11th session

8th May 2014

- **Dealers** ⮧ Harris: chap.13

- Obtain a profit by selling high and buying low.

- They supply liquidity. They are passive *traders*: they trade when other traders want to trade.

- They can speculate, trying to predict future price changes looking at the order flow they get.

- Not commissions, *spread.*

- Directly or through brokers.

- Directly: the *bid* and the *ask* are requested before one reveals on which side one is.

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- Dealers quote a bid and an ask but they usually prefer one of the sides. For example, if they prefer to buy, they raise prices (both the bid and the sell).

- Inventories rise when dealers buy more than they sell and fall when they sell more than they buy. (*Inventories* are positions that dealers have on the security they trade.)

- Targets Inventories: positions they want to hold.

- Inventory imbalance: difference between the actual level and the target inventory.

- cost of having an inventory: lose when prices move against the position –<u>Inventory Risk</u>

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- The inventory risk is lower if the dealer is able to rebalance inventory quickly.
  - Buy quickly after selling
  - Sell quickly after buying

  } Round-trip transactions

Inventory control

- Inventory level too low:
  - Raise the *bid*.
  - Raise the *ask*.
  - Take another dealer's *ask* . Fast. Costly.
- Inverse.
- Price discovery process— Search for prices that ensure a balance between Demand and Supply.

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- Types of inventory risk:
  - <u>Diversifiable inventory risk</u> - Uncorrelated with the inventory imbalance .Changes in P that cannot be predicted, zero on average. Dealers gain and lose with equal probabilities.

  - <u>Adverse selection risk</u> - informed traders. ↘P after the *dealers* buy and ↗P after the *dealers* sell.

- Trading with the informed traders (on only one side of the market) causes divergence from the inventory target.

- Setting the quotes close to the fundamental values allows to avoid informed traders. In practice, dealers worry about the price discovery process. Fundamental values are a by-product.

- When the *dealer* suspects he traded with an informed *trader*
  - adjusts quotes to avoid keep on offering profit opportunities.
  - If has sold: raises quotes. Discourages a new sale. Encourages purchases that rebalance inventory.
  - If has bought: lowers quotes. Discourages a new purchase. Encourages new sales that rebalance inventory.
- When the *dealer* wants to avoid trading with an informed *trader*
  - He tries to determine what informed traders are doing. If he suspects that informed traders are buying, he raises his quotes. If he suspects that informed traders are selling, he lowers his quotes. – prices reflect information.

- Informed traders prefer to trade anonymously, using brokers to arrange their trades.

- *Dealers* form an opinion. Large orders, impatient traders. However, all are suspect.

- If the next buyer is an informed trader, the *ask* should be higher.

  If the next seller is an informed trader, the *bid* should be lower.

- *Ask* as the expected value of the fundamental value given the probability that the next t*rader* is a buyer. Conditional expected value .
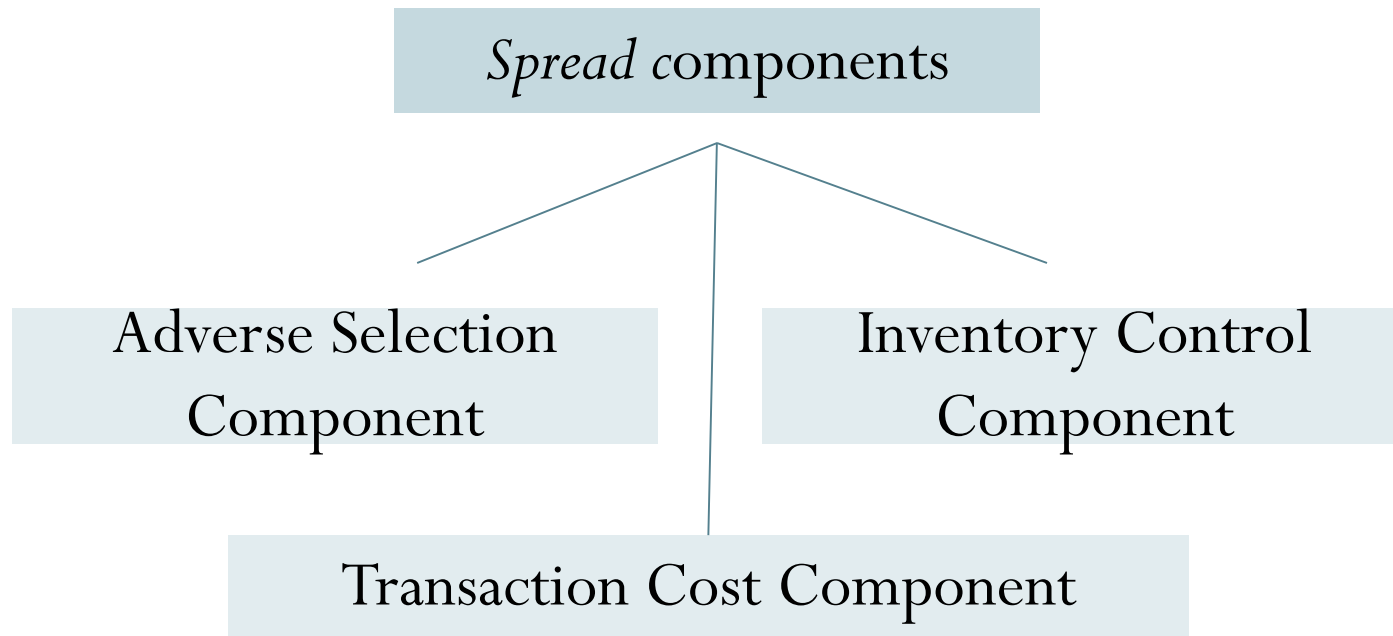
  Bid as the expected value of the fundamental value given the probability that the next t*rader* is a seller. Conditional expected value .

