

**EXCHANGE RATE ECONOMICS – LECTURE 3  
ASYMMETRIC INFORMATION AND ORDER FLOW**

**2. ASYMMETRIC INFORMATION AND PRICE  
DISCOVERY IN THE FX MARKET:  
*Does Tokyo Know More About the Yen?***

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# I. INTRODUCTION

<b>Microstructure theory <math>\Rightarrow</math> informed trader presence affects market dynamics</b>
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## Empirical problem:

identifying informed

## Suggested experiment:

Tokyo pre- and post-Dec. 22, 1994

Ito, Lyons, and Melvin, *Journal of Finance*, 1998.

*\*Informed trader concentration in pre-lunch BEFORE period*

**Some initial stylized facts:**

**U-shaped volatility for Japan BEFORE**

**no U-shape for non-Japan BEFORE**

**no U-shape for either AFTER**

**What kind of private information?**

**customer order flow**

**early knowledge of government action**

**inventory positions**

**GOAL: Test implications of microstructure theories regarding market dynamics with many informed traders present**

## II. IMPLICATIONS OF INFORMED TRADER CONCENTRATION

### A. A Representative Theory

$$(1) F = \bar{F} + \delta.$$

$$(2) P = \bar{F} + \lambda \omega,$$

Informed trader demand:  $\beta(\delta + u)$

$$(3) \beta = 1 / \{ (1 + \phi) \lambda (k + 1) + A [ \phi + \lambda^2 \sigma_Z^2 (1 + \phi) ] \},$$

$$(4) \lambda [ k^2 (1 + \phi) + \sigma_Z^2 \alpha^2 ] = k \alpha,$$

$$\alpha = \beta^{-1} = A [ \phi + \lambda^2 (1 + \phi) \sigma_Z^2 ] + (k + 1) \lambda (1 + \phi).$$

**informational efficiency,  $Q = [\text{var}(\delta | \omega)]^{-1}$**

$$(5) Q = 1 + \{ 1 / [ \phi + (\sigma_Z^2 / k^2 \beta^2) ] \},$$

**IMPLICATION: Prices are more informative and converge more quickly to full information levels when there are many informed traders in the market**

## **B. Estimating Speed of Adjustment**

### **Sample**

***\*10:30-12noon Tokyo***

***\*20 days BEFORE and AFTER***

***\*Reuters quotes on yen/dollar***

***\*1-minute returns***

### **MA(1)-GARCH(1,1)**

$$(6) r_t = \alpha_0 + \varepsilon_t + \alpha_1 \varepsilon_{t-1}$$

$$(7) h_t = \gamma_0 + \gamma_1 h_{t-1} + \gamma_2 \varepsilon_{t-1}^2 + \gamma_3 dum * h_{t-1} + \gamma_4 dum * \varepsilon_{t-1}^2$$

**Estimated half-life of shock to volatility:**

***2 ½ minutes BEFORE***

***14 minutes AFTER***

### III. JAPANESE AND NON-JAPANESE BANK DYNAMICS

If Tokyo knows more, then Japanese quotes should *lead* non-Japanese?

Causality tests:

$$(9) r_t^d = a + br_{t-1}^i + cr_{t-1}^d + e_t$$

Sample:

\*20 days *BEFORE* and *AFTER*

\**early-morning, late-morning, and afternoon*

\**filter tick-by-tick  $r^i$  returns  $\geq 2.5$  basis points*

\**construct  $r^d$  returns around  $r^i$*

#### FINDINGS:

\**2-way causality in all periods but one*

\**Japan causes non-Japan in late-morning BEFORE*

## Nonsynchronous Quoting and Cross Correlations

**Difference between 2 observed quotes equals sums of returns of underlying unobserved quote process**

$$(i) \quad q_{t_{i+1}} - q_{t_i} = \sum_{t=t_{i+1}}^{t_{i+1}} \Delta q_t$$

$$(ii) \quad E(y_{ij}) = E\left[(q_{t_{i+1}}^J - q_{t_i}^J)(q_{t_{j+1}}^N - q_{t_j}^N)\right]$$

$$= E\left[\sum_{t=t_{i+1}}^{t_{i+1}} \Delta q_t^J \cdot \sum_{k=k_{j+1}}^{k_{j+1}} \Delta q_s^N\right] = \sum_{t=t_{i+1}}^{t_{i+1}} \sum_{k=t_{j+1}}^{t_{j+1}} \gamma_{t-k}$$

$$(ii) \quad \gamma_k = \text{Cov}(\Delta r_t^J, \Delta r_{t-k}^N), r_t \equiv q_t - q_{t-1}$$

$$(iii) \quad \chi_{ij}(k) = \max[0, \min(t_{i+1}, t_{j+1} + k) - \max(t_i, t_j + k)]$$

