

Excess liquidity and the yield curve

Wolfgang Lemke¹ and Andreea L. Vladu¹

¹European Central Bank
²European Central Bank

Paper highlights new channel connecting money market liquidity and the yield curve

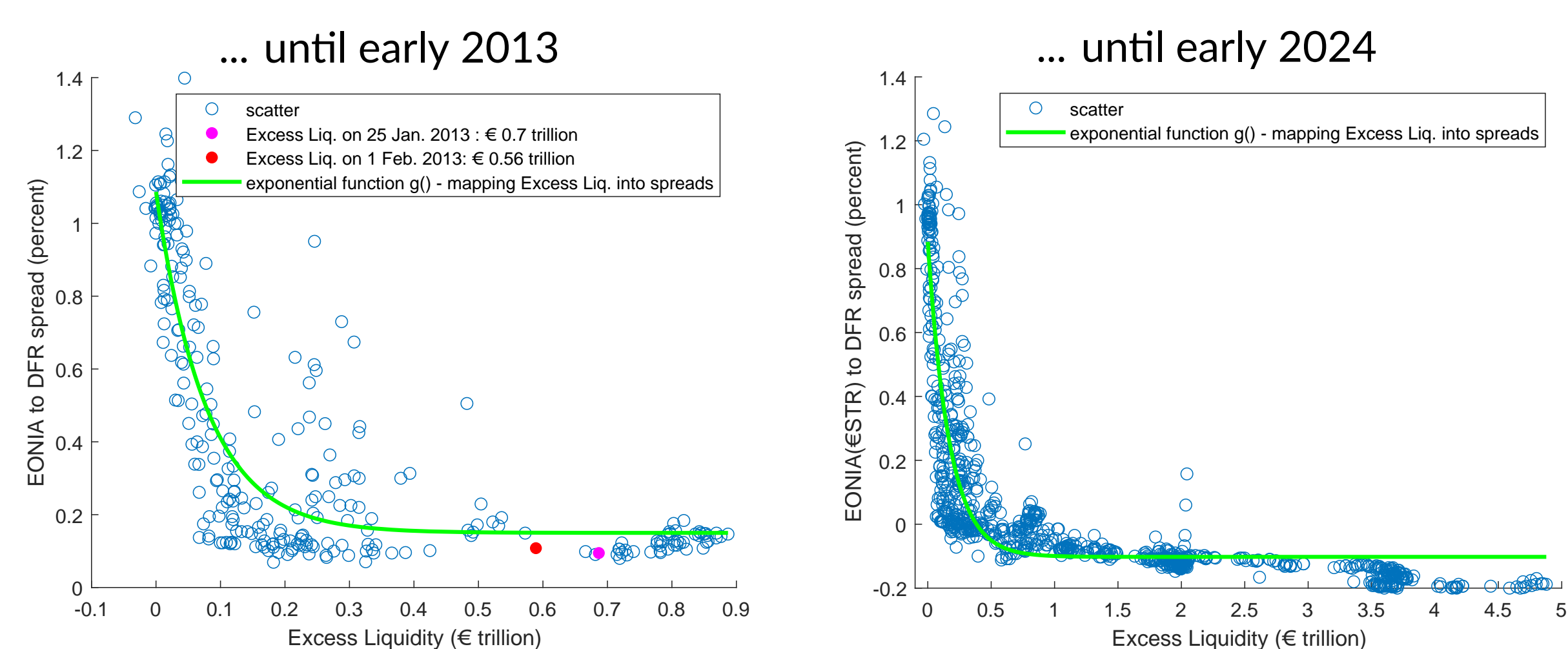
How does it work:

- Lower and/or more uncertain expectations of future excess liquidity
- ... lead markets to expect €STR to lift off from DFR earlier/faster
- Higher expected €STR-DFR spreads shift forward rates up for any given policy rate expectations
- ... and thereby affect the yield curve today

New nonlinear yield curve model

- Mapping distributions of future excess liquidity into distribution of spreads
- Closed form solution for spread distribution and yield curve implications