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- If dealers suspect the next trader is informed, they increase the *spread*. **Adverse selection component**.

- Larger *spreads* for larger orders

- Pricing mistakes:
  - Adjust the quotes too much, giving excessive weight to the probability of trading with an informed trader. They may move prices away from fundamental values and create profitable opportunities for well-informed traders.

  - Fail to adjust the quotes enough after trading with informed traders, losing when prices move against the inventory.

- Trade deliberately with well-informed traders: lose by trading on the wrong side of the market but obtain valuable information. Adjust prices quickly to avoid keep on losing.

- *Spread*   ⇩ Harris: chap.14

- cost of immediacy and compensation for supplying liquidity.

- When the *spread* is large, there is less incentive to place market orders and more incentive to place limit orders.

- Low competition: possibility of setting the *spreads* in order to maximize profits.

- More elastic demand: smaller *spreads*.
- In competitive dealer markets, *spreads* adjust until dealers earn "normal profits".

Spread components

Adverse Selection Component

Inventory Control Component

Transaction Cost Component

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Transaction Cost Component

- operation costs (wages, space costs, accounting…).
- Demsetz (1968)

Inventory Risk Component

- Dealers are not passive providers of immediacy, they actively adjust the spread in response to fluctuations in inventory levels. Risk-averse, demand compensation for the costs of building up positions to accomodate order flow.
- Stoll (1978), Ho & Stoll (1981, 1983), Amihud & Mendelson (1980)

Adverse Selection Component

- Copeland e Galai (1983), Glosten & Milgrom (1985), and Easley & O'Hara (1987).

- If the *spread* was set so that only transaction costs and inventory risk are covered, trading with informed traders would drive dealers out of the market. S*pread* is widened to cover the adverse selection risk.

- Information Perspective: It is the difference between the expected fundamental value conditional on the next trader being a buyer and the expected fundamental value conditional on the next trader being a seller.

- Accounting Perspective: it is the part of the *spread* that compensates the dealer for what they expect to lose by trading with the informed traders.

- Glosten-Milgrom theorem: the two perspectives are equivalent.

- <u>1st perspective</u> (information)

  - Unconditional Value : *V*.

  - The probability that the next order is a buy order is equal to the probability that the next order is a sell order.

  - Probability that the next *trader* has superior information : *P*.

  - If the informed *trader* wants to buy: value $=$ V+E.

    If the informed *trader* wants to sell: value $=$ V-E.

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- *Spread:* the difference between the expected fundamental value conditional on the next trader being a buyer and the expected fundamental value conditional on the next trader being a seller.

- Expected fundamental value conditional on the next trader being a buyer $= P.(V+E) + (1-P).V = V + E.P$

- Expected fundamental value conditional on the next trader being a seller $= P.(V-E) + (1-P).V = V - E.P$

> *Spread* (adverse selection) according to the 1st perspective $= 2E.P$

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- ## 2nd perspective (accounting)

  - *Spread:* value that compensates the expected loss for trading with the informed traders

  - If the next order is a sell, the *dealer* buys at B.

    - If the trader is uninformed, the dealer gets $V - B$.
    - If the trader is informed, the dealer gets $(V - E) - B$.

  - If the next order is a buy, the *dealer* sells at A.

    - If the trader is uninformed, the dealer gets $A - V$.
    - If the trader is informed, the dealer gets $A - (V + E)$.

