

# Frequently Asked Questions About the Micro Approach to FX

Martin Evans and Richard Lyons

July 2004

Available at [faculty.haas.berkeley.edu/lyons](http://faculty.haas.berkeley.edu/lyons)

## The Micro Approach: A Definition

The micro approach is a new approach to exchange rates whose foundations lie in microeconomics (drawing particularly from microstructure finance). The focus of the approach is dispersed information and how information of this type is aggregated in the marketplace. By dispersed information we mean dispersed bits of information about changing variables like money demands, risk preferences, and future inflation. Dispersed information also includes information about the actions of others (e.g., about different trading responses to commonly observed data). Traditional macro models do not consider that the private sector might be solving a problem of dispersed information. Rather, macro models assume that information about variables like money demands, risk preferences, and inflation is either symmetric economy-wide, or, in some models, asymmetrically assigned to a single player—the central bank. In reality, there are many types of dispersed information that exchange rates need to impound. Understanding the nature of this information problem and how it is solved is the essence of this micro-based research agenda.

### **(1) Isn't order flow—the variable that conveys information in the micro approach—just the same as the traditional concept of excess demand?**

No it isn't. Excess demand equals zero in equilibrium, but order flow generally does not equal zero (neither empirically—see plots in literature—nor theoretically). Order flow is defined as the cumulative flow of *signed* transactions, where each transaction is signed positively or negatively depending on whether the initiator of the transaction (the non-quoting counterparty) is buying or selling, respectively. At an even more basic level, then, order flow is not even the same as demand: order flow measures actual transactions, whereas demand changes need not involve any transactions whatsoever. Consider, for example, textbook models of exchange rates. In those models shifts in macro fundamentals cause shifts in demand and price, but without any transactions taking place, or needing to take place, in order for the price change to occur; i.e., demand is shifting but no order flow is occurring because at the new price people are indifferent again between buying and selling. These textbook models are unable to account for the strong positive correlations between signed order flow and the direction of price changes found in the data because they assume that all demand shifts are driven by changes in public information.

### **(2) So prices go up when there are more buyers than sellers. Isn't that all that order flow analysis is telling us? What else could be moving prices?**

Though this view of order flow analysis seems reasonable at first blush, it is missing some rather basic ideas from financial economics. One of those basic ideas is that quantities play two distinct roles—they clear markets and they convey information (Grossman JF 1976, Kyle EMA 1985, Glosten and Milgrom JFE 1985). Only the first of these roles is reflected in the “more buyers than sellers” view of why flows affect prices. The second is deeper (and too often missed). It arises in contexts where information is dispersed because transaction flows affect people's *expectations* (about future fundamentals and prices). That this second role is empirically relevant in foreign exchange is clear from, for example: (1) findings that transactions have different effects on price, dollar for dollar, depending on the institution type behind them and (2) findings that transaction flows in one currency market have price effects in other currency markets, despite not occurring in those other markets.

There is another basic idea in financial economics that the above question is missing. It is tied to the second part: What else could be moving prices? As noted, order flow measures actual transactions. It is well understood in financial economics that shifts in demand can move price without involving transactions. So long as the shift in demand is common knowledge—say, because it is driven by the arrival of public information—then there shouldn't be any relation between signed transaction flows and the direction of

price movements. Put differently, in textbook exchange rate models (all of which are based wholly on public information), order flow plays *no* role in moving prices—a sharp contrast to the 100 percent role suggested by the second part of the question.

**(3) Isn't order flow an endogenous variable?**

Yes, it is. But remember, the explanatory variables used in traditional macro models (money, income, and interest rates) are also endogenous variables. Endogeneity is not in itself a serious shortcoming of New Micro theory. What theory must provide—and does provide in this case—is a means for understanding why causality should run from order flow to price (despite order flow's endogeneity). The reason causality runs from quantities to prices under the New Micro approach relates to information, e.g., order flow is correlated with information that is not known by all market participants (such as micro-level information about firms' or individuals' money demands, outputs, or risk preferences). Order flow, then, is a *proximate* cause of exchange rate changes, with the underlying dispersed information being the primitive cause.

**(4) But how can we ever learn what is behind the order flow, i.e., what is causing it?**

In fact, the emerging literature offers many approaches to addressing this question. Examples include the following: (1) Empirically flow appears to serve as a kind of expectation “proxy” in the sense that it reflects individuals' heterogeneous expectations about future macro variables, including an ability to forecast those variables; (2) The arrival of macroeconomic news has been shown to drive flow, perhaps because people's exchange-rate expectations respond differently to the same data; (3) The arrival of other market states has been shown to drive flow, e.g., periods encompassing central bank intervention; (4) The information content of flow has been shown to differ by source, leading to analysis of the types of information specific agent-types might have; And (5) trades in many major markets, e.g., the \$/€ market, have been shown to convey information relevant for other rates, e.g., the \$/¥ rate. These cross-market results help identify the nature of the underlying information (e.g., whether it is \$ specific). Researchers in the field are pursuing these strategies as well as others. As results emerge we'll have an increasingly clear picture of the underlying sources of exchange rate shocks.

