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**Working Paper**

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Discussion Paper, No. 377

**Provided in Cooperation with:**

European University Viadrina Frankfurt (Oder), Department of Business Administration and Economics

*Suggested Citation:* Sydykova, Meerim; Stadtmann, Georg (2015) : Taylor rules for CEE-EU countries: How much heterogeneity?, Discussion Paper, No. 377, European University Viadrina, Department of Business Administration and Economics, Frankfurt (Oder)

This Version is available at:

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ISSN 1860 0921

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# Taylor rules for CEE-EU countries: How much heterogeneity?

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## Abstract

We derive Taylor rates for those CEE-EU countries which are not part of the Eurozone. The degree of heterogeneity decreased tremendously over time (2005 – 2015). Nevertheless, the business cycles are still not fully synchronized. As a consequence, joining the Eurozone seems to be premature and should not be an option right now.

**JEL classification:** E52, E58, F15

**Keywords:** CEE, monetary policy, currency union, convergence, Taylor rule

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## Abstract

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# 1 Introduction

One characteristic of a currency union is that there exists only one central bank which has to implement a monetary policy for all its members. Since the central bank can only set one target rate common for all countries, it has to orientate itself at the weighted average of the macroeconomic conditions. Therefore, the monetary policy will only suit all countries, in case that the member countries have reached a sufficient degree of business cycle convergence.

With respect to the Eurozone,<sup>1</sup> countries are evaluated according to the well known *Maastricht criteria*. However, several authors criticize that these criteria just measure *nominal* convergence, but not *real* convergence.<sup>2</sup> Despite this criticism, the Maastricht criteria are still relevant for all CEE-EU member countries. In case that a country fulfills the criteria, it has to abolish its national currency and adopt the Euro (De Grauwe/Schnabl 2005).

In this paper we examine – *from the perspective of a central bank* – the degree of heterogeneity within the CEE-EU countries. We do so by applying a simple Taylor rule with an unemployment gap (Nechio 2011) to derive CEE country specific and CEE group specific Taylor rates. We also compare these CEE rates with Taylor rates for the existing Eurozone.

Our results show that the degree of heterogeneity decreased tremendously over time. However, the business cycles are still not fully synchronized. Joining the Eurozone does not seem to be an option right now.

The remainder of the paper is structured as follows: In section 2, we describe the Taylor rule. In section 3, we describe the data set, derive the empirical results, and interpret our findings. The last section concludes.

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<sup>1</sup>Currently, the Eurozone consists out of the following 19 countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.

<sup>2</sup>See, for example, Heylen/Van Poeck/Van Gompel (1995) for some early warnings.

## 2 Different versions of the Taylor rule

Monetary policy rules have gained importance in the last few years (see Williams 2015, p. 8). Due to the so called '*Federal Reserve Accountability and Transparency Act of 2014 (FRAT)*' even Bernanke (2015) evaluates several Taylor rates related to the monetary policy implemented by the Federal Reserve.

The original work of Taylor (1993) focused on the following relationship

$$\text{Target rate} = 1 + 1.5 \cdot \text{Inflation rate} + 0.5 \cdot \text{Output gap}, \quad (1)$$

where he assumed a 2 % level for the target inflation rate and also a 2 % level of the real interest rate. Nechio (2011) used a slightly different version of the Taylor rule to examine the macroeconomic conditions and the degree of heterogeneity *within* the Eurozone:

$$\text{Target rate} = 1 + 1.5 \cdot \text{Inflation rate} - 1 \cdot \text{Unemployment gap} \quad (2)$$

Hence, Nechio (2011) relied on the unemployment gap instead of the output gap to measure the macroeconomic conditions in the real economy and the business cycle.<sup>3</sup> In the following, we will follow the work of Nechio and apply the Taylor rule defined in equation (2).

## 3 Data set and empirical results

Detailed information with respect to the different data sources are given in the appendix. We use monthly information from 01/2005 – 08/2015 on the unemployment rate to construct the unemployment gap. Since the Non-Accelerating Wage Rate of Unemployment (NAWRU) is only available on a yearly basis, we assume that within one year, the NAWRU is constant.<sup>4</sup> In order to measure inflation, we rely on the consumer price index.

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<sup>3</sup>Both Taylor rules would lead to the very same level of the Taylor rate in case that the following relationship holds perfectly:  $0.5 \cdot (y - y_n) = -1 \cdot (u - u_n)$ . The term in brackets on the left hand side symbolizes the output gap and the term in brackets on the right hand side symbolizes the unemployment gap.

<sup>4</sup>See European Commission (2013) for a detailed description of the procedure to calculate the NAWRU.

We aggregate the macroeconomic variables to compute a CEE-group specific Taylor rate. In order to determine the weights, we used the average of the GDP levels during the time period 2005 – 2014. The CEE countries enter the CEE group specific Taylor rule with the following weights: Poland (58.3 %), Hungary (16.7 %), Czech Republic (24.9 %).

