

# COMMON FEATURES AND DIFFERENCES IN THE NAIRU AND ECONOMIC CYCLE DEVELOPMENT IN THE LABOUR MARKET OF THE CZECH REPUBLIC AND SLOVAKIA IN 1995 – 2012 INCLUDING THE IMPLICATIONS FOR THE ECONOMIC POLICY MAKERS

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## Abstract

The article analyses the development of the time-varying NAIRU and the economic cycle in the Czech Republic and Slovakia by three internationally applied econometric methods. It searches for the differences in the estimates of unnoticeable variables, the reasons of their occurrence and the support in real economic data. The analysis shows that, compared to the Czech Republic, following the accession to the Eurozone in 2009, there was a significant improvement in the generally worse impression of the market labour situation in Slovakia as a whole, particularly in the industry and civil engineering sectors. The analysis also includes an overview of good experience of the industry and civil engineering sectors, which the economic policymakers in both countries have failed to transfer, within individual economic cycle phases, onto the labour market in the remaining economy sectors.

**Key words:** NAIRU, HP filter, Kalman filter, Stochastic trend and unemployment gap

**JEL Code:** E24, E32, E37

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## Introduction

Effective labour market operation, flexibility, and competitiveness of the economy are the issues of interest not only for individual EU Member States but also for the whole Union. In this respect, the key role is played by the document entitled Employment Lisbon Strategy. Among other things, it calls for creating access to the labour market and defence against the segmentation and inactivity or gender inequality. Within this strategy, it is the structural unemployment that plays a key role in meeting the general and national unemployment targets, being subject to regular forecasts and examination of the development.

Apart from the microeconomic and macroeconomic view of the economic system, it was the mesoeconomic perspective that has gradually been established. According to Andersson (2003), the reason for this approach consists in the need to perceive the economic

system as components of the mesoeconomic level and the relationships between them and government policies. According to Preston (1984), mesoeconomics has appeared due to the economists' dissatisfaction with the micro and macro dichotomy of the presentation of knowledge. For instance, Gordon (1996) pointed out the diverse sector development and its importance for understanding the status and direction of the whole national economy. According to McAdam and McMorrow (1999), the precise NAIRU measurement is hampered by two fundamental sources of uncertainties. The first uncertainty is based on the fact that the NAIRU is unobservable. The second type of uncertainties comes from the NAIRU calculation combining stochastic variables and parameters.

The paper is divided into the following sections. The first part will present a list of representatives of the concepts of the substitution between the inflation and unemployment on the macro- and meso-levels. In the second part, the methods will be divided into groups to be subsequently associated with a specific representative. In the third part, the individual methods will be applied. The fourth part summarises the conclusions.

## **1 List of representatives of the concepts of substitution between the inflation and unemployment on the macro- and meso-levels**

Humphrey (1985) starts the list of the representatives of the substitution between the inflation and unemployment with the names that he considers as predecessors of the modern version of the Phillips curve (hereinafter only as the "PC"). In addition, he extends this list with the representatives developing the modern version of this substitution. For instance, this applies to Samuelson and Solow (1960). Among other things, these two authors converted the Phillips chart into a chart with varying unemployment rates necessary for every degree of changes in the price level. In the introduction to his book, Friedman (1968) discusses two limitations of the monetary policy. Humphrey considers Phillips (1958) to be the founder of the modern PC version. Tobin et al. (1999) speaks of the Non-Accelerating Inflation Rate of Unemployment.

Eagly (1965) dealt with the PC sector analysis, examining the relationship between the changes in the wages in individual industry sectors or changes in the bargaining power index and the unemployment level of the civil population. Neumark (1993) attributed a decline in inflation to the drop of the trade unions' bargaining power, which he failed to move empirically on the industrial production level.

## **2 Dividing the methods into groups and associating the representatives to individual groups**

McAdam and McMorrow (1999) consider the Friedman's definition to serve as the basis for estimating the natural rate of unemployment. In the economy, a standard level of unemployment also persists in the case of the balanced labour market. Since it is in fact a theoretical construct, this unobservable variable cannot be measured directly.

