

# Microstructure effects, bid–ask spreads and volatility in the spot foreign exchange market pre and post-EMU

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Available online 31 July 2006

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## Abstract

This article examines how microstructure effects, evident in high frequency data, influence bid–ask spreads and volatility in transaction price series. It uses the event of European Monetary Union (EMU), and the upheaval that this entailed, as an opportunity to empirically investigate these relationships in the electronic inter-dealer spot FX market. The microstructure effects relate to both price and time. There are two price effects, namely price discreteness and price clustering, and two time effects, namely the time elapsed between sample periods and the time-gap between successive trades or quoted price submissions. Strong evidence emerges that all four factors are important in the determination of bid–ask spreads.

This study uses a unique and rich foreign exchange (FX) dataset of global inter-dealer electronic transactions to examine microstructural effects in the spot foreign exchange market. This dataset enables us to shed new light on the debate surrounding the observations that trading volumes have fallen and bid–ask spreads have widened in inter-dealer spot FX markets following European Monetary Union (EMU). Our work provides a more detailed account of the changes that actually occurred at this time, because our data is more comprehensive than has previously been available. Our four-technical-feature explanation is in contrast to the hypothesis of market maker response to exogenous changes in volume as proposed by Hau, Killeen and Moore [Hau, H., Killeen, W., Moore, M. (2000). The euro as an international currency: Explaining puzzling first evidence. Centre for Economic Policy Research, working paper., Hau, H., Killeen, W, Moore, M. (2002). How has the euro changed the foreign exchange market? *Economic Policy* 17, 34, 149–191].

Price discreteness means that prices or exchange rates are not an infinite number of digits long, but rather they are truncated to a small number of digits. In the case of the FX market, exchange rates are specified to five digit accuracy. Price clustering refers to the fact that traders may not use all available exchange rates uniformly. In practice, rates ending in 0 or 5 tend to be used more than other rates. The time elapsed between the sample periods is important for a very obvious reason— price levels can differ radically if data is sampled from periods that are far apart in time. On the other hand, the time-gap between successive individual prices is also important because it allows these prices to drift apart. When the

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successive prices are transaction prices, this effect increases volatility. When they are successive bid and ask prices, the bid–ask spread is increased.

EMU brought widespread change to financial markets. Much of this change is directly due to the redenomination of certain instruments from Deutschmarks (DEM) to euros (EUR). Since these currency units are of different values, the nature of the price discreteness affecting instruments which are now denominated in EUR will be different from what it was under DEM denomination. This point is exemplified by our finding that the smallest sized bid–ask spread and smallest price increment for the EUR are both 74% greater than that for the DEM, after controlling for drift in currency values.

Our four proposed factors are successful in explaining the observed changes in bid–ask spreads, but are less able to explain the observed changes in price volatility. Also, our results overwhelmingly accept the price resolution hypothesis explanation for price clustering behavior in the spot FX market and overwhelmingly reject the price attraction hypothesis. In the case of the EUR(DEM)/USD bid–ask spread, we provide a deeper understanding of the technical market features that caused this to increase. We show that the widening of the USD/JPY bid–ask spread seems primarily due to the inter-temporal change in currency value. We also show that the narrowing of EUR(DEM)/CHF bid–ask spreads seems largely due a near 50% decrease in the pricing increment used. We find that increased volume has reduced the time-gap for traded and quoted prices for USD/CHF. Finally, in the case of EUR(DEM)/JPY, we find that market practice caused wider bid–ask spreads. The bid–ask spread data evidence suggests that the advent of EMU seems to have strengthened the USD's position as the dominant international vehicle currency. We consider this surprising because we believe that part of the intention in launching the single currency must surely have been the opposite.

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## 1. Introduction

This study uses a unique and rich foreign exchange (FX) dataset of global inter-dealer electronic transactions to examine microstructural effects in the spot foreign exchange market. This dataset allows us to shed new light on the debate surrounding the observations that trading volumes have fallen and bid–ask spreads have widened in inter-dealer spot FX markets following European Monetary Union (EMU). Our work provides a more detailed account of the changes that actually occurred at this time, because our data is more comprehensive than has previously been available. However, this is more than just an empirical study. We also introduce new theoretical explanations and new methodologies to this debate. These enable us to demonstrate that much of the change in bid–ask spreads and some of the change in price volatility can be explained by four technical features of high-frequency data, namely price discreteness, price clustering, the time elapsed between sample periods and the time-gap between successive traded or quoted prices. This explanation is in contrast to the hypothesis of market maker response to exogenous changes in volume proposed by [Hau, Killeen, and Moore \(2000, 2002\)](#).

It is widely acknowledged that volumes decreased in the inter-bank spot FX market after EMU (see [BIS, 2001](#)). It also became increasingly accepted that the EUR/USD bid–ask spread widened at the same time. [Hau et al. \(2000, 2002\)](#) suggested that lower FX trading volumes and wider bid–ask spreads observed since EMU, are both due to a decrease in “market transparency”. The latter hypothesis centers on the idea that the availability of fewer currency pairs after EMU makes risk management harder to implement. [Hau et al.](#) suggest that this causes market makers to quote wider bid–ask spreads, which in turn results in lower volumes.

One part of our argument has been made previously by [Goodhart, Love, Payne, and Rime \(2002\)](#). They argued that “price granularity” could account for the observed fall in inter-dealer bid–ask spreads and that reduced volumes are a coincidence due to unrelated structural changes in the industry. What they call “price granularity” is more usually called “price discreteness” in the

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