THIRD REPORT ON THE LIQUIDITY OF THE SECONDARY MARKET OF ITALIAN GOVERNMENT BONDS, YEAR 2024

MEF Dipartimento del Tesoro

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THIRD REPORT ON THE LIQUIDITY OF THE SECONDARY MARKET OF ITALIAN GOVERNMENT BONDS, YEAR 2024

The Report was elaborated by CRIEP research team on the liquidity of the secondary market of the Italian government bonds (Ms. Valentina Catapano, Prof. Luciano Greco and Mr. Filippo Mormando), with the technical support of Mr. Fabrizio Tesseri and Mr. Alessandro Iacono from the MEF, and Ms. Carla Tretto and Mr. Antonio Caruso from MTS Spa. Ms. Valentina Catapano's PhD scholarship is funded by the European Union – Next Generation EU. The analyses were carried out based upon the database made available by the MEF, within the framework of the institutional cooperation agreement between the MEF, MTS and CRIEP. The final version of the Report is the result of the review and collaboration in the context of the Technical and Scientific Committee of the above-mentioned agreement, composed of Mr. Davide Iacovoni (MEF), Mr. Ciro Pietroluongo (MTS) and Prof. Luciano Greco (CRIEP).

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1. Summary

The Report analyses the trend in liquidity conditions in the interdealer market for Italian government bonds (MTS Italy) with a focus on 2024. We explore the different dimensions through which the micro-structural liquidity of the market may be assessed: on the one hand, the quoting activity and availability of market makers to offer competitive prices in the interdealer market to execute buy and sell orders (possibly significant ones) of government bonds; on the other hand, the trading activity on the market platform. We also investigate the interaction between the two dimensions, testing the resilience of market makers against trading flows. We conduct the analysis separately for each government bond segment; specifically, we analyze the same metrics for each line on which the Italian Treasury operates through bond issues (so-called on-the-run lines): 6-month and 12-month BOTs, Short-Term (2-year), 3-year, 5-year, 7-year, 10-year, 15-year, 20-year, 30-year and 50-year nominal BTPs, Green BTPs, 5-year, 10-year, 15-year and 30-year Euro-zone inflation-indexed BTPs, 5-year and 7-year CCTs-eu. The Report focuses primarily on micro-structural liquidity, which is measured according to established metrics based on existing scientific literature and market best practices; then discrepancies among the liquidity conditions of the various government bond segments are described. Moreover, given the important technological evolution that has increasingly characterized the operations of intermediaries in the financial markets over the last few years, we look at the algorithmic trading of market makers, with a focus on the development and use of auto-hedging functions in the quoting and trading activities of such operators and on the execution of significant flows involving multiple securities in the same flow (so-called basket/block trades). A special section of this third Report looks at the activity with final clients and its relationship with the liquidity in the secondary interdealer market.

Our main findings are that in 2024 liquidity conditions were good across all segments analyzed (and almost all metrics adopted), stabilizing the improvement observed in 2023 and marking a continued recovery from the deterioration in 2022. In broad terms, market makers offered good liquidity conditions fairly homogeneously across them, with no significant differences in the behavior between the more competitive dealers and the more risk-averse ones. Liquidity conditions in 2024 were robust in an environment characterized by loosening of central banks' restrictive monetary policies and the actual interest rate cut cycle. Trading volumes on MTS Italy, which had started to rise in April 2020 (but declined in 2022), surged in 2024 reaching an all-time high. The rise in traded volumes is also representative of a relevant increase in the traded risk in the market. Compared to 2023, the increase in traded volumes was almost evenly distributed across different flow sizes for most of government bond segments. Combining both quoting and trading dimensions, liquidity conditions in 2024 remained broadly stable compared to previous years—even during directional fast market phases and periods of medium-sized trading flows—confirming the overall resilience of primary dealers' quoting activity on MTS Italy. Finally, it appears that the execution of large trades, which frequently involve multiple securities, stabilized in 2024 and the average number of securities involved in a single flow is lower compared to the previous recent years, suggesting a limitation in the execution of basket trades. In 2024, the volumes generated by auto-hedging trading strategies stabilized after reaching a record high, reflecting the overall good liquidity conditions.

In the special section, we further deepen the analysis by investigating the potential links between business-to-customer activity and interdealer activity. First, we analyze the dynamics of macro variables related to final investor market activity (e.g., traded volumes and imbalances) and compare them with quoting and trading activity on MTS Italy, to provide a general framework. Second, we focus the analysis on MTS BondVision, a dealer-to-client trading platform, introducing several metrics (e.g., the standard deviation of quotes received from the selected sell-side operators for each request-for-quote, the effective execution cost) to explore liquidity conditions for final clients and their relationship with interdealer liquidity conditions on MTS Italy. Finally, we investigate the interaction between the two dimensions, by testing how the execution of a request-for-quote on BondVision affects liquidity conditions and trading volumes on MTS Italy. Preliminary results indicate that liquidity conditions on the interdealer market and on the dealer-to-client market are intertwined and a high correlation exists between trading activity with final investors and that in the interdealer segment. In 2024, there was evidence indicating that the activity on BondVision resulted in better liquidity conditions on MTS Italy.

2. Market maker quoting

In the context of the micro-structural liquidity, we firstly investigate the quoting activity of market makers on the MTS Italy government bond market, which is the wholesale secondary market selected by the Ministry of Economy and Finance for the evaluation of Specialists in government bonds[1]. The analysis of quoting activity is structured as follows: in Section 2.1 we provide a long-term perspective analysis over the period 2006-2024 focusing on the benchmark securities; then, in Section 2.2, we focus on the 2022-2024 period in order to delve into the effects of the European Central Bank (ECB) monetary policy decisions on market liquidity conditions; finally, in Section 2.3, we analyze the evolution of liquidity in 2024 for each segment of government bonds on which the Treasury operates through bond issues. An in-depth box provides a brief analysis of the recent dynamics of the repo market.

We conduct the analysis based upon the database containing all quotations on MTS Italy of traders on the government bonds under analysis, in which quoted prices and quantities are recorded every five minutes. From a sample of around 30 indicators of liquidity, we select the following six measures, which allow us to provide a clear picture of the liquidity phenomenon and its evolution[2]:

- one indicator of quoting book[3] tightness: the best bid-ask spread;
- two indicators of quoting book depth: the overall volumes quoted on the platform; the quoted volumes associated with the three best prices as a percentage of the overall quoted volumes;
- three multidimensional indicators: the volume-weighted bid-ask (VWBA) spread; the ratio between the volume-weighted bid-ask spread and the daily volatility of the bond (VWBA spread/volatility); the slope.

The Appendix provides a description of the six indicators of liquidity and analyses their performance for each of the segments on which the Treasury operates through on-the-run issues.

2.1 The 2006-2024 period

The analysis of the 2006-2024 period provides a long-term view of the quoting activity of market makers. In this regard, 2006 is selected as a benchmark year in the investigation of the liquidity

[1] The evaluation of Specialists in government bonds allows the Ministry not only to verify compliance with the minimum requirements of Specialists in order to keep such status, but also to set the conditions to promote competition among operators when providing liquidity on the market. For more details, see Ministerial Decree No. 853355 of 1 March 2011, available at: https://www.dt.mef.gov.it/export/sites/sitodt/modules/documenti_en/debito_pubblico/normativa_spalla_destra/Selection_of_wholesale_Government_bond_markets_eligible_for_the_evaluation_of_Specialists_in_Government_Bonds_-_Decree_1st_of_March_2011_and_Annexes.pdf.

[2] The selected measures are believed to provide a smart yet comprehensive representation of the different sizes (in terms of prices and quoted quantities) of the liquidity phenomenon. See the *First Report on the Liquidity of the Secondary Market of Italian Government Bonds*, for further details on existing liquidity metrics (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html, footnote 2, p. 6).

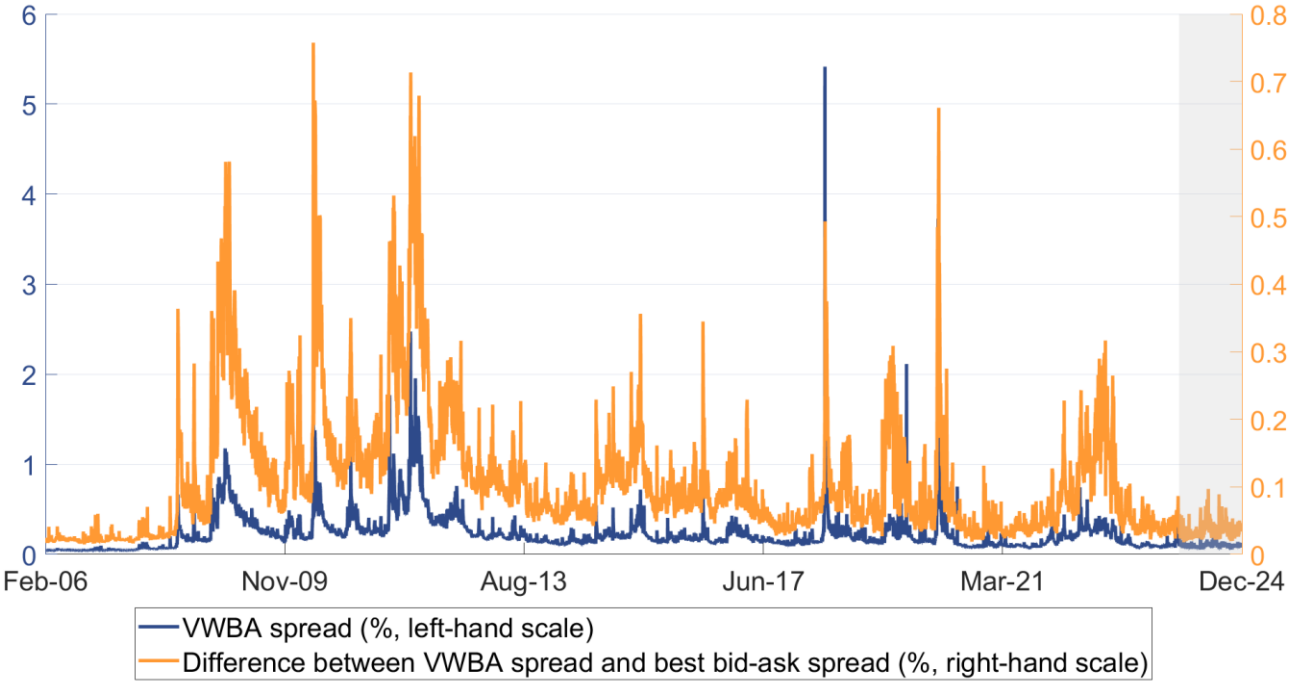
[3] MTS is a central limit order book market. The quoting book consists of the continuous proposals (i.e., bid and ask prices along with the corresponding quantities) from market makers for each bond, which are immediately executable.

conditions in the wholesale market for Italian government bonds prior to the 2007-2008 financial crisis. To keep the long-run analysis as simple as possible, we consider only the 10-year BTP[4].

