Journal of Asian Economics 10 (1999) 525–535

JOURNAL OF ASIAN ECONOMICS

Decomposing exchange rate volatility around the Pacific Rim☆

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Received 1 December 1998; received in revised form 1 October 1999; accepted December 1999

Abstract

Volatility in exchange rates is decomposed into components associated with domestic and international concerns for six Pacific Rim currencies. A latent factor model is used to model bilateral exchange rate changes as the weighted sum of three factors; two factors are uniquely associated with each of the currencies involved in the exchange rates and the other represents world shocks common to all exchange rates. The results show that international factors are more important in determining exchange rate volatility for the smaller nations of Australia, Singapore, and New Zealand, than for the larger nations of Japan and Canada.

*JEL classifications:*F31; G15; C33

Keywords: Exchange rates; Volatility; GMM

1. Introduction

This paper decomposes bilateral exchange rate volatility for a selection of Pacific Rim currencies into components associated with domestic and international concerns. Governments and monetary authorities often express concern in the face of increases in exchange rate volatility and a desire to reduce it, using means such as foreign exchange intervention

☆This paper is a much revised version of a paper presented at the December 1998 ACAES Conference in Bangkok. The conference paper is in press (see Dungey and Martin, forthcoming).

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1049-0078/99/$ – see front matter
PII: S1049-0078(00)00030-0

or Tobin taxes for example. The effective reduction of volatility relies on understanding its source; if exchange rate volatility for a particular currency is primarily sourced internationally there may be very little national authorities can do to alter the situation, while retaining a flexible exchange rate regime. However, if the volatility is primarily domestic in origin, then the particular source of the disturbances may bear closer examination.

There is now a well-developed literature on exchange rate volatility, and an accepted measure of unconditional volatility as either the variance or standard deviation of movements in exchange rate changes. However, there has as yet been no consensus on the sources of exchange rate volatility, either by individual country or across panels. Volatility in bilateral exchange rates between six currencies is examined in this paper. The focus here is on the different experiences of Pacific Rim countries with flexible exchange rate regimes. The currencies examined are the U.S. dollar (USD), Canadian dollar (CAD), Japanese yen (JPY), Singaporean dollar (SGD), Australian dollar (AUD) and New Zealand dollar (NZD). A latent factor model of exchange rate movements in the tradition of Mahieu and Schotman (1994) and Diebold and Nerlove (1989) is used to decompose exchange rate volatility into three components, two due to each of the currencies involved in the exchange rate, and a common world factor which effects all exchange rates. The focus on international and domestic factors is similar to that taken by Engle, Ito, and Lin (1990). Estimation is accomplished through Generalized Method of Moments (GMM) using a panel of exchange rate data. The results demonstrate that the reason for the lack of consensus in the literature as to the causes of volatility lies with the differing responses of individual exchange rates to common and idiosyncratic information. Hence, studies concerned with explaining exchange rate movements with panels of observed information (such as Rose, 1994) are unlikely to be successful. The results derived in this paper are in accordance with Enders and Hurn (1994) who concluded that international events are highly influential in explaining exchange rate movements for smaller Pacific Rim nations. For instance, volatility in the Canadian dollar exchange rate is found to be largely due to Canadian factors, while volatility in the NZ dollar is primarily sourced from overseas.

The paper proceeds as follows. Section 2 outlines the latent factor model and Section 3 presents the estimation technique. The data is outlined in Section 4 and results follow in Section 5. Section 6 concludes.

2. A factor model of exchange rate changes

Consider a simple factor model of exchange rates, such as Eq. (1).

$$s_{io} = \sum_{j=1}^{M} f_{ij} b_{ij} \tag{1}$$

where s_{io} is the *change in the log* of a bilateral spot exchange rate expressed as currency i against a numeraire currency 0, f_{ij} are the factors which influence s_{io}, and b_{ij} is the response coefficient for the exchange rate to each factor. There are M factors involved in determining the changes in the exchange rate, each of which is assumed uncorrelated. If the factors were