

SNB Economic Note

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How does SARON react to the provision of reserves by the SNB?

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The SNB implements its monetary policy by steering short-term interest rates, particularly SARON, close to the SNB policy rate. Doing so requires the SNB to control the provision of reserves. In this Economic Note, we quantify how SARON reacts to adjustments in reserves and show that the relationship can vary over time. In the current environment, SARON decreases by 0.1 basis points if reserves increase by CHF 10 billion.

To ensure price stability, the Swiss National Bank (SNB) aims to maintain appropriate monetary conditions, which are jointly determined by the interest rate level and the exchange rate. The SNB influences the interest rate level by keeping short-term interest rates close to the SNB policy rate. This is referred to as monetary policy implementation in the money market. In doing so, the SNB focuses on the Swiss Average Rate Overnight (SARON), the Swiss franc reference rate for financial markets. SARON is the price at which financial institutes are willing to borrow or lend reserves at the SNB on an overnight basis against high quality collateral.¹

The level of short-term interest rates is influenced by supply and demand for reserves. The SNB sets supply via its monetary policy implementation. Financial institutes demand reserves for various reasons, such as settling transactions, fulfilling regulatory requirements, holding precautionary liquidity buffers as well as earning the interest paid on reserves. Academics and practitioners have examined the demand for reserves theoretically (see Afonso et al., 2023a, or Poole, 1968) and empirically (see Afonso et al., 2023b, Fuhrer et al., 2021, or Kraenzlin and Schlegel, 2012). In this note, we estimate the demand curve for reserves in the

¹ In the context of the SNB, reserves are often referred to as sight deposits. We use the general term reserves.

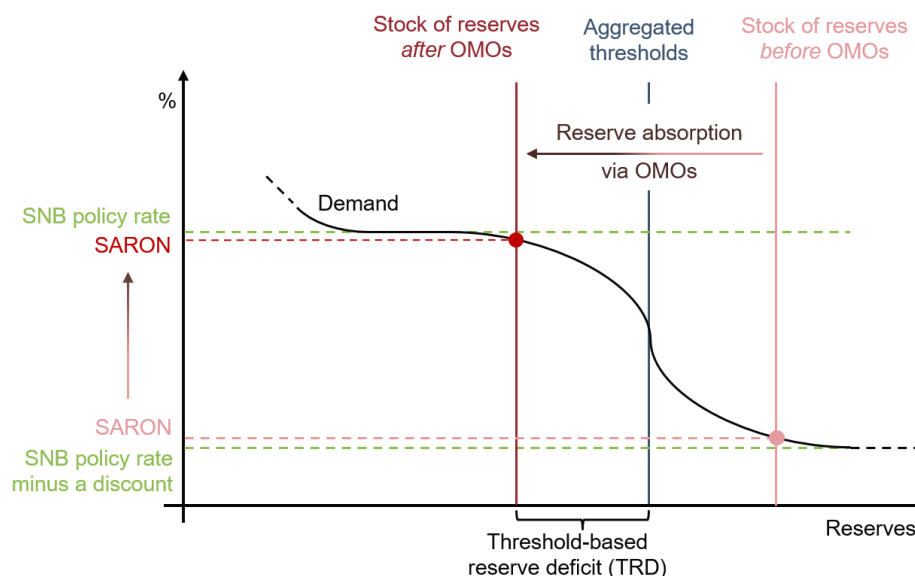
environment characterized by both a positive SNB policy rate and large reserve holdings of financial institutes that has prevailed since September 2022.

How does the SNB implement its monetary policy in the money market?

In the current environment, the SNB uses two levers to steer SARON close to the SNB policy rate.² The first lever is the remuneration of reserves. Reserves up to an institute-specific threshold are remunerated at the SNB policy rate, whereas a lower remuneration rate is applied to reserves above the threshold.³ As a result, some institutes have reserves that exceed their threshold and some institutes have reserves that fall short of it. This heterogeneity and the different interest rates used to remunerate reserves ensure that financial institutes have an incentive to trade with each other, leading to a redistribution of reserves in the system and a robust SARON calculation.

Similar to many goods and services in the real economy, the demand for reserves increases when the price decreases. In Chart 1, the corresponding demand curve is hence downward-sloping with respect to the interest rate. If the stock of reserves was substantially larger than the aggregated thresholds, no institute would be willing to demand reserves at a higher interest rate than the lower remuneration rate. Hence, money market interest rates would be close to the lower remuneration rate, as depicted by the light red dot in Chart 1. This means that on its own, the first lever would not be sufficient to steer SARON close to the SNB policy rate. To reach this objective, the SNB needs to lower the stock of reserves, thereby keeping it sufficiently scarce relative to the aggregated thresholds.

CHART 1: RESERVE DEMAND CURVE AND SNB'S APPROACH TO IMPLEMENTING MONETARY POLICY



² Moser (2023) and Maechler and Moser (2022) discuss the SNB's approach to implementing monetary policy in the money market in detail.

