of high positive gaps (ca. 5 p.p.) in the **whole national economy** in the period from the 4th quarter of 2007 to the 4th quarter of 2008 was the inability of the model to reflect the last significant improvement of the situation on the labour market into the NAIRU values. In the **construction sector** there were found positive gaps of ca. 2.0 p.p. in the period from the 3rd quarter of 2006 to the 3rd quarter of 2007. The beginning of this period precedes the development in the whole national economy (4th quarter of 2007). By contrast, the end of this phase lags behind the whole national

economy (4th quarter of 2008). This short boom phase on the labour market is in accordance with the development of the real economy.

4) The influence of the recession on the labour market in the **Czech Republic** started to be apparent in the 3rd quarter of 2009 and lasted until the 4th quarter of 2010 and it corresponded with the real economy development. In the **construction sector** the influence of recession showed from the 4th quarter of 2007 to the 3rd quarter of 2012. The beginning of the recession in the construction sector preceded the development in the whole national economy. Its effect in the whole national economy ended in the 4th quarter of 2010, which is much sooner than in the construction sector.

5) In the **whole national sector** we can trace the boom phase from the 1st quarter of 2011 to the 3rd quarter of 2012. Gradual depletion of this gap resulted in the return of the **recession phase** to the labour market in the 4th quarter of 2012. In the **construction sector** this **phase** was traced only in the 4th quarter of 2012 (the average positive gap was 0.4 p.p.), which was in contradiction with the development of real data (the specific unemployment rate increased annually by 2.0 p.p. and the added value decreased annually by 5.4%).

1.3 Application of the Stochastic trend for the NAIRU estimation and conclusions for the development of the economic cycle

In this model the dependant variable was also the consumer price index and the construction work price index (year-on-year changes in %). Explanatory variables were year-on-year changes of the consumer price index at the level of the whole national economy and of the construction work price index with various delays in %, unemployment rates with delays in %, year-on-year changes of the exchange rate with a delay (beyond the level of the whole national economy) and year-on-year changes in import prices in % with delays (apart from the whole national economy).

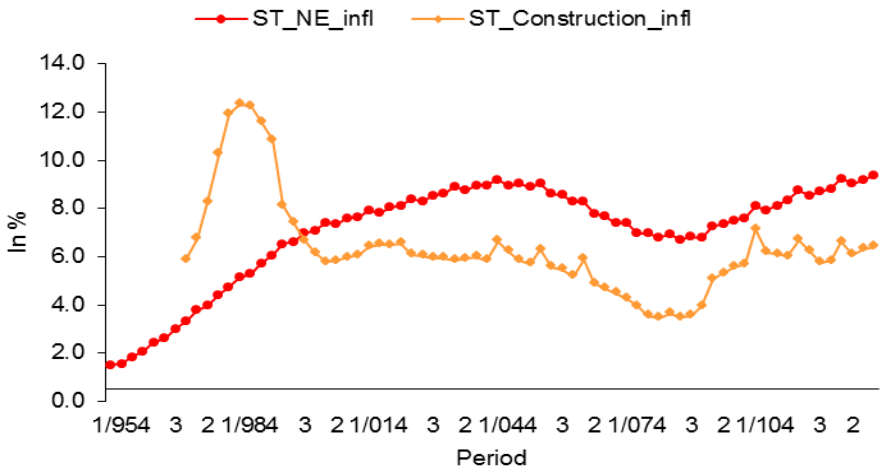

Fig. 3: NAIRU according to the Stochastic trend in the NE and in the construction sector (Source: Our own calculation based on data from the Ministry of Labour and Social Affairs, the Czech Statistical Office and the Czech National Bank)

From the analysis of results obtained by the **Stochastic trend** follows that:

1) NAIRU values in the **national economy** were located in the interval from 1.5 to 9.3% and in the **construction sector** in the interval from 3.5 to 12.3%.

2) In comparison with the method of the HP filter and the Kalman filter, NAIRU values in the **national economy** corresponded with the real unemployment rate even more closely. In the **construction sector** the NAIRU values ranged further around the real specific unemployment rate than in the case of the HP filter and closer than in the case of the Kalman filter.

