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Central bank interventions and implied exchange rate correlations ☆

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ABSTRACT

This paper examines the effects of the foreign exchange market interventions by the Bank of Japan on the ex ante correlations between the JPY/USD, EUR/USD, and GBP/USD exchange rates. The correlation estimates used in the analysis are derived from the market prices of OTC currency options. The results show that central bank interventions significantly affect the market expectations about future exchange rate co-movements. In particular, we find that interventions tend to temporarily increase the ex ante correlations among the major exchange rates. However, our results also suggest that intervention episodes are associated with lower-than-average levels of exchange rate correlations.

1. Introduction

The debate on whether central banks can affect exchange rate dynamics with interventions has stimulated a large body of literature over the last ten years (for surveys, see e.g. Schwartz, 2000; Sarno and Taylor, 2001; Galati et al., 2005). Although monetary authorities seem to view intervention as an effective instrument of exchange rate policy (Neely, 2000), there is widespread skepticism among academics about the effectiveness of interventions in achieving the alleged objectives of either changing the level of an exchange rate or reducing its volatility.[2]

The empirical evidence on the effects of interventions on exchange rate dynamics is mixed. Several studies find that interventions affect the level of the exchange rate (e.g., Fatum and Hutchison, 2003, 2006; Chaboud and Humpage, 2005; Kearns

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[2] According to official central bank statements, interventions may be conducted, for instance, in order to counter disorderly market conditions (U.S. Federal Reserve), or to stabilize excessive exchange rate movements (Bank of Japan). Nevertheless, it should be noted that the stated intervention objectives are not necessarily the true objectives. Recent empirical findings indicate that interventions are often conducted in response to deviations of the exchange rate from past levels or fundamentals (see e.g., Ito and Yabu, 2007; Beine et al., 2009).

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and Rigobon, 2005; Fratzscher, 2006; Fatum, 2008) and may reduce market uncertainty (e.g., Kim et al., 2000; Beine et al., 2003; Hillebrand et al., 2009).[3] However, there is also considerable evidence suggesting that interventions are not particularly effective in affecting exchange rate movements (e.g., Baillie and Osterberg, 1997; Aguilar and Nydahl, 2000; Morana and Beltratti, 2000; Brandner et al., 2006) nor market expectations regarding future exchange rate developments (e.g., Rogers and Siklos, 2003; Galati et al., 2005). Furthermore, instead of stabilizing exchange rates, interventions are often found to increase volatility in the foreign exchange markets (Bonser-Neal and Tanner, 1996; Beine and Laurent, 2003; Frenkel et al., 2005; Dominguez, 2006). While no consensus has yet emerged, the previous studies, in general, suggest that interventions may be effective in affecting exchange rate dynamics, but not necessarily in achieving the objectives that central banks pursuit.

In this paper, we take an alternative approach to examine the effects of central bank interventions on exchange rates. Specifically, rather than assessing the impact of interventions on the dynamics of a given spot exchange rate, we focus on the co-movements of exchange rates around interventions. Assuming that the triangular parity condition holds among a triplet of currencies, an effective intervention should not only affect the exchange rate in which the intervention is conducted, but also the cross-dynamics among the exchange rate triplet. Hence, to address whether central bank attempts to affect the dynamics of a particular exchange rate induce changes in the cross-dynamics of exchange rates, we examine the effects of the official Bank of Japan (BoJ) yen-selling interventions on the ex ante correlations between the major exchange rates.[4] Our analysis is based on the ex ante correlation estimates derived from the market prices of currency options.

Given the vast empirical work on central bank interventions, it is rather surprising that the impact of interventions on the co-movements of exchange rates has so far been largely neglected in the literature.[5] Our idea to focus on the exchange rate co-movements is not, however, completely novel. In a recent paper, Beine (2004) examines the effects of central bank interventions on the ex post exchange rate correlations. Using multivariate GARCH modeling, Beine (2004) shows that interventions not only affect exchange rate volatility but also tend to increase the conditional correlations among exchange rates.

