Ignoring structural breaks in models may cause misspecification problems. In addition, traditional unit-root tests lose power when the analysis ignores the presence of breaks in the variables. However, the exact number, dates, and the functional form of structural breaks are usually unknown. Becker et al. (2006) and Enders & Lee (2011a) show that the low frequency components of Fourier series expansion can capture the behavior of a variety of breaks. Fourier approximation allows the model to control for multiple breaks without having to specify the exact form of the breaks. Enders & Lee (2011a, b) show how to incorporate Fourier approximations into unit root tests. Enders & Holt (2012) and Enders and Jones (2015) illustrate how Fourier approximations can be used to model structural changes.

Using the Fourier approximation, a simple VAR that includes four variables (real oil prices, real interest rate differentials, real effective exchange rates of Japanese yen, and the trade balance of Japan) is estimated. The results obtained from the impulse response analysis indicate that the Fourier approximation can be useful for dealing with unknown breaks in time-series models.

References

Becker, R., Enders, W. Lee, J. 2006. A stationary test with an unknown number of smooth breaks. Journal of Time Series Analysis 27, 381-409.

Enders, W., Holt, M.T., 2012. Sharp breaks or smooth shifts? An investigation of the evolution of primary commodity prices. American Journal of Agricultural Economics 94, 659-673.

Enders, W., Jones, P., 2015. Grain prices, oil prices, and multiple smooth breaks in a VAR. Studies in Nonlinear Dynamics and Econometrics. ISSN (Online) 1558-3708, ISSN (Print) 1081-1826, DOI: 10.1515/snde-2014-0101, April 2015

Enders, W., Lee, J., 2012a. A unit root test using a Fourier series to approximate smooth breaks. Oxford Bulletin of Economics and statistics 74, 574-599.

Enders, W., Lee, J., 2012b. The flexible Fourier form and Dickey-Fuller type unit root tests. Economics Letters 117, 196-199.