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Repo transaction costs and balance sheet frictions

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Introduction

Repurchase agreement (repo) markets are central to the financial system, enabling institutions to borrow and lend cash on a short-term basis using high-quality collateral. As such, the repo market plays a crucial role in liquidity management. Central banks also rely on the repo market to manage short-term interest rates. Collateral in repo transactions often takes the form of government bonds, which means the repo market facilitates the borrowing and lending of these securities. This, in turn, supports the overall functioning of the government bond market. Dealers earn revenue by acting as intermediaries for nearly all repo transactions for end-users. By facilitating transactions, dealers charge and incur transaction costs. Despite their significance, these costs have historically been less closely monitored in repo markets compared to other financial markets.

Transaction costs in the repo market offer valuable insight into market conditions, including funding pressures and balance sheet constraints.[1] In most repo markets, including those in Canada, dealers typically operate matched books[2] and they earn revenue by charging a spread between their borrowing (repo) rates and the lending (reverse repo) rates. See Figure 1 for an example of those rates.[3] Also shown in Figure 1 is the Canadian Overnight Repo Rate Average (CORRA), which serves as the benchmark rate for general collateral overnight funding costs in Canada.[4] In the figure, the dealers' lending and borrowing rates appear around CORRA, and the resulting spread reflects both dealers' transaction costs and the level of competition in the market.

Measuring transaction costs in the repo market presents unique challenges

We calculate the transaction costs in the bilateral repo market despite the lack of quote data. In exchange-traded markets such as equity markets, bid and ask quotes are continuously posted on centralized exchanges or electronic trading platforms, allowing market participants to see the highest price a passive buyer is willing to pay (bid) and the lowest price a passive seller is willing to accept (ask) in real time. The bid-ask spread provides a direct measure of transaction costs and measures the liquidity of the market. In contrast, the repo market in Canada and many other jurisdictions is mainly over-the-counter (OTC), so these costs are not directly observable and must be estimated. We calculate the "effective spread", which is the absolute difference between the transaction rate (repo or reverse repo rate) and the market midpoint, a proxy for the market clearing price of an asset.

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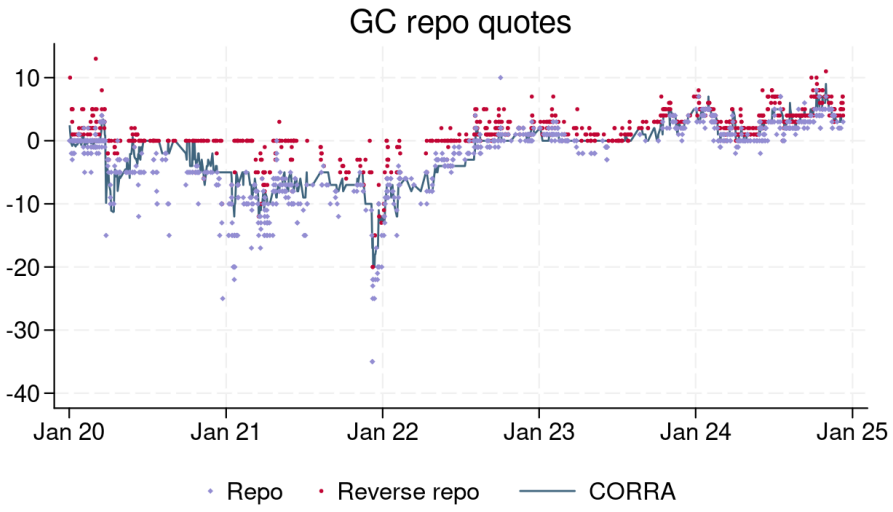
[1] For more information on repo, see Garriott and Gray (2016). "Canadian Repo Market Ecology", Bank of Canada Staff Discussion Paper 2016-8, https://www.bankofcanada.ca/2016/03/staff-discussion-paper-2016-8/.
[2] Hempel et al. (2025). "The $12 Trillion US Repo Market: Evidence from a Novel Panel of Intermediaries", FEDS Notes, https://doi.org/10.17016/2380-7172.3843.
[3] The underlying data are from the general collateral (GC) Government of Canada overnight repo market. See the second paragraph in the next section below for a discussion of GC transactions.
[4] For more information on CORRA, see https://www.bankofcanada.ca/rates/interest-rates/corra/.