On the whole, the analysis of the selected liquidity indicators points to favorable secondary market liquidity conditions for Italian government bonds in 2024—despite a few minor spikes—reinforcing the improving trend observed in 2023.

Figure 1 shows the evolution of the VWBA spread (on the left vertical axis) and the difference between the VWBA spread and the best bid-ask spread (on the right vertical axis).

Figure 1: 10-year BTP



Notes: The graph shows on the left vertical axis the volume-weighted bid-ask (VWBA) spread in % (blue line), calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond, and on the right vertical axis the difference between VWBA spread and best bid-ask spread in % (orange line), the latter calculated as the difference between the best ask and the best bid against the mid-price of the bond, for the 10-year BTP on a daily basis. The grey area points out the last year.

The VWBA spread in 2024 is confirmed at the same level as in 2023, when it reached very low levels that are comparable to those before 2008, when the government bond market enjoyed excellent liquidity conditions. The gap between the VWBA spread and the best bid-ask spread reflects potential differences in primary dealers' behavior in quoting activity, distinguishing between the market makers quoting on the best prices and on less favorable prices. This difference decreases in 2023 and remains at about the same level in 2024, which means that in the last two years market makers have offered good liquidity conditions homogeneously across them[5], as opposed to 2022

[4] For an extended long-run analysis, see the *First Report on the Liquidity of the Secondary Market of Italian Government Bonds* (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html).

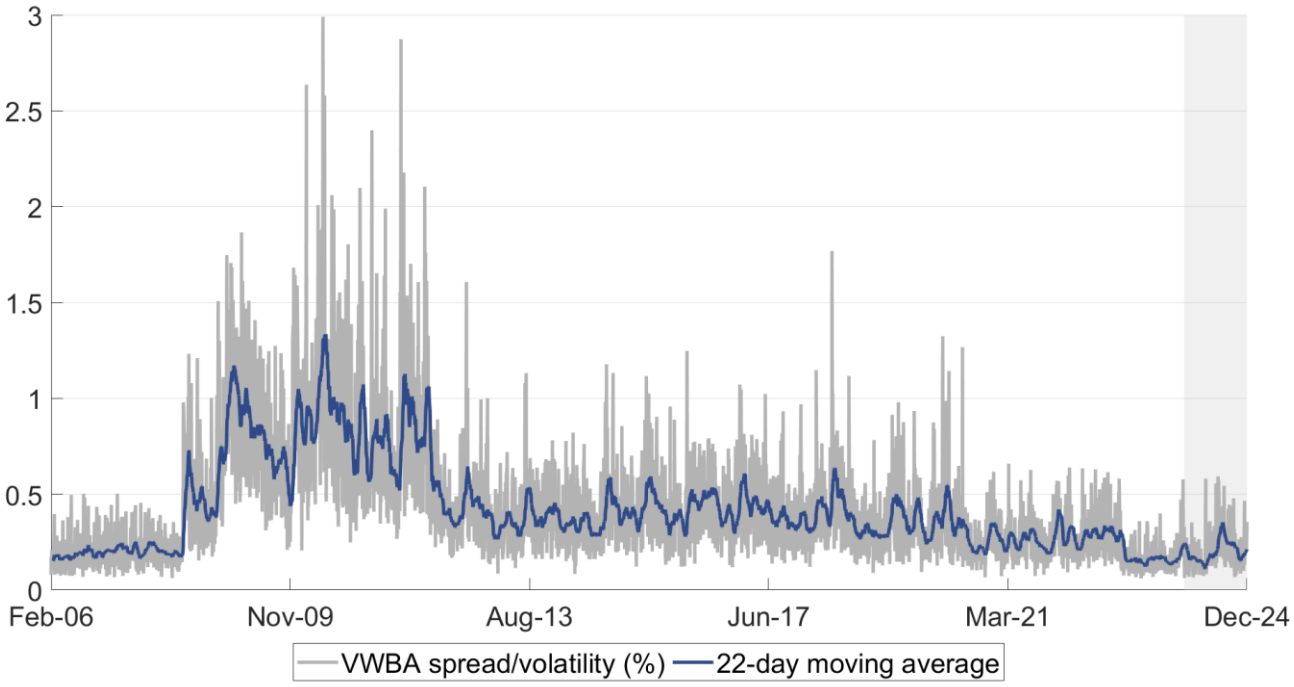
[5] In the *Second Report on the Liquidity of the Secondary Market of Italian Government Bonds* (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html), we show that the greater homogeneity in the quoting activity of primary dealers in 2023 is a phenomenon present in almost all segments of Italian bonds (not limited to the most liquid ones).

where there was a greater divergence between the more competitive market makers and the more risk-averse ones[6].

The higher confidence in providing better liquidity conditions by the whole group of primary dealers in 2023 and 2024 might have been driven by several factors, such as greater competition induced by a larger number of Specialists and lower uncertainty about the ECB's interest rate strategy in contrast to 2022 (when the more risk-averse market makers offered worse liquidity conditions than the more competitive ones)[7]. Moreover, we note that Italy faced a positive market phase in terms of stable lower credit risk pricing in 2024: (i) the 10-year BTP-Bund spread was steadily below that of the 2022-2023 period[8]; (ii) the yearly average 5-year CDS pricing on Italy was at about 65 basis points, the lowest level since 2008. In this sense, the overall positive credit risk re-pricing supported investor and dealer appetite for BTPs, thus positively impacting the overall liquidity conditions.

However, controlling for volatility, liquidity conditions have slightly worsened in 2024 compared to the previous year. This is apparent in Figure 2, which shows the evolution of the VWBA spread/volatility ratio—which allows us to compare VWBA spreads under different volatility regimes—and its one-month moving average.

Figure 2: 10-year BTP



Notes: The figure shows the daily evolution of the volume-weighted bid-ask (VWBA) spread to volatility ratio in % (dark grey line) and its one-month moving average (blue line). The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The volatility of the bond is the daily variation between the minimum and maximum mid-price. The grey area points out the last year.

[6] However, the available database does not allow for a precise identification of this effect, which is beyond the scope of this Report.

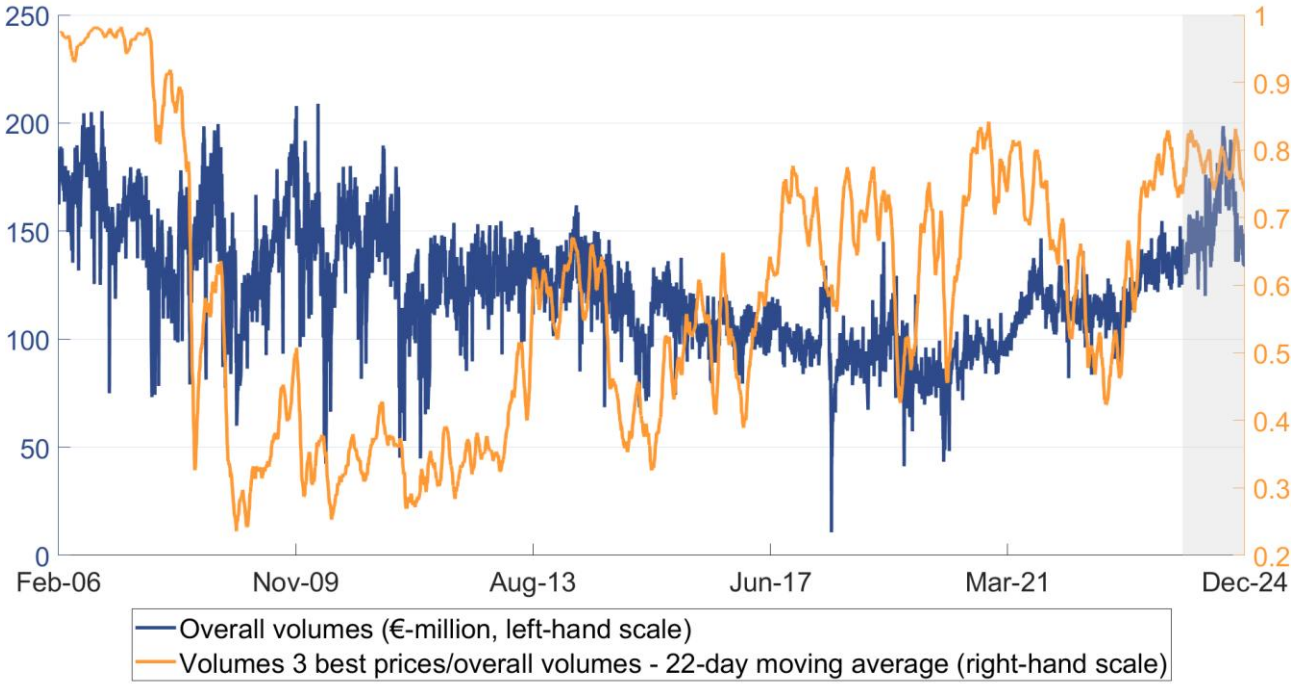
[7] Two new banks joined the Public Debt Specialist community during 2024 (in June and November). See the *Second Report on the Liquidity of the Secondary Market of Italian Government Bonds*, for further details on the updates to the list of specialized banks and the accreditation process for Candidate Specialists (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html, footnote 6, p. 7).

