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NAIRU ESTIMATES IN A TRANSITIONAL ECONOMY WITH AN EXTREMELY HIGH UNEMPLOYMENT RATE: THE CASE OF THE REPUBLIC OF MACEDONIA

ABSTRACT: *The main goal of the paper is to estimate the NAIRU for the Macedonian economy and to discuss the applicability of this indicator. The paper provides time-varying estimates for the period 1998-2012, which are obtained using the Ball and Mankiw (2002) approach, supplemented with the iterative procedure proposed by Ball (2009). The results reveal that the Macedonian NAIRU has ahump-*

shaped path. The estimation is based on both the LFS unemployment rate and the LFS unemployment rate corrected for employment in the grey economy. The dynamics of the estimated NAIRU stress the ability of the NAIRU to present the cyclical misbalances in a national economy.

KEY WORDS: *NAIRU, unemployment, inflation, Macedonia.*

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1. INTRODUCTION

The non-accelerating inflation rate of unemployment (NAIRU hereafter) is, along with the output gap, the reference point for macroeconomic policies. There is a close link between the deviations of actual unemployment from the equilibrium rate of unemployment (the NAIRU) on the one hand, and the output gap on the other hand, represented by the cyclical fluctuations of the economy's total output around its potential level. This link is explicitly captured in the production function, which, when used to estimate potential output, must include the equilibrium labour force. One option is to estimate the equilibrium using the NAIRU concept (Gylianik and Hucek 2009). Therefore the NAIRU is a key indicator in describing the cyclical position of the economy – the basis on which policy instruments are set. The NAIRU's implications for economic policy is nicely discussed in Gordon (1997).

In the case of the Republic of Macedonia (Macedonia hereafter), another reason to analyse unemployment is its extremely high level (since transition the unemployment rate has constantly been over 30%), which is one of the country's key economic problems. Estimating the NAIRU in the Macedonian economy could bring a clearer understanding of the extent to which unemployment is the result of cyclical disequilibrium or structural disproportion in the labour market.

The main goal of this paper is to provide an estimation of the macroeconomic indicator NAIRU for the Macedonian economy and to verify its applicability to the output gap. NAIRU estimates are not available for Macedonia, thus making the empirical results the main contribution of the paper. This approach is the opposite of current Macedonian academic thinking, which considers that the NAIRU is not applicable to the Macedonian economy. Miljovski and Stojkov (2012) questioned the applicability of the NAIRU in Macedonia, giving as the main reasons for the limited applicability of the concept the methodological problems in quantifying potential output and output gap, the profound demographic, political, and socioeconomic changes, and the shallow time dimension of the available series. Similarly, Fiti et al. (2013) recommend that the official unemployment rate in the country (obtained through the International Labour Organisation's (ILO) Labour Force Survey) should be corrected for the influence of the grey economy in order to achieve adequate NAIRU estimates.

The present paper uses the Ball and Mankiw (2002) procedure for NAIRU estimation, which estimates the time-varying NAIRU, as a far better alternative than the constant estimation (Hogan (1998) showed that the assumption of a constant NAIRU reduced the ability of a Phillips curve to explain the inflation observed in the USA). In addition, we improve the time-varying NAIRU estimates with the iterative procedure proposed by Ball (2009). We provide an estimation of the time-varying NAIRU for the Macedonian economy based on both the Labour Force Survey (LFS) unemployment rate and the corrected unemployment rate. The analysis is based on quarterly data for the period 1998-2012. The period is relatively short due to data availability: LFS were first implemented by the Macedonian State Statistical Office in 1997.

The main result of this paper is that in Macedonia the NAIRU has followed a hump-shaped path: in the second quarter of 1998 the estimated NAIRU was in the interval between 23.5% and 31.8%; it peaked to the interval between 28.3% and 35.3% in the last quarter of 2005, and fell to the interval between 23.6% and 32.7% in the last quarter of 2012. This dynamic reveals the ability of the NAIRU to present the cyclical misbalances in a national economy. Specifically, the paper finds a negative correlation between the employment gap and output gap in Macedonia for the period 2003-2012.