**(5) If these are some of order flow's causes, what are its consequences, i.e., what does it matter?**

Well, as an empirical matter, one of order flow's consequences is well understood: order flow innovations definitely affect prices, and in fact account for a substantial share of exchange rate variation (in the 30-80 percent range for major floating rates against the dollar; see, e.g., Evans and Lyons JPE 2002, Evans and Lyons JIMF 2002). The consequences of these price effects for many different issues are now being addressed in the literature. For example, the long-standing topic of “excess volatility” is being revisited in light of the empirical effects of order flow on exchange rates. This includes fresh analysis of related policy issues like Tobin taxes. Another natural consequence being addressed empirically is trading volume. On the theory side, the radically different information structures suggested by New Micro analysis are prompting people to revisit issues like the emergence of international currencies (e.g., the dollar's role as a global vehicle currency and the possibility that the euro might supplant it).

**(6) Doesn't public information induce order flow, so that causality is reversed (e.g., good news for the dollar causes the dollar to appreciate and also stimulates trades initiated by dollar buyers)?**

No, not under the assumption of rational markets. The confusion here mostly likely stems from confusion between order flow and volume. In many models it is true that public information (and the resulting price change) induces trading volume. But trading volume and order flow are different concepts. Indeed, that public information does not affect order flow is a working premise with a long history in empirical finance, dating back at least to the work of Joel Hasbrouck (JF 1991, RFS 1991), and serving as the basis for a host of papers in top finance journals since Hasbrouck's work (e.g., empirical papers by Madhavan, O'Hara, Stoll, Hasbrouck, and many others). It is now a standard assumption in that literature.

Of course, if the assumption is wrong, or implausible, then it is a bad assumption regardless of how often it is used. Consider the following quote, offered as a possible counter-example to the assumption. Understanding why it is not in fact a counter-example brings the related economics to the fore:

*“Suppose there are two types of agents—risk neutral and risk averse. There is public news about increased riskiness of the mark, which directly affects the exchange rate. That is, even in the absence of trade, the price of mark assets declines because they are perceived as riskier. But it will also lead to trade in assets—risk-averse agents will want to dump some of their mark assets now that they’re riskier, and the risk-neutral agents happily buy them. This counterexample is a simple one with perfectly rational agents. In general, it is natural that news should induce trade in assets—for whatever reason.”*

True, it is quite plausible that public news should induce trade in assets. But trade in assets is volume, not order flow. The order flow implications of the offered counterexample are zero: at the new market-clearing price—reached instantaneously since all trades here are predictable—risk-neutral agents initiate mark purchases and risk-averse agents initiate mark sales of offsetting magnitude (market-clearing). The price established should not systematically favor imbalances of either mark sell orders or mark buy orders (i.e., there should not be a correlation between bad public news for the mark and subsequent net mark sell orders, so long as the update of the market price is rational).

### **(7) Don’t price changes themselves induce order flow, so that causality is reversed (e.g., various types of feedback trading)?**

Causality between order flow and price changes is definitely a two-way street. For example, virtually all models of trading involve a type of reverse causality—what people commonly refer to as “liquidity provision.” That is, they include rational participants who, upon seeing prices rise and inferring that the rise is not fully justified by fundamentals, are willing to sell into the rising market (and vice versa). This is of course a fully rational form of feedback trading, one that has been well understood in exchange rate economics since at least the work on “stabilizing speculators” by Milton Friedman.

Econometrically, the key to separating this standard type of feedback trading from informative order flow (there are, after all, two sides to every transaction) is to separate demand-curve *shifts* from price-induced movements along curves. There is information in unexpected curve shifts, but no new information in movements along known curves. Order flows—by tracking the initiating side of transactions—are a theoretically sound way to distinguish shifts in demand curves from movements along demand curves.