[8] The 2024 trading range was at 110-160 basis points.

Normalizing the VWBA spread by volatility, we observe that the one-month moving average is higher especially in the mid-months of 2024, signaling an upward correction in the VWBA spread for equal volatility (i.e., a deterioration in liquidity conditions).

Lastly, Figure 3 shows the indicators of the quoting book depth: the overall quoted volumes (on the left vertical axis) and the one-month moving average of the quoted volumes related to the three best prices as a percentage of the overall quoted volumes (on the right vertical axis). The former continues to increase in 2024, reaching the level of the pre-2008 period, when the government bond market experienced excellent liquidity conditions. The latter remains stable in 2024 after the increase in 2023, fluctuating around 80%, in line with the most liquid periods since the outbreak of the financial crisis in 2008. In particular, total quoted volumes peak in the mid-months of 2024. More importantly, the stability of the share of the quoted volumes associated with the three best prices may indicate that the increase in the quoted quantity is homogenous across market makers, at the top and the bottom of the quoting book. The new Specialists entering in 2024, who may be more cautious in their quoting activity, provide liquidity conditions comparable to the whole group of market makers. One possible explanation for the even distribution of quoted volumes among market makers is increased competition driven by a larger number of Specialists.

Figure 3: 10-year BTP



Notes: The figure shows on the left vertical axis the overall quoted volumes by averaging bid side and ask side in million (blue line) and on the right vertical axis the one-month moving average of the quoted volumes related to the three best prices as a share of the overall quoted volumes by averaging bid side and ask side (orange line) for the 10-year BTP on a daily basis. The grey area points out the last year.

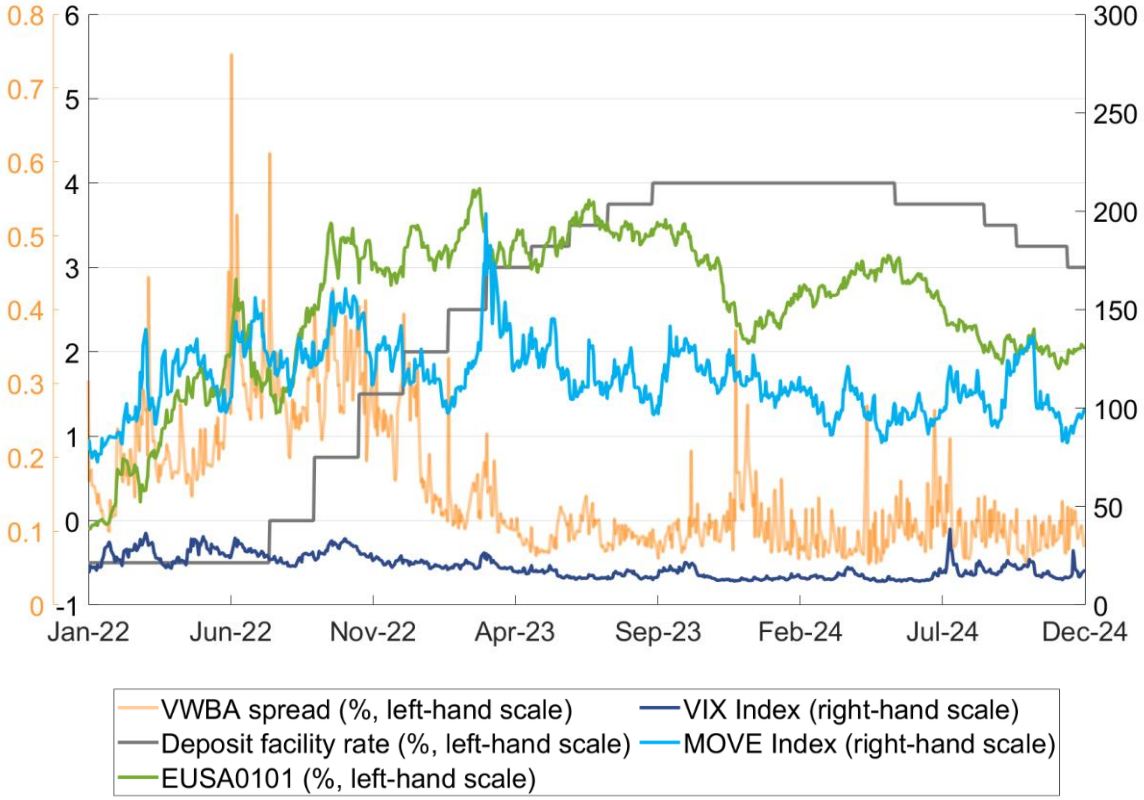
2.2 The ECB interest rate cut in 2024

This section provides an in-depth look at the evolution of liquidity indicators over the 2022-2024 period in their relationship with restrictive monetary policy adopted by the ECB and its loosening in

2024[9]. Due to the global inflation shock experienced in the 2021-2022 period, central banks of several developed and emerging countries changed their monetary policy stance. In the Eurozone, the ECB has reduced the monetary accommodation of the last decade by raising the reference interest rates by 450 basis points in the 2022-2023 period and through other operations that reduced the amount of extra-liquidity in the financial system. After the last rise in September 2023, the ECB kept the reference interest rates unchanged until June 2024, when it started to cut them[10]. In this section, we provide some evidence on the possible effects of these measures on the liquidity conditions of the Italian government bonds on MTS Italy.

In particular, we focus on two multidimensional indicators on the 10-year BTP: the VWBA spread (Figure 4) and the slope (Figure 5). The Figures 4 and 5 also show, on the left vertical axis, the interest rates on the deposit facility and the one-year forward rate on the one-year interest rate swap (EUSA0101) as a measure of market expectations about money market rates one-year ahead, and, on the right vertical axis, the VIX index, as indicator of volatility on global financial markets, and the MOVE index, as indicator of bond market volatility.

Figure 4: Volume-Weighted Bid-Ask spread (%) in 2022-2024



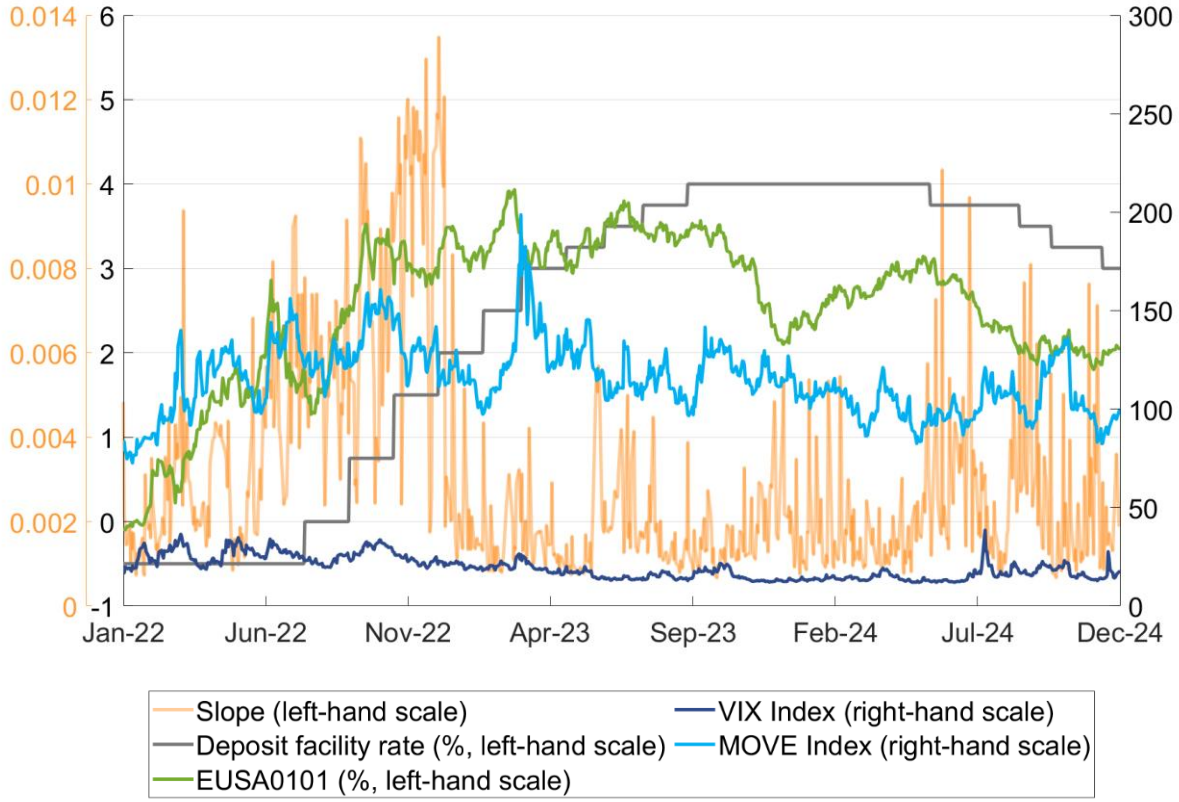
Notes: The top and bottom figures show on the orange left vertical axis the volume-weighted bid-ask (VWBA) spread in % (orange line), calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond, for the 10-year BTP, on a daily basis. On the left vertical axis, it is shown the deposit facility rate in % (grey line) and the one-year forward rate on the one-year € interest rate swap (EUSA0101) in % (green line). On the right vertical axis, it is shown the VIX index (blue line) and the MOVE index (light blue line).

[9] This section is a follow-up to the analysis of the *Second Report on the Liquidity of the Secondary Market of Italian Government Bonds* (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html, Section 2.2, pp. 11-14), which also compares the latest cycle of rate hikes with the previous one in 2008-2009.

[10] In 2024, the ECB cut the reference interest rates in June, September, October and December by a total of 100 basis points.