The paper is organized as follows. The next section discusses the analytical value of the NAIRU. Section 3 presents the stylized facts about unemployment in the Republic of Macedonia. Section 4 corrects LFS unemployment rates for grey economy activities. Section 5 explains the strategy for NAIRU estimation. Section 6 presents the empirical results and checks their applicability. The last section presents the main conclusion.

2. THE ANALYTICAL VALUE OF THE NAIRU

In the literature, the term NAIRU (Non-Accelerating Inflation Rate of Unemployment) is often used instead of the term 'natural rate of unemployment'. These two terms are used as synonyms for practical reasons. Although there are differences between the two concepts, in this paper the terms are taken as synonyms and hereafter the term NAIRU will be used, which is the term used by new Keynesians (Snowdon, Vane, and Wynarczyk 1994, Blanchard and Katz 1997).

Although the concept of the NAIRU is disputed, the fusion between inflation and unemployment is theoretically well defined. When actual unemployment is below the NAIRU there is pressure on the inflation rate to rise, and vice versa: when actual unemployment is above the NAIRU there is pressure on the inflation rate to drop. The concept of the NAIRU has taken into consideration the inverse relationship between inflation and unemployment (Phillips curve in the short term). But the NAIRU is a long-term concept. A Phillips curve, increased by expectations, connects the current deviations of inflation from the expected rate of inflation, as a function of deviations of actual unemployment from the NAIRU. Changes in monetary policy push unemployment and inflation in two opposite directions. Adjustment between unemployment and inflation, whose changes are influenced by monetary policy, is at the core of this concept (Weiner 1993, Ball and Mankiw 2002).

Today there is a general view that the NAIRU exists, but that it changes over time. Robert Gordon (Gordon 1997) researched the variation of the NAIRU over time. By analysing a period longer than 40 years, he concluded that the NAIRU in the United States varies in the narrow range between 5.7% and 6.4%. Changes in the NAIRU are the consequence of first, changes in the demographic structure of the labour force; second, changes in labour productivity, which cause the "wage-aspiration effect"; and third, increase in the competitiveness of the labour market and market of goods and services (Stiglitz 1997)

Theories that explore the determinants of the NAIRU can be divided into two groups: first, institutional theories that locate the main reason for higher unemployment rates in low labour market wage flexibility, which disables its fast cleaning and creates involuntary unemployment; and second, hysteresis theories, which explain that the natural rate of unemployment is determined by the rate of unemployment in the previous period (Blanchard and Wolfers 1999, Blanchard and Summers 1987, Phelps and Zoega 1998).

New Keynesians believe that the NAIRU is a very useful analytical concept because first, through the NAIRU the causes of inflation can be understood; second, the NAIRU is a very good empirical basis for predicting changes in the inflation rate; and third, the NAIRU is a general guide for policymakers when conceptualizing economic policies (Stiglitz 1997).

The nobel laureate, Stiglitz, believes that changes in unemployment are good "announcers" of the movement in inflation. He explains this with the following facts about the U.S. economy. First, since 1960 inflation has grown in 26 out of 32 quarters when the unemployment rate was below 5%, but inflation decreased in 24 out of 27 quarters when unemployment was below 7%. Second, when the unemployment rate is held one percentage point below the NAIRU for one year, the result is an increase in inflation of 0.3 to 0.6 percentage points. Third, a minimum of 20% of changes in inflation can be explained by changes in unemployment (Stiglitz 1997), which indicates a very strong link between inflation and unemployment. New Keynesians consider that changes in inflation are not independent of the level of unemployment. The likelihood of inflation during the year is greater if the level of unemployment at the beginning of the year is reduced. Hence, economists should not ignore this concept, as the fact that at least 20% of changes in inflation are explained by changes in unemployment should not be neglected.

Studies show that the concept of the NAIRU is applicable to the U.S. and developed market economies. But it remains an open question whether this concept is applicable to countries in transition. Studies have shown that the concept of the NAIRU is applicable in some transition countries such as Latvia (Gravelis 2007). In Russia the actual unemployment rate converges to the NAIRU, which suggests that unemployment is structural rather than cyclical (Bragin and Osakovski 2005). In the following we will analyse the applicability of the NAIRU to the Macedonian labour market.