Figure 1



IDB data; all rates relative to Bank of Canada target rate

Effective spreads must distinguish between so-called general collateral (GC) and special collateral. GC transactions are those in which the interest rate is negotiated first, with the collateral selected afterward from a pool of eligible securities. In addition, the repo market also includes special collateral repos, where a particular security is identified upfront, and the repo rate is then set based on factors such as its scarcity. These tend to have lower repo rates (called "special" rates), as they reflect the specific collateral value given up by the collateral provider. Each of these products will have a different midpoint, but they are typically not labelled in the transaction-level repo data.

Effective spreads must account for different trading motives, distinguishing between passively serving clients and initiating trades. Not all trades executed by dealers are for the purpose of intermediation between clients. Dealers also trade for other reasons, such as managing their own inventory or conducting transactions on behalf of bond trading desks within their affiliated bank. We hypothesize that the repo rates (reverse repo rates) for these latter transactions are generally higher (lower) than the mid-point. The reason is that the dealer will be the initiator of these transactions and be charged transaction costs by its counterparty. This phenomenon could lead to an underestimation of the effective spread charged by dealers if unaccounted for. To control for factors like the one just described, we use a method, which we describe in the next paragraphs, that isolates client-initiated transactions. We use only those transactions to avoid biasing the calculation of intermediation costs.

Our main data source is the Market Trade Reporting System (MTRS). MTRS provides transaction-level data on dealers' repo and reverse repo trades. For each transaction it includes information on the reporting dealer, its counterparty, volume, price, security, transaction date, settlement date, and

maturity date. We utilize data covering the period from January 2016 to June 2025. To ensure data quality, we eliminate outliers.[5]

To estimate transaction costs, we first calculate the market midpoint by grouping trades in ways that reflect market practices. We begin by grouping transactions by trade date and term to maturity, which ensures comparability. Within these groups, we further segment by collateral type. Since there is no label distinguishing between GC and special collateral, the methodology must be designed such that the measurement can account for potential specialness. To reflect GC repo, we create separate groups for provincial bonds, Canada Mortgage Bonds (CMBs), and specific corporate, municipal, or Crown issuer securities.[6] In general, the repo rate for these categories is determined first, before a particular collateral within the group is chosen. For Government of Canada (GoC) bonds, we take the conservative approach, grouping trades by CUSIP. The reason is that GoC bonds are frequently traded as special collateral repos, as opposed to other collateral categories.

We rely on interdealer broker (IDB) transactions (also reported in MTRS) to obtain precise midpoints for all our defined groups. This enables accurate calculation of effective spreads across the full dataset. Only dealers and banks have access to IDB trading platforms. Transactions are either conducted via a limit order book[7] or mid-point auctions[8]. In Figure 2 we plot the distribution of repo and reverse repo rates separately for IDB and non-IDB transactions. The IDB data reveal that the distributions of repo and reverse repo rates are closely aligned, and the distributions exhibit a high concentration around the mode. This explains why the observed spreads between bid and ask quotes on the platforms are narrow. Given their shape and alignment, the distributions allow for a precise midpoint estimation. We therefore rely on IDB data to calculate the midpoints, which are then used to calculate the effective spreads. To obtain the midpoints, we calculate the volume-weighted averages per day across all transactions within a group. Refer to the appendix for a robustness test designed to address potential concerns about potential bias in midpoints due to small sample sizes.

Before calculating effective spreads, we eliminate transactions that are unlikely to reflect client-driven intermediation. For this, we use the Lee-Ready method (1991), which classifies equity trades by comparing the trade price with the midpoint: trades priced above the midpoint are treated as buyer-initiated, and those priced below are treated as seller-initiated. Similarly, we categorize (reverse) repo trades as not client-initiated if the rate is above (below) the midpoint. These trades have a negative effective spread from the dealer's point of view. They are unlikely to result from typical intermediation activity, as the rates are "too high" or "too low" for a dealer to reasonably accept when

[5] We remove extreme transaction amounts (greater than $150 million), and trades where the rate is too far from CORRA (more than 150 bps). We also remove outliers at the CUSIP level by dropping anything with a rate too far from the weekly median (more than 30 bps or 3 standard deviations).