The stabilization of the VWBA spread in 2024 at a good level of liquidity (as shown in Figure 1) has been achieved in a context characterized by the start of the interest rate cut by the ECB, but also in a general environment characterized by moderate volatility (as shown by the VIX index and the MOVE index, which do not increase, except for a slight deterioration after the actual start of the rate cut cycle). However, the slope shows a more pronounced deterioration in liquidity conditions in 2024 at the start of the ECB rate cut. On the contrary, the micro-structural liquidity deteriorated significantly in 2022, as shown by the two multidimensional indicators, along with the increase in Italian and European government bond yields and in market volatility. Indeed, market players anticipated the beginning of a period characterized by restrictive monetary policies adopted by Western central banks, well before the actual start of the interest rate hike cycle (the first 50 basis points hike decided by the ECB was in July 2022). Later in 2023, the liquidity conditions offered on the quoting book of the interdealer market became more favorable.

Figure 5: Slope in 2022-2024



Notes: The top and bottom figures show on the orange left vertical axis the slope (orange line), calculated as the ratio of the difference between the best and worst bid (ask) and the overall quoted volumes excluding those relating to the best bid (ask) by averaging bid side and ask side, for the 10-year BTP, on a daily basis. On the left vertical axis, it is shown the deposit facility rate in % (grey line) and the one-year forward rate on the one-year € interest rate swap (EUSA0101) in % (green line). On the right vertical axis, it is shown the VIX index (blue line) and the MOVE index (light blue line).

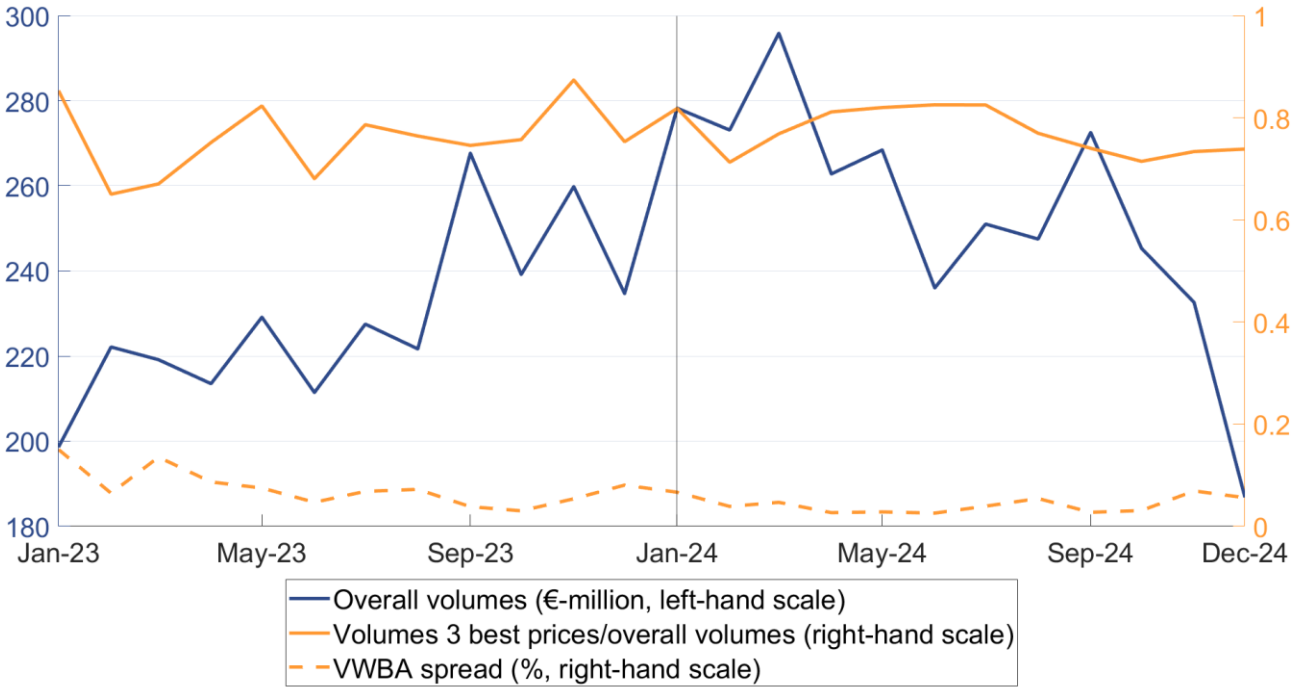
2.3 Security segments in 2024

In this section, we present an analysis of the liquidity conditions in 2024 for each of the segments on which the Treasury operates through on-the-run issues.

BOT

Figure 6 shows the VWBA spread and the quoted volumes associated with the three best prices as a percentage of the overall quoted volumes (on the right vertical axis) and the overall quoted volumes (on the left vertical axis) for the 6-month BOT. The multidimensional indicator of the VWBA spread improves in the middle months of 2024, reaching slightly tighter levels than in 2023, with a worsening observed in the last two months of the year. The total quoted volumes show an upward trend in 2023 and the first quarter of 2024, reaching their highest peak in recent years in March 2024 at almost €300 million, then they decline especially in the last quarter of 2024. The deterioration at the end of the year might be partially attributed to a seasonality effect for the holiday period. Indeed, in line with what was observed in the fourth quarters of 2021 and 2022 (but differently from the fourth quarter of 2023 that seems to be an outlier with respect to the dynamics observed over the last four years), the overall quoted volumes reached the minimum level on a yearly basis at about €190 million in 2024 (e.g., vs. approximately €193 million in December 2022). Differently from other measures, the quoted volumes associated with the three best prices as a percentage of the overall quoted volumes remain fairly constant throughout 2024.

Figure 6: 6-month BOT



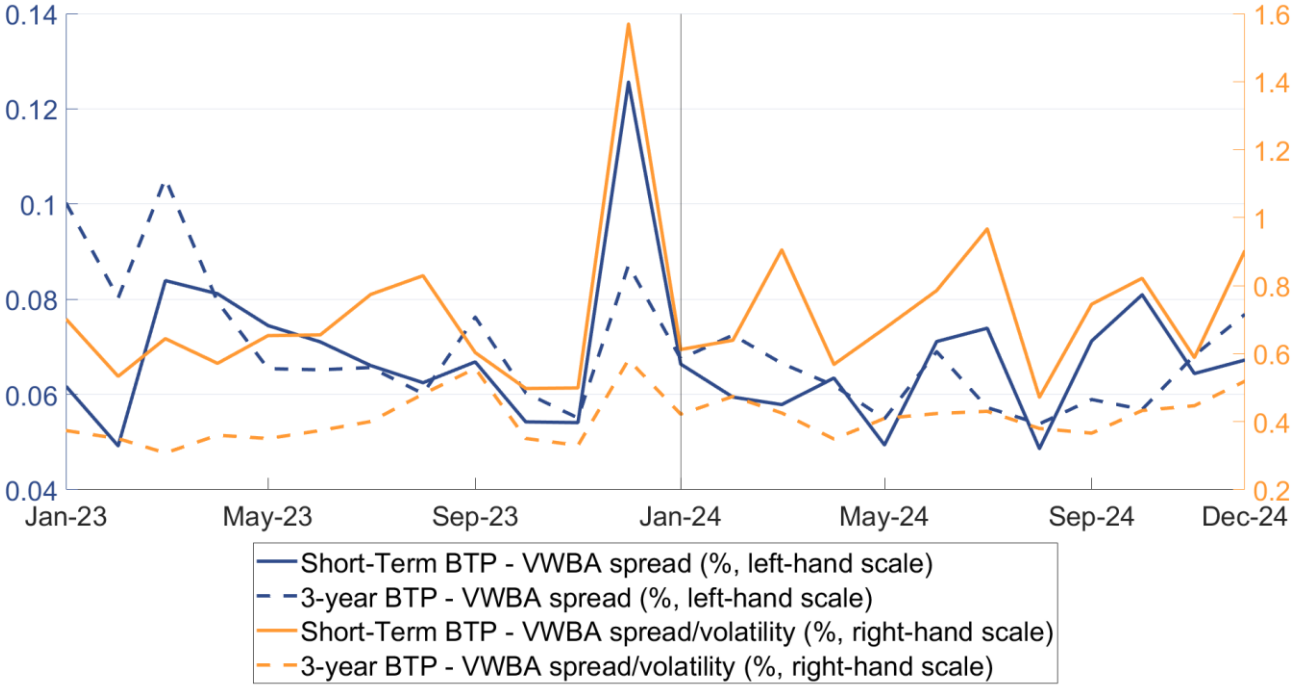
Notes: The figure shows on the left vertical axis the overall quoted volumes by averaging bid side and ask side in million (blue line) and on the right vertical axis the quoted volumes associated with the three best prices as a share of the overall quoted volumes by averaging bid side and ask side (solid orange line) and the volume-weighted bid-ask (VWBA) spread in % (dashed orange line) for the 6-month BOT, on a monthly basis. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond.

< 10-year BTP

Splitting BTPs according to their maturity smaller or greater than 10 years, a trend towards better (or stable with respect to the previous year) liquidity conditions emerges for several segments in 2024.

As for BTPs with a maturity of seven years or less, we analyze the liquidity indicators for Short-Term (2-year), 3-year, 5-year and 7-year BTPs (see Figure A.3 in Appendix). Figure 7 shows the VWBA spread (on the left vertical axis) and its ratio to volatility (on the right vertical axis) for the Short-Term BTP and the 3-year BTP. The two segments seem to experience highly correlated liquidity conditions and thus appear to be perceived as very similar by market makers.

Figure 7: Short-Term BTP and 3-year BTP



Notes: The figure shows on the left vertical axis the volume-weighted bid-ask (VWBA) spread in % (solid blue line for the short-term BTP and dashed blue line for the 3-year BTP) and on the right vertical axis the VWBA spread to volatility ratio in % (solid orange line for the short-term BTP and dashed orange line for the 3-year BTP), on a monthly basis. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The volatility of the bond is the daily variation between the minimum and maximum mid-price.