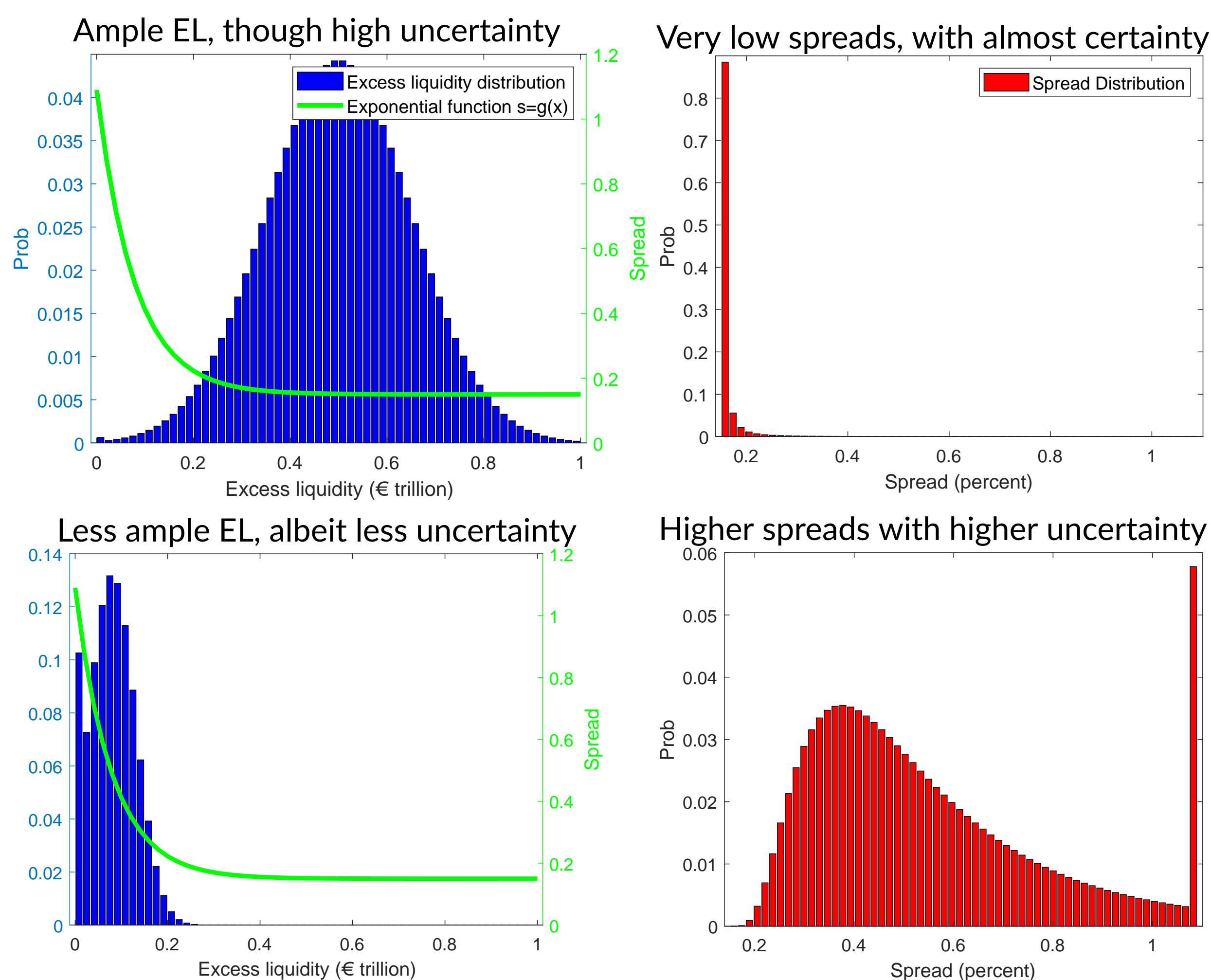
Contemporaneous relationship of Excess Liquidity and €STR/EONIA spreads to DFR



Notes: Each dot represents a pair of excess liquidity and the money market spread of EONIA (€STR) to DFR in the left (right) panel, standardised by the size of the DFR to the MRO rate corridor. Excess liquidity is the amount of central bank reserves held by commercial banks over and above minimum reserve requirements. The green line depicts the exponential mapping $g(X_t) = a + b \cdot \exp(-cX_t)$, estimated over each panel's subsample. End-of-week data, with sample in left panel: Aug 2007 to Feb 2013 and for right panel: Aug 2007 to Feb 2024.