Though causality between flow and exchange rate changes is a two-way street, there is an emerging consensus that exchange rate movements are driven predominantly by flow, at least in the major markets. That consensus is built from two basic facts. First, flow effects are empirically present and substantial: nobody is arguing that flow has no causal effect on price, with causality running *wholly* in reverse. Of course, this first fact is not, in itself, enough to establish that price movements are driven predominantly by flow. It must also be true that non-flow-driven price movements are small relative to flow-driven movements. Enter the second fact underlying the consensus: the alternative to flow-driven prices—namely direct price effects from public information arrival—empirically accounts for a very small proportion of *total* exchange rate variance (less than 5 percent, as shown in many event studies of news and exchange rates). In the end, it is only in the following more narrow sense that causality remains an open issue: the issue is the degree to which order flow—even when measured in the theoretically correct way for capturing demand-curve shifts—still reacts to price, rather than reflecting innovations in underlying dispersed information. This is an important question: if causality is not running only from order flow to price, then OLS coefficients measuring of the size of price effects are biased (the direction of the bias depending of the direction of the reverse causality, e.g., positive versus negative feedback).

At the same time, one needs to be a bit careful with the notion of reverse causality in the context of trading foreign exchange. For example, some argue that trading strategies like “the trend is your friend” or “momentum” produce positive feedback that can explain the strong positive correlation found in aggregate data between flows and price. But it is not enough for *some* people to follow these strategies; it must be true that the market *on average* follows these strategies (on average because we are speaking of aggregate flows here). This is a higher hurdle. In fact, empirical work on this topic in foreign exchange finds the opposite result: the direction of feedback trading in aggregate interbank data is, if anything, negative (Evans and Lyons JME 2002). The empirical case that feedback from price to flow is driving the positive correlation between price and flow is not so compelling at present.

**(8) Suppose order flow occurs after price changes, can't we infer in that case that price changes are causing the order flow?**

Temporal ordering does not generally imply causal ordering, and this is no exception. Here is a simple counter-example, which builds on the exchange rate being an asset price. Suppose flows are positively correlated over time (net purchases are followed by net purchases, on average, and vice versa) and also that flows are not in any way caused by price. (Transaction flows of FX end-users are in fact positively auto-correlated.) Now remember that exchange rates are forward-looking asset prices, and so effects from expected future flows should be fully discounted upfront. So, a positive shock to dollar buying today will increase the value of the dollar today and will also be followed by further positive flow into dollars; i.e., the current price increase will forecast these future positive flows. Though the price increase occurs before the subsequent dollar purchases, there is no positive feedback trading: by construction causality is running wholly from flow to price. Bottom line: because the exchange rate is a forward-looking asset price, one should not conclude that prices are causing flow just because prices sometimes precede flow. (Current research is taking care to distinguish expected from unexpected flows, where the expected component should be based on information that is publicly available for it to have no price impact.)

**(9) Aren't order flow's effects on prices temporary?**

It is true that some of order flow's effects on price are temporary. The classic example is what is called "bid-ask bounce," that is, the bouncing of transaction prices back and forth from the bid side of the market to the ask side as alternating buy and sell orders arrive.

But the presence of temporary effects does not rule out persistent or even permanent effects. As a theoretical matter, as long as order flow is conveying information relevant to exchange rates then its effects on price should persist. That it does convey such information has been established in many studies, both micro and macro, using many different approaches. In FX, see, e.g., the brief survey in the book by Lyons (MIT Press 2001), pages 22-26. In equities and bonds, see the survey by Madhavan (JFM 2000).

Think of it this way. It is a well-known fact that exchange rate changes (major floating rates) at the daily frequency are very nearly a random walk. It is also a fact that every change in the level of a random walk is a *permanent* change (i.e., is relevant for that process' level at the infinite horizon). This helps understand why empiricists in this area have been looking at daily data rather than intradaily data: when exchange rate returns are time-aggregated to the daily frequency the temporary return components are "integrated out." So, when studies show that order flow explains 30-80 percent of daily exchange rate changes, the random-walk behavior of daily rates implies that these effects remain present over the long term. (Don't forget, for effects of this magnitude to dissipate rapidly would be a gross violation of market efficiency in any event.)

For those more econometrically inclined, one might ask whether order flow cumulated over time is also non-stationary, and whether cumulative flow and price might be cointegrated, as a truly permanent link between them would imply. There is some evidence of this, though the data samples for order flow are as yet on the short side for doing this sort of long-run analysis (see, e.g., Killeen et al. 2001, NBER WP 8491).

**(10) Isn't the micro approach dependent on the idea that FX institutions are what really matters?**

No, not really. The micro approach to FX is dependent on the idea that what really matters is the market's information structure, and that the true information structure—with lots of dispersed information—is radically different than in traditional models with purely public information. Though much "primitive" information is dispersed (primitive meaning independent of trading institutions), it is true that information structure depends on institutions, e.g., institutions determine the degree to which order flow is observable.