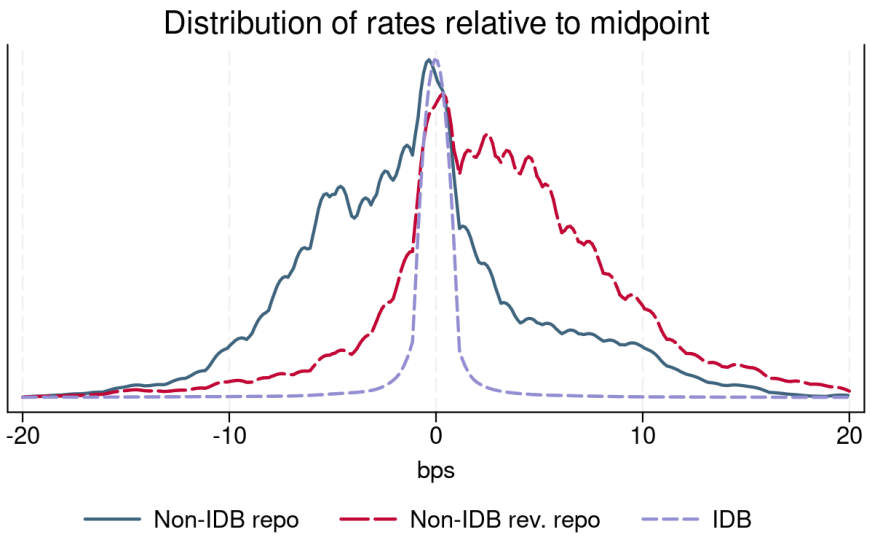
[6] Crown issuer securities are assets issued by the government or a government-related entity. Canada Mortgage and Housing Corporation is an example of the latter.

[7] A limit order book is a record of buy and sell orders for a security. Orders are typically matched based on price priority, with the highest bid and lowest ask orders being executed first. The limit order book provides high transparency by displaying all open orders.

[8] On a trading platform with midpoint auctions, buy and sell orders are matched at the midpoint of the bid and ask prices. This mechanism ensures a fair execution price by reflecting the consensus between buyers and sellers.

acting as an intermediary for clients. We exclude all of these trades. For the remaining trades, we calculate the effective spread as the absolute distance between each transaction rate and the relevant group midpoint. As a final step, we eliminate effective spreads greater than 20 bps since these are likely outliers but can throw off the calculation of averages. Overall, this method provides a comprehensive measure of transaction costs across segments of the repo market, while also accounting for the fact that some dealer trades may serve purposes other than intermediation.[9] Refer also to the appendix for a supplementary test on the accuracy of the measured effective spread size.

Figure 2



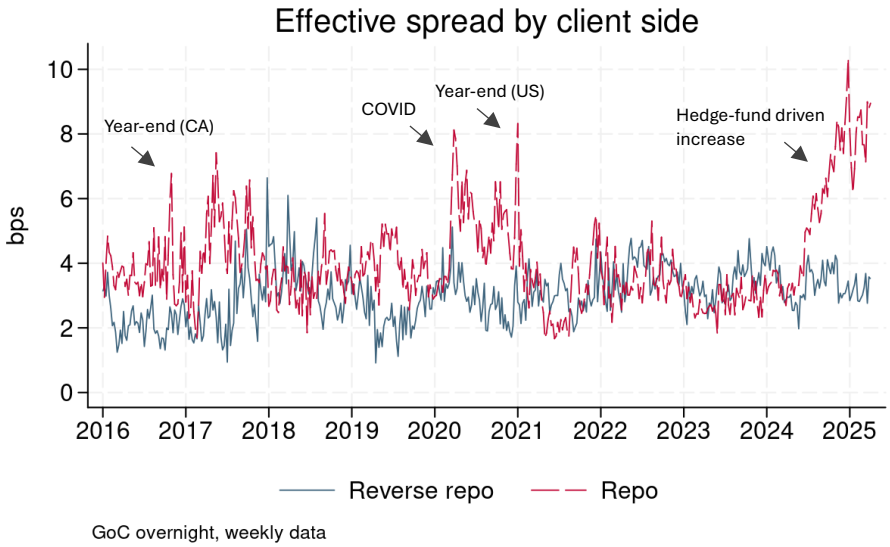
Effective spread and balance sheet costs

Effective spreads appear to reflect balance sheet costs. Figure 3 shows the weekly average effective spread for overnight GoC repo transactions separately for repo and reverse repo transactions. The effective spread generally ranges between 2 and 5 basis points, and relatively symmetric on average between repo and reverse repo. The time period shown in our figure also captures episodes of broader market stress, including the elevated spreads observed during the onset of the COVID-19 pandemic. Distinct year-end spikes are also visible (on December 31 for the

[9] For the largest three dealers (measured by gross outstanding repo), client-driven transactions make up approximately 70% of their activity, indicating a strong focus on intermediation. In contrast, for the smallest three dealers, the share is only 30%, suggesting a more limited role in intermediating between counterparties.

