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Large versus small foreign exchange interventions

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ABSTRACT

We use non-temporal threshold analysis to investigate the exchange rate effects of large versus small interventions. More than two decades of official daily data on intervention in the JPY/USD market facilitate our analysis. We find no evidence that small interventions exert a discernible influence on the exchange rate while large interventions significantly influence the exchange rate in the theoretically consistent manner. We conclude that small interventions may not be considered a determinant of the exchange rate while large interventions constitute an important element in our understanding, and modeling, of the exchange rate.

1. Introduction

We investigate whether small and large foreign exchange interventions influence the exchange rate differently. To do so we apply the non-temporal threshold analysis procedure developed by Hansen (2000) to official daily data on intervention in the JPY/USD rate over the April 1991 to December 2011 period.[1,2] The results of our study reveal that the exchange rate effects of intervention are not constant across interventions of varying amount but, instead, the effects differ across small and large interventions to the point that only large interventions are influential.[3]

Clearly, whether the amount of an intervention matters for the exchange rate effect of an intervention is of key interest to authorities with a mandate to intervene since knowledge in this regard is necessary in order to make an informed decision concerning the amount with which to intervene. The existing empirical evidence is, however, far from conclusive on the matter of intervention amount. For example, Dominguez and Frankel (1993) find that central bank market presence rather than the amount of intervention can at times fully explain the exchange rate effects of intervention. This implies that intervention amount may not matter at all. By contrast, Fatum and Hutchison (2006) and others find evidence that while both small and large interventions are effective, large interventions are more likely to be effective. This implies that the amount of intervention matters and that central bank presence alone cannot explain the effects of intervention.[4]

Studies such as Kim and Sheen (2006), Fatum and Hutchison (2006) and others that consider whether intervention amount matters for the effects of intervention typically do so by first imposing a somewhat arbitrarily defined threshold to define large versus small interventions. In turn, in the context of time-series studies (e.g. Beine and Szafarz, 2006; Kim and Sheen, 2006), large intervention dummy variables are then added to the estimated exchange rate models. In the context of event studies, the exchange rate effects of intervention are assessed separately across sub-samples of large and small interventions (e.g. Fatum and Hutchison, 2006).

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[1] As of August 2013, no intervention has occurred in the JPY/USD market since the end of 2011.

[2] Humpage (2003), Neely (2005), and Sarno and Taylor (2001) provide surveys of the intervention literature. Fatum and Hutchison (2010), Ito (2003, 2005), Iwata and Wu (2012), Marsh (2011) and several others study the effectiveness of intervention in the USD/JPY market. Dominguez and Frankel (1993), Fatum and Hutchison (2003, 2006) and others assess whether the amount of an intervention matters for the influence of an intervention on exchange rate levels. Connoly and Taylor (1994), Kim et al. (2000) and others consider whether the intervention amount matters for the influence of intervention on exchange rate volatility. The focus of our study is on the influence of the amount with which intervention is carried out on the exchange rate level.

[3] The intervention literature also refers to intervention amount as intervention volume, intervention magnitude, scale of intervention, etc.

[4] Beine and Szafarz (2006) even find that large interventions are effective while smaller interventions are significantly counterproductive, i.e. systematically associated with exchange rate movements in the opposite of the theoretically consistent direction.

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These approaches are problematic for two reasons. First, since intervention amounts tend to increase over time, testing the relevance of an arbitrarily defined amount threshold is indistinguishable from testing whether more recent interventions influence the exchange rate differently than interventions carried out a longer time ago. This is particularly concerning in the context of time-series analyses of the effects of intervention and intervention amount. Second, another fundamental concern is that whenever a threshold is arbitrarily defined rather than identified, the results of the associated analysis could be influenced by the choice of threshold itself.

The contribution of our paper is to employ the non-temporal threshold analysis proposed by Hansen (2000) for considering whether small and large interventions influence the same-day exchange rate differently. The non-temporal threshold analysis of Hansen (2000) is a sophisticated analytical technique that has not previously been applied to the intervention literature. It is similar to a standard temporal parameter change test for unknown breakpoint (e.g. Andrews, 1993), except instead of analyzing a temporally-ordered data set, the procedure allows us to sort the data according to a non-temporal variable such as, in our context, absolute intervention amount. Hansen (2000) procedure enables us to distinguish between large and small interventions according to the endogenously identified most likely intervention amount threshold and, furthermore, to test whether small and large interventions influence the exchange rate differently in a non-temporal modeling framework. In doing so we are overcoming the two key shortcomings of previous studies of the role of intervention amount in their reliance on temporal analyses and arbitrary classification of small versus large interventions.

In order to answer our research question regarding whether small and large interventions influence the exchange rate differently, we pursue the following research strategy. We first address the inherent issue of endogeneity (reverse causality) that is present in an intervention study such as ours. We do so by following Humpage (1999), Naranjo and Nimalendran (2000), Fatum and Pedersen (2009) and others in estimating central bank intervention reaction functions in order to capture the expected component of the intervention variable. In turn, we use the residuals of the reaction function estimations to proxy for unexpected intervention that we use for the non-temporal threshold analysis instead of actual intervention. We then carry out the non-temporal threshold analysis with absolute (unexpected) intervention amount as the sorting variable, i.e. we rearrange our time-series data according to intervention amount, in order to identify the most likely intervention amount threshold and to test its significance. The properly identified most likely intervention amount threshold allows us to distinguish between small and large interventions and, in turn, estimate and compare the exchange rate effects of small versus large interventions.

