12nd session

15th May 2014

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The Microstructure of the Foreign Exchange Market

↳ Evans (2005)
↳ Lyons (2001)

- Alternative to traditional approaches.

- Trading Volume.

- News. Macroeconomic variables – public information – exchange rate should jump, even without trades.

- Differences in the types of participants, not using the totality of the available information, differences in the mechanisms of transaction influence prices. **The importance of details.**

Evans, 2005, Foreign Exchange Market Microstructure, mimeo

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- Foreign exchange market:
  - multiple *dealers*
    - Two segments: 1st- *dealers* trade with clients; 2nd- *dealers* trade among them.
  - Inexistence of physical space. Decentralized. Transactions can take place by phone, telex or computer system. Interdealer market : mostly electronic.
    - Electronic Broking System (EBS)
    - Reuters D3000
  - Reduced transparency. The order flow is not public observation. Only every 3 years BIS publishes the aggregate volume.
  - Very liquid. The foreign exchange rates with higher liquidity: euro-dollar, yen-dollar, sterling pound-dollar. Large volume.
  - Most of clients – institutions. Individuals with much less weight than in other financial markets.
  - High frequency movements of exchange rates with little correlation with the fundamentals.

- Importance of information. Importance of order flow. As the dynamics of spot rates are largely attributable to the effects of news, microstructure models have a big advantage over traditional models because they provide details on how news affect exchange rates.

- The equilibrium foreign exchange rate is a result of the prices quoted by *dealers*.

- New information only impacts the foreign exchange rate if it impacts *dealers'* quotes.

- D*ealers* may change their quotes after macroeconomic news or following the observation of order flow, both from clients and from other *dealers*.

- Dealers - News concerning fundamentals – Direct Channel or Indirect Channel
  - Direct Channel:
    - Common Knowledge – immediately incorporated into the price dealers quote.
    - Macroeconomic announcements could be a source of Common Knowledge news but in practice it is seldom new information - Common Knowledge news events are rare.
    - Also, if agents have different views about the mapping from the announced variable to fundamentals, then the news contained in any announcement, while simultaneously observed, will not be common knowledge.

- Indirect Channel:

  - Order flow: net demand for a particular currency: the value of buyer-initiated orders minus the value of seller-initiated orders.

    - Conveys dispersed information. Examples: sales and orders for the products of firms, market research on consumer spending and evolution of demand, private research about the economy by financial institutions …or the particular interpretation of public variables.

    - The order flows are private information to the specific dealer.

    - Dealers use their private information in interdealer trade. Therefore, information on their customer orders is aggregated and spread across the market. INFORMATION AGGREGATION

- Who are the informed traders in the FOREX?
  - There are no rules about the information that must be revealed in the foreign exchange market.
  - To identify whether participants are typically informed, examine whether their trades anticipate FX returns. If an agent consistently tends to buy (sell) before prices rise (fall) one concludes he is informed.
  - *Dealers* receive information concerning their clients' order flow, which is not observed by other *dealers*. They also receive information that is not public related with the transactions with other *dealers*. Brokers publicize information: the direction of the last transaction and the change in the available quantity on the side of the last transaction.
  - Central Banks

The explanatory power of order flow

- Evans and Lyons (2002) Order Flow and Exchange Rate Dynamics

$$\Delta s_{t+1} = \beta_i \, \Delta(i_t - i*_t) + \beta_z \, z_t$$

Δs_{t+1} : first difference in log of daily foreign exchange rate

$\Delta(i_t - i*_t)$: first difference in interest rate differential (public information)

Z_t : difference between nr of buyer-initiated trades and seller-initiated trades during the day.

- Later models: Z_t is signed trade size

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- The order flow has explicative power with relation to the foreign exchange rate changes. It explains approximately 0,5 of the variation, whereas *fundamentals* typically explain no more than 0,1.

- The impact of order flow on price is a function of the order size , of the time of day and of the horizon.

- As time passes, the effect of order flow on price decreases.

- In traditional macro models, the order flow has no role. The expectations about the foreign exchange rate are influenced by the arrival of information and the price is automatically adjusted with no need for transactions.

- However, about 2/3 of the influence of news on the foreign exchange rates and on volatility runs through the order flow.

- Do order flows from different market participants affect the exchange rate in the same way?
  - Some studies find different effects of order flow on exchange rates from financial and non-financial traders [Carpenter & Wang (2003) , Mende & Menkhoff (2003), Marsh & O'Rourke (2005), Bjonnes et al (2004)], from important financial centres and the rest [Menkhoff & Schmeling (2008)].
  - The order flow from financial customers is positively associated with the exchange rate; the order flow from non-financial customers is either uncorrelated or negatively correlated with the exchange rate.
  - The financial institutions are dominant influencing the exchange rates. Non-financial institutions basically provide liquidity.
  - Financial institutions (hedge funds, insurance companies, pension funds, etc) get smaller bid-ask spreads. To extract private information, dealers are willing to give them better conditions.