Paper idea:

Market perceptions of future Excess Liquidity (EL) (left) => pricing of future €STR to DFR spread distribution (right)



Notes: Blue bars represent a distribution of future excess liquidity, denoted by X . Green line is the exponential mapping from X to the spread S , $S = g(X) = a + b \cdot \exp(-cX)$. Red bars are the corresponding distribution of future spread S .

Model building blocks

- Nonlinear (exponential) mapping from excess liquidity X to spread S

$$S = g(X) + \epsilon,$$

where $S = \frac{\text{€STR} - \text{DFR}}{\delta}$, with $\delta = \text{MRO} - \text{DFR}$ the 'corridor' of policy rates

- We assume it holds for any future horizon h

$$S_{t+h} = g(X_{t+h})$$

- Expected spread depends on full distribution of future X

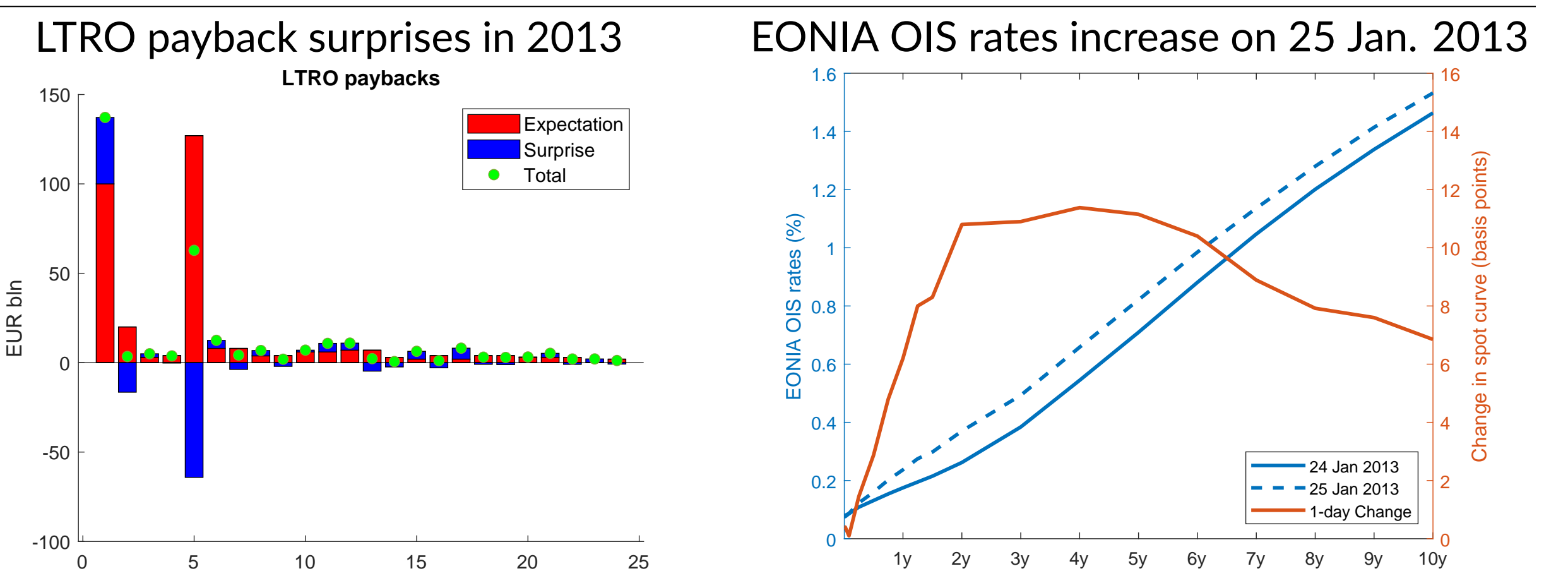
$$E_t[S_{t+h}] = E_t[g(X_{t+h})]$$

- Forward rates ($f_{t,h}$) depend on the distribution of future X

$$f_{t,h} = E_t(\text{€STR}_{t+h}) = E_t(\text{DFR}_{t+h}) + \delta E_t[S_{t+h}] = E_t(\text{DFR}_{t+h}) + \delta E_t[g(X_{t+h})]$$

- X_{t+h} is distributed conditionally censored normal, with mean $\mu_{t,h}$ and variance $\sigma_{t,h}^2$
- Closed-form expression for $E_t(S_{t+h})$, depending on $\{g(\cdot), \mu_{t,h}, \sigma_{t,h}^2\}$