3. STYLIZED FACTS ABOUT UNEMPLOYMENT IN MACEDONIA

The Republic of Macedonia has one of the highest unemployment rates in Europe. The unemployment rate at independence in 1991 was 26%. It increased continuously during the transition period and reached its highest level of 37.3% in 2005. However, the increase in unemployment is not only characteristic of the transition period. There has been an upward trend over the last fifty years, from an unemployment rate of 9.5% in 1959 to an unemployment rate of over 30% in the transitional period.

Figure 1. Unemployment rate in Macedonia, 1959 – 2012



Source: State Statistical Office of the Republic of Macedonia, Statistical Yearbook (different issues).

Note: The methodology of unemployment estimation for the presented unemployment rates is inconsistent. The State Statistical Office of the Republic of Macedonia has only used LFS methodology since 1997.

The unemployment rate in Macedonia is far above the European Union average, and also far higher than the unemployment rate in the new EU member states and candidate countries for EU membership. In the EU-27 the unemployment rate is maintained below 10%, and although there are countries where unemployment is in double digits it is still much lower than in Macedonia.

In the Republic of Macedonia the unemployment trend before transition and during transition was upward. The unemployment rate stabilized at around 35% in the middle of the first decade of the 21st century.

Unemployment in Macedonia is characteristic of structural unemployment, while frictional unemployment is quite low. Unemployment is determined

primarily by imbalances between supply and demand of labour skills, and also by the unfavourable structure of unemployment from the point of view of waiting time for employment.

Trpeski (2012) argued that unemployment in Macedonia is largely structural. 87.16% of total unemployment can be explained by changes in long-term unemployment and 13.24% by changes in short-term unemployment. Unemployment cannot be explained by changes in economic cycles because only 6.75% of changes in unemployment can be explained by changes in GDP.

Imbalances between labour supply and demand, and geographical imbalance, show that unemployment in Macedonia is structural: i.e., that it is long-term unemployment, characterised by the phenomenon of displaced workers, most of whom who have lost their jobs due to company closure or have been made redundant. It is very difficult for these workers to find another job and if unemployment lasts for a long period they stop searching for work. Over time, long-term unemployment means that these individuals become more difficult to employ. Wages that employers are willing to pay to the long-term unemployed are lower than wages they are willing to pay to the short-term unemployed, even when they have the same qualifications (Blanchard and Diamond 1990).

In the period 1997-2008 the average rate of short-term unemployment (unemployment of less than one year) was 5.1%. For comparison, for the same period the average rate of unemployment of less than one month was 2.8%. If we consider that the average rate of unemployment in this period was 34.4%, then it can be concluded that only 14.8% of unemployment was short-term (frictional unemployment), while the other 85.2% was long-term (structural) unemployment.

Table 1. Unemployment in Macedonia by duration (%)

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|------------------|------|------|------|------|------|------|
| Up to 1 month | 2.4 | 1.8 | 4.4 | 4.8 | 3.4 | 2.3 |
| 2 to 5 months | 5.4 | 6.0 | 4.2 | 4.7 | 4.4 | 5.8 |
| 6 to 11 months | 9.1 | 9.3 | 7.6 | 7.2 | 5.3 | 7.4 |
| 12 to 17 months | 7.3 | 5.9 | 5.2 | 4.6 | 5.9 | 4.1 |
| 18 to 23 months | 8.6 | 7.9 | 7.5 | 7.8 | 5.3 | 5.9 |
| 2 years | 14.1 | 1.5 | 0.9 | 1.2 | 0.9 | 1.2 |
| 3 years | 9.6 | 12.2 | 10.9 | 9.3 | 10.0 | 10.5 |
| 4 years and more | 43.6 | 55.4 | 59.4 | 60.4 | 64.8 | 62.8 |

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|------------------|------|------|------|------|------|------|
| Up to 1 month | 3.0 | 1.7 | 2.0 | 2.2 | 2.3 | 3.5 |
| 2 to 5 months | 5.3 | 6.0 | 5.1 | 5.5 | 6.2 | 6.4 |
| 6 to 11 months | 6.6 | 6.9 | 6.1 | 6.0 | 6.6 | 5.2 |
| 12 to 17 months | 5.8 | 6.6 | 6.0 | 5.4 | 5.7 | 5.3 |
| 18 to 23 months | 5.9 | 4.7 | 4.9 | 3.9 | 4.6 | 4.2 |
| 2 years | 1.2 | 0.8 | 0.9 | 0.9 | 0.8 | 0.8 |
| 3 years | 11.7 | 9.0 | 9.5 | 9.8 | 8.8 | 7.5 |
| 4 years and more | 63.6 | 64.3 | 65.4 | 66.4 | 65.0 | 67.1 |

Source: State Statistical Office of the Republic of Macedonia, Statistical Yearbook (different issues).

