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Asymmetric responses of ask and bid quotes to information in the foreign exchange market ☆

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ABSTRACT

We study the price discovery in a foreign exchange electronic limit order market on a daily basis, by examining the informativeness of ask and bid quotes in the process of price formation. Using the data of prices and trades in the Euro–Dollar spot market via Electronic Broking Services (EBS), we find bid quotes provide more price discovery. This dominance of bid quotes in price discovery is stronger on Monday and is weaker on Friday. Asymmetries in the responses of ask and bid quotes to trade-related information evolve with daily order flow, daily return, the interactive term between spread and order flow, and the volatility, skewness, and kurtosis in the distribution of efficient exchange rate changes.

1. Introduction

Adjustments of ask and bid quotes towards the implicit efficient price can be asymmetric in the presence of trade-related shocks, as trading costs can be different for buyers and sellers. Moreover, the contribution of ask and bid quotes to price discovery may differ when sellers and buyers respond to information differently. If one side of the market is better informed, the adjustment of ask and bid quotes towards the efficient price can be asymmetric, thus leading to different contribution to price discovery of ask and bid quotes.

In empirical market microstructure analyses, the quote midpoint is often assumed to represent an unbiased estimator of the unobservable true price.[1] However, using the midpoint of bid and ask quotes to proxy the true price is meaningful only if bid and ask prices are set symmetrically around the true price. When the midpoint may not accurately reflect the true price, studying the relative contributions of ask and bid quotes in price discovery is important.[2]

As inspired by Pascual and Pascual-Fuster (2010), we study the price discovery in a foreign exchange electronic limit order market on a daily basis, by examining the informativeness of ask and bid quotes in the process of price formation.[3] Since the 1990s, electronic broking systems in foreign exchange markets have provided transparent and efficient trading venues and significantly changed the market structure of currency trading (Rime, 2003). As Berger et al. (2008) address, EBS operates an electronic limit order book system, which virtually all foreign exchange dealers use to trade in major currency pairs. Using the intradaily data of prices and trades in the Euro–Dollar spot market via the Electronic Broking Services

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[1] It is common to use the midpoint of the ask and bid quotes as a measure of the true price, because actual transaction prices suffer from the well-known bid–ask bounce effects and are more noisy than midpoints of the quotes.

[2] For example, using the TAQ data set from New York Stock Exchange (NYSE), Huang and Ting (2008) find that the price impact of buyer-initiated trades is statistically greater than that of seller-initiated trades, and they use the asymmetric price impacts of buys and sells to obtain a more accurate proxy of the unobservable true price.

[3] Pascual and Pascual-Fuster (2010) show that, in the Spanish Stock Exchange, an electronic order-driven equity market, trading costs differ between buyers and sellers, which corresponds with the strong asymmetry in the relative contributions of ask and bid quotes to price discovery.

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(EBS) platform, we measure the relative contributions of bid and ask quotes to price discovery, and investigate how the level of contribution asymmetry evolves with market quality.

In the foreign exchange market, Bessembinder (1994) finds that the placement of the quotes in relation to asset value is not constant, but rather is sensitive to the dealer's inventory holding costs.[4] In a quote-driven market, market makers may use asymmetric quotes and adjust bid–ask spread to keep their inventories from deviating too much to an optimal level, and these adjustments may cause the midpoint to differ from the true price. However, in the order-driven market, limit-order traders cannot be assumed to take undesired positions, and inventory holding costs may be negligible. Hence, the inventory holding costs will be symmetric for buyer and seller sides in the EBS trading platform.

The adverse selection costs that arise from the presence of private information should be the reason for asymmetric trading costs for buys and sells. In equity markets, adverse selection problem faced by dealers is severe when some traders have better information regarding firm-specific information. However, in the foreign exchange market, the sources of private information of dealers are the customer order flow and the central bank intervention (Covrig and Melvin, 2002; Cerrato et al., 2011; Moore and Payne, 2011). Dealers in the foreign exchange market often adjust bid and ask quotes asymmetrically to increase the spread to protect themselves from potential losses with informed traders (Bossaerts and Hillion, 1991; Lyons, 1995; Naranjo and Nimalendran, 2000; Bjønnes and Rime, 2005). Therefore, information asymmetry may affect the adjustments and informativeness of bid and ask quotes. Moreover, the presence of stale quotes or recording errors in the trade and quote data on the EBS system may alter the best bid and ask prices, as shown on the EBS screen, from the "real" best prices in the short term (Peterson and Sirri, 2003).