³ Since 1 December 2023, reserves held by financial institutes to meet minimum reserve requirements are no longer remunerated.

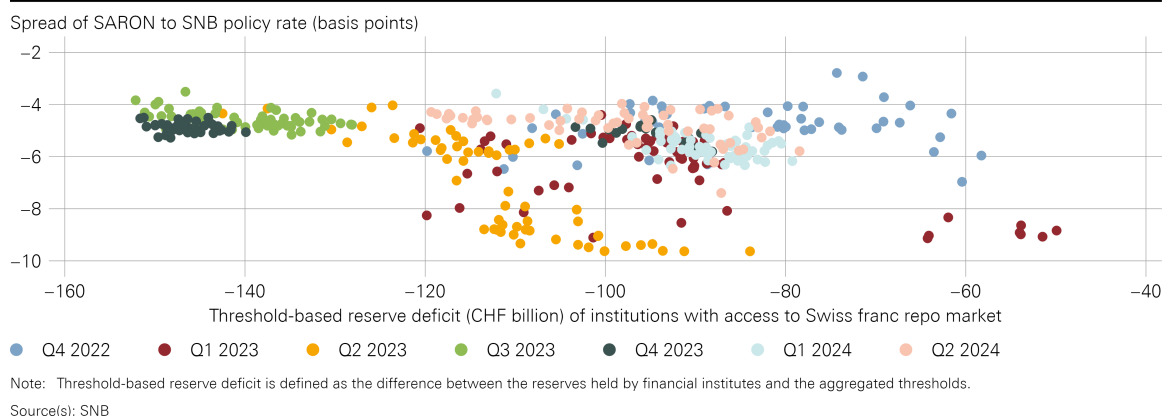
The SNB achieves this through the second lever, namely the absorption of reserves via open market operations (OMOs).⁴ Absorbing too many reserves could crowd out private sector activity in the money market, which in turn could impair a robust calculation of SARON. The SNB therefore tends to operate in the gently downward-sloping part of the demand curve. This implies that changes in the stock of reserves have an effect (albeit rather limited) on SARON. To quantify the size of this effect, we need to empirically estimate the reserve demand curve.

How can we estimate the reserve demand curve?

We quantify how SARON reacts to changes in the stock of reserves in the gently downward-sloping part of the reserve demand curve. For the analysis, we omit the initial phase after the transition to a positive SNB policy rate and focus on the period from 24 October 2022 to 30 June 2024. We use the daily spread of SARON to the SNB policy rate at market close, thereby accounting for changes in the policy rate during the sample period. SARON typically moves close to, but below the SNB policy rate, resulting in a negative SARON spread.⁵ To measure reserve scarcity, we define the daily *Threshold-based Reserve Deficit* (TRD) as the difference between the reserves held by financial institutes and the aggregated thresholds. The TRD is negative since the SNB aims at the stock of reserves being scarce relative to the aggregated thresholds in order to effectively steer SARON.

CHART 2: EMPIRICAL RESERVE DEMAND CURVE

Daily observations from 24.10.2022 to 30.06.2024; Quarters defined based on the SNB's monetary policy assessments



In Chart 2, we plot the SARON spread and the TRD, which are coloured differently for each quarter. The observations in each of the coloured data clusters are negatively correlated, suggestive of a negative slope for the reserve demand curve. To assess this empirically, we first calculate the overall sensitivity by simply regressing the SARON spread on the TRD for

⁴ The SNB absorbs reserves via reverse repo transactions and the issuance of SNB Bills. For this purpose, repo transactions with a term of one week are auctioned daily, whereas SNB Bills with terms ranging from one month to one year are auctioned on a weekly basis.

⁵ In the SNB's current approach to implementing monetary policy, SARON and other short-term interest rates typically move below the SNB policy rate due to transaction costs and costs that arise from balance sheet constraints, amongst other factors. These costs incentivise market participants to require a minimum spread to the SNB policy rate when borrowing reserves in the money market.

the entire sample period. Second, we estimate how this slope changes over time by using rolling windows of 60 days for the regression. Finally, we confirm our results by using an instrument that addresses the identification challenge discussed below.

Which challenges do we face in the estimation of the reserve demand curve?

We face three main challenges when estimating the reserve demand curve. First, we observe the demand curve only for a certain range of reserve holdings. Given the SNB's monetary policy implementation, we observe reserves only in the neighbourhood of the dark red dot in Chart 1. In this sense, our estimates of reserve demand are local and should not be extrapolated.

Second, as Chart 2 shows, the reserve demand curve seems to have shifted horizontally and changed its slope over time. Such shifts can arise due either to changes in the drivers for reserve demand described above or technical adjustments in the SNB's monetary policy implementation. This highlights the importance of allowing the slope to vary over time.

