Exchange-Rate Dynamics
Chapter 8

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Identifying Order Flow

Outline:

1. Order Flow in a Rational Expectations Model
   i. Walrasian Equilibrium
   ii. Supporting the Equilibrium via Trade in a Limit Order market
   iii. Market Orders and Order Flow
   iv. Exchange Rate Dynamics and Order Flow

2. Order Flow in a Limit Order Market
   i. The Trading Problem
   ii. The Structure of Limit Orders
   iii. Information and Order Flow

3. Estimating Order Flow
   i. Estimating Order Flow from Portfolio Holdings
   ii. Estimating Order Flow from Transactions Prices

4. Summary

8.1 Order Flow in a Rational Expectations Model

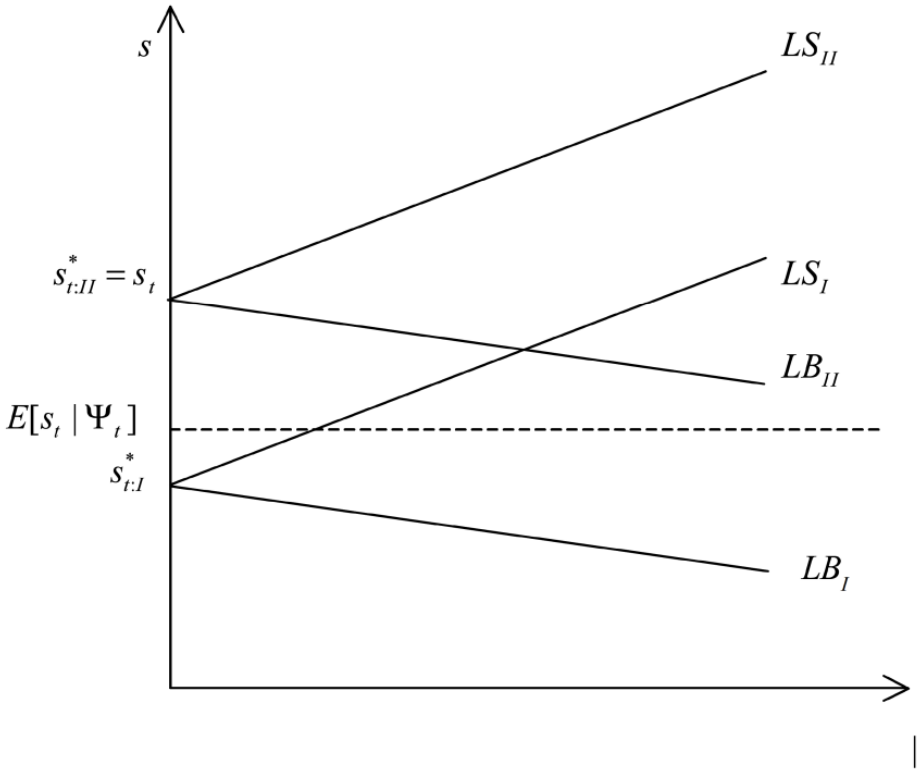


Figure 1: Limit Orders Supporting the Walrasian Equilibrium

Notes:

- The round i limit orders converge at a point that differs from household prior common expectations regarding the Walrasian rate for the period to compensate for the change in the hedging properties of EU bonds as more information becomes available.