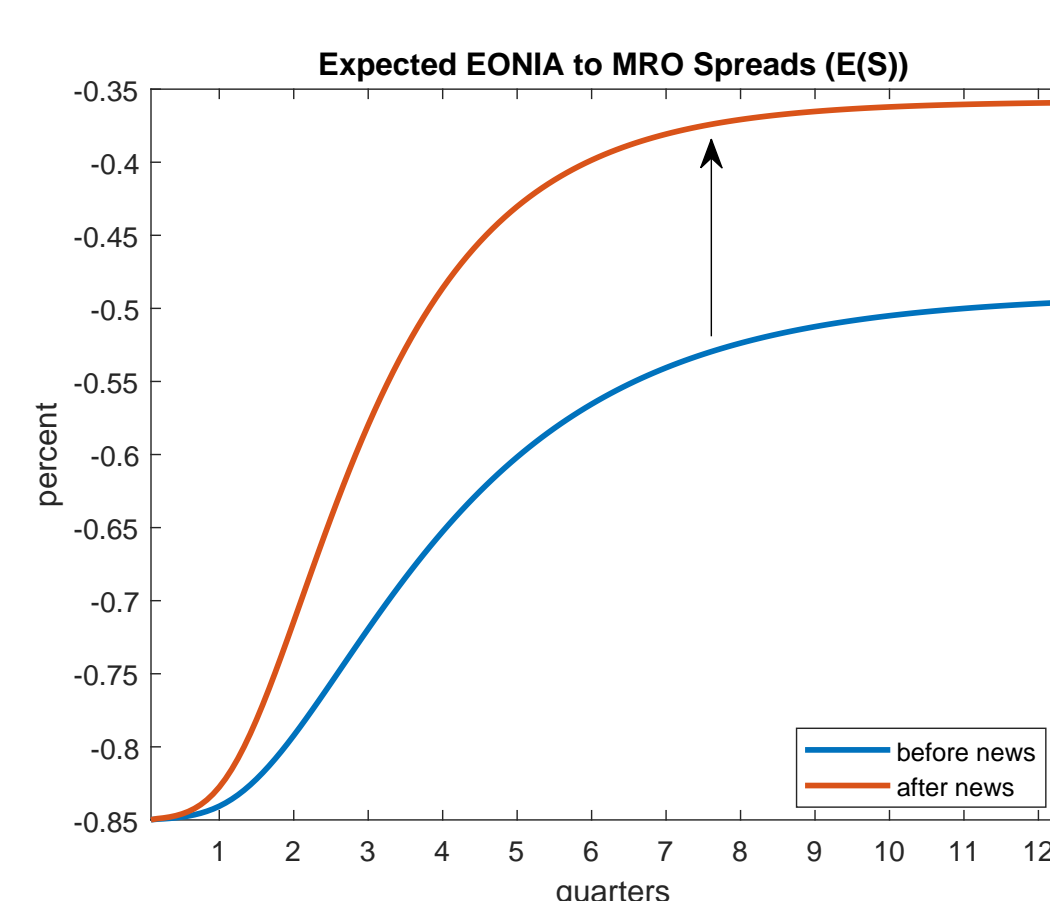
Case Study 1: ECB's Long-term Refinancing Operations (LTROs) paybacks in 2013



