



## News announcements and price discovery in foreign exchange spot and futures markets

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### ABSTRACT

This paper studies competition in price discovery between spot and futures rates for the EUR–USD and JPY–USD markets around scheduled macroeconomic announcements. Using both the information shares approach and the common factor component weight approach for futures prices from the Chicago Mercantile Exchange (CME), as well as deal prices from spot trading on the Electronic Broking Services (EBS), we gauge how foreign exchange spot and futures markets respond to news surprises. The results show that the spot rates provide more price discovery than do the CME futures rates overall; however, the contribution of the futures rates to price discovery increases in the time surrounding macroeconomic announcement releases.

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### 1. Introduction

The effect of public information announcements on foreign exchange (FX) spot and futures rates reveals the relative efficiency between these two markets. Using recently available spot exchange rate data from Electronic Broking Services (EBS), we study the relative contributions to price discovery of both FX spot and futures rates surrounding the releases of major US macroeconomic announcements. By using EBS data, we can examine the reaction of transaction-level EUR–USD and JPY–USD exchange rates to macroeconomic information.

The price discovery process refers to how price movements react to relevant information. Understanding exactly how information gets incorporated into exchange rates is critical for understanding exchange rate dynamics (e.g., Osler et al., 2006). With high-frequency exchange rate data across currencies, we can investigate the potential determinants and characteristics of price discovery in greater detail. Furthermore, we use a broad set of synchronized survey data about market participants' expectations and thus infer "surprises" or "innovations" from announcements of macroeconomic fundamentals.

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The announcement of macroeconomic indicators may change the information structure in the market, such that the price discovery process between FX spot and futures markets varies significantly.

Studies that explore news announcement effects in currency markets generally focus only on an individual market, whether the FX spot or futures market, and analyze the impact of news announcements on market volatility.<sup>1</sup> Few studies compare the relative contribution of FX spot and futures markets to price discovery when news releases occur. However, when they compare the volatility spillover between FX spot and futures markets, both Crain and Lee (1995) and Chatrath and Song (1998) find that the volatility spillover from the futures market to the spot market is more prominent on announcement days. This finding relates to the difference in market quality of the FX spot and futures markets.

Unlike Crain and Lee (1995) and Chatrath and Song (1998), who use the volatility spillover relationship to determine which market reacts to information more rapidly, we employ the information share approach and the common factor component weight

<sup>1</sup> For example, Andersen et al. (2003) and Bauwens et al. (2005) study announcement effects on the spot FX market volatility. In addition, Ederington and Lee (1993) and Andersen et al. (2007), among others, investigate how the volatility of FX futures market is affected by macroeconomic announcements.

approach to explore the evolution of price discovery.<sup>2</sup> These two methods consider the stochastic common factor behind spot and futures rates and measure the degree of relative efficiency across related markets.

Without a centralized marketplace, the traditional interdealer FX spot market is fragmented and decentralized, with transactions occurring in different locations and at different prices. That is, the level of transparency in the FX spot market is lower, and the exchange rate may respond more slowly to information related to fundamentals, in contrast with the FX futures market on the Chicago Mercantile Exchange (CME). Crain and Lee (1995), Chatrath and Song (1998), Martens and Kofman (1998), Rosenberg and Traub (2009), and Tse et al. (2006) reveal that the FX futures market contributes more to price discovery than does the spot market.

However, the trading volume of the FX spot market is the largest among existing forward, futures, and swap transactions markets.<sup>3</sup> Because the FX futures market is much smaller than the FX spot market, it seems reasonable to infer that the spot market takes a more significant share of the price determination (Lyons, 2001). Furthermore, the active trading and higher liquidity in the FX spot market could enhance information assimilation, such that FX spot rates should react to relevant, fundamental news faster than do the FX futures rates.

The use of spot rates from the EBS could avoid mismeasurement of spot rates' pricing efficiency. Results based on both the Hasbrouck information share and the Granger–Gonzalo common factor weight show that the EBS spot market contributes more to price discovery than do the CME futures markets for both the JPY–USD and EUR–USD exchanges, consistent with Cabrera et al. (2009).<sup>4</sup> Our finding differs from the conclusions of Crain and Lee (1995), Chatrath and Song (1998), Martens and Kofman (1998), Rosenberg and Traub (2009), and Tse et al. (2006), all of whom argue that FX futures rates contribute more to price discovery than do the spot rates.<sup>5</sup> This conflict may reflect the enhanced price effi-

ciency in EBS trading (Ito and Hashimoto, 2006), which has a larger market share, more liquidity, and greater transparency than other trading venues for spot FX rates.

Other things being equal, the profit potential associated with the leverage advantage of the futures market attracts informed traders. When macroeconomic announcements are released, the information structures in FX spot and futures markets likely vary, such that the futures markets may attract more informed traders and contribute more to price discovery. Our empirical results indicate that after news announcements, the contribution of futures rates to price discovery is greater than it would be without any announcement; however, the contribution of the spot rates declines when news announcements are released.