US and October 31 for Canada) reflecting balance sheet pressures around reporting dates.[10] The US year-end spikes reveal that the reporting pressures in the US market also spill over to the Canadian market. Finally, the increase in repo effective spreads in 2024 reflects large cash-borrowing positions by hedge funds funding bond positions in the environment of a larger government debt stock and quantitative tightening.[11]

Figure 3



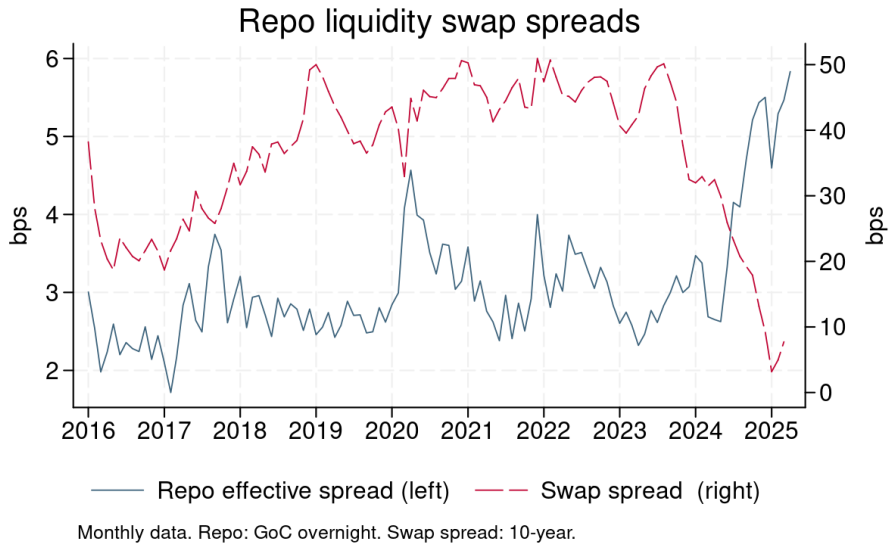
Effective spreads are also correlated with swap spreads, an established proxy for balance sheet costs. Swap spreads are the difference between the fixed rate on an interest rate swap and the yield on a government bond with the same maturity. When the government bond yield lies below the swap's fixed rate, the swap spread is positive, indicating that the government bond carries a convenience yield. Conversely, when swap spreads narrow or turn negative, government bonds become relatively less convenient. A common explanation is rising intermediation or balance sheet costs. This interpretation is consistent with Figure 4: increases in our effective spread measure are associated with declines in swap spreads. This is additional evidence that effective spreads capture balance sheet costs that are difficult to observe through other measures. While swap spreads are

[10] The U.S. has a fiscal year-end on December 31, while Canada ends its fiscal year on October 31. These dates can create distinct fluctuations in the repo market, where institutions adjust their positions for regulatory or financial reporting purposes. For example, very pronounced year-end spikes can be observed on 31 December in both 2016 and 2020.

[11] For more information refer to Plong and Maru (2024). "CORRA: Explaining the rise in volumes and resulting upward pressure", Staff Analytical Note 2024-21, https://www.bankofcanada.ca/wp-content/uploads/2024/08/san2024-21.pdf.

influenced by expectations of future market conditions, our effective spread measure is not. The reason is that repo trades have a short term, mostly overnight, while swap spreads have much longer maturities, typically years or decades. Thus, our measure reflects immediate rather than expected market conditions. For example, recent work suggests that swap spreads can reflect expectations of banking deregulation amid discussions of regulatory easing (see Perli, 2025).