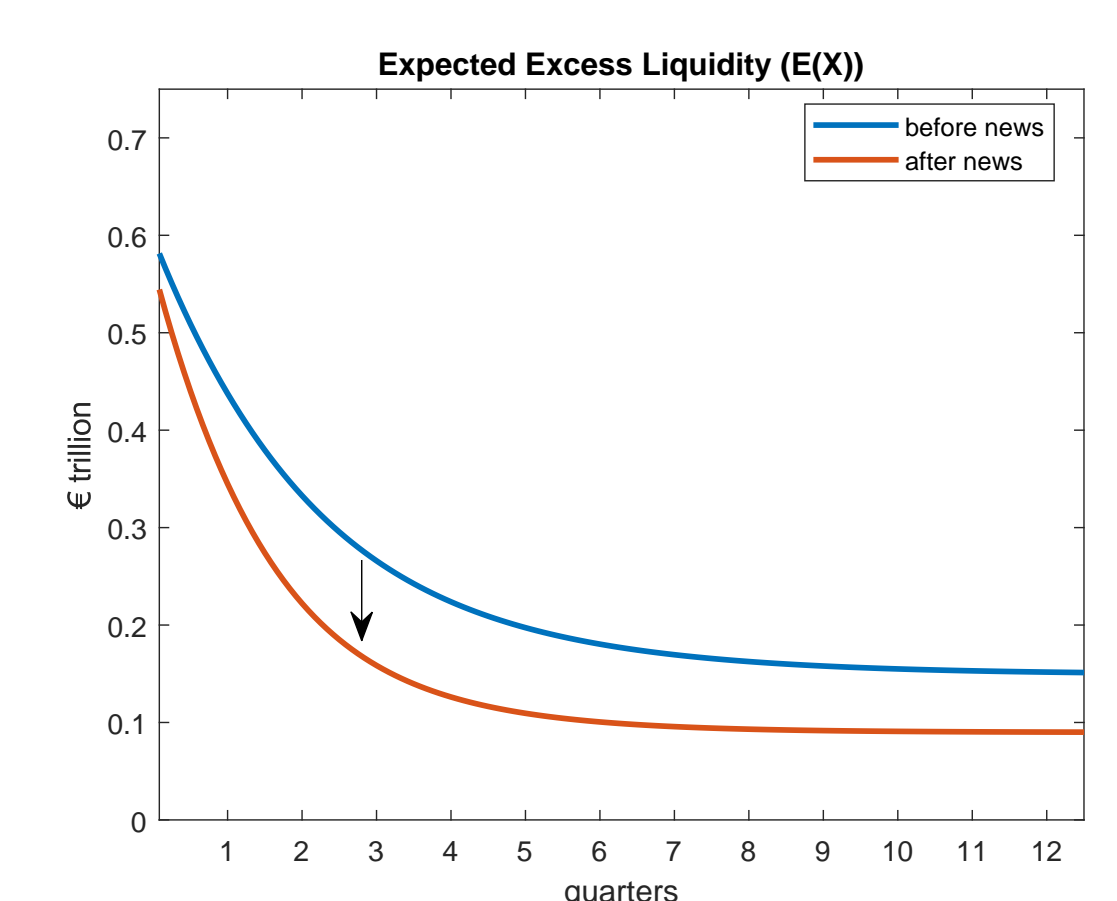
Notes: In the left panel the green dots represent actual LTRO repayment amounts, red bars represent survey-based expectations of each repayment, and blue bars represent the surprise repayment, computed as the difference of the former to the latter. In the right panel EONIA OIS yields until 10-year in levels (lhs axis) and daily changes (rhs axis).

25 January 2013 first surprise => EONIA OIS yield curve higher <=> Changes in perceptions about future Excess Liquidity

Expected spreads rose amid ...



