

Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market

Presenter: Clara Vega

Discussant: Cheng Gao
Rutgers University

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Paper
Overview

Control
Needed

Market Share

Triangular
Arbitrage and
AT

Market
Quality

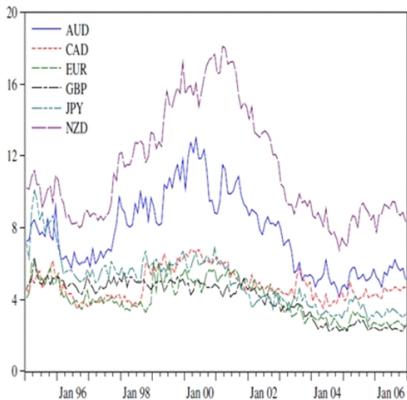
AT vs. HFT

Conditional
Measure

- The first empirical study on AT in the FX market.
- Three major findings:
 - ① AT actions are more correlated than those of humans;
 - ② AT helps price discovery by reducing the number of triangular arbitrage opportunities;
 - ③ AT improves information efficiency by reducing the autocorrelation in high-frequency returns.

Spread and Turnover in the FX Market

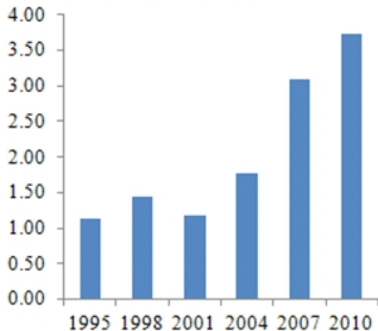
Relative Bid-ask Spread for Currencies against USD



Source: King, Osler, and Rime (2011)

FX Market Turnover

Daily average in trillion of USD



Source: BIS Triennial Surveys 1995-2010

- The paper shows the participation of AT in late 2003 is still close to 0%.
- An appropriate control is needed to study the effect of AT.

Trading Costs and Turnover in the Equity Market

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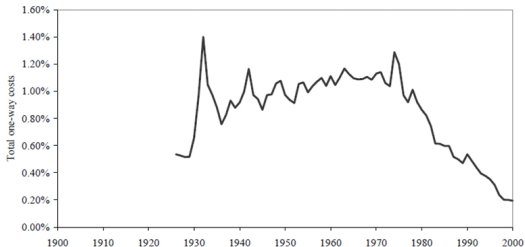
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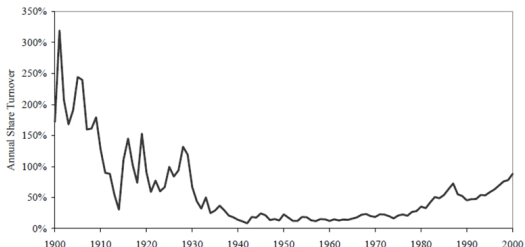
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Average one-way transaction costs (half-spread + NYSE commission)



Annual share turnover on NYSE stocks



Source: Jones (2002)

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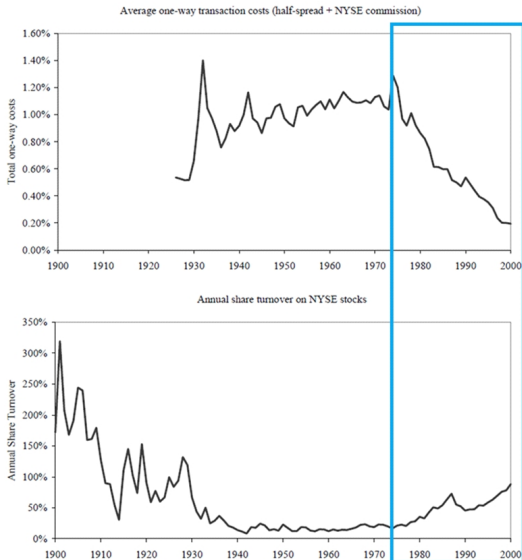
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Source: Jones (2002)

Control Needed to Explain the Effect of AT

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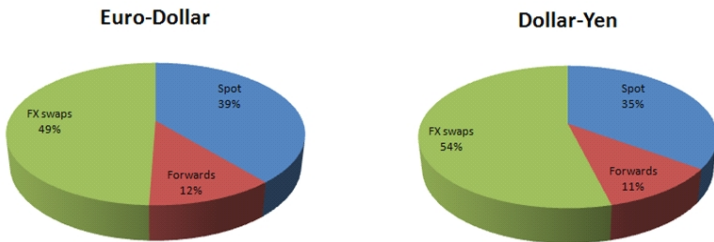
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- When there was no AT in 70s and 80s, spreads and trading costs fall as turnover rises.
- How do we separate out the independent effect of AT?
- Do other market variables have more impact?