3) This model placed the period of transformation of the Czech economy in the time period from the 4th quarter of 1998 to the 1st quarter of 2001, which is in accordance with the Kalman filter estimate. Comparison of the results of all the three methods and the real data shows that in the Czech Republic it is possible to accept the conclusion of the authors regarding the usage of the local linear trend to increase the credibility of the NAIRU estimate. [12] This method identified the period of transformation of the economy in the **construction sector** in the period from the 4th quarter of 1996 to the 4th quarter of 2001. The HP filter identifies the beginning of this phase in the 1st quarter of 1996 and the Kalman filter only in the 4th quarter of 1998. Each of the methods also sees the end of the process of transformation on the labour market differently. Even though the Stochastic trend corresponded with the development of the real economy, its results did not cover the whole period and therefore we cannot consider the authors' suggestion to expand the random walk as legitimate. [12]

4) In the **national economy** the estimate of the positive gap and the boom phase in the period of 2nd quarter of 2007 to the 4th quarter of 2008 overlaps with the estimate of the HP filter, which corresponded with the development of the unemployment rate and the GDP. The conformity of the estimates of the Stochastic trend and the real data is supported by the suitability of the random walk adjustment. Positive gaps in the **construction sector** were found in the period from the 2nd quarter of 2007 to the 4th quarter of 2010. The Kalman filter estimated the beginning of this period as the earliest (2nd quarter of 2005), followed by the Kalman filter (3rd quarter of 2006). The end of the phase was firstly estimated by the Kalman filter (3rd quarter of 2007) and then by the HP filter (4th quarter of 2008). A boom phase on the labour market defined in a such way corresponds with the development of the real economy. As the results of the Stochastic trend did not cover the whole period, we cannot consider the authors' suggestion to expand the random walk as legitimate. [12]

5) The influence of the recession on the labour market in the **national economy** can be traced in accordance with the data just like in the case of the HP filter from the 2nd quarter of 2009 to the 1st quarter of 2011. Again, the consistency of the estimates of the Stochastic trend and the real data suggests that the authors' adjustment of the random walk was done correctly. [12] In the **construction sector** the recession started to be apparent in the 1st quarter of 2011 and lasted until the 4th quarter of 2012. Each of the methods defined the beginning of the phase very differently. The recession took place the earliest according to the Kalman filter (4th quarter of 2007), after that it was detected by the HP filter (1st quarter of 2009). The method of the HP filter and the Stochastic trend estimate the boom phase in contradiction to the date of the real economy and they both identify the end of the year 2012 as an end of this phase. This period also corresponded to the real economy development. Since the Stochastic trend put the beginning of the transition between the phases of boom and recession with a significant delay, it is also in contradiction with the authors of the random walk. [12]

6) The development in the period from the 2nd quarter of 2011 to the 4th quarter of 2012 in the **national economy** was characterized by the fact that the labour market was only in the boom phase. According to the Kalman filter and the HP filter the boom phase lasted only until the 3rd quarter of 2012 and in the following quarter the labour market returned to the phase of recession. As the comparison of the obtained estimates with the development of the real data confirmed the presence of the recession on the labour market in the last quarter, the authors' expansion of the random walk in the case of the Stochastic trend cannot be considered as positive. [12]

CONCLUSION

The paper surveys the comparison of the economic cycle on the labour market in the whole national economy and in the construction sector in the Czech Republic through the variable NAIRU. We see the difference between the estimated values of NAIRU and the real unemployment rate as an indicator of the economic cycle on the labour market. For the verification of the phases of the economic cycle on the labour market obtained by econometric statistical methods we used statistical data.

The significance of such researches lies in the fact that economic policy makers can use them to derive a level of stable and non-inflation economic growth, to assess the economic growth and the efficiency of structural, macroeconomic and microeconomic reforms.

From the analysis we carried out following these overall conclusions:

1) The NAIRU values in the **construction sector** measured by the method of the Stochastic trend ranged further around the real specific unemployment rate than in the case of the HP filter and closer than in the case of the Kalman filter. The Stochastic trend put the values of NAIRU for the **national economy** in the interval of 1.5 to 9.3% and in the **construction sector** 3.5 to 12.3%.