...perceived lower future liquidity



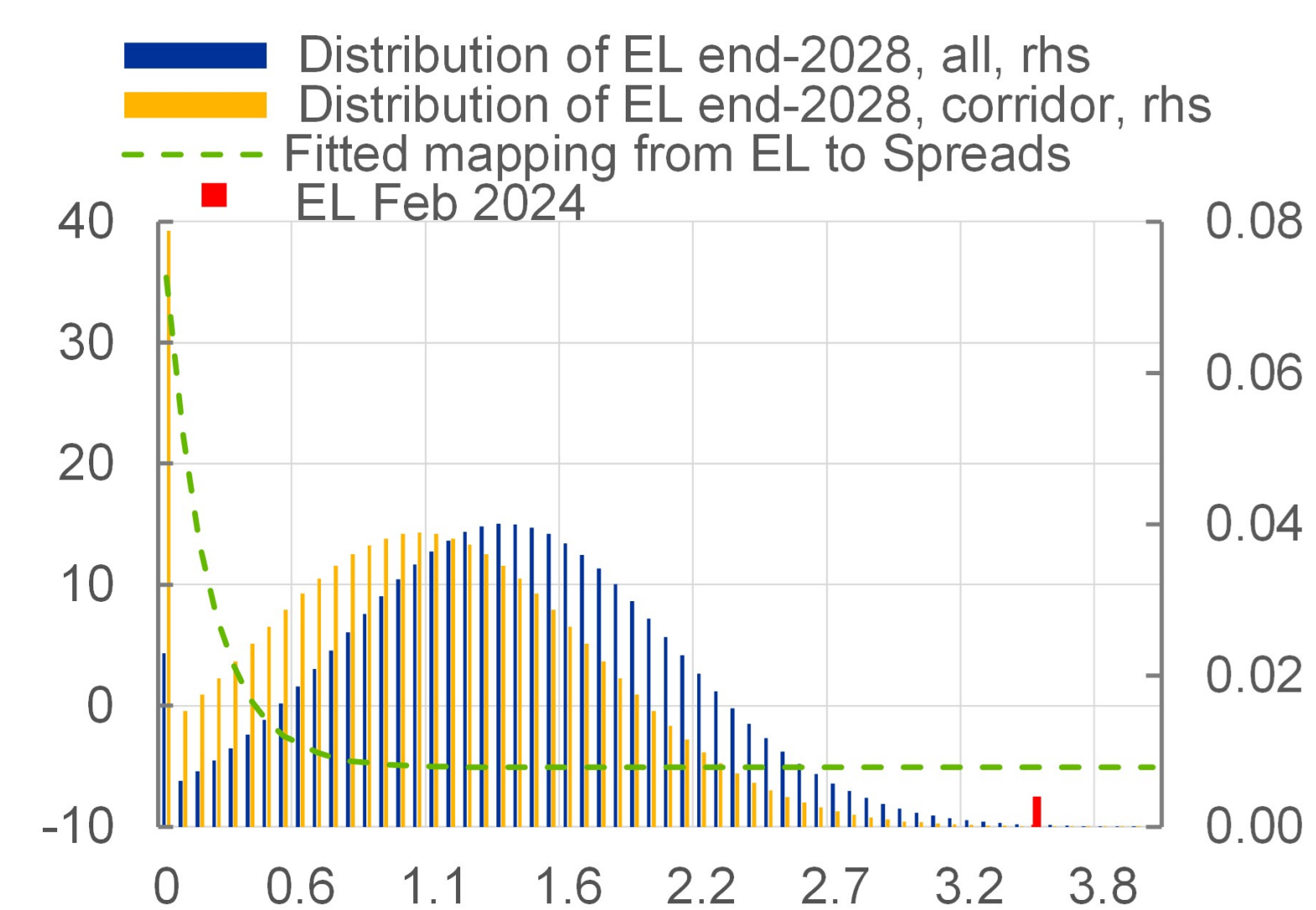
Notes: Left panel: model-implied term structure of scaled money market spreads to the MRO rate before (blue) and after (red) announcement on 25 January 2013 about LTRO payback. Right panel: model-implied expected excess liquidity before (blue) and after (red) surprise announcement.

Case Study 2: ECB Operational Framework Review 2024

- Revised Operational Framework announced in March 2024 (excerpts):
 - Governing Council to continue to steer monetary policy stance by adjusting deposit facility rate (DFR)
 - Spread between the rate on MROs and DFR to be reduced to 15 basis points as from 18 September 2024
- Policy application: quantify how reducing the MRO-DFR corridor affects the uncertainty of the €STR-DFR spread, accounting for "floor" and "corridor" survey-expectations for the revision of the operational framework (Bloomberg)
- Results: Narrowing the MRO-DFR corridor reduces uncertainty about future money market rates, i.e. it limits the potential yield-curve effects of uncertainty surrounding future excess liquidity.