Not only do we find an aggregated effect of news announcements in the price discovery of futures and spot rates for the JPY–USD and EUR–USD exchanges, but we also discover that several individual announcements affect the price discovery process between futures and spot markets. Moreover, some news surprises, such as the gross domestic product (GDP), employment report, and durable goods orders, have a positive impact on the price discovery of the FX futures rates. These results support the proposition that the dynamics of the price discovery process depend on the information flow and the content of the information in the markets.

The remainder of this paper is organized as follows. In Section 2, we introduce trading on the EBS. Section 3 describes the data we use for this study. After discussing how to measure contributions to price discovery through information share and common factor component weight approaches in Section 4, we summarize the empirical results and the determinants of the futures market's relative information shares over time in Section 5. Section 6 concludes.

## 2. FX electronic broking system

Spot FX transactions invariably occur in modern global electronic broking systems, mostly in the form of the EBS and Reuters D3000.<sup>6</sup> The presence of electronic brokers in the interdealer market has changed the mechanisms for FX spot trading significantly. Electronic brokers collect and match orders from screens connected together in a worldwide network. The dealers can see the pre-trade information, including the best bid prices, the best ask prices, the dealing prices, and the signs of all trades. Therefore, the introduction of electronic brokers induces a more centralized and transparent marketplace for FX trading.

We use the “deal” rates for the JPY–USD and EUR–USD exchanges, provided by the EBS, as spot exchange rates to compare their relative contribution to price discovery with that of the CME futures rates.<sup>7</sup> The EBS data provide tick-by-tick global electronic broking bid and ask quotes, as well as the lowest given and highest paid transaction prices. As noted by Ito and Hashimoto (2006), the EBS data set offers two advantages over the frequently used, indicative quotes of a foreign exchange market's tick-by-tick data set (e.g., the FXFX of Reuters). First, the EBS records “firm” quotes at which banks that post the quotes must trade when they are “hit.” The indicative quotes on the FXFX screen instead are added by dealers for informational purposes, without any commitment to trade. Indicative quotes thus are much less reliable than firm quotes

<sup>2</sup> The information share approach recommended by Hasbrouck (1995) and the common factor component weight approach proposed by Gonzalo and Granger (1995) are two widely used methods to discover the extent to which prices in different markets respond to information shocks. Using the information share approach, Mizrahi and Neely (2008), and Frijns et al. (2010) study the price discovery process in the US Treasury and stock markets. Forte and Peña (2009) adopt both approaches of information share and common factor component weight to examine the price discovery among the stock, bond, and credit default swap markets. As Hasbrouck (2002) notes, neither approach is superior, though the efficient price that Gonzalo and Granger's approach simulates is more volatile and autocorrelated. Overall, the information share approach appears to provide a more meaningful inference and have more economic relevance. Furthermore, de Jong (2002) shows that the two measures are closely related, though only the information share takes the variability of the innovations in each market's price into account.

<sup>3</sup> According to the Foreign Exchange Committee's 2005 Annual Report, the average daily volume is US\$211,799 million for spot transactions, US\$73,190 million for forward transactions, US\$155,314 million for FX swap transactions, and US\$36,721 million for over-the-counter FX options in October 2005.

<sup>4</sup> Cabrera et al. (2009) investigate the contribution to the price discovery of euro and Japanese yen exchange rates in three currency markets: GLOBEX regular futures, E-mini futures, and EBS spot markets. They find that the spot market leads the price discovery process for both currencies during April–July 2005. Instead of a short sample period, we use an extended period (January 1, 2004–December 31, 2005) so that we can study the issue of price discovery without worrying about data uncertainty due to fewer sample data. From our two-year, intra-day dataset, we compute daily information shares based on Hasbrouck (1995) and investigate how information shares relate to market quality in both FX spot and futures markets.

<sup>5</sup> For the market of Deutschemark/US dollar, Martens and Kofman (1998) find that futures prices lead the spot quotes on the Reuters FXFX by up to three minutes. Rosenberg and Traub (2009) use Reuters D2000-1 spot rates and conclude that the FX futures market offers more of a contribution to price discovery than does the spot market. Tse et al. (2006) estimate the relative contribution of the CME floor-traded (via open outcry) futures prices, electronic GLOBEX futures prices, and electronic retail online CMC spot quotes in the euro/dollar and Japanese yen/dollar markets; the GLOBEX futures prices provide the best price discovery for the euro. Our results may differ from those of Tse et al. (2006) because the EBS data we use have a higher market share in the FX market than CMC retail online trading.

<sup>6</sup> The trading platform of the D3000 (or D2000-2) was introduced by Reuters in April 1992. The EBS launched in September 1993. For a detailed description of the structure of electronic brokerage systems in the FX market, see Rime (2003).

<sup>7</sup> Ito and Hashimoto (2006) state that the EBS has a very large market share (absolute value) in the dollar/yen rate and the euro/dollar rate, compared with the Reuters D3000. It is thus reasonable to assume that almost all electronically brokered spot deals of these two currencies are represented in the EBS data.

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