

Estimating Non-Spurious Factors in U.S. Macroeconomic Time Series

Yohei Yamamoto*

Hitotsubashi University

January 2013

Abstract

This paper follows up the question "Why so many factors exist in the U.S. economy?" raised by Stock and Watson (2005), by focusing on the fact that the time instability in the factor loadings inflates the number of principal components thus produce spurious factors. I propose an algorithm to estimate the non-spurious factors by identifying the set of observations with stable factor loadings. The algorithm is based on the sequential procedure suggested by Inoue and Rossi (2011), but it updates the factor estimates in every step to overcome the problems of the existing structural change tests. Monte Carlo simulations show that the proposed method yields good coverage ratios for the set of stable observations and estimate the correct number of non-spurious factors in most cases. Using this procedure, I found that 51 out of 132 of Stock and Watson (2005)'s U.S. macroeconomic time series have stable factor loadings. The factor loadings for the "fast variables" such as housing and financial variables are less likely to be stable than the "slow variables" are. The number of non-spurious factors in the U.S. macroeconomy is one or two, although the crude estimates provide eight or more. The one or two non-spurious factors can improve out-of-sample forecasting performance over the forecasts using more than eight crude factors especially with long horizons.

JEL Classification Number: C14, C22

Keywords: dynamic factor model, principal components, structural change, spurious factors, out-of-sample forecasts

*Hitotsubashi University, Department of Economics, 2-1 Naka, Kunitachi, Tokyo, Japan 186-8601 (yohei.yamamoto@econ.hit-u.ac.jp).