



Modeling unemployment as an inventory: A multicointegration approach

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ABSTRACT

We examine the dynamic phenomenon of unemployment as a constantly changing inventory of unemployed individuals. We focus on the possibility raised by [Elsby et al. \(2009\)](#) of an innate “inseparability” between the flows into and out of unemployment. Multicointegration, introduced by [Granger and Lee \(1989\)](#), offers a natural way to model the level of unemployment as an inventory. We find that there is multicointegration between inflows into and outflows from unemployment and the level of unemployment itself. By identifying this multicointegrating relationship, we are able to specify an error correction model for unemployment, improving forecasting ability.

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1. Introduction

The US labor market is characterized by significant movements of workers switching between employers as well as between different states of labor market participation. Research on unemployment has recognized this fluid nature of the labor market and has investigated the role of worker flows in bringing about the observed change in aggregate unemployment. In this paper, we contribute to the literature on unemployment flows by using the econometric concept of multicointegration to estimate the long-run interactions between the stock of unemployment and the flows into and out of unemployment. To our knowledge, no published research has applied the concept of multicointegration to modeling unemployment.

Much of the literature on unemployment flow models the inflows and outflows of unemployment as separate determinants of unemployment, investigating the effect each component has on aggregate unemployment. However, as [Elsby et al.](#) point out in their 2009 paper, “inflows and outflows may be inherently inseparable”, indicating that a common factor may exist among the flows into and out of unemployment. According to this view, the inflow rate influences the outflow rate through the former’s impact on the stock of unemployment as well as by direct changes in the level of outflow. For example, in certain situations an increase in the flow into unemployment raises the stock of unemployed, in turn generating a

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decrease in the hazard rate of exiting unemployment even though the number of people leaving unemployment remains constant. This interpretation of the labor market implies that cyclical unemployment is determined not only by the relationship between the flows and the stock of unemployment but also the relationship between the inflow and the outflow.

The econometric technique of multicointegration, developed by Granger and Lee (1989, 1991), offers a natural way to model an inventory through modeling the special cointegrating relationships between the stock and flow variables as well as among the flow variables. In this case we use multicointegration to model the stock of unemployed workers as an inventory while taking into account the inseparable nature of the flows into and out of unemployment. This concept of multicointegration (detailed in Section 3) introduces a deeper form of cointegration among variables particularly useful in modeling stock–flow relationships. In the case of unemployment, this multicointegrating relationship identifies a long-run relationship between not only the flow into and out of unemployment, but also between these flow variables and the stock of unemployment itself.

In this paper, we show that a multicointegrating relationship does in fact exist between the flows into and out of unemployment as well as between those flows and the level of unemployment. By identifying these relationships, we are able to specify an error correction model for unemployment, capturing the long-term and short-term dynamics of the interaction between the flow of individuals through the labor market and changes in the stock of unemployed individuals. In addition, estimation of the cointegrating parameter measuring the impact accumulated inflow has on accumulated outflow yields useful information regarding these relationships of the flow into and out of unemployment. Our estimated value for this cointegrating parameter of approximately one indicates that on average over the entire sample period the inflows into unemployment moved at a similar pace to the outflows from unemployment. Fig. 1 shows the movement of the flows into and out of unemployment as well as the stock of unemployed labor over the sample period. This empirical evidence supports our expected result of a cointegrating parameter close to unity in that while short-term deviations may occur between the inflows into and outflow from unemployment, in the long-run frictional unemployment and the economic needs of a society dictate these cointegrated movements of the flows into and out of unemployment. Furthermore, we show that incorporating the long-run relationship between inflows and outflows of unemployment may improve the forecasts of the unemployment level over a relatively stable ex-post forecast period when compared to ARIMA models. Likely of even greater value is the insight garnered for comparative policy analysis when looking at the controllability and responsiveness of the flow variables to the overall inventory of unemployment. Clearly when examining the unemployment situation, control of the unemployment level itself is the overall objective of policy makers. However, these results are achieved through policy decisions regarding the specific flows into and out of unemployment. Therefore, the behavioral relationships we identify through this research provide us with a framework for future research and policy analysis incorporating the impact of the varying cyclical trends within the flow activity on the overall objective, the unemployment level.

The structure of this paper is as follows. Section 2 reviews the current literature and defines the unemployment stocks and flows used in this research. Section 3 provides a brief review of the technique of multicointegration. Section 4 gives a detailed description of the data used in this analysis. Section 5 presents the results of tests for multicointegration among the stock and flow variables for unemployment, as well as the empirical results of the error correction models. Section 6 provides a comparison of forecasts for the unemployment level from four models over an ex-post forecast period. Finally, Section 7 offers the conclusions, possible policy implications, and areas for future research.

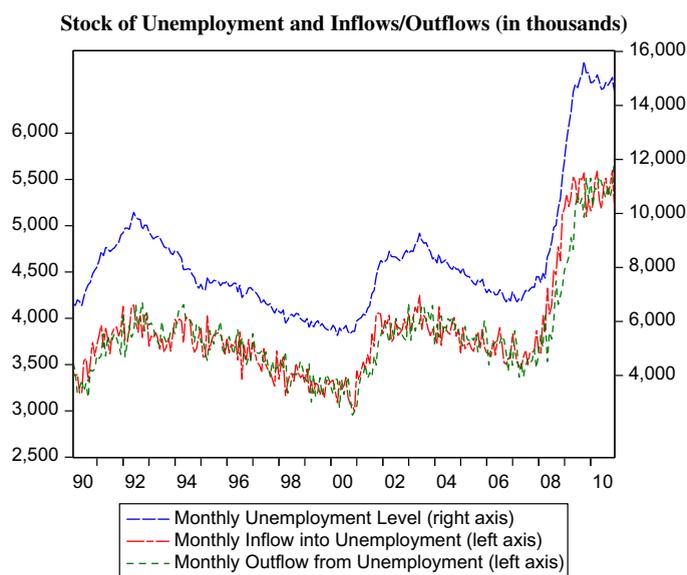


Fig. 1. Graph of gross flows and unemployment level by month from 02/1990 through 12/2010 (in thousands). Data from the US Bureau of Labor Statistics from the Current Population Survey.

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