Settlement Liquidity in SIC
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Environment – oldtimers Fedwire & SIC

– *Settlement liquidity*: ease with which participants can discharge payment obligations (Bech et al., 2012)
– Literature: \( ST \) or \( QT \) as proxies of *settlement liquidity*
– Fedwire - FIFO / no central queuing arrangement
– SIC - FIFO / central queuing (no hybrid elements = no bilateral or multilateral netting based on queues)
– Fedwire: automated overdrafts (immediate settlement)
  – *Release Time* (RT) \( \equiv \) *Settlement Time* (ST)
– SIC: on-demand intraday liquidity (queuing of payments)
  – \( RT \leq ST \)
  – \( RT + \text{Queuing Time} (QT) \equiv ST \)
– RT and QT are the relevant proxies for queuing systems
Hypotheses

- **H1**: *Increasing settlement balances induce earlier release and settlement of payments*

- **H2**: *Central queuing arrangements & ample settlement balances eliminate strategic payment mgt*

- **H3**: *Earlier release to a simple central queuing arrangement improves settlement liquidity*
  - Martin & Jurgilas (2013)
Hypotheses

- **H4**: The integration of retail payments into RTGS payment systems improves settlement liquidity
  - Armentier et al. (2008) for Fedwire – reuse argument

- **H5**: Elevated default risk among RTGS participants induces participants to release later
  - Mills & Nesmith (2008); Benos et al. (2014); literature on operational disruptions – risk mgt

- **H6**: NIR improves settlement liquidity in RTGS systems with a central queuing arrangement
  - Earlier release to reduce EoD uncertainty about remaining balances (repo market to change balance)
Data

- Daily & individual payment data from 2005 to April 2017
- **Release Time (RT)**
  - Institutionalized payments ($i$): released as a direct debit by some third-party (CSD, ACH, repo, …)
  - Non-institutionalized payments ($ni$): payments subject to strategic delay – $RT(ni,x)$ for each percentile
- Differentiation according to category $x$=
  - Size: $t=10'000-100'000$ / $s=100'000-1$mio / $m=1$mio-10mio / $l=10$mio-100mio / $xl=100$mio-
  - Purpose: customer / *b2b*
- Priorities: 1 for highest priority, 2 and 3
Data

- **Queuing Time (QT):**
  - Focus on all payments – average QT(all)
  - We rely on settlement value (SV)-weighted indicators for release and queuing time
- **Many other variables and derivatives thereof:**
  - number of payments n, HHI(x), dr={CDSX, LB2UBS}, NIR dummy, RS2N, average RT(x) and QT(x), settlement value of unsecured (umm) and secured money markets (smm), share s of x in SV, ...
- **Extracted payments:** <CHF10’000, CLS, SNB, no Mondays & settlement days after a banking holiday
Release time

- Disentangle factors influencing RT(ni; x)
- Daily 100 OLS regressions (per percentile of RT(ni,x)) for the whole sample (all & subcategories)
- Newey-West corrected standard errors

\[ \Delta r_{ni,all}^{p,t} = \left\{ \begin{array}{l}
\alpha_p + \beta_p^1 \Delta sr_t + \beta_p^2 \Delta ic_t + \beta_p^3 \Delta HHIsb_t + \beta_p^4 \Delta sv_t + \\
\beta_p^5 \Delta HHI sv_t + \beta_p^6 \Delta n_t + \beta_p^7 \Delta HHI n_t + \beta_p^8 \Delta umm_t + \\
\beta_p^9 \Delta smm_t + \beta_p^{10} \Delta \bar{q}_t + \beta_p^{11} \Delta \bar{q}_{all} + \beta_p^{12} dr_t + \\
\beta_p^{13} NIR_t + \beta_p^{14} \Delta RS2N_t + \varepsilon_{p,t} 
\end{array} \right\} \]
Release time

- Confidence band in grey indicates the 5% significance level
- Standardized coefficients measure changes in minutes (mind the changing scale!)
- Positive coefficients indicate later and negative coefficients indicate earlier RT(ni; x)
- Results for other explanatory variables and all subcategories are found in the paper

settlement reserves

H1

intraday credits

H1

queuing time all transactions

H1
Release time
Release time

dummy(max. G-SIBs-CDS>150)

dummy(NIR)

reserves subject to NIR
Queuing time
(average SV-weighted QT(all) in h:m; SB in billion CHF)
Queuing time

− What influences average $QT(\text{all})$?
  − Mechanical relationship: $QT = f(SB, SV, N, RT, \text{frictions})$
  − QT close but $>0$ for the full sample
− Regression approach:

$$
\Delta \ln \bar{q}_t = \left\{ \begin{array}{l}
\alpha + \beta_1 \Delta \ln (sb_t) + \beta_2 \Delta \ln (HHI \times sb_t) + \beta_3 \Delta \ln (sv_t) + \\
\beta_4 \Delta \ln (HHI \times sv_t) + \beta_5 \Delta \ln (n_t) + \beta_6 \Delta \ln (HHI \times n_t) + \\
\beta_7 \Delta \ln (\bar{r}_t^{all}) + \beta_8 \Delta \ln (summ_t) + \beta_9 \Delta \ln (ssmm_t) + \\
\beta_{10} \Delta \ln (sxl_t) + \beta_{11} \Delta \ln (sl_t) + \beta_{12} \Delta \ln (s1_t) + \varepsilon_t
\end{array} \right.
$$