2) The method of the Stochastic trend placed the period of transformation of the **Czech economy** in the time period from the 4th quarter of 1998 to the 1st quarter of 2001, which is in accordance with the Kalman filter estimate and with the development of the real data. The HP filter puts its beginning in the 1st quarter of 1999 and its end already to the 1st quarter of 2000. In the **construction sector** the method of the Stochastic trend put the period of transformation of the economy into the period from the 4th quarter of 1996 to the 4th quarter of 2001. The HP considers as a beginning of this phase already the 1st quarter of 1996 and the Kalman filter only the 4th quarter of 1998. Each of the methods also sees the end of the labour market transformation elsewhere. The HP filter sets it into the 4th quarter of 1998 and the Kalman filter considers it the 4th quarter of 2003.

3) The estimate of the positive gap and the boom phase in the **economy** by the Stochastic trend, which puts it into the period from the 2nd quarter of 2007 to the 4th quarter of 2008, overlaps with the estimate of the HP filter. According to the Kalman filter this phase did not begin until the 4th quarter. The positive gaps in the **construction sector** were detected in the period from the 2nd quarter of 2007 to the 4th quarter of 2010. However, the earliest beginning of this period was estimated by the HP filter (2nd quarter of 2005) and was followed by the Kalman filter (3rd quarter of 2006). The end of this phase is estimated the earliest by the Kalman filter (3rd quarter of 2007) and then by the HP filter (4th quarter of 2008). A boom phase on the labour market defined in this way is therefore in accordance

with the real economy development.

4) According to the Stochastic trend in the **economy** we can trace the influence of recession on the labour market in compliance with the data just like when we use the HP filter: from the 2nd quarter of 2009 to the 1st quarter of 2011, that is one quarter ahead of the estimate of the Kalman filter. In the **construction sector** the recession came through from the 1st quarter of 2011 to the 4th quarter of 2012. The methods set the beginning of this phase very differently. According to the Kalman filter the recession started the earliest (4th quarter of 2007). It was followed by the HP filter (1st quarter of 2009). All the methods except for the Kalman filter (which estimates the boom phase in contradiction with the real economy data development) agree that the end of this phase was at the end of the year 2012.

5) According to the Stochastic trend the development in the period from the 2nd quarter of 2011 to the 4th quarter of 2012 in the **economy** was characterized by the fact that the labour market was only in the boom phase. According to the Kalman filter and the HP filter, the boom phase did not last longer than until the 3rd quarter of 2012 and in the following quarter the labour market returned into the phase of recession.

The overview of specific conclusions of the analysis showed that the estimates of the unobservable variable NAIRU and the derived economic cycle on the labour market differ, depending on the used statistical econometric method. While the HP filter and the Stochastic trend were in a close correspondence with the development of the real unemployment rate, the Kalman filter followed them only loosely. However, in most periods the estimates of all the methods reflected the real development in the real economy, which was outlined by the published data. This fact confirms that they are suitable for application in the economic policy measures, most importantly in terms of support of the economy in recession. This support is significant mainly for the construction sector, in which the recession phase starts the earliest and ends the latest. Recession also usually has a deeper impact on this sector than on the economy as a whole. Measures leading to mitigation of recession or shortening of the phase of recession in the construction sector can have a positive influence on the development of the cycle in the whole economy.

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Internet sources

Czech National Bank

Foreign exchange rates

http://www.cnb.cz/cs/financni_trhy/devizovy_trh/kurzy_devizoveho_trhu/denni_kurz.jsp

Czech Statistical Office

Consumer price index

http://www.czso.cz/csu/csu.nsf/kalendar/aktual-isc

Construction work price index

http://www.czso.cz/csu/csu.nsf/kalendar/aktual-ipc

Import price index

http://www.czso.cz/csu/redakce.nsf/i/ceny_vd_ekon

Ministry of Labour and Social Affairs

Registered unemployment rate

http://www.mpsv.cz/cs/869