The authors Richardson et al. (2000) point out that prior to the application in political analyses, the unobservable NAIRU must be quantified. The authors have classified into three groups all the methods that may be used to estimate the NAIRU. The structural methods deal with modelling the behaviour when setting the wage and price. The second group estimates the NAIRU by means of purely statistical techniques. The authors define the third group as a compromise between the structural and purely statistical methods, calling it the reduced form method.

McAdam and McMorrow (1999) consider as the NAIRU estimate, using the group of structural methods, the calculation of the balanced unemployment rate or the unemployment rate in the constant state (i.e. stable inflation). The authors include, in this dominant PC system, a simple equation of the inflation system (in particular, they speak of the Gordon's "Triangle" model) and a system of wage-price equations (e.g. the Bargaining model). According to Fabiani and Mestre (2000), the group of purely statistical methods consists of, for instance, the Hodrick-Prescott filter (hereinafter only as the "HP filter") and Baxter-King filters. According to these authors, the reduced form method is represented by either the Kalman filter, in which the basic model of the inflation equation is complemented with the assumption of the law of the NAIRU volatility. The second method in this group includes the stochastic trend.

## **3 Development of the NAIRU and economic cycle in terms of the labour market on the macro-level and in selected sectors of the meso-level in the Czech Republic and Slovakia using three methods**

Due to the fact that this paper mainly focuses on the estimate of the time-varying NAIRU, it will gradually apply the methods of the HP filter, Kalman filter, and stochastic trend. This variable will then be subtracted from the actual unemployment rates, which will provided us with a view of the economic cycle development of the labour market and relevant positions in the whole national economy of both countries and in both selected sectors.

The description of the price development in the whole national economy of the Czech Republic and Slovakia uses the household consumption deflator taken from the national accounts. The industry and civil engineering sectors also used the indicators taken from the national accounts, being the industry deflator and the civil engineering deflator. On the macro-level in both countries, the labour market was represented by the unemployment rate published by the International Labour Organization (ILO). Since there has been no officially published unemployment rate on the meso-level in either country, we have calculated our own specific unemployment rates. In the Czech Republic, the calculation completely followed the procedure of Kadeřábková and Jašová (2011). In the case of Slovakia, we have applied this algorithm using the time series of the Statistical Office of the Slovak Republic. Specifically, it was the indicators entitled “Unemployment rate according to the economic activity of the last employment” and “Employment” according to the “Labour Sample Survey”. With the help of the Kalman filter, the analysis also made use of the time series of the year-on-year change in the exchange rate (in Slovakia, except for the industry and civil engineering sectors), import prices (in the Czech Republic, except for industry and in Slovakia, except for the national economy and industry), Brent oil prices (in the Czech Republic, except for the national economy and civil engineering), and in Slovakia, also indirect taxes (except for civil engineering and industry). In the case of using the stochastic trend method, the year-on-year changes in the exchange rate have not been applied only to industry in the Czech Republic and industry and civil engineering in Slovakia. In the Czech Republic, the independent variable of import prices has been statistically significant only in the model for the NAIRU estimate in the whole national economy and in Slovakia, in the civil engineering sector. The explanatory Brent oil price variable has only been statistically significant in the models for Slovakia in both sectors. The adopted and calculated unemployment rates have been seasonally adjusted by means of the multiplicative running average. For all the time series, the stationarity has been verified by means of the Augmented Dickey – Fuller test.