Figure 4

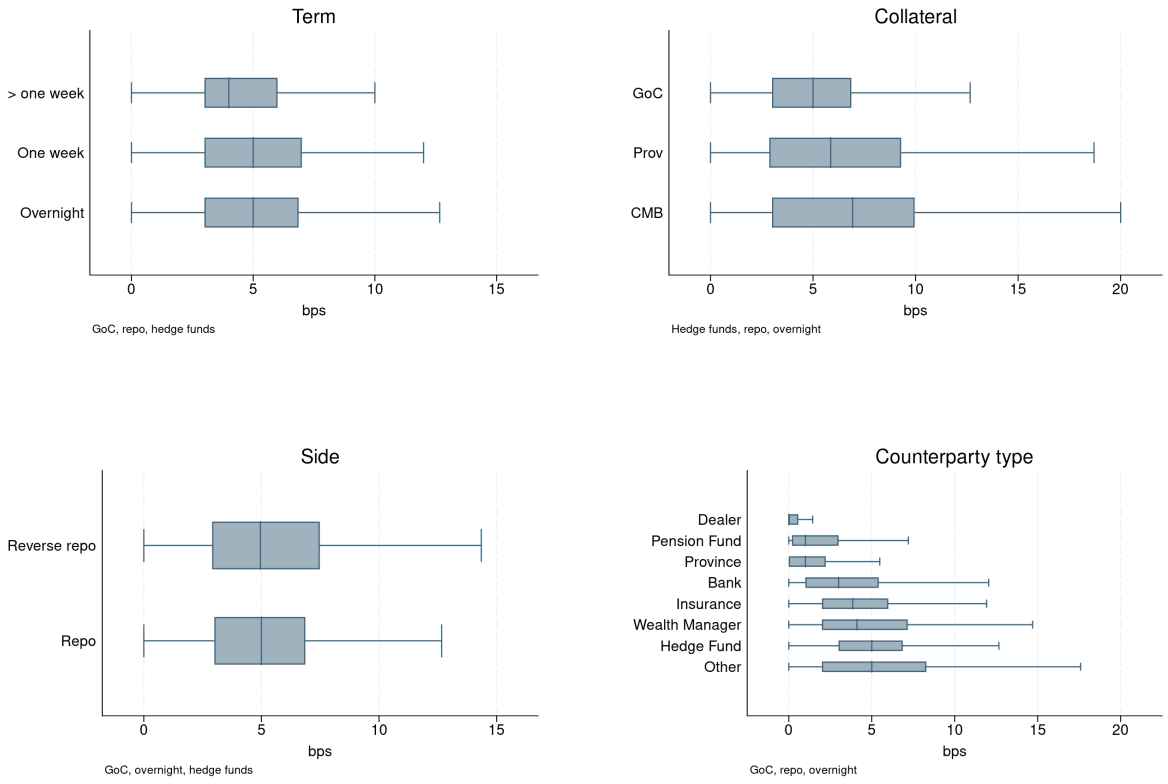


Monthly data. Repo: GoC overnight. Swap spread: 10-year.

Effective spreads vary widely and intuitively across subsamples. Because our methodology yields a spread for each transaction, we can create subsamples across multiple dimensions. Figure 5 illustrates average effective spreads by term, collateral, side and counterparty type. We take the effective spreads of hedge funds as a baseline unless we otherwise specify it. The reason is that they are among the most active in the repo market and therefore we have the most data to compare subsamples of it. When looking at Figure 5, we observe that the variation across the categories is consistent with anecdotal evidence. Effective spreads have similar medians across terms, while the distributions for overnight and one-week trades are slightly wider due to our sample's focus on hedge-fund activity. We also observe that both sides of the market, repo and reverse repo, have roughly the same average effective spread. The most standardized transactions are backed by GoC collateral, which tends to result in lower effective spreads compared with transactions secured by provincial bonds or CMBs. Effective spreads further vary by counterparty. Interdealer spreads are the lowest, reflecting the high volume of transactions occurring each day in the interdealer market. The next lowest spreads are observed for pension funds and provincial counterparties, likely because the diverse and substantial business they bring to dealers across multiple market segments reduces the spreads they pay. The middle layer of spreads is paid by banks, insurance companies, and wealth

managers, while the highest spreads are observed for hedge funds and other institutions.[12] Although Figure 5 presents cross-sectional averages, the methodology also allows for constructing customized time series to examine specific market segments over time.