A feature of long-term unemployment in Macedonia is its permanent increase and sustained high level. In 1997, 43.6% of unemployment was of four or more years, and in 2008 this rose to 68%. Long-term unemployment in Macedonia confirms the international experience that there is a negative correlation between ability to find a job and duration of unemployment. It also confirms the opinion of Blanchard and Diamond (1990) presented above, that even when wages are flexible it is much harder for persons who have been unemployed for a long time to find a job. Employers give preference to those who have spent less time waiting for work (mostly people under 34 years of age), even though they have to pay them higher wages. Indeed, this is one way of solving problems of adverse selection and moral hazard in the labour market. Thus those who have

been waiting for jobs for a longer period of time, although willing to accept lower wages, remain unemployed.

We can conclude that unemployment in Macedonia derives from the mismatch of supply and demand of skilled labour, without the wage flexibility that can make it easier for the unemployed to find work. The labour supply does not meet the qualifications required by the labour market. Data from the State Statistical Office shows that in 2008 only 7.7% of the estimated unemployed had higher education, while 2% had college education. The remaining 90.3% had a maximum of four years of secondary education, and 41.6% had primary education. Kavkler et al. (2009), using Cox regression models, estimated that the probability of being unemployed in Macedonia decreased with an increase in educational level. However, in the transition period, although some efforts have been made, the educational structure of unemployed persons has remained almost unchanged.

4. LFS UNEMPLOYMENT RATE CORRECTION FOR THE GREY ECONOMY

The very high level of LFS-recorded unemployment is generally thought to be overstated. There are several relevant studies where the Macedonian LFS unemployment rate is corrected for the grey economy. For example, the IMF (2006) corrected the LFS unemployment rate for the grey economy, and found that in 2005 the unemployment rate was probably 24% rather than the LFS' 37%. The ILO (2011) found that in 2010 grey economy employment in non-agricultural activities equalled 12.6% of non-agricultural employment. Jovanovik and Kabashi (2011) used the simple assumption that 30% of the unemployed are in fact unregistered employed persons. Garvanlieva et al. (2012) used the same approach and corrected the LFS unemployment rate with the grey economy rate. Finally, Fiti et al. (2013), in a project developed by the Macedonian Academy of Science and Arts, recommended that the country's LFS unemployment rate should be corrected with the grey economy rate in order to achieve adequate NAIRU estimates.

The main problem of the Macedonian LFS data is not the methodology but the implementation of the survey. Jovanovik and Kabashi (2011) stated that long-term unemployment (defined as unemployment of four years or more) was more than 60% of the total number of unemployed in 2000-2008, and, more

importantly, that this percentage is relative stable (it is not decreasing through time). They argue that there is low probability that a person who is unemployed for four years or more is still trying to be active according to the LFS unemployment definition. This unemployed person will probably exit the labour force to the economically inactive population (the effect of the discouraged worker), but this is not the case in Macedonia because most of the long-term unemployed are unregistered workers. We think that these unregistered workers are incentivized to provide incorrect information in the survey because they are afraid of losing unemployment benefits (health care insurance, etc.).

This argument is confirmed by unemployment data from the Employment Agency of the Republic of Macedonia (EARM). The EARM strengthened the criteria for registration as unemployed, which led to a significant decrease in the registered unemployment rate, from 29.9% in 2011 to 10.0% in 2013.

This section of the paper provides corrected LFS unemployment rates for the period 1998-2012. In section 6 we provide an estimation of the NAIRU based on both LFS unemployment rates and corrected LFS unemployment rates.

