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Capturing the time dynamics of central bank intervention☆

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ABSTRACT

We estimate central bank reaction functions using the autoregressive conditional hazard model and the autoregressive conditional binomial model. We find that the Federal Reserve and Bundesbank intervened when the market was calmer, and the Bundesbank intervened in response to exchange rates being out-of-line with fundamentals. Japan intervened in response to changes in the nominal exchange rate, and intervention differed before and after Eisuke Sakakibara became Director General of the International Finance Bureau of the Ministry of Finance in Japan. We argue that these results are consistent with central bank policy goals and the effect of intervention on the exchange rate.

1. Introduction

Sterilized intervention is an intriguing policy tool utilized by central banks.[1] Even though interventions are small relative to total foreign exchange market activity (the largest intervention in the DM/$ market in the 1980s was $1.3 billion compared to total daily market activity of $1300 billion, and the Federal Reserve intervened at times in amounts as little as $50 million), there appears to be a consensus amongst central bankers that intervention is an effective policy tool. All of the central bankers surveyed by Neely (2001) believe that intervention is able to alter the exchange

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[1] An intervention is sterilized if it is offset by a corresponding change in the domestic monetary base, so that the intervention will have no net effect on the domestic money supply.

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rate. Additionally, in surveying the academic literature on intervention's effectiveness, Neely (2005) finds that there is a consensus amongst a key group of papers that "interventions successfully move exchange rates, at least in the very short run" (p. 11).

A related question is whether central bank intervention behavior is consistent with stated policy goals. These policy goals are commonly thought of as being to: (a) move exchange rates into line with long-run fundamentals, (b) resist undesirable exchange rate changes, and/or (c) remove excess volatility from the foreign exchange market (Neely, 2001). Studies that estimate central bank reaction functions (i.e., functions that determine when a central bank will intervene) obtain mixed results as to what motivations trigger an intervention. Baillie and Osterberg (1997a) find evidence that the U.S. Federal Reserve and German Bundesbank intervened in response to the DM/$ exchange rate moving away from its target, but not in response to excess foreign exchange market volatility. The authors also found mixed evidence for the Bank of Japan intervening in response to excess market volatility and in response to the exchange rate moving away from its target. That is, Baillie and Osterberg (1997a) found that the Bank of Japan intervened in response to excess volatility by buying and selling dollars, while they found that the Bank of Japan intervened in response to the exchange rate moving away from its target only by selling dollars. Almekinders and Eijffinger (1994, 1996) find evidence that the Federal Reserve and Bundesbank have intervened in order to resist undesirable exchange rate changes (i.e. "leaning against the wind") and in response to increases in exchange rate volatility (to "calm disorderly markets"). Ito (2002) finds evidence for Japan "leaning against the wind" from April 1991 to March 2001, but this behavior is only statistically significant in the second subsample of his data (after Eisuke Sakakibara became Director General of the International Finance Bureau of the Ministry of Finance). However, the institutional background given in Ito (2002) suggests that interventions prior to Sakakibara are "leaning against the wind", whereas interventions after Sakakibara are "leaning with the wind" (intervening to further support exchange rate changes if those changes are in the desired direction). Thus, there is a consensus as to the effects intervention has on the foreign exchange market. However, it is less clear if central banks consistently follow their policy goals when deciding whether or not to intervene.

The goal of the present paper is to investigate what motivations trigger a central bank intervention, in order to determine whether or not intervention behavior is consistent with stated policy goals. Similar to monetary policy actions, there is considerable time dependence in intervention decisions, with successive periods of intervention being followed by successive periods without intervention (see Table 1). That is, when something causes the central bank to decide to undertake an intervention, the central bank tends to intervene on successive days. Thus, the serial correlation of intervention decisions must be controlled for if motivations for intervention are to be teased out of the data. For example, suppose there is an overnight appreciation in the nominal exchange rate, and the central bank decides to intervene to counter this movement. And, suppose this appreciation in the nominal exchange rate was a one-time event, but the intervention in response to it happened on successive days (including days where no change in the nominal exchange rate took place). In this case, a model that fails to account for the dynamic nature of intervention behavior will not find statistical evidence that a change in the nominal exchange rate triggers intervention, even though such a change in fact does. This is relevant because in his survey of central bankers, Neely (2001) finds that 95% of central bankers either "sometimes" or "always" determine the size of interventions based on the market's reaction to initial interventions. That is, central bankers intervene in response to a particular event, observe the market's reaction to it, and then further intervene if the market's reaction was not consistent with the central bank's objective.

We add to the intervention literature by capturing the dynamic nature of intervention decisions by estimating two new econometric models designed to address this issue, the autoregressive conditional hazard (ACH) model and the autoregressive conditional binomial (ACB) model. The ACH model of Hamilton and Jordà (2002) is an extension of the autoregressive conditional duration (ACD) model of Engle and Russell (1998). The ACD estimates the time between successive events. That is, the ACD answers the following question: if an intervention took place today, how long will it take until the next one? The ACH extends the ACD to estimate the probability of observing an intervention on a given day, conditional on the information known up to that point. This information includes both the expected duration, or time, between successive interventions and information related to stated policy goals. Hamilton and Jordà (2002) have success in applying the ACH to monetary policy data. That is, using an