Figure 1 displays the inflation rate within the CEE countries, a CEE group specific weighted average, and the Eurozone: During the time period 2006 – 2012 the average inflation rate of the CEE-group was always larger than within the Eurozone. However, since 2013 this relationship is reversed. Overall, we can see a high degree of convergence. When one focuses on the country level it is the case that the inflation rate of the Czech Republic follows the inflation pattern in the Eurozone more closely than the inflation rate of Hungary or Poland.

Figure 2 plots the unemployment gap over time. One characteristic is that there exists a very high degree of convergence among the group of CEE countries. Today (08/2015), the unemployment gap is slightly negative for all CEE-countries, pointing into the direction that the natural rate of employment is reached. For the Eurozone, the unemployment gap is still positive and currently at the level of +1.0 %. The Eurozone is not running at fully capacity right now.

The different pieces of information are aggregated by the computation of Taylor rates according to equation (2). Results are plotted in Figure 3. Not surprisingly, we can observe a very high degree of convergence since the end of 2012 until the end of the observation period (08/2015). Nevertheless, when comparing the different level of the Taylor rates there is still a gap of about 2 %: While the Taylor rate in the Eurozone is still very low (0.2 %) it takes the value of 2.0 % in the Czech Republic and 2.3 % in Hungary. Despite the overall convergence, this gap still seems to be large.

In order to measure the degree of business cycle correlation between the CEE countries and the Eurozone, we calculated correlation coefficients for all macroeconomic series. More specifically, the coefficients presented in Table 1 capture the correlation between each country and the Eurozone for the full sample as well as two sub-periods (01/2005 – 12/2010 and 01/2011 – 08/2015).

The degree of correlation with respect to the inflation rate is higher in the second than in the first sub-sample. This empirical evidence supports the impression gained from Figures 1 – 3 with respect to the convergence process. However, the correlation coefficient of the unemployment gap – for the Czech Republic and Hungary vis-a-vis the Eurozone – is much lower in the second sub-sample than in the first one. The correlation coefficient for Hungary becomes even slightly negative.

These results point into the direction that there is a high degree of *nominal* convergence (with respect to the inflation rate), but still a high degree of heterogeneity with respect to the *real* macroeconomic variables measured by the unemployment gap.

## 4 Conclusion

We analyze the development of the inflation rate and the unemployment gap for those CEE-EU countries, which are not part of the Eurozone right now. We find a high degree of convergence not only within this group of countries, but also compared to the Eurozone. As a consequence, we also observe a convergence of the Taylor rates.

Nevertheless, a closer look at the results also highlights, that there still exists a difference between the Taylor rates up to 2 %. Additionally, the business cycles are not fully synchronized: The correlation coefficients for the unemployment gap show lower values in the second half of the observation period. Hence, joining the Eurozone seems to be still premature from the standpoint of a policy maker.

Furthermore, one should not overlook the high degree of heterogeneity within the Eurozone itself. When taking, for example, at the work of Nechio (2011) into consideration, it is highly questionable whether the Eurozone is an optimal currency area in itself.



## Appendix: Description of the data set

The data set was downloaded from the ECB Data Warehouse (unemployment rate, inflation rate) and from the AMECO data base (NAWRU; GDP as weights) as of 05.11.2015. To be more precise the data set can be described by its codes. The codes always reflect the time series for the EMU19:

- **Unemployment rate**

STS.M.I8.S.UNEH.RTT000.4.000, Euro area 19 (fixed composition) – Standardised unemployment, Rate, Total (all ages), Total (male and female); unspecified; Eurostat; Seasonally adjusted, not working day adjusted.

- **Inflation rate**

ICP.M.I8.N.000000.4.ANR, Indices of Consumer Prices; Frequency: Monthly; adjustment indicator: Neither seasonally nor working day adjusted; Classification – ICP context: HICP – Overall Index; Institution originating the data flow: Eurostat; Series variation – ICP context: Annual rate of change.

- **Non-Accelerating Wage Rate of Unemployment (NAWRU)**

EA19.1.0.0.0.ZNAWRU, AMECO database

- **GDP**

EA19.1.0.0.0.UVGD, AMECO database

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Table 1: Correlation coefficients of the different CEE countries with the Eurozone

		01/2005 – 08/2015	01/2005 – 12/2010	01/2011 – 08/2015
Inflation	Czech Republic	0.82	0.84	0.86
	Hungary	0.60	0.23	0.93
	Poland	0.55	-0.06	0.96
	CEE group specific	0.72	0.41	0.96
Unemployment gap	Czech Republic	0.43	0.83	0.28
	Hungary	0.36	0.90	-0.04
	Poland	0.53	0.46	0.94
	CEE group specific	0.55	0.55	0.83
Taylor rate	Czech Republic	0.78	0.88	0.76
	Hungary	0.75	0.52	0.83
	Poland	0.52	0.14	0.97
	CEE group specific	0.68	0.42	0.95