The correction is based on Schneider et al. (2011) and ILO (2011) data. The most reliable source for the scale of the grey economy in Macedonia is Schneider et al. (2011), while the ILO (2011) provides the only relevant estimation of employment in the grey economy. However, it only estimates employment in the grey economy in non-agricultural activities, not in all activities (including agricultural), and it refers only to the year 2010. Therefore, we made the assumption that employment in the grey economy in agriculture is the same as in non-agricultural activities. Faced with a lack of relevant data, we believe that this is a conservative assumption, because informal employment is probably even higher in the agricultural sector than in other areas. We use the estimates of the grey economy as a percentage of GDP by Schneider et al. (2011), in order to avoid the assumption that employment in the grey economy is 12.6% of total employment in all years in the 1998-2012 period. This should make employment in the grey economy sensitive to the scale of the grey economy.

Table 2. Estimates of the grey economy in Macedonia, 1999-2007

| Year | Grey economy as percentage of GDP |
|------|-----------------------------------|
| 1999 | 34.9 |
| 2000 | 35.7 |
| 2001 | 34.8 |
| 2002 | 35.1 |
| 2003 | 35.5 |
| 2004 | 36.4 |
| 2005 | 36.9 |
| 2006 | 37.7 |
| 2007 | 38.8 |

Source: Schneider et al (2011).

LFS unemployment is corrected for the grey economy using the following formula:

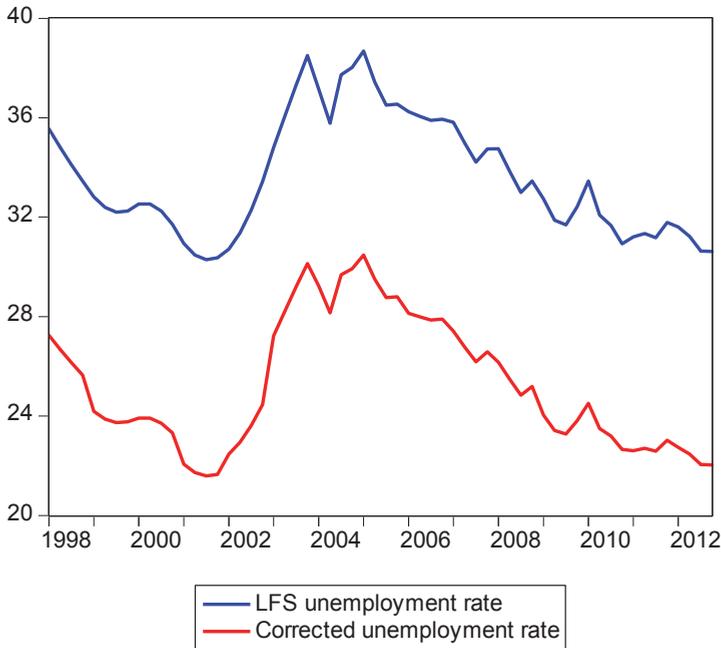
$$U_c = [U_{LFS} - (F \cdot E_{LFS})]$$

where U_c is corrected unemployment; U_{LFS} and E_{LFS} are unemployed and employed persons according to the LFS; and F is a correction factor, which is calculated as:

$$F = (GE \cdot 0.348)$$

where GE is the grey economy as a percentage of GDP; and the scalar 0.348 is the percentage of grey economy employment for 1% of the grey economy. It is calculated as $\frac{12.6}{36.2}$, based on ILO information. If we take, for example, the year 2007, GE is 38.8% of GDP and F is equal to 13.5% (employment in grey economy as a proportion of total employment), which leads to 74,369 persons in grey economy activity ($F \cdot E_{LFS}$) and U_c equals 242,536 (E_{LFS} and U_{LFS} are 590,234 and 316,905, respectively, in 2007). The corrected unemployment rate is 26.7%, instead of the LFS' 34.9%. This is a reduction of the unemployment rate by 23.5%). Note that F is 12.6% for 2010.

Figure 2. LFS unemployment rates and corrected unemployment rates in Macedonia, 1998-2012



Source: National Bank of Macedonia (2013) and author's calculations.

Schneider's estimates of the grey economy are presented in Table 2. Since estimations are only available for the period 1999-2007 and we are correcting the LFS unemployment for 1998-2012, the average percentage of grey economy in the available period is used for the years 2008-2012 (36.2% of GDP). We think that it is a more realistic assumption than the trend approach, due to the influence of the global financial and economic crisis on the Macedonian economy since 2008. The 1999 and 2000 averages are used to estimate the gray economy in 1998 (35.3% of GDP).