Figure 5



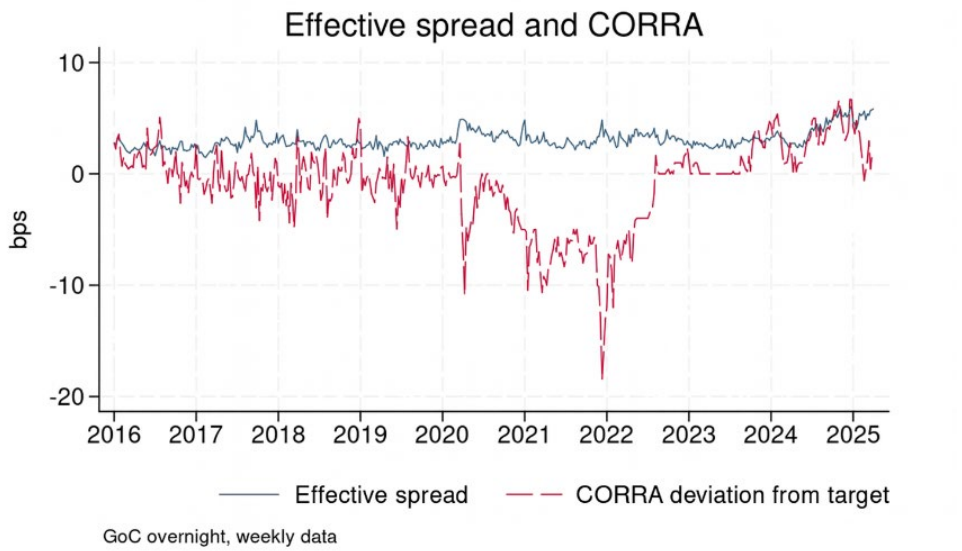
Comparison to other common indicators in the Canadian fixed-income market

Effective spreads provide information that is distinct and complementary to the deviations of CORRA from the target rate. CORRA, a measure of GC overnight funding backed by Government of Canada bonds, is a key benchmark for short-term interest rates. It is usually very close to the Bank of Canada's overnight target rate, which reflects the monetary policy stance of the Bank of Canada. Significant deviations of CORRA from that target can signal liquidity imbalances or stress in funding markets, weakening the transmission of monetary policy. As shown in Figure 6, the time series of effective spreads follows a different pattern than the deviations of CORRA from the policy rate. We for example see that in 2021 there were large deviations of CORRA from the policy rate while the effective spreads stayed stable. This illustrates that the level of interest rates and effective spreads capture two separate concepts: CORRA reflects overall market funding conditions, while effective

[12] Other institutions include non-Canadian sovereigns and sub-sovereigns, as well as credit unions.

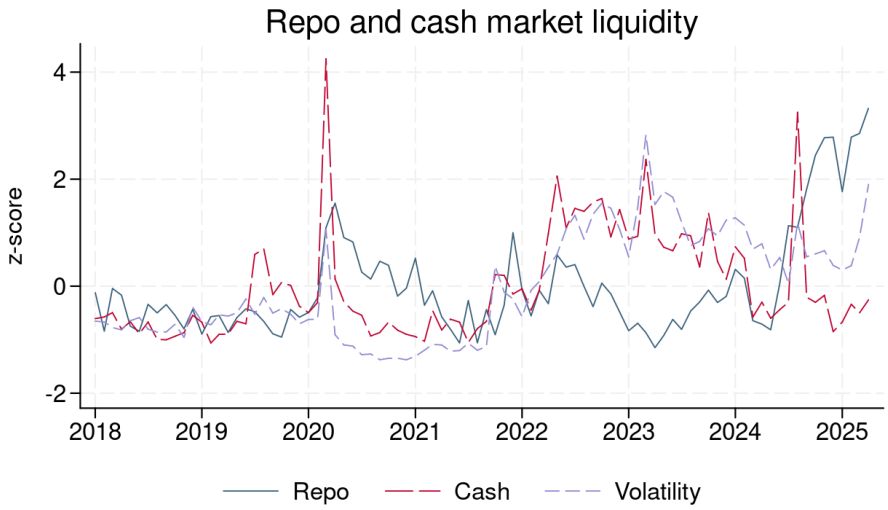
spreads measure client transaction costs in the repo market. While they can move together during periods of market stress, as in March 2020, when liquidity pressures and heightened uncertainty simultaneously drove CORRA below the policy rate and widened effective spreads, they do not necessarily do so under normal conditions. This underscores that analyzing both measures together provides a more complete picture of funding market dynamics than relying on either one alone.