− Newey-West corrected standard errors
Queuing time

<table>
<thead>
<tr>
<th></th>
<th>Coeff.</th>
<th>Std. Err.</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δln(sb)</td>
<td>-0.189</td>
<td>0.084</td>
<td>0.024</td>
</tr>
<tr>
<td>Δln(HHI, sb)</td>
<td>-0.069</td>
<td>0.035</td>
<td>0.047</td>
</tr>
<tr>
<td>Δln(sv)</td>
<td>0.327</td>
<td>0.048</td>
<td>0.000</td>
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<tr>
<td>Δln(HHI, sv)</td>
<td>-0.122</td>
<td>0.075</td>
<td>0.106</td>
</tr>
<tr>
<td>Δln(n)</td>
<td>-0.100</td>
<td>0.044</td>
<td>0.022</td>
</tr>
<tr>
<td>Δln(HHI, n)</td>
<td>-0.026</td>
<td>0.124</td>
<td>0.835</td>
</tr>
<tr>
<td>Δln(r)</td>
<td>-1.613</td>
<td>0.271</td>
<td>0.000</td>
</tr>
<tr>
<td>Δln(summ)</td>
<td>0.100</td>
<td>0.023</td>
<td>0.000</td>
</tr>
<tr>
<td>Δln(ssmm)</td>
<td>0.047</td>
<td>0.008</td>
<td>0.000</td>
</tr>
<tr>
<td>Δln(sxl)</td>
<td>0.142</td>
<td>0.052</td>
<td>0.006</td>
</tr>
<tr>
<td>Δln(sli)</td>
<td>0.856</td>
<td>0.289</td>
<td>0.003</td>
</tr>
<tr>
<td>Δln(s1st prio)</td>
<td>0.071</td>
<td>0.030</td>
<td>0.018</td>
</tr>
<tr>
<td>const.</td>
<td>0.000</td>
<td>0.007</td>
<td>0.992</td>
</tr>
</tbody>
</table>

- More SB allow to reduce SV-weighted QT(all) to “almost” zero
- However, substantial SB are required to fully eliminate QT
- A simple central queuing arrangement fosters settlement liquidity – earlier RT(all) results in lower QT(all)
- More smaller payments smooth settlement of larger payments
- Concentration factor seems to be low – fast and efficient liquidity redistribution through settlement
- Otherwise expected signs

No. of obs. 1646
R² 0.095
Conclusion

- RT and QT (instead of ST/QT only) allow for a more differentiated picture of settlement liquidity
- Findings suggest theory may be incomplete in relation to RTGS systems with central queuing arrangements
- Are hybrid RTGS systems worth the investment?
  - A simple queuing arrangement can serve as an LSM
  - Retail payment integration improves settlement liquidity
    - No integration of fast payments (QT and high priority)
- Is it safe to widen access to RTGS systems?
- Lack of similar studies does not allow to generalize
- Findings suggest greater focus on RT(ni) and RT(i)
Thank you for your attention!

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Settlement liquidity Fedwire: Settlement = Release Time

Figure 1: Time Series of Settlement Liquidity

Notes: Twenty-one-day centered moving average. Values exclude payments related to CHIPS, CLS, DTC, and P&I payment funding.
Sources: Federal Reserve Bank of New York, Authors' calculations.
Settlement liquidity SIC: Release Time

Value percentiles of released ni payments; 20-day moving average; hours after beginning of settlement day

Graph showing the value percentiles of released payments with 20-day moving averages for different hours after the beginning of the settlement day.
Settlement liquidity SIC: Settlement Time

Value percentiles of settled net inflows; 20-day moving average; hours after beginning of settlement day
Release time
(average SV-weighted RT(ni; all/t/s/m/l/xl) in h:m after start of SIC day, 20-day ma)
Release time
(Percentage(ni; t/s/m/l/xl) in SV of all payments, 20-day ma)
Release time
(average ST(all), RT(i/ni) in h after start of SIC day and QT(all), 20-day ma)
Data
SV(i/ni/all/excluded) (in billions CHF, 20-day ma)
Robustness - Release time

− Results remain qualitatively unchanged for the following robustness checks
  − \textit{Value-weighted RT\( (ni) \)}
    − \textit{CDSX} / LB2UBS / CDS
    − \textit{NIR&RS2N} / NIR / RS2N
  − Only Mondays are considered
  − SB used instead of SR and IC individually
  − \textit{Unweighted RT\( (ni,all) \)}
Robustness - Queuing time

- Results remain qualitatively unchanged for the following robustness checks
  - \textit{Value-weighted }$RT(ni)$
    - Only Mondays are considered – $n$ stays negative but turns out to be insignificant
  - Replace $RT(\text{all})$ with $RT(ni)$
  - \textit{Unweighted }$RT(ni,all)$
Release time
(average RT(c/b2b) in h after start of SIC day, 20-day ma)
Release time
(average RT(1/2/3) in h after start of SIC day, 20-day ma)