  - The *dealer* will not lose on average if :

    - $(1-P) . (V - B) + P . [(V - E) - B] + (1-P).(A - V) + P . [A - (V + E)] = 0 \quad \Leftrightarrow$

$$A - B = 2P.E$$

- Determinants of the size of the *spread*
  - Asymmetric information
  - Volatility
  - Utilitarian trading interest.

- The only one that is easily measurable is volatility.

- Asymmetric information (already seen)

- Volatility

  - Assets with high volatility should have wide *spreads*. Inventory risks are higher because possible losses are larger. Risk-averse dealers charge a risk premium.

  - It is more difficult to be fully informed about the value of very volatile assets, so the information asymmetry problems are greater.

- Utilitarian trading interest
  - When utilitarian trading interest is strong, the markets are very active. Active markets tend to have narrow *spreads*.
    - When utilitarian trading interest is strong, the adverse selection component of the *spread* is smaller because information is more diluted in the order flow.
    - Dealers that trade actively can spread their fixed costs over more volume- small transaction costs component.
    - The inventory risk is smaller, because it is easier to lay off inventory imbalances
    - Those who place limit orders prefer to do it in more active markets because the probability that they are quickly executed is higher. That narrows *spreads* in these markets (competition between *dealers* and limit orders).

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Liquidity

- The ability to trade large size quickly, at low cost. 3 dimensions

- Impatient *traders* take liquidity.

- *Dealers,* limit order traders offer liquidity.

- Brokers and exchanges organize liquidity.

- Liquidity is the object of a bilateral search, in which buyers look for sellers and sellers look for buyers . When they are matched under acceptable conditions they have found liquidity.

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Change	Hold constant	Implication
Spend more time searching	Size of trade. Price willing to pay or receive.	Expect to find: better price, more size.
Increase size of desired trade	Time spent searching. Price.	Expect to find: worse price, more time searching.
Offer a better price	Size of trade. Time spent searching.	Expect to find: less time searching. more size

Harris 2003, p.398

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- Liquidity dimensions:
    - Immediacy – how quickly trades of a given size can be arranged at a given cost.
    - Width– cost of doing a trade of a given size *(spread*, commissions).
    - Depth – size of a trde that can be arranged at a given cost.

- Width and Depth are duals to each other: To minimize the cost given the size is similar to to maximize the size given the cost.
- Impatient *Traders* – immediacy.
- Patient *Traders* – width
- Large *Traders*– depth.

- Liquidity in the same market may be different to different *traders*. For example, for a *trader* known as well-informed, liquidity may be lower than for another type of trader.

- Assets for which the fundamental values are not well known tend to trade in illiquid markets – fear of trading with a better-informed trader.

- Volatility
- Price Variability.
- Volatility – risk.

- Fundamental Volatility *vs* Transitory Volatility
  - Fundamental Volatility : variation in prices that is a result of the change in fundamental values. Expected changes in fundamental values usually do not change prices.

  - Transitory Volatility : variation in prices that is a result of a divergence from fundamental values caused by uninformed traders. It is transitory because prices will eventually revert to fundamental values. The simplest form of transitory volatility is the *bid/ask* bounce. Large trades and cumulative order imbalances created by uninformed traders also cause prices to move from their fundamental values.

  - Total volatility = Fundamental volatility + Transitory volatility

- Measuring Volatility
  - Variance of price changes (returns): $\sum[(\Delta P - \overline{\Delta P})^2]/N$
  - Standard deviation of returns: square root of variance.
  - Absolute average deviation:

$$\sum |\Delta P - \overline{\Delta P}|/N$$

  - Statistical models are necessary to separate the fundamental and the transitory components. The fundamental component must exhibit random price changes that do not revert. The transitory component should exhibit reversion.

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- The probability of informed trading

  - Inferring trade direction when data series do not contain that information
    - When bid/ask quotes are available – compare the trade price with the quotes existing at the time of the trade.
      - At or above the Ask – Buy
      - At or below the Bid – Sell
      - Within the Quotes - unclassified
    - When bid/ask quotes are not available, and for trades within the quotes – Tick Test
      - Uptick – Buy
      - Downtick – Sell
      - Zero-tick – equal to the previous trade

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The Microstructure of the Foreign Exchange Market

↳ Lyons (2001)

- Alternative to traditional approaches.

- The foreign exchange rate as a result of the market participants' individual optimization problems.

- 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.**

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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.

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- Indirect Channel:

Order Flow – (positive: more buyer initiated trades than seller initiated trades)

- 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?

Menkhoff & Schmeling (2008)

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

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References

- Lyons, 2001, The Microstructure Approach to Exchange Rates, MIT Press: Cambridge, MA

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