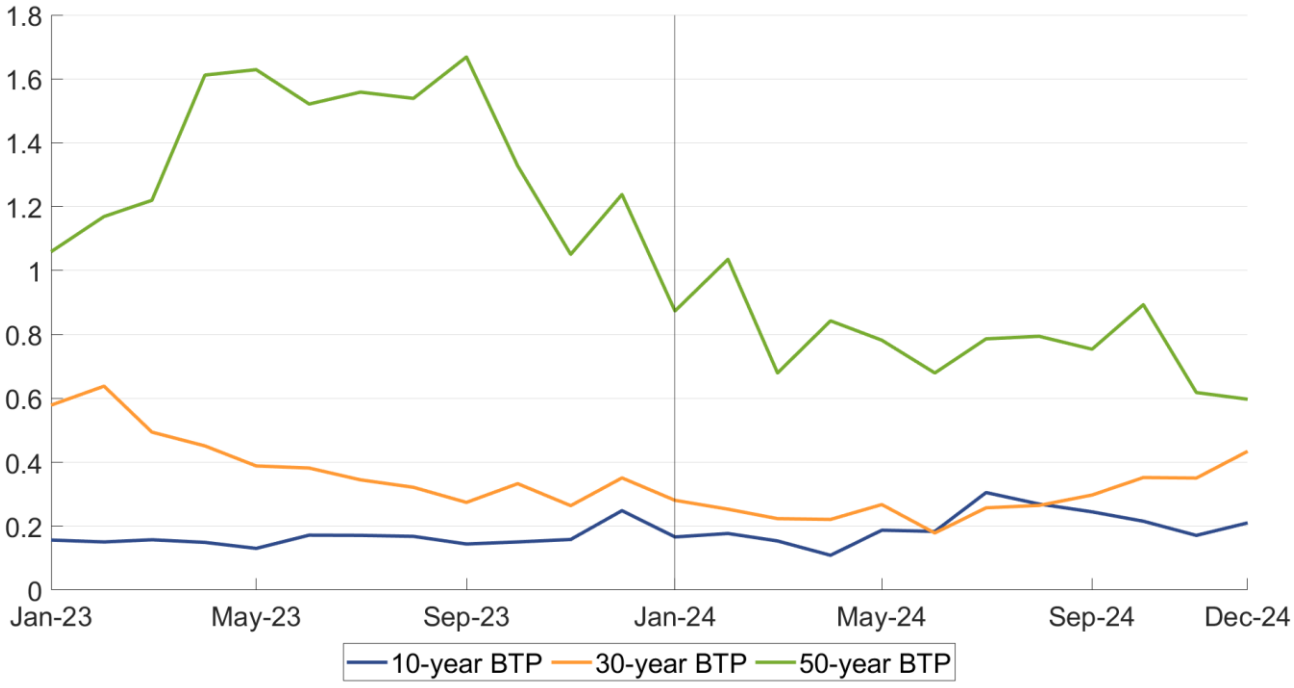
As regards the VWBA spread, the level of the Short-Term BTP and the level of the 3-year BTP intersect in several months during 2023 and 2024, which arguably indicates more volatile liquidity conditions for the Short-Term BTP. Indeed, the Short-Term BTP shows a greater deterioration in liquidity conditions during negative market phases (and a slower recovery to better liquidity conditions). A possible reason might be related to the higher volatility induced by uncertainty about the ECB interest rate strategy on the short-term part of the yield curve. However, in 2024 the Short-Term BTP seems to have slightly less volatile liquidity conditions, arguably supported by the ECB decision to effectively deliver a rate cut of 100 basis points in the second half of the year. Controlling for the volatility of the bonds, the VWBA spread always shows worse liquidity conditions for the Short-Term BTP compared to the 3-year BTP. This might be related to several factors: (i) higher exposure to uncertainty regarding monetary policy decisions; (ii) lower exposure to market activity on Short-Term BTP futures; (iii) some underlying differences in investor appetite for the two segments.

≥ *10-year BTP*

For BTPs with a maturity of ten years or more, here we focus on 10-year, 30-year and 50-year BTPs. In Appendix, we also analyze 15-year and 20-year BTPs, whose metrics have similar trends and lie roughly between the 10-year BTP as a lower bound and the 30-year BTP as an upper bound (see Figure A.4 in Appendix). Historically, the 10-year BTP line performs better and sharply differs from the liquidity conditions of the 15-year, 20-year and 30-year BTPs, which in turn show structurally better liquidity conditions than the 50-year BTP. These structural differences may refer both to the longer duration of the considered bonds and to differences in terms of soft regulation through the Specialists' evaluation criteria defined by the Treasury (e.g., the minimum amount required for evaluation purposes in the case of 10-year BTPs is higher than for BTPs with a longer maturity). However, in 2023 and 2024 some of these differences were significantly reduced.

Figure 8 shows the VWBA spread/volatility ratio for 10-year, 30-year and 50-year BTPs. The indicator for the 30-year BTP crosses the 10-year BTP in the June-August period of 2024, indicating that dealers were offering a narrower bid-ask spread (controlling for the risk of the bond, namely its volatility) for the 30-year BTP than for the 10-year case. Controlling for the volatility of the bonds, the VWBA spread for the 50-year BTP decreases strongly over time as it approaches the 10-year BTP (as a benchmark), indicating convergence. This trend may signal greater confidence among the whole group of primary dealers, who shrink the bid-ask spread on securities with higher duration risk.

Figure 8: Volume-Weighted Bid-Ask spread/Volatility (%)

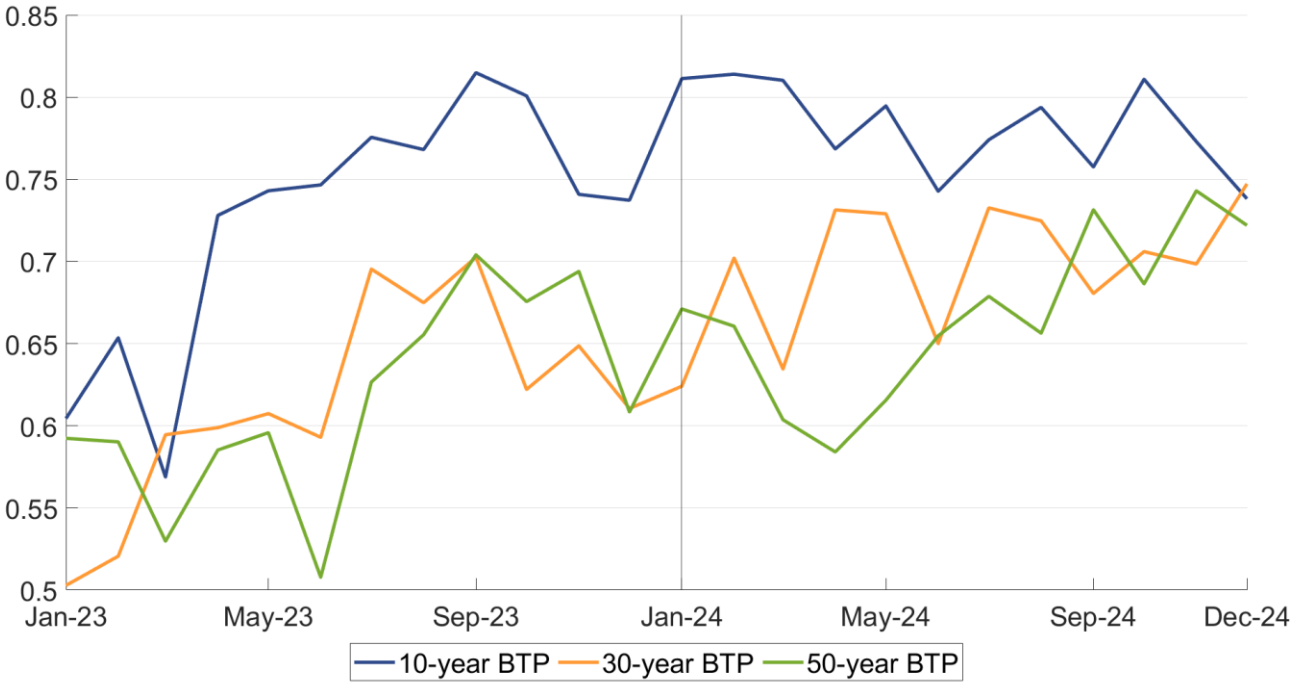


Notes: The figure shows the volume-weighted bid-ask (VWBA) spread to volatility ratio in % for the 10-year, 30-year, and 50-year BTP, on a monthly basis. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The volatility of the bond is the daily variation between the minimum and maximum mid-price.

Finally, it is interesting to note that this convergence started from the second quarter of 2023 for the 30-year BTP and from the last quarter of 2023 for the 50-year BTP, substantially aligned with the beginning of a positive market phase for BTPs in terms of credit risk re-pricing[11]. Indeed, the indicator for the 50-year BTP worsens in the mid-months of 2023[12].

Lastly, Figure 9 shows the quoted volumes associated with the three best prices as a percentage of the overall quoted volumes for 10-year, 30-year and 50-year BTPs. The indicator shows an improving trend for all the segments analyzed in 2023 (except in the last quarter of the year), which is more pronounced as the duration of bonds decreases. In 2024, however, the indicator continues to improve slightly for the 30-year and 50-year BTP, while it stabilizes for the 10-year BTP. This leads to a clear convergence in the relative depth between the 30-year and 50-year BTP, on the one hand, and the 10-year BTP, on the other: BTPs with longer maturities show a growing concentration of volumes quoted on the three top prices, reaching a level comparable to that of the 10-year BTP.

Figure 9: Volumes 3 best prices/overall volumes - average Bid/Ask



Notes: The figure shows the quoted volumes associated with the three best prices as a share of the overall quoted volume by averaging bid side and ask side for the 10-year, 30-year, and 50-year BTP, on a monthly basis.

Green BTP

In March 2021, the Treasury offered the first green bond[13] maturing in April 2045 (with a maturity of 24 years, i.e., different from the benchmark lines of the traditional BTPs). Then, the Treasury issued,

[11] During the second quarter of 2023 the average BTP-Bund spread decreased by about 25 basis points, from about 190 basis points in March to about 165 basis points in June.

