Cointegration and common trends on the West German labour market

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Abstract. In this paper we analyze the West German labour market by means of a cointegrated structural VAR model. We find sensible stable long-run relationships that are interpreted as a labour demand, a wage setting and a goods market equilibrium. In order to study the dynamic behaviour of the model we identify two common trends that push unemployment. We find that goods market shocks have only transitory impacts on unemployment. In the long run, it is almost equally determined by technology and labour supply factors. However, transitory shocks have major importance in the shorter run since adjustment processes are rather sluggish.

Key words: cointegration, common trends, structural shocks, unemployment

JEL classifications: E24

1. Introduction

Unemployment is one of Germany’s main economic and social problems that has become even worse since German reunification took place in 1990. This paper extends the cointegration analysis of Hansen (1996) who found stable labour demand and supply relations on the West German labour market before reunification. In order to study the dynamic behaviour of the labour market we identify a so called common trends model proposed by King et al. (1991) and Warne (1993). This model makes use of the duality between cointegration and common trends as noted by Juselius (1994) or Johansen (1995)

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and is nothing more than a structural VAR model with specific long-run restrictions. Similar applications of a common trends framework to the Scandinavian labour market are Hansen and Warne (1995, 1997) and Jacobson et al. (1997, 1998), Carstensen and Hansen (1998b) analyse the labour market of Germany after reunification. Further applications can be found in Mellander et al. (1992) and Carstensen and Hansen (1998a).

The remainder of the paper is structured in six sections. In section 2 we present a small model of the labour market in order to motivate our identifying restrictions in the later analysis. Section 3 contains a short introduction into the common trends model. The empirical cointegration relations of the German labour market are presented in section 4. In section 5 we identify a common trends model and in section 6 we use this model to study the dynamics of the German labour market. Section 7 concludes.

2. A model of the labour market

The model of the labour market used in this paper is similar to that proposed by Hansen and Warne (1995), see also Jacobson et al. (1997). It consists of a production function, a labour supply relation, a labour demand relation, a wage setting equation, and a goods market equation:

\[ y_t = \rho \varepsilon_t + \theta_{1t} \]  
\[ l_t = \pi w_{n,t} + \theta_{2t} \]  
\[ e_t = \eta_1 y_t - \eta_2 w_{g,t} + \theta_{3t} \]  
\[ w_{n,t} = \gamma_1(y_t - e_t) - \gamma_2 u_t + \theta_{4t} \]  
\[ w_{g,t} = \gamma_1(y_t - e_t) - \gamma_2 u_t + \theta_{5t} \]

All variables are expressed in natural logarithms. Equation (1) is a log-linearized production function of the Cobb-Douglas type\(^1\) with \( y_t \) denoting output, \( e_t \) denoting employment and \( \theta_{1t} \) denoting a stochastic technology trend \( \theta_{1t} = \theta_{1t-1} + \varepsilon_{1t} \) with the pure technology shock \( \varepsilon_{1t} \).

According to equation (2) labour force \( l_t \) is influenced by the net real product wage \( w_{n,t} \), which measures the opportunity costs of not working, and a stochastic labour supply trend \( \theta_{2t} = \theta_{2t-1} + \varepsilon_{2t} \) with the pure labour supply shock \( \varepsilon_{2t} \).

Labour demand is modeled by equation (3). Employment depends on output, gross real product wages \( w_{g,t} \) and a labour demand shock \( \theta_{3t} = \phi_1 \theta_{3t-1} + \varepsilon_{3t} \). Since earlier studies show that labour demand is a stationary relation (see Hansen, 1996) we are confident that \( |\phi_1| < 1 \) holds.

Equation (4) states that wage setting behaviour is determined by labour productivity \( y_t - e_t \), unemployment \( u_t \approx l_t - e_t \), and a wage shock \( \theta_{4t} = \phi_2 \theta_{4t-1} + \varepsilon_{4t} \). Layard et al. (1991, chapter 8) show how an equilibrium wage

\(^1\) We could also think of this function as a log-linear approximation to a more complicated production function.