In contrast to Beine (2004), we use ex ante exchange rate correlation estimates extracted from the prices of currency options.[6] These ex ante correlations implied by option prices may be regarded as the market expectation of the degree of future co-movements between two exchange rates over the remaining life of the option contracts. Given that central bank interventions are often considered to affect exchange rate dynamics by changing market participants' expectations, it is of interest to examine whether the expected exchange rate co-movements are affected by interventions.[7] The potential intervention induced changes in market expectations should be immediately reflected in option prices, and thus, also in implied correlations. Hence, the use of option-implied correlations, instead of ex post correlation estimates, may provide new insights about the effects of central bank interventions on exchange rate dynamics.

Previously, a number of papers have used option-implied volatilities and probability distributions to examine the behavior of market expectations around central bank interventions. In general, these studies find that implied volatilities in the foreign exchange markets are increased by interventions (see e.g., Bonser-Neal and Tanner, 1996; Dominguez, 1998; Frenkel et al., 2005; Fratzscher, 2006), while the higher-order moments of expected exchange rate distributions appear to be virtually unaffected (Rogers and Siklos, 2003; Galati et al., 2005). Some studies, however, report evidence for stabilizing effects of interventions over certain periods (see e.g., Dominguez, 1998; Aguilar and Nydahl, 2000), and Castren (2004), Morel and Teiletche (2008), and Gnabo and Teiletche (2009) document systematic changes in implied probability distributions around central bank actions. In this paper, we attempt to extend the above literature by examining the effects of interventions on option-implied exchange rate correlations.

Our empirical findings demonstrate that central bank interventions significantly affect the market expectations about future exchange rate co-movements. In particular, the results show that implied exchange rate correlations increase on the first day of a period of successive intervention days. Furthermore, we find that the size of the intervention, as measured by the BoJ's daily net purchase of U.S. dollars against the yen, is positively related to the change in implied correlations. However, this positive effect of interventions on implied correlations does not continue after the first intervention day. Instead, we find that implied correlations typically decrease during the remaining days of an intervention episode. Finally, our findings suggest that the ex ante exchange rate correlations are somewhat lower during the intervention episodes than during periods with no central bank activity.

[3] Several transmission channels through which central bank interventions may affect exchange rates and/or exchange rate expectations have been proposed in the literature. For discussions of these alternative channels, see e.g. Dominguez (1998), Sarno and Taylor (2001), Kearns and Rigobon (2005), Fratzscher (2006), and Gnabo and Teiletche (2009).

[4] It should be noted that the conceivable impact of central bank interventions on exchange rate correlations is most likely indirect and unintended. Although monetary authorities tend to monitor exchange rate correlations, it is difficult to assume that they would actually attempt to affect the correlations by conducting interventions. However, it is nevertheless plausible that interventions affect market expectations about future exchange rate dynamics, and thereby cause changes in the ex ante correlations between exchange rates.

[5] Fatum and King (2005) and Fatum (2008) take into account exchange rate co-movements around the Bank of Canada (BoC) interventions in the CAD/USD exchange rate. They document that the observed effects of the BoC interventions are weakened when the CAD/USD rate is adjusted for general co-movements against the USD.

[6] Option prices are inherently forward-looking financial indicators that implicitly contain information about market expectations regarding future asset price developments. Hence, as noted e.g. by Campa and Chang (1998) and Walter and Lopez (2000), market prices of currency options can be used to derive ex ante estimates of correlations between exchange rates. Provided that market participants are rational, these option-implied correlations should incorporate all the available information that is relevant for forming expectations about future exchange rate developments.

[7] According to the signaling channel hypothesis, central banks may use interventions as a tool to signal their superior information about future fundamentals and policy intentions, and thereby affect exchange rates by changing market expectations. Also the noise-trading channel proposed by Hung (1997) and the microstructure (or order flow) channel of Vitale (1999) provide a plausible mechanism for intervention induced changes in market expectations. These alternative transmission channels may be particularly relevant in our context, as the sample period is largely characterized by secret interventions (see Beine and Lecourt, 2004; Beine and Bernal, 2007; Beine et al., 2009).