Figure 1: Inflation rate

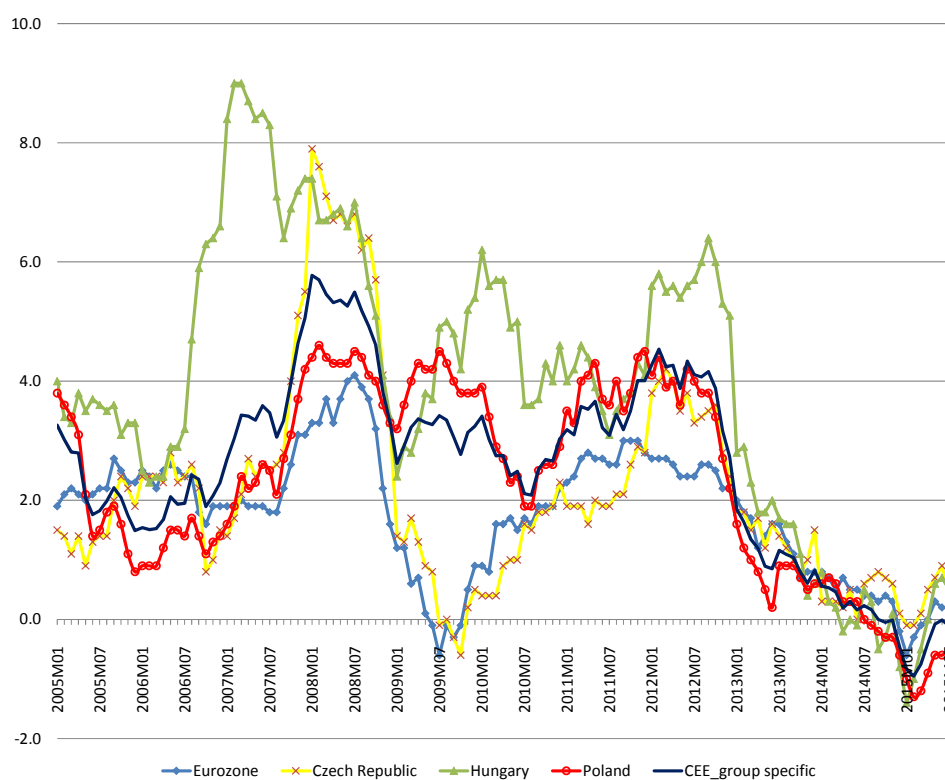
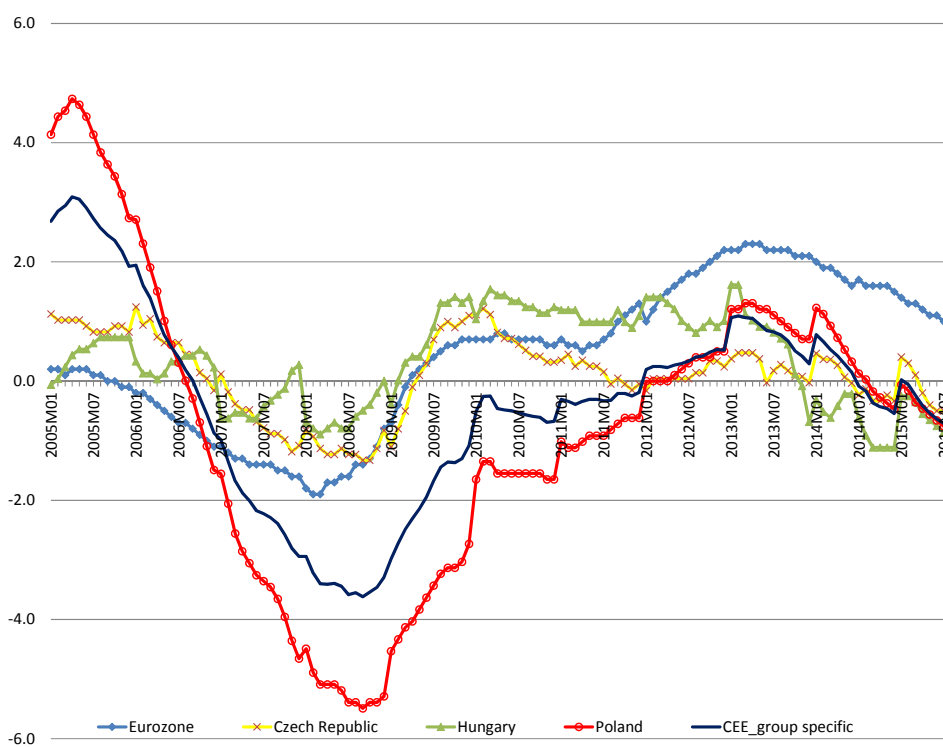


Figure 2: Unemployment gap



Note: Positive values of the unemployment gap ( $u - u_n$ ) characterize a situation, where the economy is running *below* the capacity limit. Hence, the actual unemployment rate is larger than the natural rate ( $u > u_n$ ).

Figure 3: Taylor rate