Figure 2 compares LFS unemployment rates and corrected unemployment rates in Macedonia for the period 1998-2012. The average reduction of the LFS unemployment rate in the observed period is 25%. The average value of the corrected unemployment rate is 25%, which is comparable with the

unemployment rates before transition. The corrected unemployment rates are used to estimate the NAIRU in Macedonia.

5. METHODOLOGY FOR NAIRU ESTIMATION

To estimate the NAIRU we follow the Ball and Mankiw (2002) approach, which is supplemented with the iterative procedure proposed by Ball (2009). The starting point is a modified Phillips curve:

$$\pi_t - \pi_t^e = \alpha(U_t - U^*) + v_t \quad (1)$$

where π_t is actual inflation rate at time t , π_t^e is expected inflation rate at time t (the expectation is being formed in year $(t - 1)$), U_t is actual unemployment rate prevailing at time t , U^* is natural rate of unemployment (NAIRU) at time t , and v_t is the stochastic error term at time t . The stochastic error term reflects disruptions in the normal inflation process, such as that caused by an oil embargo or a change in the exchange rate.

Since π_t^e is not directly observable, in order to implement equation (1) the assumption is made that expected inflation is equal to the last period's inflation: $\pi_t^e = \pi_{t-1}$. The inflation-unemployment tradeoff then becomes:

$$\pi_t - \pi_{t-1} = \alpha(U_t - U^*) + v_t \quad (2)$$

The used assumption is the simplest version of the adaptive expectations approach, according to which the expected inflation is the weighted average of past inflation. However, the rational expectation revolution was founded precisely on criticizing this approach (Lucas 1972, Sargent 1971). Ball and Mankiw (2002) argue that while it is indefensible to accept adaptive expectations as a precise and immutable description of the world regardless of the monetary regime, the assumption of adaptive expectations is not far from rational, because the inflation in the economy has been close to a random walk.

Rewriting equation (2) in the standard linear regression leads to the following estimation equation:

$$\pi_t - \pi_{t-1} = c + \alpha U_t + v_t \quad (3)$$

where $c = -\alpha U^*$. Equation (3) states that the change in the inflation rate between two time periods is linearly related to the current unemployment rate (U_t). The constant term (c) and the unemployment coefficient (α) are estimated by OLS. A priori, the unemployment coefficient (α) is expected to be negative and the constant term (c) is expected to be positive (Gujarati, 2003). If the assumption is made that U^* is constant and that U_t is uncorrelated with v_t , then the value of the U^* is given by the ratio of the constant term to the unemployment coefficient:

$$U^* = \frac{c}{-\alpha} \quad (4)$$

However, many economists question this constant nature of the NAIRU, especially since the apparent fall of the NAIRU in the US economy in the late 1990s. Therefore the methodology is upgraded in order to find a time-varying NAIRU. The approach is based on the idea that movements in the U^* are long-term shifts in the unemployment-inflation relation, while the v_t captures short-term fluctuations. Rearrangement of equation (3) gives:

$$U^* - \frac{1}{\alpha} v_t = U_t - \frac{1}{\alpha} (\pi_t - \pi_{t-1}) \quad (5)$$

The right side of this equation can be computed from the estimated α and data on unemployment and inflation, yielding an estimate of $U^* - \frac{1}{\alpha} v_t$, which is the NAIRU minus a term proportional to the shorter-term supply shock. The U^* can be extracted from $U^* - \frac{1}{\alpha} v_t$ using a Hodrick-Prescott (HP) filter (Hodrick and Prescott 1997). The HP filter is a generalization of a linear time trend that allows the slope of the trend to change over time. Formally, the HP filter minimizes the sum of squared deviations between the trend and actual series, with a penalty for curvature that keeps the trend smooth – smoothing parameter (λ). If the $\lambda = 0$, the filter will yield the original series; if λ is very high, it will yield a linear time trend. The choice of this parameter is largely arbitrary. Hodrick and Prescott suggest a smoothness parameter of 1,600 for quarterly data, and that parameter value is most commonly used in practical applications (French, 2001), while 100 is the most commonly used value of the parameter for annual data.