Third, movements in reserves also reflect the reactions of the SNB itself. For example, a large increase in reserve demand may prompt the SNB to reduce its reserve absorption via OMOs. This makes it difficult to observe changes in reserve demand since interest rates do not react the same way they would without the SNB's response. Inspired by Lopez-Salido and Vissing-Jorgensen (2023), we address this identification challenge by using an instrument that is able to capture variations in the TRD that are unrelated to the SNB's reserve provision. This instrument variable (IV) estimation is used to validate the results obtained via simple regression. The instrument consists of the stock of reserves held by all financial institutes plus outstanding OMOs minus the aggregated thresholds. We argue that variations in this instrument are driven by the SNB's foreign exchange interventions, which do not depend on daily fluctuations of the Swiss franc repo market conditions, as well as other factors that are outside the SNB's control.⁶ Using this instrument to identify the slope of the demand curve is econometrically more challenging than simply using TRD and thus requires more observations. When assessing how the slope varies over time, we discuss the results of the IV estimation alongside the results of the simple regression.

What are the results of our demand curve estimation?

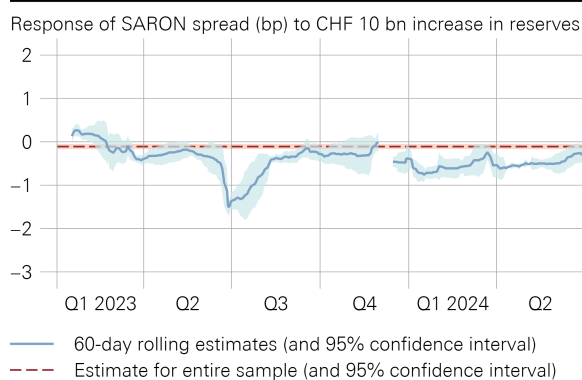
Our slope estimates of the reserve demand curve are displayed in Charts 3 and 4. For the overall sample period, we find a negative and statistically significant slope of the reserve demand curve. An increase in the stock of reserves by CHF 10 billion is associated with a decrease in SARON by an additional 0.11 basis points relative to the SNB policy rate. The slope based on the IV estimation is only slightly larger at 0.14 basis points. This confirms that

⁶ Those factors take the form of conversions of reserves into banknotes and vice versa, as well as transfers between the reserve accounts of the Swiss Confederation and financial institutes.

the slope of the demand curve is reliably estimated. As the slope appears to be rather small in magnitude, our estimation confirms that the SNB currently steers reserves in the gently downward-sloping part of the reserve demand curve.

The slope of the demand curve varies over time (cf. Chart 3). Comparing the time-varying estimates, which allow for shifts of the demand curve, to the single estimate based on the entire sample indicates that the latter underestimates the slope. Imposing a single demand curve over the entire sample period, which ignores potential shocks to reserve demand, implicitly imposes the demand curve to be flatter than it actually is. Moreover, the charts show that large slope variations can occur temporarily. Notably, we observe a volatile period following the crisis at Credit Suisse in March 2023, during which SARON became more sensitive to the stock of reserves. Other than this episode, the estimates are fairly stable over time and across our two estimation methods.

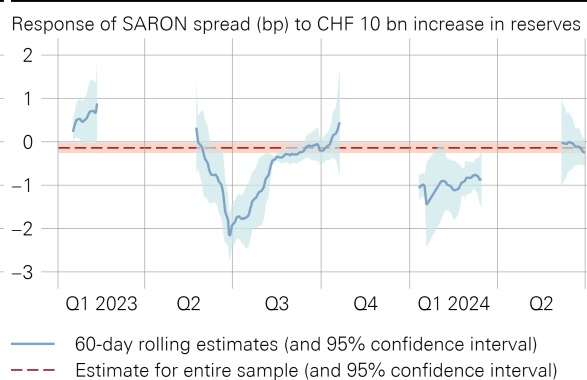
CHART 3: SIMPLE ESTIMATION



Note: Estimates for ten days in December 2023 were omitted due to a technical adjustment of the threshold factor relevant for the remuneration of reserves.

Source(s): SNB

CHART 4: IV ESTIMATION



Note: The IV model can only be reliably estimated for periods where the instrument proxies TRD well, resulting in gaps for time-varying estimates.

Source(s): SNB

How do our results relate to the SNB's implementation of monetary policy?

Our analysis contributes to understanding the relationship between money market interest rates and financial institutes' reserve holdings at the SNB. Of course, our approach is only one way to assess this. Together with other tools, the reserve demand curve estimation provides useful information for the effective implementation of monetary policy. It contributes to informing the SNB about how many reserves to supply in order to steer short-term interest rates, particularly SARON, close to the SNB policy rate. Moreover, in light of the recent global monetary policy tightening, understanding the reserve demand curve has become a pressing issue for many central banks. As central banks reduce their balance sheets, the stock of reserves available to financial institutes declines, which may affect conditions in money markets. Quantifying the sensitivity of rates to changes in reserves can help to assess how changes in central bank balance sheets may ultimately affect the central bank's ability to steer interest rates effectively.

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