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- Empirical Evidence

  - Difficulties

    - Availability of order flow data for considerable time spans and covering several dealers.

    - Customer trading: decentralized, no electronic platform, confidential data.

  - Some empirical success

  - Evans and Lyons (2002): Aggregate interdealer order flow in the spot dollar/DMark on day d accounts for 64% of the variation in the depreciation rate between the start of days d and $d+1$. Macro models can account for less than 1% of daily depreciation rates.

    The same contemporaneous relationship was found for other currencies, with different frequencies (from one day to one month) and in different studies.

  - The order flow of a currency pair may affect the exchange rate of different currency-pairs.

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VOLUME

- Hot Potato Model (Lyons 1997) – justification of the high trading volumes in the foreign exchange market, not justified by Exports and Imports.

A trader trades a large size (block)

Contacts a dealer

Dealer departs significantly from the desired position

High risk that prices move adversely

In order to reduce that risk, the dealer breaks the order trading using the other dealer's quotes

The block is passed on, creating a volume of transactions that is larger than the initial order

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- Is there information in Volume?

Not clear.

- If agents trade currencies as new information arrives to the market, and if this trading change exchange rates, exchange rate volatility should be positively related to trading volume.

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Returns and volatility

Osler 2008 http://people.brandeis.edu/~cosler/

- Excessive volatility: the foreign exchange rate is much more volatile than the fundamentals.

- Similar fundamentals correspond to a higher volatility in floating exchange rates. Dornbusch overshooting.

- Exchange rates are frequently described as following a random walk at the daily horizon. The unconditional autocorrelation of daily returns is approximately null. At the highest frequencies (5 mins, for e.g) not a random walk.

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- $s_t = s_{t-1} + u_t$

$$u_t \sim N(0, \sigma_u^2)$$

The autocorrelation of returns is null, on average: the level of the returns is not predictable.

However, the square of returns exhibits autocorrelation – <u>volatility clustering</u>

- Strong autocorrelation of volatiliy: volatility is clustered in time (ARCH/GARCH) – Large changes tend to be followed by large changes of either sign. Periods of high volatility alternate with periods of tranquility.

  - Baillie and Bollerslev (1991) : The patterns of hourly volatility are similar among countries and are associated with the opening and closing of time zones of foreign exchange markets.

  - Trading interdealer volume and volatility move together

    - Asia opens – volume and volatility rise modestly from overnight lows

    - U – shape during Asian trading hours

    - Another U-shape during London morning

    - Both peak at the closing of London

    - Decline monotonically after that until Asian trading opens.

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- Types of *volatility clustering*. Heat waves *vs* meteor showers [Engle, Ito & Lin (1990)]
  - Decompose daily change in exchange rates into the parts occurring at the working times of each market segment.
  - The expected hourly variance for a segment of the market is a function of the shock on a different market segment.

- Time patterns of volatility
  - Lunch time and week-ends (lower volumes) - lower volatility. 1st hour of trading on Monday –highest volatility
  - Positive association between volume and volatility interpreted as a common influence. Larger nr of *traders* - higher probability of disagreement about the right prices. Frankel & Froot (1990) find evidence that a measure of dispersion that quantifies the forecasts disagreement with survey data obtained by asking *traders* causes (Granger causality) both volume, and volatility.

- Announcements usually increase volatility, but not always. Ex: FED announcements decrease volatility – reduction of uncertainty.

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Incorporation of market microstructure findings into traditional models (hybrid)

- More realistic.

- Capable of performing tasks typical of general macro models: simulations, forecasts, welfare analysis.

- Example: Bacchetta & Wincoop (2004): Monetary model [money market equilibrium, ppp, uncovered interest parity] but with heterogeneous economic agents [asymmetric information]

  - No strong co-movement between short run exchange rates and fundamentals.
  - The exchange rates and the order flow move close.
  - In the Long run fundamentals determine the exchange rate.

Final remarks- What role for the Macro Approach?

- Macro fundamentals as a means of "setting the parameters" within which microstructural models may be constructed.

- Even though the nominal exchange rate is hard to distinguish from a random walk even at the 1-year horizon, a simple macro fundamentals-based model outperforms the random walk at horizons 5 years+.

- The process by which information is obtained and disseminated in the FOREX is only analysed in the microstructural approach.

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- Time-of-day complicate the relation between order flow and returns, with unstable coefficients across different time intervals.

- Relationship between order flows and fundamentals.

  - If the dealers set prices taking into account the expectations regarding future fundamentals based on information, current exchange rates must have predictive power for fundamentals. There is some evidence to that effect, although the predictive power is limited.

  - Although verifying that dispersed information is impounded into prices via interdealer order flow is important, it does not provide evidence on the "ultimate source of exchange rate dynamics".

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- Another example: Evans and Lyons (2004)

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