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Conditional covariances and direct central bank interventions in the foreign exchange markets

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Abstract

In this paper, we investigate the effects of central bank interventions (CBIs) on the ex post correlation and covariance of exchange rates. Using a multivariate GARCH model with time-varying conditional covariances, we estimate the effects of CBIs on both the variances and covariance between the yen and the deutsche mark (the Euro) in terms of the US dollar. Our results suggest that coordinated CBIs not only tend to increase the volatility of exchange rates but also explain a significant amount of the covariance between the major currencies. We show that this result can be useful for short-run currency portfolio management.

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1. Introduction

Estimates of correlations between financial asset prices, such as exchange rates, are of tremendous importance in financial applications. For instance, reliable estimates of correlation are required for the mean/variance optimization of financial asset portfolios, for modelling asset returns, or for computing value-at-risk measures

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of asset portfolios (Jorion, 2001). Most empirical studies (for example, Bollerslev et al., 1988) emphasize that conditional covariances and conditional correlations are variable over time. This throws doubt on the usual implicit or explicit assumption that correlations among financial assets are constant. This calls both for econometric approaches aimed at capturing the way these covariances evolve over time, and for a better understanding of their determinants.

Simple methods such as rolling historical correlations provide a first step toward a better understanding of the correlation process. They are, however, insufficient to capture the full dynamics of this process. There is, therefore, significant econometric literature concerned with developing econometric tools that can capture the (unobservable) time-varying covariances. These approaches basically extend the existing multivariate constant correlation GARCH model of Bollerslev (1990). Bollerslev et al. (1988) had earlier developed the VECH model in which each element of the variance/covariance matrix follows a univariate GARCH model driven by the corresponding cross-product of the return innovations.¹ While interesting, these approaches should be extended by introducing explanatory variables of the conditional variances and covariances.² This would permit a clearer understanding of the way correlations react to financial events and policy interventions. In turn, such an analysis should be valuable for forecasting purposes.

To improve the relevance of these econometric models, the financial variables that are thought to affect the dynamics of the second moment of these asset prices have to be considered as well. In this paper, we are interested in the correlation among the major exchange rates and hence we examine the direct central bank interventions (CBIs) in these markets. The gradual release of data relative to official CBIs has prompted the development of an extensive empirical literature concerned with the effects of these interventions (Dominguez and Frankel, 1993; Baillie and Osterberg, 1997; Dominguez, 1998; Beine et al., 2002). A significant part of this literature has attempted to assess the efficiency of CBIs by estimating their impact on the ex post dynamics of exchange rates. More precisely, these studies have investigated the effects of CBIs on exchange rate returns and their volatility. Most papers have relied extensively on univariate GARCH-type models and on distinguishing the various types of interventions (official vs. reported, coordinated vs. unilateral, dummies vs. amounts).

The literature in general points out that CBIs are not very efficient, at least in the very short run. There is some limited evidence that interventions can affect the exchange rate level (Baillie and Osterberg, 1997). Nevertheless, attention has gradually shifted to the effects on higher moments and especially on the volatility of exchange rates (which was the main concern of the 1987 Louvre Agreement). The conclusions appear much more clear-cut with respect to exchange rate volatility. The literature

¹ Sometimes this model yields variance/covariance matrices that are not positive definite. With this in mind, Engle and Kroner (1995) have derived useful restrictions that led to a new model, the so-called BEKK model.

² It is thus hardly surprising that Engle and Sheppard (2001, p. 21) call for such developments in empirical investigations of correlation dynamics.

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