8.2 Order Flow in a Limit Order Market

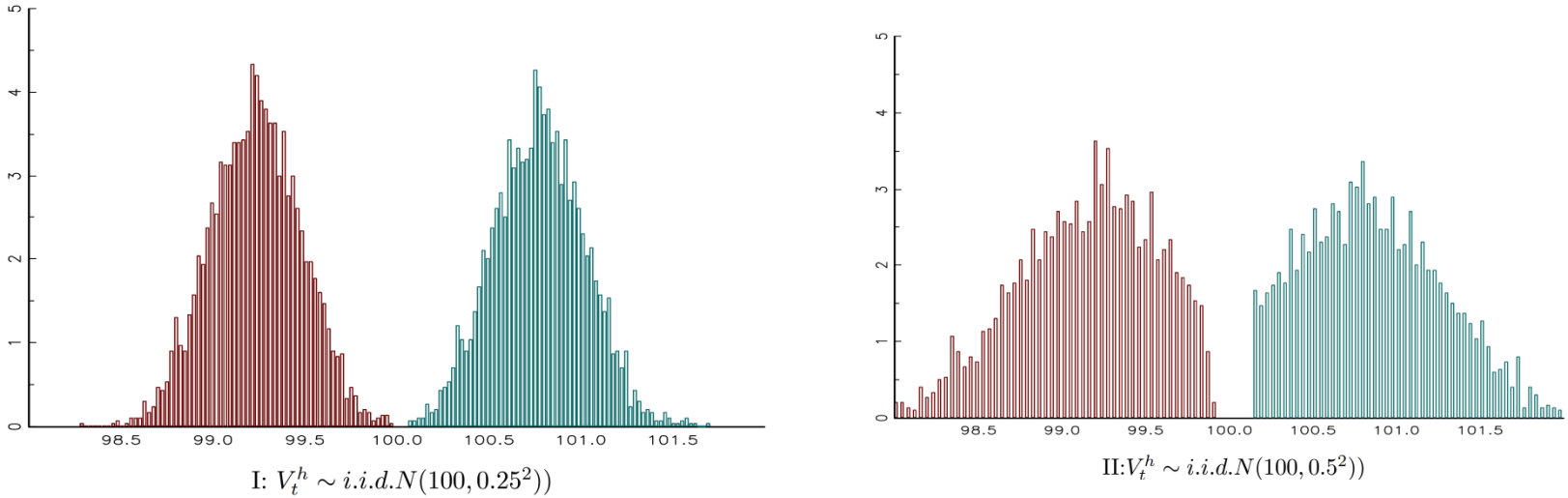


Figure 2: The Structure of Limit Prices; ask prices in green, bid prices in red.

8.2 Order Flow in a Limit Order Market

Information and Order Flow

Consider the trading implications of a shift in the distribution of reservation prices across households.

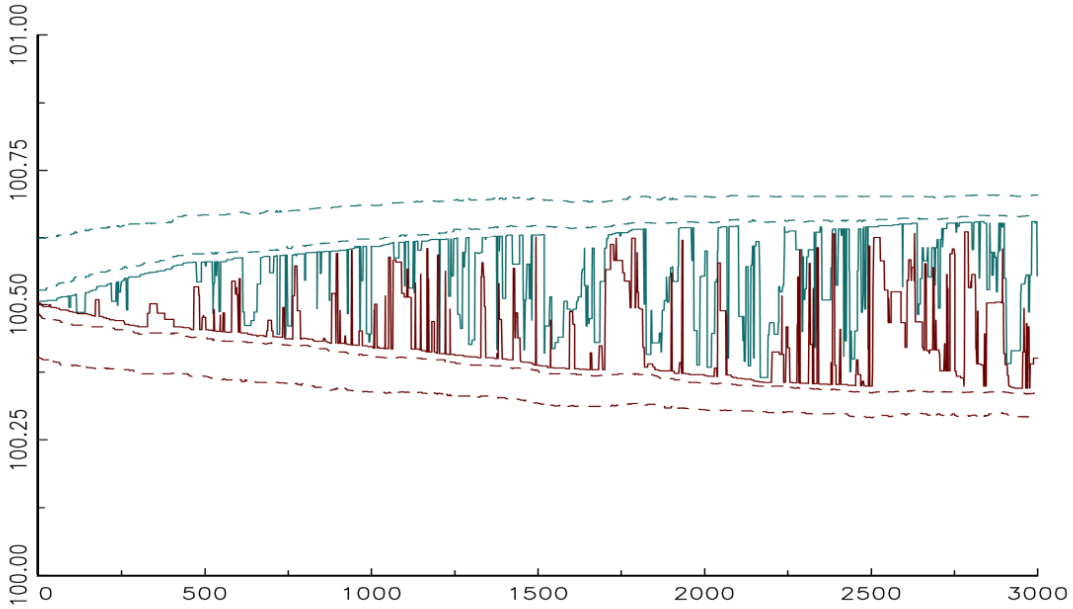


Figure 3: The Evolution of Limit Prices

Approximately 24% of households submit market orders when given the opportunity to trade but there are very evenly split between market purchases and sales. Consequently, aggregate order flow over the period is approximately zero.

8.2 Order Flow in a Limit Order Market

Now assume that there is a fixed cost to revising any outstanding limit order at the start of period t+1.