FX Market Shares by Instrument

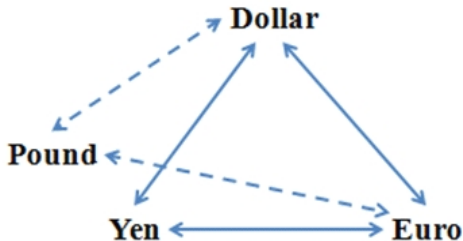
- Which market contributes more to the price discovery?



Source: BIS Triennial Surveys 2004

- The EBS volume accounts for 14% of euro-dollar and 10% of dollar-yen trading activities, using the highest estimate from Chaboud et al (2007).
- According to ICAP, the EBS trading volume has been declining. Its market share is approximately 4.7% in 2007 and 4.0% in 2010 of trading in all currencies .

- Are the quotes indicative or firm?
- How much depth is there?
- Other triangular arbitrage opportunities may involve one of the three transactions. e.g.,



Turnover by Currency in the FX Spot Market

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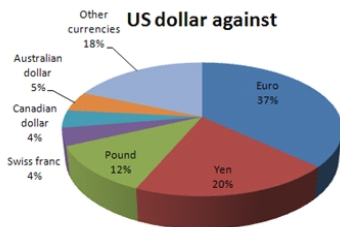
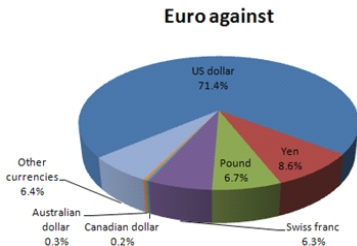
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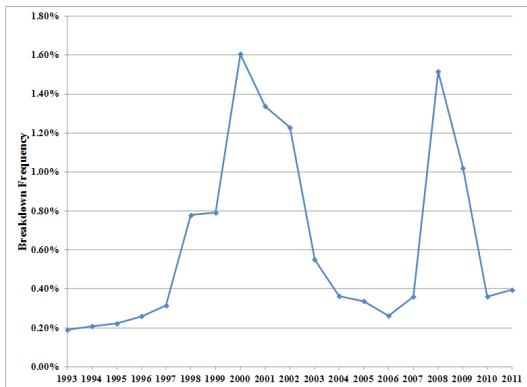
Source: BIS Triennial Survey 2004

- AT participation in euro-dollar, dollar-yen, and euro-yen trading **overestimates** their activities in euro-dollar-yen triangular arbitrage opportunities.

- It is the autocorrelation of risk-adjusted returns, not raw returns, that reflects the price efficiency.
- Why not consider the persistency of signed order flow?
- Is this the policy goal?
- How is the return autocorrelation connected to the correlation of AT?

- Who uses the algorithmic machines?
 - Market makers
 - Proprietary traders
 - Brokers handling retail trades
 - High frequency traders
 - et al.
- How do we separate out the effect of each source?
- Are algos associated with market quality breakdowns?

- Gao and Mizrach (2012) studied the frequency of market quality breakdowns in the equity market.



- We find spikes in market correlation make breakdowns 22.88% more likely and HFT increases breakdowns an additional 16.86%.

- How do we distinguish the effect of HFT from AT?
 - Is there any way to infer HFT participation from the dataset?
- Celent reports that HFT firms accounted for about 12% of all currency trading in 2010; it is set to be up to 28% in 2012.
- The Tabb Group reports that HFT firms are accounting for a declining percentage in the equity market, from 61% in 2009 to 51% now.
- Why is HFT rising in the FX market but falling in the equity market?

- The paper shows the variance of AT measures increase over time.
- Does AT behave differently during times of potential market stress?
 - Gao and Mizrach (2011) find HFT firms cut back on their liquidity provision and trade more actively against non-HFT participants during POMO operations.
- Conditional measure of AT activity?
 - e.g. conditioned on time, volatility, news, and et al.