Figure 6



Effective spreads in the repo and cash market provide different insights. Cash market effective spreads are closely correlated with intraday volatility (Fleming and Nelson 2022, Fleming 2023, Fleming 2024), while repo market spreads show little such relationship (Figure 7). For example, during the Silicon Valley Bank (SVB) episode, which was an event characterized by heightened uncertainty, cash market effective spreads spiked along with volatility, while repo market spreads remained stable. In contrast, repo spreads increase at year-ends due to balance sheet pressures, which is a pattern not reflected in cash market spreads, as this type of pressure is not related to uncertainty. During the onset of the COVID-19 pandemic, both markets experienced stress, and effective spreads rose in both. These patterns indicate that repo and cash market effective spreads provide complementary information, with cash market spreads capturing volatility, while repo market spreads reveal balance sheet costs.

Figure 7



Monthly data. Repo: GoC overnight. Cash liquidity, volatility: GoC 2-year benchmark.

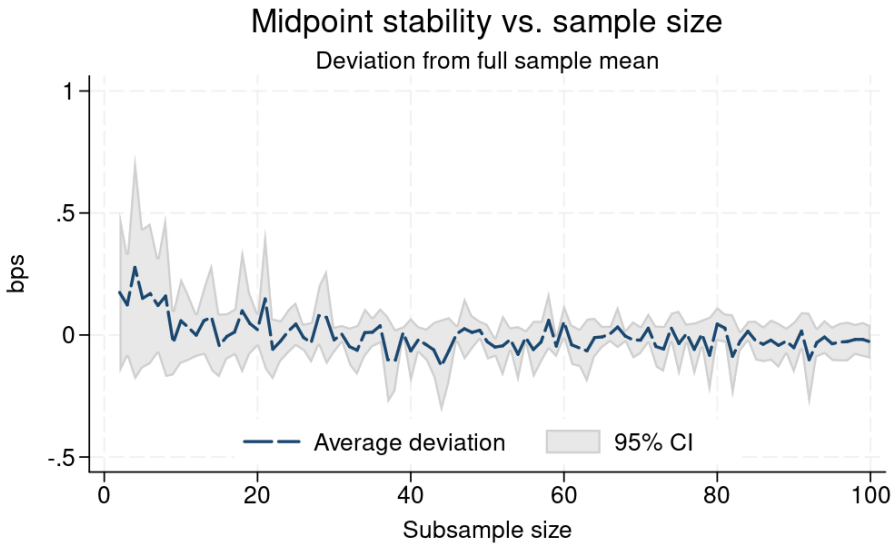
Conclusion

We develop a methodology to estimate transaction costs in the repo market using OTC data, where bid-ask spreads are not directly observable. By calculating effective spreads at the transaction level, we provide a flexible tool for analyzing intermediation costs across different segments of the market. Effective spreads are particularly informative about balance sheet costs, as for example reflected in consistent year-end spikes and elevated levels during the onset of the COVID-19 pandemic. These findings underscore the value of effective spreads as a high-frequency indicator of market functioning and provide a foundation for further analysis of monetary policy transmission and market participant behaviour.

Appendix

In this appendix we address any concern that midpoints could be biased because of small sample sizes, given our grouping of transactions. We assess the robustness of using IDB transactions to calculate the midpoints through a subsampling exercise with 20 groups. We use transactions of given CUSIPs on particular dates for which we observe a high IDB activity. For each group, we subsample using a range of subsample sizes. For each size, we draw 100 random samples and compare the midpoint in each subsample with the pair's full-sample average as a benchmark for the true midpoint. The average deviation of subsample average midpoints from the full-sample average is small and decreases rapidly as the subsample size increases (see Figure 8). Because deviations are close to zero even for small samples, this indicates that IDB-based midpoints are unbiased even for such sample sizes.

Figure 8



In addition, we perform an unreported, separate analysis to assess the correct measurement of the magnitude of our effective spreads by comparing them against the ones of so-called netted packages. Netted packages consist of two offsetting trades, a repo and a reverse repo, executed between the same dealer and client, with the terms negotiated jointly. Because you can directly observe the differences in rates, netted packages provide another highly precise measure of transaction costs. However, we do not have a large enough number of package transactions to rely on them for building our measure. Nevertheless, we can use them for comparison. Our comparison shows that the magnitudes of our measured effective spreads closely align with those of the netted packages, providing robustness about the accuracy of our measurement.