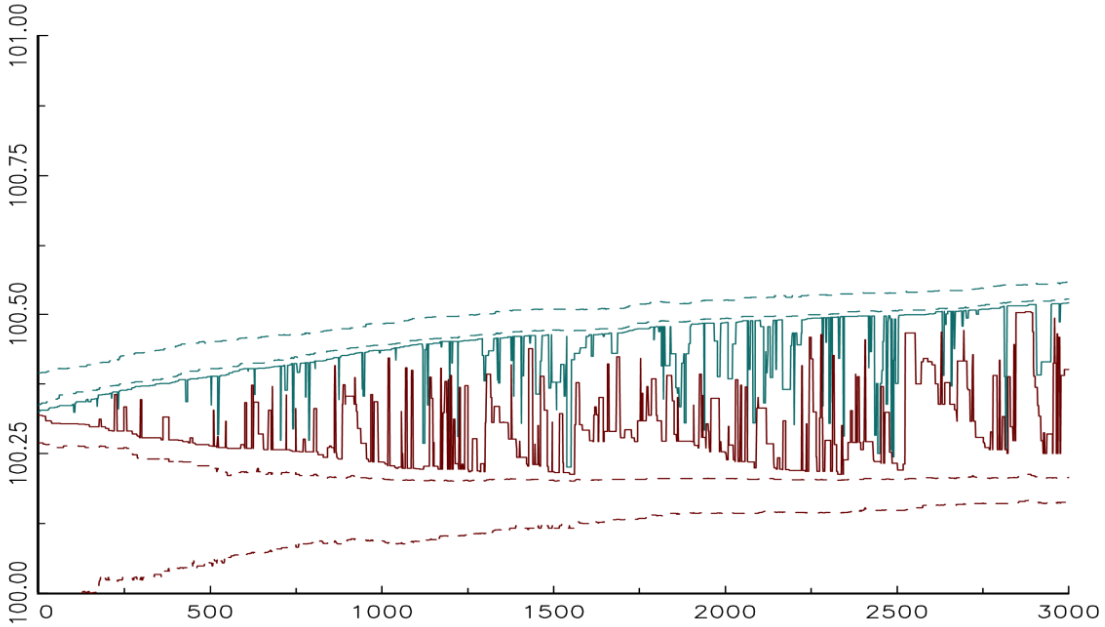
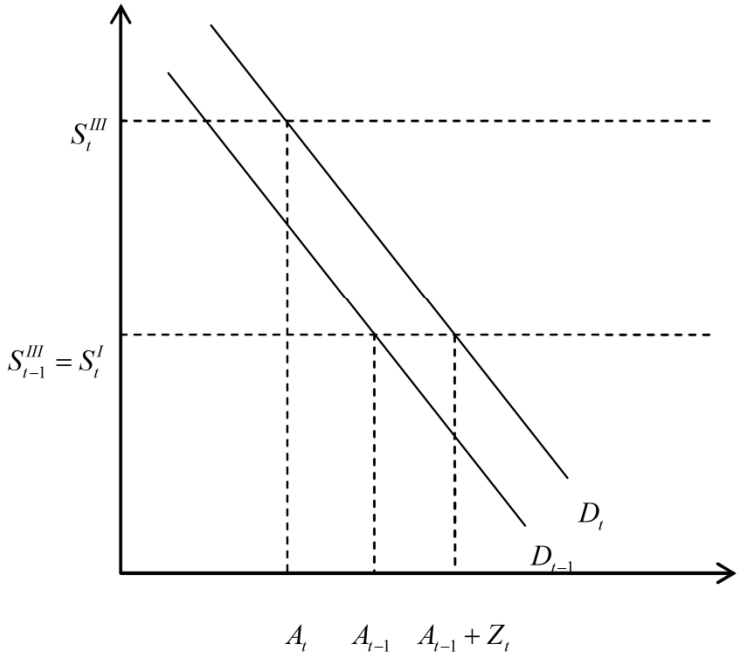


Figure 4: The Evolution of Limit Prices with Frictions

The ratio of market purchases to sales is approximately 2 to 1 in this simulation. The upward drift in the limit price distribution is accompanied by strongly positive order flow.

8.3 Estimating Order Flow

The Miss-Match Problem (cont.)



Suppose, that aggregate investor income is negative so the demand for foreign currency shifts rightward to D_t. The net result is positive customer order flow. Subsequent interdealer trading reveals D_t, and Y_t, so dealers change the spot rate.

Figure 5 makes clear that order flow can only be identified by changes in portfolio holdings if those changes are measured at transaction frequencies.

Figure 5: Order and Portfolio Flows in the Portfolio Shifts Model

8.3 Estimating Order Flow

Table 1: Estimating Order Flow from the Limit Order Market Model

	Market Buys	Market Sales	Order Flow
Figure 3 (a) Actual	11.77	12.37	-0.60
(b) Estimates	11.57	12.57	-1.00
Figure 4 (c) Actual	16.43	8.83	7.60
(d) Estimates	17.77	7.50	10.27

Rows (a) and (c) report the fraction of the 3000 trading opportunities that result in the submission of a market buy or market sale in simulations depicted in Figures 3 and 4. The table also reports estimates based on the change in the portfolio holdings of the 3000 households in rows (b) and (d).

8.3 Estimating Order Flow

Table 2: Price-Contingent Orders

	Sell	Buy
Take Profit	$S^{B} > \bar{S}^{B}$	$S^{A} < \underline{S}^{A}$
Stop Loss	$S^{B} < \underline{S}^{B}$	$S^{A} > \bar{S}^{A}$

Price-contingent orders fix the amount to be traded once certain price conditions are met, but the actual transaction price is flexible. By contrast, a limit order specifies the price at which a trader is willing to transact leaving the quantity traded to be determined by the matching market orders.

8.3 Estimating Order Flow

Estimating Order Flow from Transactions Prices

Table 3: Trade Identification Algorithms

Algorithm	Condition	Inference for trade at t
Tick Test	$S_t > S_{t-1}$	Buyer-Initiated
	$S_t < S_{t-1}$	Seller-Initiated
Lee and Ready	$S_t > \frac{1}{2}(S_t^{\mathrm{A}} + S_t^{\mathrm{B}})$	Buyer-Initiated
	$S_t < \frac{1}{2}(S_t^{\mathrm{A}} + S_t^{\mathrm{B}})$	Seller-Initiated
	$S_t = \frac{1}{2}(S_t^{\mathrm{A}} + S_t^{\mathrm{B}})$ and $S_t > S_{t-1}$	Buyer-Initiated
	$S_t = \frac{1}{2}(S_t^{\mathrm{A}} + S_t^{\mathrm{B}})$ and $S_t < S_{t-1}$	Seller-Initiated