Ball (2009) argues that this procedure is internally inconsistent because it estimates a time-varying U^* , but assumes a constant U^* to estimate α . Therefore he proposed an iterative procedure for resolving this inconsistency. Once the series for U^* is extracted, that series is used to re-estimate equation (2), yielding a new estimate of α . Then the new α is used to estimate a new series for U^* , and so on until results converge to a U^* series.

6. EMPIRICAL RESULTS AND THEIR APPLICABILITY

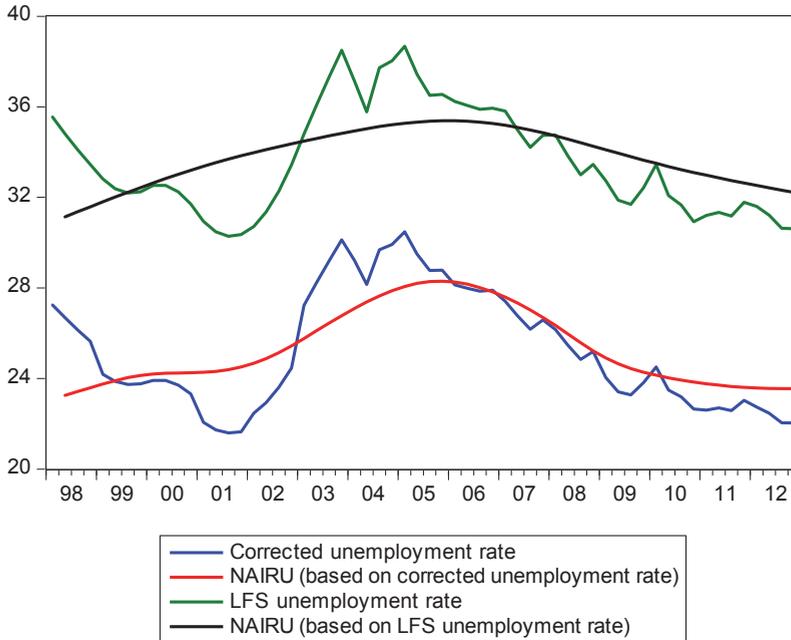
The strategy for NAIRU estimation is applied to data from the Macedonian economy. Two variables are used: unemployment rate and inflation rate. Unemployment rate is represented by the LFS unemployment rate and its corrected version (presented in Section 4). The inflation rate is based on the Macedonian State Statistical Office consumer price index. The period starts with the first quarter of 1998 and ends with the fourth quarter of 2012. Both variables are seasonally adjusted using CensusX12.

Figure 3 presents the two estimates of the time varying NAIRU in Macedonia. The first estimates are based on the corrected unemployment rate. The second estimates are based on the LFS unemployment rate. We use 1,600 for the value of smoothness parameter in the HP filter in both cases. The NAIRU series (U^*) converge after the sixth iteration. The estimated NAIRU based on the corrected unemployment rate is 23.5% in the second quarter of 1998, peaks at 28.3% in the last quarter of 2005, and falls to 23.6% in the last quarter of 2012. The estimated NAIRU based on the LFS unemployment rate is 31.8% in the second quarter of 1998, peaks at 35.3% in the last quarter of 2005, and falls to 32.7% in the last quarter of 2012. In both cases the NAIRU has a hump-shaped path.

The analytical value of the estimated time-varying NAIRUs in Macedonia is tested with the output gap. Output gap and unemployment gap are given in Figure 4. The output gap is the difference between GDP and the country's potential output. Potential output is estimated using an HP filter, with a smoothness parameter value of 1,600. The unemployment gap is calculated as the difference between corrected unemployment rate and the NAIRU. Theoretically, the relationship between the output gap and unemployment gap should be negative. This means that when there is a positive unemployment gap