Survey-perceived distributions of future Excess Liquidity

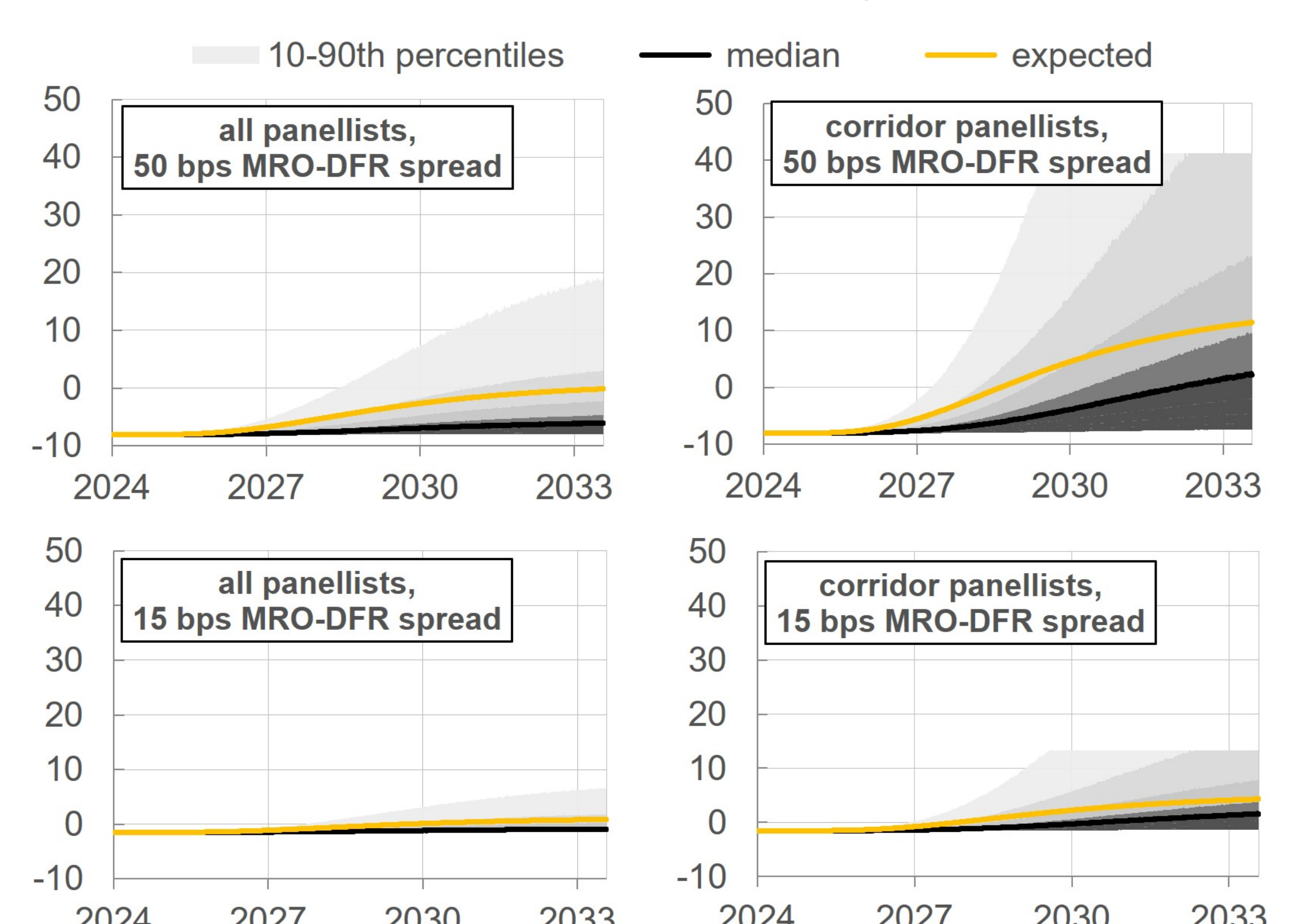
BBG survey February 2024



Notes: Blue bars represent estimated probability distribution of future excess liquidity by end-2028 of all Bloomberg panellists from the Feb. 2024 survey. Yellow bars, same, informed only by subgroup of "corridor" survey participants. Green line is the exponential mapping: $g(X_t) = a + b \cdot \exp(-cX_t)$ estimated over Aug 2007 to Mar 2024 with weekly (Friday) data, scaled for a 50 basis points MRO-DFR corridor.

Narrower MRO-DFR spread reduces uncertainty about future money market spreads

Distribution of future €STR-DFR spreads



Notes: Fan charts covering the 10 to 90th percentile of the model-implied distributions of future €STR to DFR spread. In the left panels ("all"), distributions are informed by the dispersion across all Bloomberg survey panellists around their excess liquidity outlook. In the right panels, distributions are informed by the dispersion across those Bloomberg survey panellists that foresaw in February 2024 a "corridor"-style operational framework. In the upper panels, a MRO-DFR spread of 50 bps is assumed to prevail until the 10-year horizon, in the lower panels a spread of 15 bps is assumed. The yellow line represents the forward expected spreads, i.e., the mean of the distribution at each point in time.