### **3.1 Development of the NAIRU and economic cycle in the Czech Republic and Slovakia using the HP filter method**

In the examined period, the NAIRU values for the whole national economy of the Czech Republic and Slovakia generally followed the actual unemployment rate in close proximity. In the Czech Republic, a longer-term and bigger negative unemployment gap (i.e. the actual unemployment rate exceeded the NAIRU) was found in the period of Q1 1999 to Q1 2000, when the Czech economy was undergoing structural change. In the Slovak economy, this

phenomenon affected the labour market mainly in the period of Q1 2000 to Q2 2001. The effect of the recession (i.e. frequently generally labelled financial, economic and debt recession) onto the labour market in the Czech Republic may be traced from Q2 2009, lasting until Q1 2011. Slovakia saw the effect of the recession in Q1 2009, lasting until the end of 2012. This phase reached its low level in Q1 2010, with the intensity then gradually declining the negative gap value of 0.1% in Q4 2012. Taking into account the delay in the labour market, the estimated cycle phase corresponded to the real economic situation. Already in the period of Q3 2011 to Q3 2012, the labour market in the Czech Republic showed a mild boom phase: the positive gap reached 0.2% on average. This was followed by a transition into the stagnation phase in Q4.

In the Czech Republic, the interval in which the NAIRU fluctuates in the industry sector around the actual specific unemployment rate, compared to the development in the national economy, extended slightly. In Slovakia, the industry interval was wider not only in the whole national economy, but also in the civil engineering sector. In the Czech Republic, the transformation period in industry with a long-term negative unemployment gap was recorded in the period of Q2 1995 to Q4 1998. In Slovakia, the model detected this period of transformation in industry from Q1 2001 to Q4 2005. In the Czech industry, the effect of the recession onto the labour market may be traced in Q1 2009, lasting until Q1 2011. The labour market in the Slovak industry saw the identical effect in the period from Q2 2009 to Q1 2011. In the Czech Republic, the period from Q2 2011 to Q3 2012 saw the mild boom phase, with the average positive gaps of 0.6%. In the Slovak industry, the boom phase lasted from Q2 2011 to Q4 2012. The market in the industry in the Czech Republic in Q4 2012 fell into the stagnation or even very slight recession phase, showing a negative unemployment gap of 0.1%.

In the civil engineering sector in the Czech Republic, the interval in which the NAIRU fluctuated around the actual specific unemployment rate was narrower than in the case of industry but wider than in the whole national economy. In the case of Slovak civil engineering, the actual specific unemployment rate corresponded with the development of the actual unemployment rate. The labour market in the Czech civil engineering saw the transformation phase in the period between Q1 1996 and Q4 1998. In Slovakia, this phenomenon is associated only with a mild recession phase in the period from Q1 2001 to Q1 2006. The Czech labour market in the civil engineering sector was hit by the recession starting from Q1 2009. The Slovak labour market in the civil engineering sector saw a deep

recession from Q4 2009 to Q2 2012. In the last two quarters of 2012, the market showed the phase of a moderate boom, which did not correspond to the development of the actual data.

### **3.2 Development of the NAIRU and economic cycle in the Czech Republic and Slovakia using the Kalman filter method**

Within the whole national economy of the Czech Republic, the model, by means of its negative and unrealistically low positive NAIRU values from Q4 1998 to Q3 1999 or from Q4 1999 to Q4 2000, responded to the transformation process of the domestic economy. In Slovakia, the transformation period on the labour market were found in the period of Q1 2000 to Q2 2002. The labour market in the Czech Republic saw the effect of the recession in the period starting from Q3 2009. This phase lasted to Q1 2011, and its course again corresponded to the development of the actual economy. In Slovakia, this phenomenon was ascertained in the period from Q1 2009 to the end of the examined period. The labour market was hit most strongly in Q4 2009. Nevertheless, the situation on the labour market deteriorated in the following period, with the gap rising again to 9.3% in Q4 2012. Between Q2 2011 and Q2 2012, the Czech Republic saw the acceleration of the positive gap up to the level of 1.5%. The boom phase gradually died out starting from the following quarter, with the positive unemployment gap reaching merely 0.2% in Q4 2012.

According to the model, Czech industry experienced the transformation process in the period of Q1 1999 to Q1 2002 and it was accompanied with a moderate annual decrease in the specific unemployment rate over the whole period. As for Slovak industry, the same process was found in the period of Q2 2002 to Q1 2005. The labour market in Czech industry saw the effect of the recession in the period of Q2 2008 to Q1 2010. In Slovakia, this phase started already in Q1 2009 and lasted only until Q3 2010. The phase of the subsequent boom took place in Czech industry from Q2 2010 to Q4 2011. In Slovakia, it started already in Q4 2010 and lasted until Q4 2011. According to the model, in 2012, the labour market in Czech industry was experiencing the phase of the second recession bottom with the negative unemployment gap of 3.5%. In Slovakia, the transition to the recession phase in 2012 no longer corresponded with the actual economy data.