$$(iv) \quad E(y_{ij} | \chi_{ij}) = \sum_{k=-k}^k \chi_{ij}(I_c) \gamma_k$$

$$(v) \quad y_{ij} = \chi'_{ij} \gamma + e_{ij}$$

**for k = 5, Wald test for lead/lag:**

	BEFORE	AFTER
$q^J$ lead $q^N$	16.2	12.6
$q^N$ lead $q^J$	8.3	15.7

## IV. PRICE DISCOVERY IN JAPAN AND ELSEWHERE

Follow Hasbrouck (1995) to estimate contribution of Japanese and non-Japanese quotes to price discovery

$$(10) r_t = \Psi(L)e_t$$

$$(11) r_t = \alpha(\beta' q_{t-1} - E\beta' q_t) + \Gamma_1 r_{t-1} + \Gamma_2 r_{t-2} + \dots \\ + \Gamma_{k-1} r_{t-k+1} + e_t$$

$$e_t = Fz_t, \quad Ez_t = 0, \quad \text{Var}(z_t) = I$$

$$(12) S_j = ([\psi F]_j)^2 / (\psi \Omega \psi')$$



**Japanese/non-Japanese info. share:**

<b>BEFORE</b>	<b>96%</b>
<b>AFTER</b>	<b>89%</b>

**Japanese/Hong Kong info. share:**

<b>BEFORE</b>	<b>128%</b>
<b>AFTER</b>	<b>111%</b>

**Japanese contribution to price discovery higher  
BEFORE than AFTER**

## V. CONCLUSIONS

**Market dynamics differ depending upon the presence of informed traders**

*\*greater the number of informed traders the faster price adjusts to full-information value*

*\*informed-trader quotes lead the rest of the market when high concentration of informed traders*

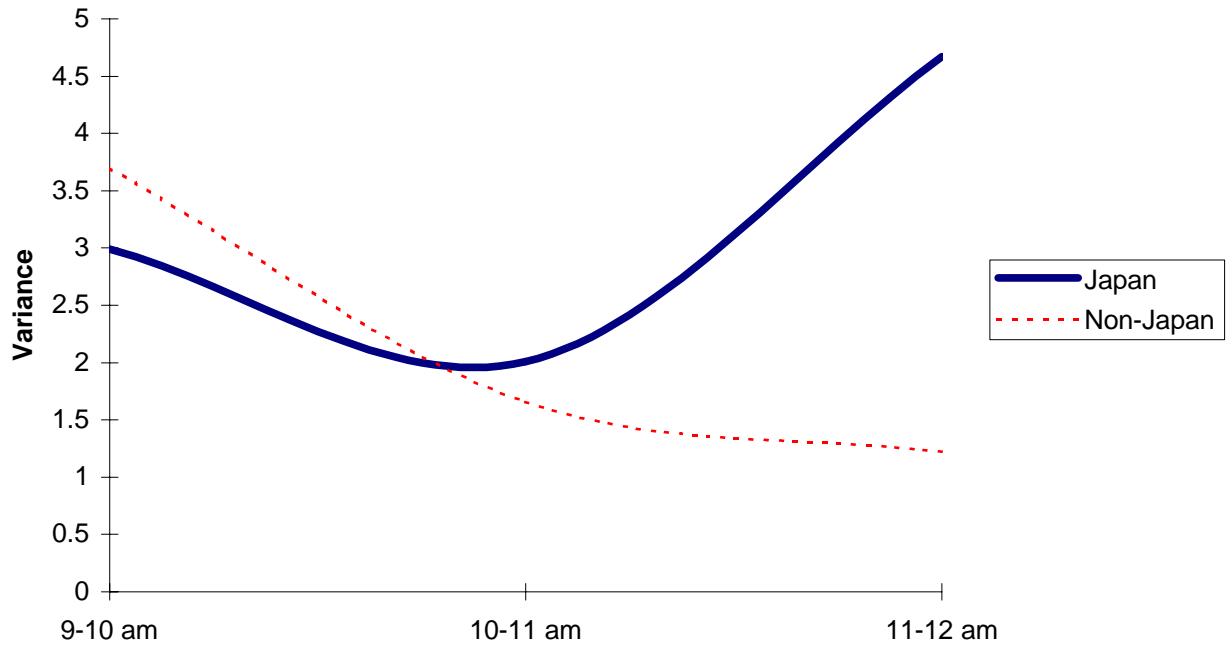
*\*informed traders' contribution to price discovery peaks when informed cluster*

**“Does Tokyo Know More About the Yen?”**

*\*qualified yes .....*

**Reference: <http://www.public.asu.edu/~mmelvin/>**

**Figure 1: Variance of Yen/Dollar Quotes in Asian Morning -- BEFORE**



**Figure 2: Variance of Yen/Dollar Quotes in Asian Morning -- AFTER**

