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Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf



Central bank intervention and the intraday process of price formation in the currency markets

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A B S T R A C T

JEL classification:

F31
G15

Keywords:

Foreign exchange
Central bank intervention
Market microstructure
Liquidity
Volatility
Bid-ask spread

We propose a novel theory of the impact of sterilized spot interventions on the microstructure of currency markets that focuses on their liquidity. We analyze the effectiveness of intervention operations in a model of sequential trading in which i) a rational Central Bank faces a trade-off between policy motives and wealth maximization; ii) currency dealers' sole objective is to provide immediacy at a cost while maintaining a driftless expected foreign currency position; and iii) adverse selection, inventory, signaling, and portfolio balance considerations are absent by assumption. In this setting, and consistent with available empirical evidence, we find that i) the mere likelihood of a future intervention—even if expected, non-secret, and uninformative—is sufficient to generate endogenous effects on exchange rate levels, to increase exchange rate volatility, and to impact bid-ask spreads; and ii) these effects are exacerbated by the intensity of dealership competition, the extent of the Central Bank's policy trade-off, and the credibility of its threat of future actions.

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1. Introduction

The foreign exchange (forex) market is one of the most active financial markets in terms of volume, frequency, and intensity of trading (e.g., [Bank for International Settlements, 2008](#)). The recent availability of high-frequency data has stimulated significant interest in its microstructure. However, with few notable exceptions (e.g., [Bossaerts and Hillion, 1991](#); [Naranjo and Nimalendran, 2000](#); [Lyons, 2001](#); [Evans and Lyons, 2005](#)), the empirical analysis of this data has not been preceded by theoretical

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investigations of the potential impact of the many institutional features specific to the forex market on its functioning. This paper contributes to closing this gap. We focus on one of those features—the presence of a rational, but not necessarily profit-maximizing Central Bank (CB)—and derive from its inclusion novel implications for the process of price formation in currency markets.

Two sets of observations about CB interventions guide our effort. First, many macroeconomics textbooks describe the exchange rate as an *intermediate* target of monetary policy: CBs choose levels (or bands of fluctuation) for the domestic currency compatibly with the “ultimate” trade-off of monetary policy, between sustainable economic growth (the “output gap”) and moderate inflation (e.g., Lewis, 1995; Taylor, 1995). CBs may also serve less stringent agendas, under pressure from political power, interest lobbies, etc. In both cases, their actions may not be motivated by pure profit. There is anecdotal and empirical evidence that policy objectives and wealth maximization often collide (Taylor, 1982; Neely, 2000). CBs may also take positions in the currency markets for purely speculative motives, as in the frequently cited example of Bank Negara, the Malaysian CB, in the early 1990s (e.g., Brown, 2001). This potential (and often ignored) trade-off between policy goals and costs (or profits) may affect the impact of CB interventions on exchange rate dynamics and on the liquidity of the forex market.

Second, while a consensus has emerged in the economic literature (e.g., Adams and Henderson, 1983) that *unsterilized* interventions influence the exchange rate through the traditional channels of monetary policy, both the effectiveness of *sterilized* interventions—i.e., those accompanied by off-setting actions on the domestic monetary base—and their impact on forex market liquidity remain controversial (Sarno and Taylor, 2001). Within the macroeconomic approach, sterilized interventions may affect the exchange rate through either of two channels, *portfolio balance* and *signaling*. According to the portfolio channel (Branson, 1983, 1984), interventions altering the relative supply of foreign assets influence the exchange rate when domestic and foreign assets are imperfect substitutes. According to the second channel (Mussa, 1981; Bhattacharya and Weller, 1997; Vitale, 1999), interventions influence the exchange rate by conveying information on policy intentions and/or macroeconomic fundamentals. Many empirical studies of the portfolio channel (e.g., Edison, 1993; Payne and Vitale, 2003; Pasquariello, 2007) find its effects on exchange rates either small and short-lived (particularly in the 1970s and 1980s) or economically and statistically insignificant, despite the important imperfect substitutability documented by Evans and Lyons (2005). There is stronger supporting evidence for the signaling channel, especially when interventions are secret and unannounced (Dominguez, 1992; Kaminsky and Lewis, 1996; Payne and Vitale, 2003; Pasquariello, 2007). Extant studies suggest that, in those circumstances, the resulting dissipation of information and adverse selection may increase exchange rate volatility and widen bid-ask spreads (Vitale, 1999; Naranjo and Nimalendran, 2000; Chari, 2007). Yet, this type of intervention is rather infrequent (e.g., Dominguez, 1998, 2003; Fischer and Zurlinden, 1999). Recent empirical research also reports that even expected, non-secret, and announced interventions have large effects on currency returns, return volatility, bid-ask spreads, and trading intensity, albeit often inconsistent with those predicated by information theory (Dominguez, 1998, 2003, 2006; Payne and Vitale, 2003; Pasquariello, 2007).

Motivated by these considerations, in this paper we propose an alternative theory of the impact of CB interventions on the intraday process of price formation in the currency markets that focuses on their liquidity. This theory illustrates that both the temporary and persistent impact of CB interventions on prices, volatility, and transaction costs in the presence of imperfect substitutability may be related to the special role of forex dealers as liquidity providers. To concentrate on this role, we construct a stylized currency market in which trading occurs sequentially. The market is populated by a continuum of risk-averse investors and an occasionally active CB facing a trade-off between policy and wealth-preservation motives—i.e., accounting for the expected cost of its pursuit of a short-term target level for the exchange rate (e.g., Bhattacharya and Weller, 1997; Vitale, 1999). The likelihood of each order arrival to be from any of the investors or the CB is exogenous, but their trades are endogenously determined in equilibrium. CB interventions are also non-secret, sterilized, uninformative, and unrelated to the relative supply of foreign assets. These assumptions rule out portfolio balance and signaling effects in our framework. Finally, we model forex dealers as risk-neutral, pure market makers providing immediacy, in the spirit of Garman (1976), Brock and Kleidon (1992), and Saar (2000a, 2000b). In particular, we impose that, at each round of trading, they stand ready to buy and sell by setting quotes and spreads that maximize the expected instantaneous compensation for their services

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