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# Econometric modelling of slack and tight labour markets

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**Abstract**

Empirical and theoretical studies suggest that employment behaviour varies with the state of the labour market since hiring and firing costs depend on the availability of labour. Extending earlier empirical work on this subject, we test for state dependence in employment adjustment and in the effects of forcing variables such as indicators of aggregate demand. We also test whether anticipated labour shortages lead to multiple equilibria in (un)employment. We develop both a linear equilibrium correction model (ECM) and a two-state Markov switching version of the ECM. The models are based on quarterly data for Norwegian industry employment and aggregate unemployment in the period 1974–1996. We find clear evidence of state-dependent adjustment and responses to changes in forcing variables. Yet equilibrium solutions for employment and unemployment appear invariant to cyclical and structural changes in the sample.


*JEL classification:* E24; J32; E32; C32; E51

*Keywords:* Adjustment costs; Asymmetric response; Multiple equilibria; Cointegration; Markov switching

## 1. Introduction

Employment adjustment costs may explain a number of empirical regularities such as sluggish employment responses to shocks, labour hoarding and asymmetric cycles in employment and GDP (e.g. Hamermesh and Pfann, 1996; Rotemberg and Summers, 1990). The adjustment costs affect not only the dynamics but may also induce lasting effects of shocks if they vary with the business cycle. Such costs are generally characterized as functions of labour shortage measures, e.g. the unemployment rate (e.g. Ball and Cyr, 1966; Peel and Walker, 1978; Burgess, 1992). Presumably, labour shortages

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raise hiring costs by increasing search costs for suitable workers and make employment adjust at a slower pace towards the desired level. Thus, conventional employment determinants such as real wages and product demand are believed to have weaker effects in a tight labour market than in a slack labour market. Further, anticipated future labour shortages may be a source of persistence and multiple equilibria in the overall unemployment rate, as implied by Moene et al. (1997).

However, existing empirical studies do not address the possible joint occurrence of all these aspects of cycle-dependent adjustment costs, i.e. cycle dependency of: (i) the adjustment process, (ii) effects of changes in forcing variables and (iii) multiple equilibria. Rather, the existing studies typically present evidence of (i) or (ii), but not of both (i) and (ii) occurring jointly (e.g. Smyth, 1984; Acemoglu and Scott, 1994; Burgess, 1992). Moreover, an increasing number of studies report evidence of multiple unemployment equilibria (e.g. Skalin and Teräsvirta, 2002; Bianchi and Zoega, 1998). However, the evidence is based on univariate models, which do not identify the mechanisms that may have led to the appearance of multiple equilibria in a given sample; multiple equilibria are implied by a range of mechanisms besides cyclical adjustment costs (e.g. Cooper and John, 1985; Manning, 1990; Murphy et al., 1989; Saint-Paul, 1995).

Compared to the existing studies, our study encompasses all three aspects of adjustment costs, using multivariate models of employment and unemployment that condition on relevant forcing variables. Econometrically, we build on Krolzig (2001) who employs a Markov regime switching vector equilibrium correcting model (MS-VECM) to allow for state dependence in the parameters (cf. Hamilton, 1989). In his two-step approach, cointegration between US employment and output is established by following the procedure developed by Johansen (1995). Thereafter, the vector autoregressive model (i.e. VAR) is reformulated as a vector equilibrium correction model (VECM) and its parameters are allowed to shift by a first order Markov chain. We follow the same route to a large extent, but start out with a VAR for the Norwegian aggregate unemployment rate, industry employment and working hours, conditioning on a set of macroeconomic variables. This VAR is developed into an interpretable linear simultaneous equation model, hereafter referred to as a structural VECM (cf. Bårdsen and Fisher, 1999). In the second step, we allow the parameters of the structural VECM to shift in the Markov way.

The rest of the paper is organized as follows: Section 2 presents the modelling framework while Section 3 presents the data set, which consists of seasonally unadjusted quarterly observations over the period 1974q1–2003q4. Estimation is conducted on data for the period 1974q1–1996q4 while the remaining observations are retained for post-sample evaluation of estimated models. Section 4 contains the structural VECM for industry employment, hours and aggregate unemployment. We test for friction-induced multiple equilibria within the context of this model. Section 5 presents the results for the models with state-dependent dynamics. Section 6 concludes while the appendix contains precise definitions of the variables, their source and tests of their time series properties.

## 2. The modelling framework

A large number of studies assume that present and anticipated labour shortages contribute to unemployment persistence by raising employment adjustment costs (e.g. Ball and Cyr, 1966; Peel and Walker, 1978; Burgess, 1992). Moreover, Moene et al. (1997) suggest that anticipated labour shortages, which is termed friction, may induce multiple unemployment equilibria. A common feature of all these models is that firms are assumed to respond directly (not only to changes in e.g. the real wage but) to "the state of" the current and future labour market. To test the various hypotheses about friction effects, an important step is to actually model labour demand, using for example a cross