ELSEVIER

Journal of International Financial Markets, Institutions and Money 10 (2000) 349–362

Journal of INTERNATIONAL FINANCIAL MARKETS, INSTITUTIONS & MONEY

Central bank interventions and exchange rates: an analysis with high frequency data

Claudio Morana [a], Andrea Beltratti [b,*]

[a] *University of Oriental Piedmont, Novara, Italy*

[b] *Bocconi University and Paolo Baffi Center for Monetary and Financial Economics, Via U. Gobbi 5, 20136 Milan, Italy*

Received 1 November 1998; accepted 9 August 2000

Abstract

We use high frequency data for the mark–dollar exchange rate for the period 1992–1995 to evaluate the effects of central bank interventions on the foreign exchange market. We estimate an unobserved component model that decomposes volatility into non-stationary and stationary parts. Stationary components in turn are decomposed into seasonal and non-seasonal intra-day parts. Our results confirm the view that interventions are not particularly effective. The exchange rate moves in the desired direction for only about 50% of the time, and often with a substantial increase in volatility. The model suggests that the two components, which are affected the most by interventions, are the permanent and the stochastic intra-day.

Keywords: High frequency data; Volatility; Central bank intervention

JEL classification: C22; E58; F31

1. Introduction

Central banks may decide to intervene in the foreign exchange market for various reasons and with various styles. In a fixed exchange rate regime, the central bank must intervene to maintain the fixed international price of the currency. In a dirty float, the central bank has the option to intervene and often does so in an attempt

* Corresponding author. Tel.: +39-2-58365306; fax: +39-2-58365343.
E-mail address: andrea.beltratti@uni-bocconi.it (A. Beltratti).

1042-4431/00/$ - see front matter
PII: S1042-4431(00)00043-3

to correct imbalances in the current account. Current proposals to extend a target zone regime to the main currency blocks of the world, the dollar, the euro and the yen, are based on increasing the role of central banks in the foreign exchange market. It is, therefore, of importance to understand the consequences of central bank intervention. The style of the intervention may be described by a combination of the following characteristics — public versus secret interventions, sterilized versus non-sterilized interventions. Sometimes, central banks publicize their interventions trying to influence the market to follow a specific direction. Interventions are often sterilized to minimize potential conflicts with other objectives of monetary policy.

Previous literature concerned with measuring the effects of interventions has given various results. Dominguez (1998) analyzes a long time series of daily data in the context of various GARCH specifications to conclude that interventions have a significant effect on volatility, but the sign changes over time. Sometimes, interventions stabilize and some other times destabilize the exchange rate. Chang and Taylor (1998) use high frequency data on exchange rates and interventions for their analysis and conclude that intervention has a very short effect on volatility. On the other hand, Le Baron (1999) uses daily data to conclude that technical rules are effective especially in periods of central bank interventions. We examine the issue in the context of high frequency data, offering some methodological modifications and an extended data set. In particular, we use a sample of exchange rates recorded at the 30-min frequency for the period 1992–1995. This data set is considerably longer than the one used by Chang and Taylor (1998) and may allow for a more significant analysis. We perform an analysis with both daily and high frequency data. The daily data are aggregated from the high frequency data to retrieve a non-parametric estimate of volatility. The advantage of daily data is that information on interventions is also available at the same frequency.

As far as direct use of high frequency data is concerned, the empirical evidence cumulated so far suggests the importance of properly taking into account the periodic intra-day dynamics. To take into account intra-day seasonals, we use an unobserved component model developed by Beltratti and Morana (1999). The thorough comparison with other methodologies reveals that the unobserved component methodology has several advantages. First, it fares well in terms of producing a series, which satisfies the theoretical aggregation properties of GARCH models. Second, it forecast satisfactorily the future volatility within the day. Third, it is very flexible in describing episodes of volatility connected with announcements of macroeconomic variables. This last characteristic is very relevant here as the scope is evaluating the effects of interventions on volatility. Given the continuous changes taking place in financial markets, it is of great importance to use an econometric model, which allows for time-varying effects of interventions, as the one we use here.

The plan of the paper is as follows. After this introduction, Section 2 reviews the literature on interventions. Section 3 presents the empirical analysis and its results, while Section 4 concludes. The main conclusions of our work are as follows. We confirm the existence of a positive effect of interventions on intra-day volatility,