Modelling the introduction of a Liquidity Saving Mechanism in CHAPS

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Contents

CHAPS

- The UK's large-value payment system
- Owned and operated by Bank of England
- Simple RTGS settlement at present
- February 2010 figures:
  - Daily average value sent - £208bn
  - Daily average number of payments sent – 118,000

Why we did it?

- Quantify the impact on liquidity usage and payment timing of introducing an LSM to CHAPS
- Key component of the business case for the introduction of an LSM in CHAPS
- Introduction of new liquidity regime in the UK
  - End of 'Double Duty' -> raise of liquidity cost
  - Incentives to reduce liquidity usage – adverse impact on efficiency of CHAPS

What we did?

Modelled CHAPS with an integrated continuous bilateral offsetting algorithm (FIFO with bypass):

- Banks allocate a fraction of their liquidity to the non-urgent queue at SOD (determined by each bank)
- Non urgent payments settle if sufficient funds available and bilateral limits met, payments may queue in the central scheduler and benefit from offsetting
- Urgent payments settle immediately and access all posted liquidity (RTGS stream)

How we did it?

- New simulator tool – **FNA (Financial Network Analyser) by Kimmo Soramaki**
- 20 days of historic CHAPS data from February 2010
  - 14 direct members
  - Information from banks on bilateral limits, payment time-criticality and timings (from member questionnaire)

Key Assumptions

- Selection of urgent payments:
  - Clearings and CLS
  - Random selection based on value and volume estimates received from each bank

Liquidity allocation to the non-urgent queue at SOD

Step 1: Uniform allocation - each bank allocates the same % of their max RTGS liquidity usage

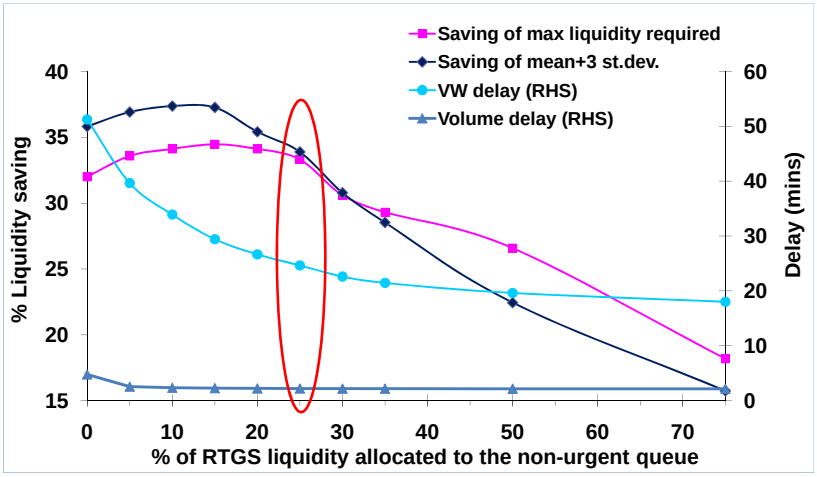
- Started with zero liquidity allocated to non-urgent queue
- Allocation gradually increased (5%, 10%, 15%, 20%…) uniformly by all banks
- Optimal uniform level found

Main measures

- Liquidity saving measures - % change to the liquidity required in the modelled set-up compared to in CHAPS, in terms of:
  - maximum of daily maximum liquidity required
  - mean + 3st.deviations of daily maximum liquidity required
- Volume and value-weighted delay
- Value and volume of transactions settled in the end of day batch

Uniform liquidity allocation

System-wide results



Optimal liquidity allocation: 25%

Liquidity allocation to the non-urgent queue at SOD (2)

Step 2: Non-uniform – banks allocate different % of their RTGS liquidity usage

- Individual banks allocated their optimal levels from Step 1
- Recalibration until individual optima found

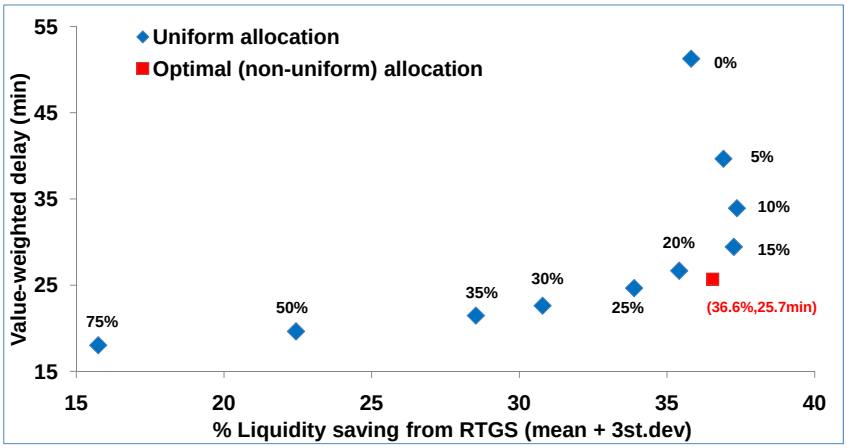
Optimal non-uniform allocation

System-wide results

Liquidity savings (% change from RTGS)		Delay (min)		Max queue (daily average)	
Mean + 3st.dev	Max	Value-weighted	Volume	Value (% of total sent)	Volume
36.6	34.1	25.7	2.2	11%	2,360 *(182 ave per bank)*

Search for optimal non-uniform allocation

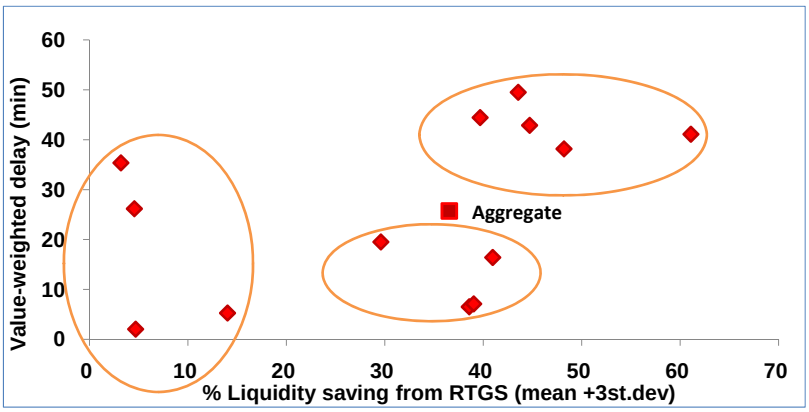
System-wide results



In the optimal case we allocate the 14.3% of total RTGS liquidity (banks ' allocations vary from 0% to 30%)

Optimal non-uniform allocation

Individual results



Uneven distribution across the banks but only 3 small banks (< 5% of CHAPS volumes) typically see little liquidity saving

Offsetting and EOD queues

System-wide results

		Uniform 25%	Optimal non-uniform
Offset stats (% of total sent)	Value of payments used for matching	24.9%	27.0%
	Actual value of offset	16.6%	18.0%
	Success rate (on average)	66.7%	66.8%
Payments settled EOD (daily averages)	Value (£ billions)	1.7	2.8
	% of total sent by value	0.9%	1.4%
	No of payments	4	7

Conclusions

- Simulations provide a strong case for the benefits of an LSM in CHAPS. Savings of greater than 30% achievable without significant delay in settlement.
- Benefits unevenly distributed across banks, but all would have incentives to use if changes were implemented.

Further Simulations

- New submission times
- Modelling outage days
- Change to network – new member
- Comparison of different algorithms
- Different ways of liquidity recycling