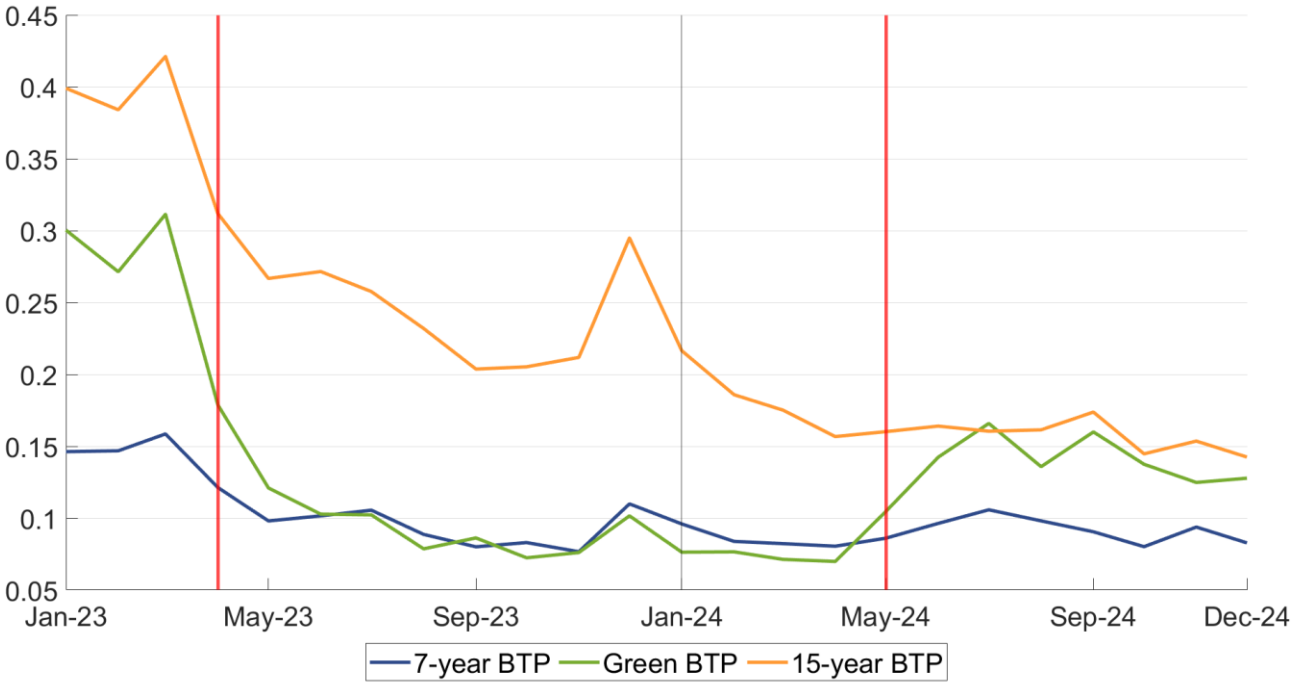
[12] Possible explanations of this phenomenon may be the less activity on the 50-year BTP segment, the poor demand and supply for these bonds, but also reduced reactions of primary dealers to adjust bid and ask prices in the face of a decreasing volatility regime on this segment.

[13] Green BTPs were issued to fund specific investments and programs of the State budget, in line with the goal of achieving climate neutrality by 2050 and, more generally, with the objectives set by the European Green Deal; see the *Framework for the issuance of Sovereign Green Bonds* of the Italian Ministry of Economy and Finance (available at:

in September 2022, a second green bond maturing in April 2035 (with a maturity of approximately 12 and a half years), in April 2023, a third green bond maturing in October 2031 (with a maturity of approximately 8 and a half years), and in May 2024, a fourth green bond maturing in October 2037 (with a maturity of approximately 13 and a half years).

These government bonds are regularly listed on MTS Italy with the same rules applied to market makers and primary dealers for traditional BTPs. In terms of liquidity conditions, green bonds show a trend consistent with traditional bonds with similar maturities. Figure 10 shows that the green benchmark bond has been replaced by the new issue in May 2024. Therefore, from May onwards, the VWBA spread converge towards the 15-year BTP levels. Similarly, after the replacement of the green benchmark in April 2023, the VWBA spread converged towards the 7-year BTP levels.

Figure 10: Volume-Weighted Bid-Ask spread (%)



Notes: The figure shows the volume-weighted bid-ask (VWBA) spread in % for the 7-year and 15-year BTP, and the Green BTP, on a monthly basis. The vertical red lines refer to April 2023 and May 2024 when the green benchmark bond was replaced with a new issue. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond.

In general, liquidity indicators for Green BTPs suggest liquidity conditions consistent with those of traditional BTPs (or even a better quality of the quoting book compared to those of traditional BTPs), although the Treasury did not set particular incentives (see Figure A.5 in Appendix). The described dynamics highlights how the good liquidity conditions of the Green BTPs (also in traded volumes, see Figure 21) are driven by the growing activity and interest from the investors in green bonds.

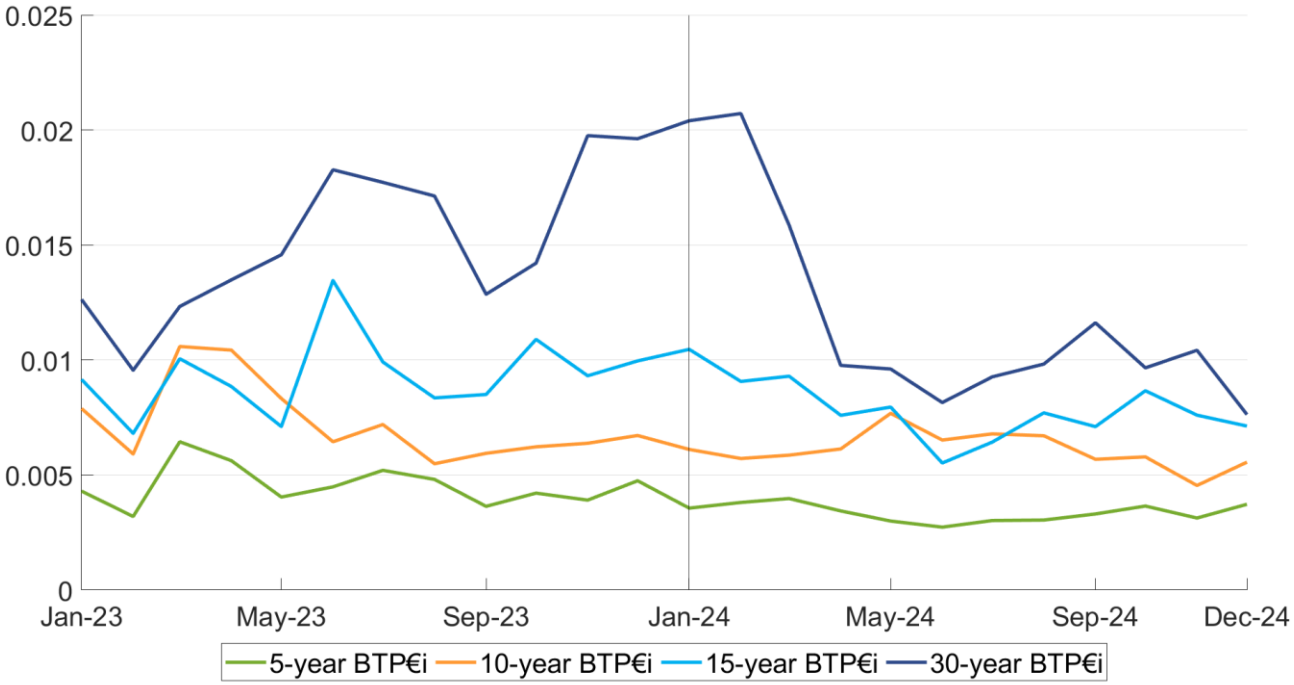
https://www.dt.mef.gov.it/export/sites/sitodt/modules/documenti_en/debito_pubblico/presentazioni_studi_relazioni/documentazione_btp_green/Framework_for_the_issuance_of_Sovereign_Green_Bonds.pdf).

BTP€i

Italian public debt is mostly issued through fixed-rate bonds (about 79%), while about 21% is issued through floating-rate instruments[14]. Among them, the Italian Treasury issues Euro-zone inflation-indexed securities with on-the-run lines with 5-, 10-, 15- and 30-year maturities. In general, the BTP€i segment is structurally characterized by worse liquidity conditions compared to nominal BTPs[15].

Figure 11 shows the evolution of the slope, a multi-dimensional measure that measures the marginal cost for the execution of orders (sell or buy) at the worst market prices compared to the best market prices, for the 5-year, 10-year,15-year and 30-year BTP€i. The analysis highlights a substantial stability of liquidity conditions in 2024 with respect to the previous year for the BTP€i segment, with a clear improvement observed for the 30-year BTP€I, suggesting a generalized recovery of primary dealers' confidence in offering good liquidity conditions on MTS Italy.

Figure 11: Slope - average Bid/Ask



Notes: The figure shows the slope for the 5-year, 10-year, and 15-year BTP€i, on a monthly basis. The slope is calculated as the ratio of the difference between the best and worst bid (ask) and the overall quoted volumes excluding those relating to the best bid (ask) by averaging bid side and ask side.

