

6 Revisiting the Natural Rate Hypothesis

In the preceding chapters, we have assumed that the natural rate hypothesis holds when we analyzed the New Keynesian model. Our empirical analysis in Chapter 2 using Keynesian and monetarist identification schemes has shed, however, some doubt on the relevance of this hypothesis for German data. In this chapter we are going to revisit this issue and test the natural rate hypothesis within a New Keynesian framework. To this end we employ a methodology recently developed by Farmer (2000) and Beyer and Farmer (2002). These authors use multivariate cointegration analysis to test the long-run implications of the New Keynesian model. For the United States they find that the data reject the natural rate hypothesis and propose an alternative aggregate supply function that would allow for a nonvertical long-run Phillips curve. In this section, we are going to apply their framework to data which refer to West Germany as in Chapter 2.

Before we commence with the analysis, we are going to take a preliminary look at the data. In the second subsection we will outline the framework proposed by Beyer and Farmer. In Section 6.3, we proceed to present the results of the cointegration analysis. We find evidence for a structural break in the macroeconomic relations occurring in 1979, and we find the second sample period is characterized by a negative long-run correlation between unemployment and inflation. Even though such a long-run relation is inconsistent with the natural rate hypothesis, in Section 6.4 we show that it is nevertheless consistent with a number of recent approaches in modern macroeconomics. In the final subsection, we modify the New Keynesian model to incorporate one of those approaches and investigate the implications for the effectiveness of monetary policy. We find that this modification changes the policy implications of the New Keynesian model substantially. While this is only an explorative investigation, it does suggest that the standard New Keynesian model needs some extensions to fit the long-run properties of German data better.

Before we proceed, it is useful to introduce some additional notation. In this section, we are going to investigate the relationship between the interest rate, the inflation rate, and the unemployment rate. We denote the logarithm of the unemployment rate as u_t . Moreover, we assume that unemployment is inversely related to output through an Okun's law type relationship, which allows us to rewrite the standard New Keynesian model as follows:

$$(6.1) \quad u_t = E_t u_{t+1} + b_1 (R_t - E_t \Delta p_{t+1} - \bar{r}) + v_t^1,$$

$$(6.2) \quad \Delta p_t = \beta E_t \Delta p_{t+1} + a_1 (u_t - \bar{u}_t) + v_t^2,$$

$$(6.3) \quad R_t = (1 - \mu)[\bar{r} + \Delta p_t + \phi_1^u(\Delta p_t - \bar{\pi}) + \phi_2^u(u_t - \bar{u}_t)] + \mu R_{t-1} + \nu_t^3.$$

The variable \bar{u}_t represents the logarithm of the natural rate of unemployment, and we assume that $\alpha_1, \phi_2^u < 0$.

6.1 A Preliminary Look at the Data

The New Keynesian model implies that even though there is a negative relationship between inflation and unemployment at the business cycle frequency, there should be no such relationship in the long run. In Figure 6.1, we plot the relation between five-year averages of both variables for West Germany. The five-year period has been chosen since it corresponds approximately to the typical length of business cycles. One would expect that over the course of a business cycle, those periods where the unemployment rate is above the natural rate are balanced by periods where the unemployment rate is below the natural rate. Since the natural rate hypothesis implies that a given natural rate is compatible with any rate of inflation, there should be no discernible relationship between the two variables. This is, after all, the essence of the natural rate hypothesis.

Figure 6.1 shows that over the entire sample period from 1965 until 1999 there is indeed not much of a relationship. However, a closer look reveals that over the period from 1980 until 1999 there is a strong negative relationship between the two variables, as suggested by the traditional Phillips curve. The long-run Phillips curve in this period appears to be fairly steep, but not vertical. It also appears to be relatively stable. Interestingly, already our analysis in Chapter 2 of the correlation between the trend components of unemployment and inflation pointed towards a strong negative relationship in the period from 1980 until 1995; Table 2.1 in Chapter 2 reports a correlation coefficient of -0.89 for this period.

In the remainder of this section, we use the technique of multivariate cointegration analysis to investigate more formally whether there is a significant relationship between the trend components of inflation and unemployment. More importantly, this approach allows us also to investigate whether such a relationship can be reconciled with the New Keynesian model.

6.2 A Framework for Cointegration Analysis

In this subsection, we outline the framework developed by Farmer (2000) and Beyer and Farmer (2002) to test the natural rate hypothesis before we apply it in the next section to West German data. These authors argue that if the unemploy-