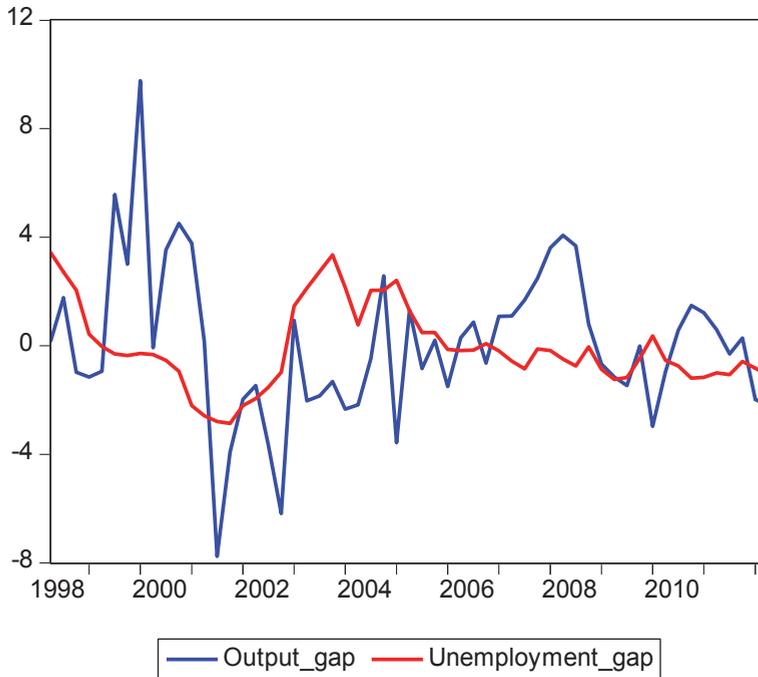
(unemployment rate is higher than the NAIRU) the output gap should be negative (the output should be below its potential), and vice versa.

Figure 3. Corrected unemployment rate and time-varying NAIRUs in Macedonia, 1998-2012



Source: Author’s calculation.

Empirically, this negative relationship between output gap and unemployment gap is not found in the period 1998-2012. The correlation coefficient is statistically insignificant. However, the correlation coefficient between these two variables in the period 2003-2012 is equal to -0.31 with 10% statistical significance (p-value is 0.06). This link between output gap and unemployment gap as of 2003 indicates a more advanced and stable phase of transition in Macedonia. The main characteristic of the period 1998-2002 is the 2001 war when the Macedonian economy had a negative rate of GDP growth of -4.5%, while unemployment fell by 1.7 percentage points. This was not due to the economy but to the number of unemployed people engaged in the reserve army and police forces, which led to a decrease in unemployment.

Figure 4. Output gap and unemployment gap in Macedonia, 1998-2012

Source: Author's calculation.

7. CONCLUSION

Although there is distinction in economic literature between the natural rate of unemployment and the NAIRU, in this paper, for practical reasons, we treated these notions as synonymous, and we used the term 'NAIRU' for both.

In the economic literature the NAIRU concept is often deemed inapplicable or of small analytical value for countries in transition. Thus economic literature in Macedonia has expressed reservations regarding the applicability of this concept to the country's labour market (Miljovski, Stojkov 2012). However, if the concept of potential GDP is applicable to Macedonia (IMF 2009, Fiti and al. 2012), then the applicability of the concept of the NAIRU cannot be disputed.

Hence, following the example of many countries in transition, our thesis is that the concept of the NAIRU has analytical value and is applicable to the Macedonian labour market, which we have proven in this paper.

There is no doubt that in Macedonia there are many factors that affect the applicability of the concept of the NAIRU. The problems and limitations of the applicability of the concept in transition countries, such as structural shifts in the economy leading to structural imbalances in the labour market, the effect of hysteresis, expressed labour market rigidity, etc., are also valid for the Republic of Macedonia. But, despite this, our research shows that the concept of the NAIRU is as applicable to the labour market in Macedonia as the concept of potential GDP.

The empirical results find that the Macedonian NAIRU has a hump-shaped path: the estimated NAIRU is in the interval between 23.5% and 31.8% in the second quarter of 1998, peaks in the interval between 28.3% and 35.3% in the last quarter of 2005, and falls to an interval between 23.6% and 32.7% in the last quarter of 2012.

In order to show that the calculated time-varying NAIRU is based on economic theory, we have also analysed its link with the output gap. We recognize the severe limitations of our results, mainly due to an insignificant correlation coefficient between the output gap and unemployment gap in the 1998-2012 period. However, we find that in the 2003-12 period there is a negative correlation between the output gap and the unemployment gap, which means that this is a more advanced and stable transition phase in the Macedonian economy when application of the NAIRU concept is possible.

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