In Czech civil engineering, the transformation period started in Q1 1999. This phase in civil engineering ended in Q3 2004. The model-generated recession phase on the labour market corresponded with the development of real figures. In Slovakia, the Kalman filter situated the transformation in the period from Q2 2002 to Q1 2005. The recession phase on the labour market estimated in this manner did not correspond to the development of real

figures. The labour market in the Czech civil engineering saw the effects of the recession in the period from Q3 2009 to Q4 2012. In Slovakia, this phase was determined in the period from Q1 2010 to Q2 2011. In the following period (starting from Q3 2011), the labour market in Slovak civil engineering switched into the short and moderate boom phase, which already in Q2 2012 fell again into the deep recession phase (the negative unemployment gaps amounted to 8.1%). Both detected phases corresponded to the development of the real data.

### **3.3 Development of the NAIRU and economic cycle in the Czech Republic and Slovakia according to the Stochastic trend method**

The model put the transformation period of the Czech economy from Q1 1999 to Q1 2000. In Slovakia, this included the period from Q1 1999 to the first half of 2000. As the only one, the stochastic trend revealed, in a timely manner, the effect of the transformation on the labour market. In both countries, the transformation periods corresponded to the development of the actual data. The stochastic trend labelled as the transformation period of Czech industry the time between Q3 1998 and Q4 2001. The correspondence of the estimates of the stochastic trend with actual data confirms the suitability of extending the random walk by the authors. This method associated the transformation of Czech civil engineering with the period of Q1 2000 to Q4 2001. However, as the estimate failed to cover the whole period, the authors' extension of the random walk cannot be perceived as justified. According to this method, the transformation period of Slovak industry lasted from Q1 2002 to Q1 2006 and from Q2 2002 to Q2 2004 for Slovak civil engineering. In the case of both sectors, the estimates produced by this method failed to correspond to the development of the actual economy.

In the Czech Republic, the effect of the recession on the labour market was detected, in accordance with the data, from Q2 2009 to Q1 2011. The labour market in Slovakia began to see its effect from Q1 2009, lasting only to Q2 2011. In Slovak industry, it is the period from Q2 2009 to Q1 2011. Slovak civil engineering was hit by the recession in the period of Q2 2009 to Q1 2012 (with the annual growth of the specific unemployment rate of 2.8% and the annual stagnation of the added value on the level of the previous year). The correspondence of the estimates of the stochastic trend with the actual data concerning the national economy of the Czech Republic, Slovakia, and Slovak industry and civil engineering implies the correctness of the adaptation of the random walk as proposed by the authors. Czech civil engineering was hit by the recession in the period between Q1 2009 and Q4 2012. Nevertheless, the conclusions for this period must be deemed as less robust since due to NAIRU closely following the actual specific unemployment rate, it was impossible to

unambiguously assess the low values of the calculated unemployment gap and frequent changing of the cycle phases. Czech industry began to experience the effect of the recession from Q2 2009, lasting until Q2 2010. Despite the fact that the stochastic trend associated the recession phase in accordance with the data, it is impossible, due to failure to cover the whole period of this phenomenon, to consider as suitable the extension of the random walk as proposed by the authors.

In the final part of the examined period (Q2 2011 to Q4 2012), the development of the whole national economy of the Czech Republic was experiencing a mild boom phase, coming to an end in the last quarter and corresponding to the data development. As for Czech industry, it was the period between Q4 2010 and Q4 2011 with an average positive gap of 0.5%. In the case of the national economy of the Czech Republic and Czech industry, the correspondence of the stochastic trend with the actual data confirms the suitability of extending the random walk as proposed by the authors. On the level of the whole national economy of Slovakia, the mild boom phase was localised in the period starting from Q3 2011, which is contrary to the development of the actual data. In Slovak industry, the boom phase was localised in the period from Q2 2011 until the end of the examined period. According to the stochastic trend, the labour market in Slovak civil engineering experienced the boom period in the last three quarters of 2012. For this reason, in the case of the national economy of Slovakia and Slovak industry, the stochastic trend method cannot be considered suitable with the extended random walk as proposed by the authors.