CCTeu

The CCTs-eu, which are indexed to the 6-month Euribor, belong to the floating-rate issuances. Until 2017, the segment was considered a single benchmark with a 7-year maturity. In recent years, due to the specific conditions of the financial markets and the different dynamics experienced in the demand for floating-rate securities, the Treasury started redefining the segment as a multi-

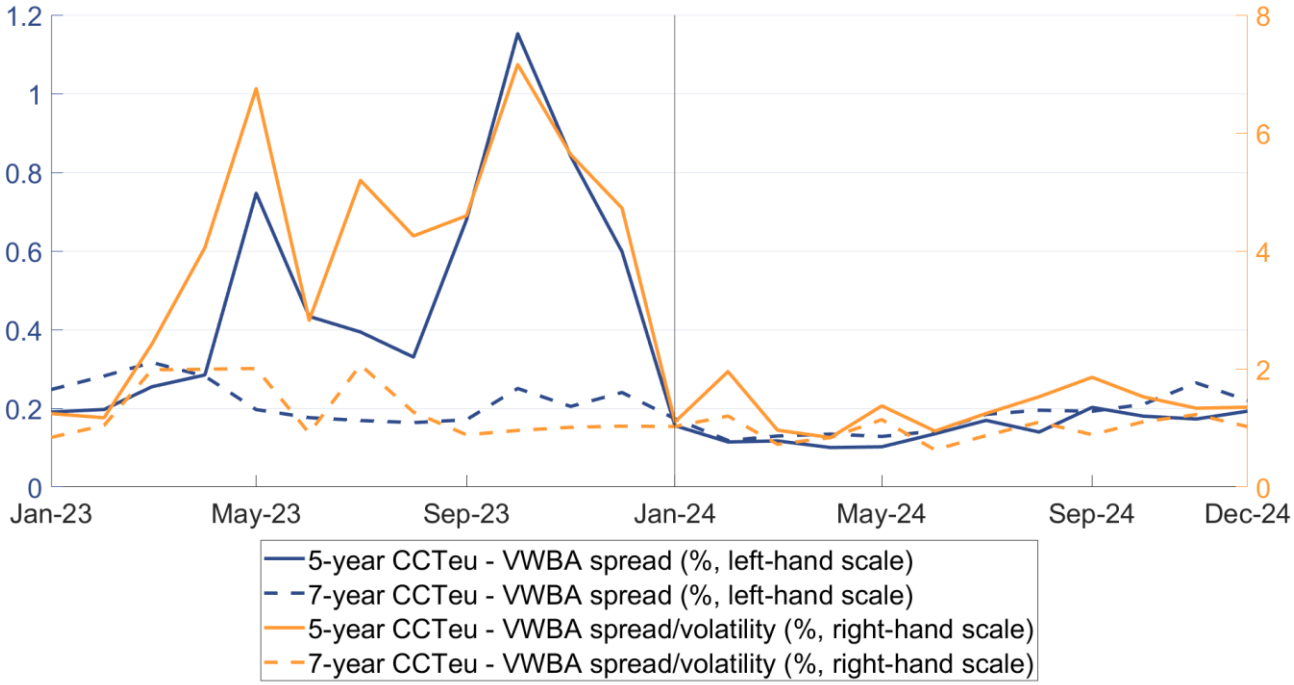
[14] See the statistics regarding the issuance of Government securities and public debt outstanding, available at: https://www.dt.mef.gov.it/en/debito_pubblico/dati_statistici/index.html.

[15] The comparison of the metrics' levels between the BTP€i benchmarks and the related nominal BTPs with the same maturity clearly reveals the structural difference between the two segments. For example, for the 10-year BTP€i the monthly average VWBA spread in 2024 ranged about between 0.24%-0.35%, and for the 10-year BTP between 0.08%-0.12%.

benchmark one (i.e., similar to the BTP€i segment), with three on-the-run lines: 3-year, 5-year and 7-year[16]. However, the 3-year CCTeu expired in December 2023 without any replacement. In 2024, the Treasury renewed the 7-year benchmark by issuing in April the new CCTeu maturing in April 2032 (while the Treasury did not renew the 5-year benchmark issued in March 2023).

Figure 12 shows the evolution of the VWBA spread and the VWBA spread/volatility measures for the 5-year and 7-year CCTeu. The analysis reveals a considerable stability of both indicators for both segments throughout 2024. In particular, liquidity conditions for the 5-year CCTeu improve significantly during 2024 with respect to the average level in 2023. This may represent a general improvement in liquidity conditions for the entire CCTeu segment, which may also be evident from the dynamics of trading volumes (see Figure 19).

Figure 12: 5-year CCTeu and 7-year CCTeu



Notes: The figure shows on the left vertical axis the volume-weighted bid-ask (VWBA) spread in % (solid blue line for the 5-year CCTeu and dashed blue line for the 7-year CCTeu) and on the right vertical axis the VWBA spread to volatility ratio in % (solid orange line for the 5-year CCTeu and dashed orange line for the 7-year CCTeu), on a monthly basis. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The volatility of the bond is the daily variation between the minimum and maximum mid-price.

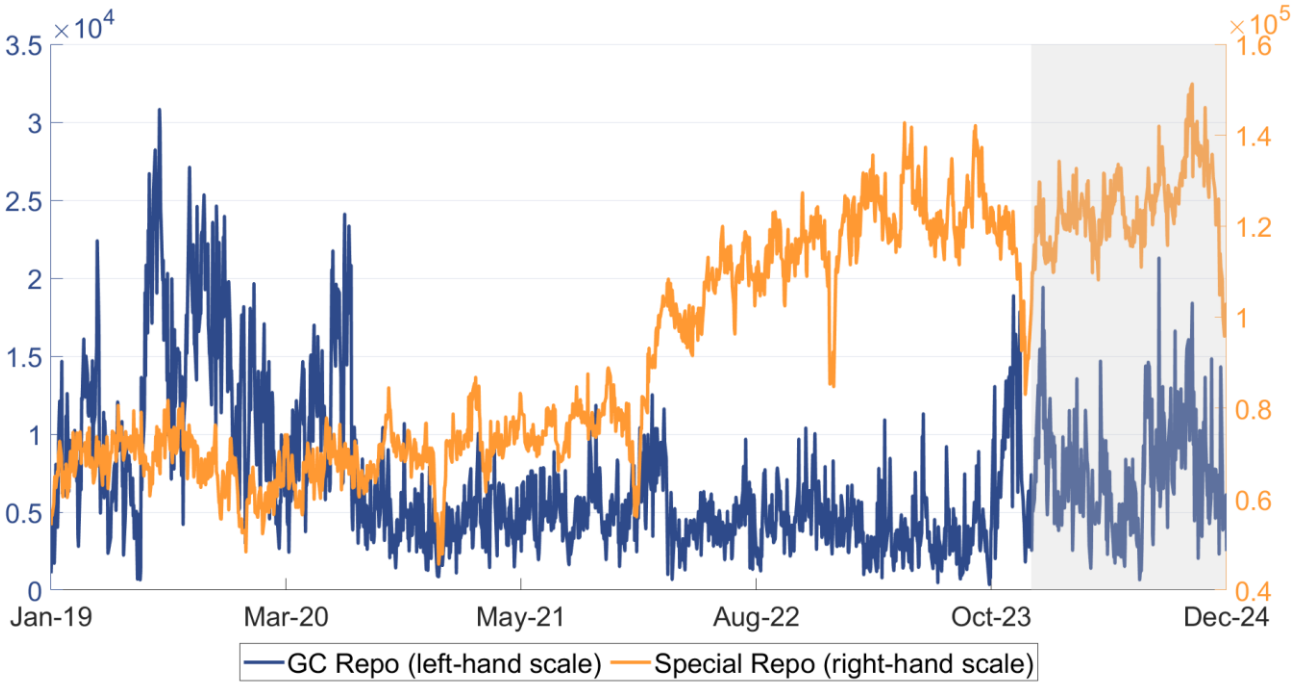
[16] Specifically, in the context of the 7-year line, it is worth noting that in 2021 the Treasury issued a new 7-year CCTeu (maturing in April 2029), replacing the previous on-the-run CCTeu (maturing in April 2026), which in turn became the benchmark bond for the 5-year maturity.

In-depth box on the repo market

The repurchase agreements (repo) market plays an essential role to ensure the liquidity of the secondary market. Market participants use the repo market either to borrow liquidity or to borrow a specific bond to accomplish their transactions in the secondary market. Therefore, transactions in the secondary market are often accomplished by market participants through complementary transactions in the repo market.

Figure 13 shows the daily volumes traded on the repo market, distinguishing between general collateral (GC) repo and special repo[17], for contracts with a spot-next maturity[18]. Special repo trading volumes have increased in recent years, especially from 2022 onwards, while GC repo trading volumes declined from the second half of 2020 and increased slightly from the end of 2023. Volumes of special repo transactions show a slump towards the end of each year, which is likely to be due to banks' balance sheet optimization operations and is similar to what was also observed in previous years.

Figure 13: Spot-next – Daily volumes (€-million)



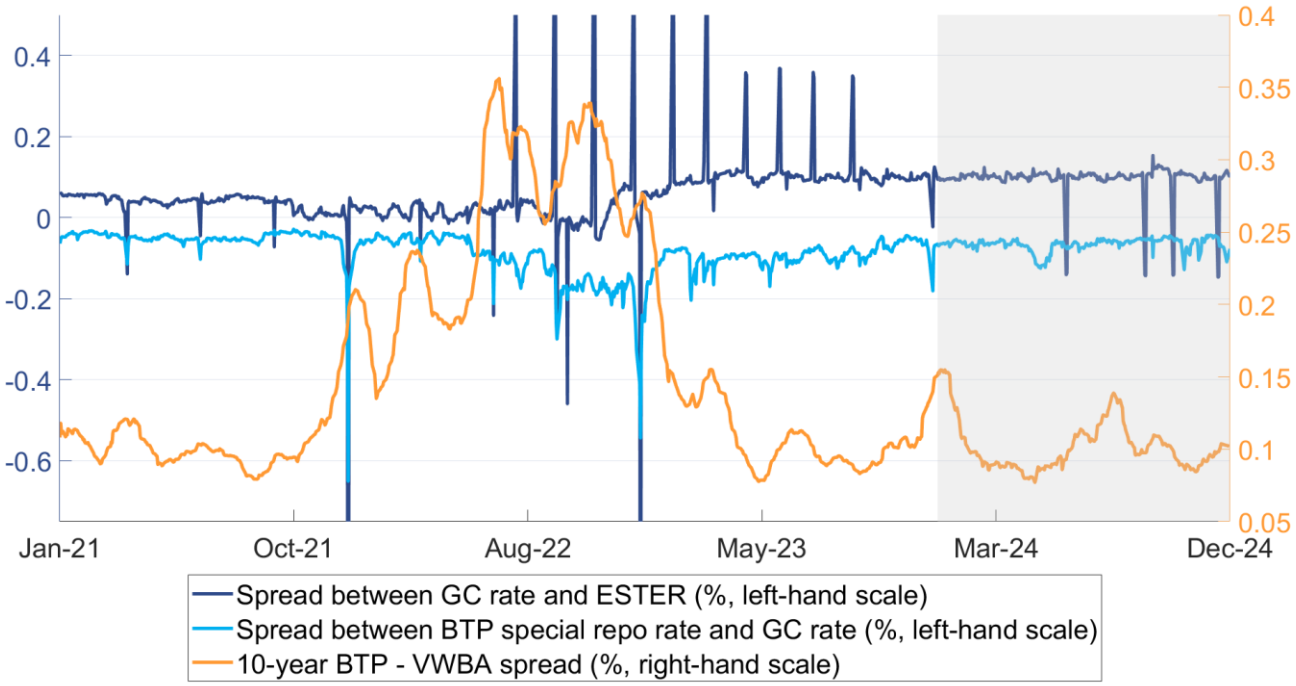
Notes: The figure shows the daily traded volumes in million of general collateral repo on the left vertical axis (blue line) and special repo on the right vertical axis (orange line) for the spot-next maturity. As an example, €1 million × $\mathbf{10^4}$ corresponds to €10 billion and €1 million × $\mathbf{10^5}$ corresponds to €100 billion. The grey area points out the last year.