The contribution of this study is threefold. First, we investigate the asymmetric reaction of bid and ask quotes to information in the spot foreign exchange market, using transaction-level data from EBS trading. Second, we study the potential determinants of asymmetric contributions of bid and ask quotes to price discovery in currency trading. In particular, we examine how the adverse selection cost component of the spread and the distribution of implicit efficient prices affect the asymmetric contributions of bid and ask prices. Finally, we investigate the dynamics of the relative contributions of bid and ask quotes and the interaction between contribution asymmetry and transaction costs in the foreign exchange market.

We use both approaches of information share (Hasbrouck, 1995) and common factor weight (Gonzalo and Granger, 1995) to measure relative contributions of ask and bid quotes in the EBS Euro–Dollar market.[5] The results show that bid quotes provide more price discovery in the EBS market, and the level of asymmetry in informativeness of bid and ask quotes varies on a daily basis. This dominance of bid quotes in price discovery is stronger on Monday and is weaker on Friday. Order flow and the skewness and kurtosis of the distribution of efficient exchange rate changes,[6] as well as the interaction of order flow and spread, relate to the adjustment of bid and ask quotes to impound trade-related information.

In terms of the absolute value of the difference between contributions of ask and bid quotes, we examine the magnitude of asymmetry in price discovery. The results indicate this discrepancy changes over time and increases with spread and the kurtosis of the distribution of efficient exchange rate changes. Finally, by decomposing spread into components of information asymmetry and order processing costs, following Madhavan, Richardson, and Roomans (hereafter, MRR, 1997), we explore to what extent these two cost components relate to the magnitude of asymmetry between ask and bid quotes to price discovery. Our results suggest that the discrepancy between contributions of ask and bid quotes increases with the level of information asymmetry in the market, confirming that adverse selection costs affect the magnitude of asymmetry in relative contributions of ask and bid quotes to price discovery in the foreign exchange market.

The rest of this paper is organized as follows. In Section 2, we discuss the asymmetry in contributions of ask and bid quotes to price discovery. We then introduce the advantages of EBS data and describe our data in Section 3, followed in Section 4 with an introduction to measures of contribution to price discovery. Section 5 displays the empirical results, and Section 6 concludes.

2. Asymmetric contributions of ask and bid quotes to price discovery

Pascual and Pascual-Fuster (2010) argue that the premise of equal contributions of ask and bid quotes to price discovery reflects an assumption that bid–ask spreads are symmetric around the expected true (implicit) value of the asset. If spreads were symmetric for either side of the market, both ask and bid quotes would simultaneously move up or down after a trade-related shock, by the same increment, and the contributions of bid and ask quotes to price discovery would be the same.

Moreover, a symmetric bid–ask spread implies identical market–marking costs on either side of the trade. Spreads can be decomposed into three components: operating costs, inventory costs, and adverse selection costs (Amihud and Mendelson, 1980).[7] We can reasonably assume that for dealers, the operating costs of providing liquidity to buyers are the same as those of providing liquidity to sellers. However, inventory costs occur because the dealer or market maker who provides liquidity to buyers and sellers with different quotes bears the risk of losses caused by price movements when holding inventory. To maintain an ideal inventory position, dealers could use asymmetric quotes to attract liquidity demanders (Stoll, 1978). Therefore, a dealer's inventory position affects the placement of following bid and ask quotes, as well as the size of the bid–ask spread.

In a pure order-driven market, limit-order traders can avoid undesired inventory positions, as suggested by Pascual and Pascual-Fuster (2010). According to Rime (2003), the task of inventory control is easier when foreign exchange dealers trade through an electronic broking system, because the electronic brokers enhance market transparency and the efficiency of matching in the market. Trading through electronic brokers not only leads to a reduction in the inventory cost component of the spread but also enables dealers to control their inventory by placing a market order and paying half the spread or placing the limit order at the best bid or ask price, to avoid the cost of excessive inventory. Therefore, inventory costs should be negligible in the order-driven EBS trading platform, and variation in inventory costs does not relate to asymmetric adjustments of bid and ask quotes to information.

[4] Amihud and Mendelson (1980), Ho and Stoll (1981), and others point out that the midpoint may deviate from the true price, due to market makers' inventory costs.

[5] These two approaches are widely used to explore the extent of price discovery. For example, Mizrach and Neely (2008) and Frijns et al. (2010) use the approach of information share to study the price discovery process in the U.S. Treasury and stock markets, respectively. Using both approaches of information share and common factor component weight, Forte and Peña (2009) examine the price discovery among the stock, bond, and credit default swap markets, and Chen and Gau (2010) study the price discovery between currency futures and spot markets.

[6] In the foreign exchange market, Bossaerts and Hillion (1991) show that the distribution of future price changes leads to an asymmetric bid-ask spread.

[7] The operative costs refer to the order processing costs when the dealer or market maker provides liquidity, including for example costs for subscriptions to electronic news services, the connection to the system, and administrative expenses.