Trading Volume, Illiquidity and Commonalities in FX Markets

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LUISS and CREATES

American Finance Association Meetings
05 January 2020, San Diego (CA)
Why is important?

- Floating FX rates, open economies, and growing capital mobility call for a better understanding of FX volatility, trading volume and illiquidity.
- Paucity of data on FX global volume.
- Relevant for international investors and policy makers e.g. implementing monetary and financial stability policies.
What we do?

- Unified **theory** for trading volume, volatility, and illiquidity in a multiple currency setting.

- **Empirical** analysis of their main determinants and main pricing implications.
Theoretical framework

- FX rate movements are determined by common information, or news, and differences in traders’ reservation prices, or disagreement, that induce trading.
- Novelties: continuous time and multiple currencies.
- Investors’ disagreement is the common determinant of trading volume and volatility of each FX rate.
- The no-arbitrage condition is the ”glue” connecting FX rates and creating commonality in trading volume, volatility, and illiquidity.
Empirical predictions

1. Traders’ disagreement drives both trading volume and volatility.
2. The ratio of volatility to volume measures illiquidity (Amihud 2002) that decreases with market depth and number of active traders.
3. Trading volume, volatility and liquidity across FX rates are linked by no-arbitrage constraints, which lead to the commonalities across FX rates.
   - Commonalities increase with traders’ disagreement across rates and the strength of the correlation between these FX rates.
   - Synthetic volume and illiquidity are positively related to the variability of the arbitrage price violations.
Data

- **CLS trading volume**
  - **Hourly trading volume / # of trades for 30 currency pairs** (15 currencies) – Nov. 2011 to Nov. 2016
  - **Intraday FX global** trading volume and illiquidity (Fischer and Ranaldo 2011; Hasbrouck and Levich 2017; Gargano et al. 2017; Ranaldo and Somogyi 2019).

- **Olsen FX rates**
  - 1-min first, last, ask, bid, high, and low quotes to compute realized variances and transaction costs.

- **EBS data**
  - 100-millisecond snaps of trades and quotes from the interdealer segment.
Intraday volume and volatility

- Volume and volatility governed by a common latent factor
Disagreement

<table>
<thead>
<tr>
<th></th>
<th>All currencies against USD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Δ Volume</td>
<td>0.0591&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(2.56)</td>
</tr>
<tr>
<td>Δ Illiquidity</td>
<td>0.0504&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(2.94)</td>
</tr>
<tr>
<td>Lagged Dep.</td>
<td>-0.3775&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(-8.81)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.0053</td>
</tr>
<tr>
<td></td>
<td>(-0.72)</td>
</tr>
<tr>
<td>R²</td>
<td>0.140</td>
</tr>
<tr>
<td>N</td>
<td>577</td>
</tr>
</tbody>
</table>

- Volume and volatility increase with disagreement.
Illiquidity

- Illiquidity as the ratio between (realized) volatility to volume decreases with market depth and number of active traders.
Liquidity measurement

<table>
<thead>
<tr>
<th></th>
<th>( A_t )</th>
<th>( BAS_t )</th>
<th>( EC_t )</th>
<th>( CS_t )</th>
<th>( R_t )</th>
<th>( \gamma )</th>
<th>( A_t^* )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A_t )</td>
<td>1.0000</td>
<td>0.7885</td>
<td>0.6680</td>
<td>0.3877</td>
<td>0.7068</td>
<td>0.9115</td>
<td>-0.0671</td>
</tr>
<tr>
<td>( BAS_t )</td>
<td>0.9080</td>
<td>1.0000</td>
<td>0.7944</td>
<td>0.5247</td>
<td>0.6594</td>
<td>0.7923</td>
<td>-0.0115</td>
</tr>
<tr>
<td>( EC_t )</td>
<td>0.8712</td>
<td>0.9128</td>
<td>1.0000</td>
<td>0.5701</td>
<td>0.8901</td>
<td>0.7455</td>
<td>0.0687</td>
</tr>
<tr>
<td>( CS_t )</td>
<td>0.5460</td>
<td>0.6335</td>
<td>0.6570</td>
<td>1.0000</td>
<td>0.4730</td>
<td>0.4285</td>
<td>-0.0784</td>
</tr>
<tr>
<td>( R_t )</td>
<td>0.6791</td>
<td>0.5696</td>
<td>0.7950</td>
<td>0.4361</td>
<td>1.0000</td>
<td>0.7690</td>
<td>0.0289</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>0.9041</td>
<td>0.7759</td>
<td>0.8332</td>
<td>0.5583</td>
<td>0.7523</td>
<td>1.0000</td>
<td>-0.0304</td>
</tr>
<tr>
<td>( A_t^* )</td>
<td>0.4005</td>
<td>0.4326</td>
<td>0.3683</td>
<td>-0.0873</td>
<td>0.1933</td>
<td>0.2138</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

- Our FX HF illiquidity measure correlates with other well established measures of market illiquidity.
Commonalities

Three methods

▪ Principal Component Analysis
▪ Connectedness index (Diebold and Yilmaz 2014)
▪ Regression analysis

▪ All results indicate strong commonality in volume, volatility and illiquidity,
▪ Which is stronger for heavily traded and liquid currencies → Liquidity begets liquidity.
Pricing implications

▪ Monthly pricing error increases with average illiquidity of the cross rates
▪ Steeper dependence for more liquid FX rates

(a) Pricing error variation against illiquidity: USDEUR  (b) Pricing error variation against illiquidity: EURCHF
Pricing implications

- Negative relation between mispricing and volume commonality → Liquidity begets price efficiency
Conclusion

- Unified **theory** and **empirical** evidence for
  - Disagreement as determinant of trading volume and volatility
  - Closed-form and intuitive solution for FX **illiquidity measure**
  - Arbitrage as the “glue” connecting prices and creating **commonalities**

- **Liquidity begets liquidity**, as most traded and liquid currencies have stronger commonality.

- **Liquidity begets efficiency**, as most traded and liquid currencies stick to (triangular) arbitrage condition.