## **Conclusion**

The analysis of the time-varying NAIRU and the economic cycle shows that each of the methods applied estimates their development in a different manner. There are apparent differences not only between the countries, but they are also determined by whether we deal with the research into the macro-level, i.e. the whole national economy, or the meso-level, where differences were localised even between the individual sectors, as well. In the whole national economy of the Czech Republic and Slovakia and in the civil engineering of both countries, the NAIRU values were more distant from the actual specific unemployment rate than in the case of the HP filter and closer than in the case of the Kalman filter.

The reason for the deviation of the estimate of the Kalman filter from the actual unemployment rate in the whole national economy of the Czech Republic and Slovakia, as well as the differences compared to the actual specific unemployment rate in the industry and

civil engineering of both countries in the transformation phase of the labour market consisted in the unstable environment. This method responded with negative and unrealistically low positive NAIRU values. Another reason for the occurrence of unrealistically high unemployment gaps in this period consisted in fluctuations in oil prices, exchange rate, import prices, and regulated prices. Nevertheless, even this turbulent period corresponded to the development of the actual data.

The correspondence of the estimates of the stochastic trend with the actual data supported the suitability of the adaptation of the random walk, as suggested by Fabiani and Mestre (2001) in the national economy of the Czech Republic in all four periods, whereas in Slovakia, this applies to the half of the identified cases. In addition, in the short boom period following the recession phase, this method estimates the positive unemployment gap contrary to the development of actual data.

Averaging the estimates of all three methods implied that on the level of the whole national economy, all the identified phases first appeared in the Czech Republic and then in Slovakia. The only exception included the phase of the financial, economic and debt recession, which started one quarter earlier in Slovakia, and the last stagnation phase, which did not occur in Slovakia at all. All the localised phases has a more negative effect into the Slovak labour market than onto the labour market in the Czech Republic. In Slovakia, the boom phase immediately following the recession was three quarters shorter and the positive gap was 0.1% lower. The presence of the stagnation phase on the Czech labour market, which did not occur in Slovakia, serves as a certain small correction of the conclusions, yet it lasted only a single quarter.

The impression of the conclusions on comparing the development of the NAIRU and economic cycle on the level of industry is not so unambiguous for both countries. What started later on the Slovak labour market was the transformation phase (14 quarters later), the boom phase immediately following the recession (2 quarter later), and the phase of the second recession bottom (1 quarter later). What was localised later in Slovakia was the end of the transformation phase (15 quarters later) and the boom phase immediately following the recession (1 quarter later).

The conclusions on the NAIRU and economic cycle development in civil engineering of both countries may also be considered as ambiguous. On the Slovak labour market, it was only the transformation phase that started later (by 12 quarters). The phases of the short boom and the second recession bottom were not at all localised in the civil engineering of the Czech Republic. In Slovakia, it was revealed that only the transformation phase ended later (11

quarters). The recession phase that hit Slovak civil engineering was even 5 quarters shorter. On the labour market of Slovak civil engineering, the period of the short boom lasted 3 quarters and the second bottom period 2 quarters.

In the transformation period in the Czech Republic and Slovakia, the economic policymakers failed to reduce the negative unemployment gaps in the remainder of the economy at least to the level of industry and civil engineering, where they were 1.5% or 0.7% and 1.2% or 1.3% lower, respectively. A shorter period of the recession phase in Czech and Slovak industry and Slovak civil engineering (by 1, 5 and 3 quarters respectively) failed to result in an earlier economic recovery as a whole. In the case of the boom phase following the recession, it was possible to use the experience from Slovak industry to extend this phase in the whole national economy.

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