

## **An Empirical Study of Testing PPP Hypotheses in the Five-dimensional VAR Model**

Niigata University    Tatsuyoshi Miyakoshi

The purpose of the paper is to empirically reexamine the hypotheses of purchasing power parity (PPP) relations between Japan and the U.S.A. We employ a framework of the multivariate time series model by using the cointegration approach developed by Johansen and Juselius (1992).

In the last ten years, a large number of articles used the cointegration technique to test the PPP relationship between the US dollar and the Japanese yen. The results can be classified into two types: first, those using long-run spans of annual data (around 100 years) and, second, those for the recent floating periods. For long-run spans of data, there is considerable evidence to support the PPP (see Kim, 1990). For the recent floating periods, the results are quite negative. In the PPP relationship, the so-called homogeneity restriction and symmetry restriction are usually strongly rejected. Moreover even the existence of cointegration relationship is rejected by (Patel, 1990; Pippenger, 1993), but not rejected by (Taylor, 1988; Mark, 1990; Kugler and Lenz, 1993; MacDonald, 1993).

Johansen and Juselius (1992, pp.212) attributed such rejections of PPP to the lack of precise specification of the sampling distribution of the data ; i.e., the general neglect of: (i) possible interactions in the determination of prices, interest rates, and exchange rates, (ii) differences between short-run and long-run effects. They provided a method of jointly analyzing the prices, interest rates, and exchange rate in a full system of the five-dimensional VAR (5-VAR) model, as opposed to the three-dimensional VAR (3-VAR) model in the previous researches. Thus, the possibility of other exchange rate determination and the short-run effects of interest rates on the exchange rate are considered. Similar analyses have been performed on Australian data in Johansen (1992), Swedish data in Sjöo (1995), and Denmark data in Juselius(1995). However, there is no study of Japanese data.

This paper reexamines the hypotheses of the PPP relations between the Japanese yen and the US dollar based on the ECM representation of the 5-VAR model. The data covers the monthly period from January 1974 to December 1996. The results of the paper reveal that the exchange rate is determined by the so-called symmetry

restriction on the PPP relation. However, in the 3-VAR, that symmetry restriction never holds, which indicates that a correct specification of the sampling distribution of the data is important. The fluctuations of the exchange rate are well predicted by the ECM representation of this 5-VAR model in the sense that the prediction errors fall in the prescribed range of the confidence bands. The sum of squared prediction error by the ECM outperforms that of a benchmark prediction. These results are robust independently of the lag length.

The organization of the paper is as follows. We explain the economic model and the Johansen and Juselius statistical method in section 2, describe the data set and discuss the estimation results in section 3, examines the one-step prediction based on the ECM representation of the VAR model in section 4, and draw the conclusion in section 5.