Testing for efficiency and rationality in foreign exchange markets—a review of the literature and research on foreign exchange market efficiency and rationality with comments

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Abstract

This paper specifies two VAR models for testing efficiency and expectations in foreign exchange markets. The sufficient conditions for efficiency and rational expectations, by imposing restrictions on the VAR parameters, are derived. Based on these models, issues on testing efficiency and rationality are discussed with reference to previous empirical studies in the area. © 2002 Elsevier Science Ltd. All rights reserved.

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1. Introduction

This paper presents a framework to test for foreign exchange market efficiency and expectations which encompasses two main approaches: single equation regression and the VAR (Vector Auto Regression). Two VAR models are specified for the purpose. The primary motivation is to inquire into the appropriateness of the standard hypothesis being tested in this area of research. The hypothesis is not subject to the choice of estimation methods, for it is assumed that the parameters obtained

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are, at least unbiased and, may be efficient, in statistical terms. Appropriateness means that even if one has obtained consistent and efficient estimators for the parameters, whether these parameters will provide appropriate guidelines for accepting or rejecting the hypothesis regarding market efficiency and rational expectations. This concerns us, because the majority of the studies have rejected the hypothesis of market efficiency and rationality to such an extent that the parameters have not only the wrong magnitudes but also the wrong signs, which do not appear to be justified by theory or practice in foreign exchange markets. Therefore, it is important to ask whether such studies are testing the right things; and whether too much effort has been invested to obtain good estimators for the parameters which do not really rule anything in or rule anything out.

This paper is organized as follows. Section 2 presents the specifications of single equation regression and the VAR model, which are commonly used in hypothesis testing. In Section 3, a minor amendment is made to the basic VAR, to develop model A, which can be reduced to one kind of single equation regression specifications and the basic VAR. We then propose a second model, called model B, which can be reduced to any kind of single equation regression specifications, and would be the same as model A under certain circumstances. Some special cases of both models A and B are illustrated in Section 4 to demonstrate that the standard hypothesis being tested is not appropriately laid out. Discussions of the "news" model as a solution to the problem and the explanatory power of "news" is explored in Section 5. Section 6 provides a summary.

2. Review of the literature and the basic testing equations

2.1. Single equations

The single equation regression method tests whether the hypothesis $H_0:\lambda_0 = 0, \lambda_1 = 1$ holds in the following equation:

$$s_{t+\tau} - s_t = \lambda_0 + \lambda_1(f_t - s_t) + \mu_{t+\tau}, \tag{1}$$

where s_t is the logarithm of the spot exchange rate S_t, f_t is the logarithm of the forward rate F_t contracted at t and matures at $t + \tau$. This method has been used by Bilson (1981), Fama (1984), Gregory and McCurdy (1984), Gweke and Feige (1979), Hansen and Hodrick (1980), Hsieh (1984), and Longworth (1981), who all reported the rejection of the null hypothesis. Although these studies were mainly conducted in the 1980s, no recent research has disproved their findings; in fact, support was offered by Cavaglia et al. (1994) after taking into account the respective effects of irrationality and time-varying risk premia. Other related work includes Peel and Pope (1995) who use ARCH (Auto Regressive Conditional Heteroscedasticity)/ GARCH (Generalised ARCH) and risk premia, but whose conclusions regarding the mean parameters are similar.

Under the umbrella of single equation regression, there are two types of tests,