Our main result is that since the mid-1990s, large interventions in the JPY/USD rate are the only influential interventions while small interventions in the JPY/USD rate are not associated with any detectable exchange rate effects. This is an insight with a very clear policy implication, namely that small interventions should not be carried out. It is also an insight that has implications for how to incorporate intervention into exchange rate models. Since small interventions exert no discernible influence on the exchange rate, small interventions should not be considered a determinant of the exchange rate. By contrast, large interventions are influential and thus important in our understanding, and modeling, of the exchange rate.[5]

The rest of the paper is organized as follows. Section 2 summarizes the data. Section 3 details the empirical methods. Section 4 presents the results. Section 5 discusses extensions and robustness checks. Section 6 concludes.

2. Data

The intervention data consist of official daily amounts of all intervention operations carried out by the Japanese and US monetary authorities in the JPY/USD foreign exchange market between 1 April 1991 and 31 December 2011.

Table 1 provides intervention data summary statistics for the full sample period as well as separately across three sub-samples.[6] The first column of Table 1 shows that during the two decades under study intervention in the JPY/USD market occurred on a total of 352 days. For the full sample period, the daily intervention amount ranges from USD 1 million to USD 103 billion, and the average intervention amount is USD 2.4 billion. Columns two through four show that the average intervention amount and frequency vary dramatically across the three sub-samples. During the first 4 years under study, the average intervention amount across 166 intervention days is USD 0.5 billion, approximately 0.57% of average daily turnover in the JPY/USD spot market. Between June 1995 and March 2004, intervention occurred on 178 days in the average amount of USD 3.0 billion, approximately 2.93% of average daily turnover. During the last sub-sample, the September 2010 to December 2011 period, intervention is carried out on 8 days in the average amount of USD 26 billion, an astounding roughly 14% of average daily spot turnover.[7]

All interventions under study are either unilateral Japanese interventions or coordinated in the sense that both Japan and the US are intervening in the JPY/USD market on the same day and in the same direction. The second-last row of Table 1 reports the number of coordinated intervention days across the full sample and across the sub-samples. As the row shows, a total of 23 intervention days are coordinated.[8]

The last row of Table 1 shows the number of detected intervention days, i.e. interventions that occur on a day when there is a rumor of intervention on the newswire. The full sample encompasses a total of 214 detected interventions, amounting to roughly 60% of the interventions in the sample.[9]

The daily exchange rate data consist of New York close JPY/USD spot market quotes obtained from Global Financial Data (GFD).[10] Exchange rate summary statistics are detailed in Table 2. The first

[5] It is beyond the scope of our empirical study to consider possible theoretical explanations for why the exchange rate effects of large interventions might differ from those of small interventions. Edison (1993), Hung (1997), Kumhof (2010), and Sarno and Taylor (2001) provide details on intervention transmission channels.

[6] The three sub-samples are identified as follows: Ito (2003, 2005) and others have established that 21 June 1995, when Mr. Sakakibara took office as Vice Minister for International Affairs at the Japanese Ministry of Finance, constitutes a regime change demarcation date in regard to Japanese intervention policy. The September 2010 intervention that followed the 6 1/2 years of no intervention since March 2004 (when what Taylor (2006) and others refer to as the "great intervention" ended abruptly) constitutes the return of Japan to an active intervention policy and thus another regime change date (see Fawley and Juvenal (2010) for details).

[7] Unfortunately, it is not possibly to measure daily intervention amount relative to daily market depth since daily data on market turnover in the JPY/USD spot market covering the roughly two decades under study does not exist.

[8] Of the 23 coordinated interventions in the full sample, 22 occur before 1999. The only coordinated JPY/USD intervention day for more than a decade occurred in March 2011 in response to the sudden JPY appreciation following the 9.0 earthquake in Japan on 11 March 2011. This particular coordinated intervention driven by very unusual circumstances is described in detail in Neely (2011).

[9] The Factiva search engine and a comprehensive combination of various English language search words (e.g. Bank of Japan, intervention, etc.) are used to find the days with a rumor of intervention. Detected intervention is sometimes referred to as "public intervention", while undetected intervention is sometimes referred to as "secret intervention". For additional details regarding detected versus undetected interventions in the JPY/USD market see, for example, Beine and Bernal (2007) and Kim and Le (2010).

[10] According to Humpage (1999), most US interventions are conducted in the New York market. According to Ito (2003), Japanese intervention on a given day could be carried out in the Tokyo market as well as in the European and/or US time zones of that day, either by the Bank of Japan directly or by other central banks on its behalf. Therefore, as explained in detail in Ito (2003), it is preferable to use New York close quotes in daily data studies of intervention in JPY/USD market.