[17] When the contract requires the buyer to lend liquidity against a generic basket of securities, it is called general collateral repo, while when the contract requires a specific security to be delivered, it is called special repo.

[18] We select the spot-next maturity (i.e., repo transactions such that the initial trade settlement is made two business days after the contract date and the bond is then repurchased in the following business day), since transactions with this maturity account for most of the volumes in the Repo market.

Figure 14 shows the time series of the GC repo rate for the spot-next maturity in terms of the spread over the ESTER[19] and the average special repo rate of BTPs used as collateral in spot-next repo transactions[20] in terms of the spread over the GC repo rate for the spot-next maturity. Together, we plot the one-month moving average of the VWBA spread for the 10-year BTP.

Figure 14: Spot-next repo rates (%) and 10-year BTP liquidity conditions



Notes: The figure shows on the left vertical axis the difference between the GC repo rate and the ESTER in % (blue line) and the difference between the special repo rate for the BTP segment, removing the cheapest-to-deliver (CTD) bond for futures contracts on short- and long-term BTPs, and the GC repo rate in % (light blue line), for the spot-next maturity, on a daily basis. The right vertical axis shows the one-month moving average of the volume-weighted bid-ask (VWBA) spread for the 10-year BTP in % (orange line). The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The grey area points out the last year.

The spread between the special repo rate and the GC rate varies over time: often it is close to zero, but there are times when the specialness is considerable (in absolute terms) since the special repo rate is significantly lower than the GC rate[21]. It is evident that when liquidity conditions in the secondary market deteriorate in 2022 (as indicated by the increase in the VWBA spread), the spread between the special repo rate and the GC rate is wider (i.e., the specialness increases). The caveat is that the repo market is clearly also affected by specific dynamics in the euro money market and by ECB decisions. In particular, we note that the peak in the average specialness level for BTPs (excluding end-of-year periods) was observed in mid-2022, when the ECB balance sheet reached a

[19] The difference between the GC repo rate and the ESTER represents the cost of liquidity when the collateral is Italian government bonds with respect to the wholesale euro unsecured overnight borrowing costs of banks located in the euro area.

[20] The difference between the special repo rate and the GC rate represents the cost of liquidity when the collateral is a “special” Italian government bond with respect to a “general” one. The special repo rate is typically lower than the general collateral rate at which a basket of similar bonds trades. In other words, the spread between the two rates represents the cost saving of providing a specific bond in the repo market in exchange for liquidity. The lower the spread (i.e., the higher the “specialness”, defined as the premium of procuring a specific bond in the repo market and calculated as the difference between the GC repo rate and the special repo rate), the higher the scarcity of the specific bond in the repo market. We compute the average special repo rate for the BTP segment by removing the cheapest-to-deliver (CTD) bond for futures contracts on short- and long-term BTPs as they are likely to be very special approaching the settlement date of futures contracts.

[21] Negative peaks in the spread between the special repo rate and the GC rate may be the result of negative special repo rates, as dealers may be willing to accept such rates in order to gain access to a scarce bond to cover a short position.

historical high (i.e., during the 2011-2022 period, the ECB balance sheet mainly increased through loan operations to the European banking system and asset purchase programs). Starting from the second half of 2022, the quantitative tightening process announced by the ECB (e.g., flat or negative net investment activity executed through partial or full roll-off of assets that were going to mature) led to a stable reduction in the scarcity effect across all relevant ECB assets, thus: (i) limiting the average level of specialness of BTPs; (ii) increasing the spread between GC rate and ESTER. . However, the figure clearly shows that liquidity conditions on the secondary market and specialness on the repo market are intertwined. An interesting channel that links the repo and the secondary market that is worth investigating in the future is the following: a more special bond is also a scarcer bond in the repo market, thus market makers face larger frictions when trading such a bond in the secondary market, which arguably leads to worse liquidity conditions (e.g., wider bid-ask spreads)[22].

[22] See the *Second Report on the Liquidity of the Secondary Market of Italian Government Bonds*, for further details on the relation between bid-ask spread on the secondary market and specialness on the Repo market (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html, Section 4, pp. 49-51).

3. Trading

In this section, we analyze the trading activity carried out on the MTS Italy platform through the database containing all concluded contracts, with information concerning the identification of the security and the operators (particularly, we distinguish two types of operator: the price maker or filler vs. price taker or aggressor), the market side (buy or sell, from the perspective of the price taker who trades, i.e., the aggressor), the price and yield of the contract, the date and time with microsecond accuracy. In general terms, measuring the trading activity in the wholesale secondary market is the second dimension to assess the micro-market liquidity conditions. The greater the traded volumes, the greater the expected liquidity.

To assess different aspects of trading activity, the analysis focuses on three different dynamics: in Section 3.1, we analyze the trend of monthly volumes that are traded on the platform and the breakdown by flow size of the volume trend in 2024 compared to the previous year; in Section 3.2, we analyze the quoting activity of market makers in the light of fast market trends and medium-sized trading flows, thanks to the interaction between the quoting activity database and the information on the trading of securities on the platform; finally, in Section 3.3, we focus on the algorithmic trading, and specifically on basket trades and auto-hedging strategies.

3.1 Trend in trading volumes

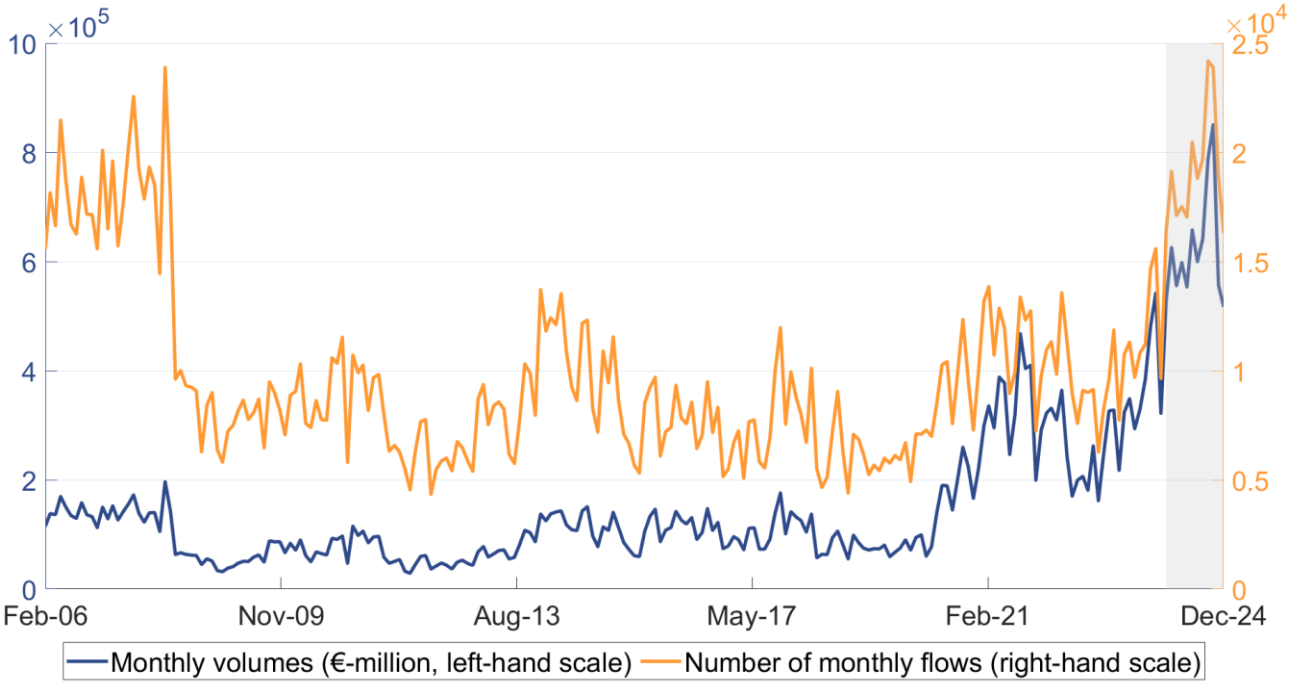
We analyze trading volumes on the MTS Italy platform by category of security and related residual maturity to properly consider different risks associated with trading of various instruments (e.g., the longer financial duration). Specifically, we divide Italian government bonds into: BOTs and BTPs with residual maturity of one year or less, BTPs with residual maturity between one year and two and a half years (2-year BTPs), BTPs with residual maturity between two and a half and four years (3-year BTPs), BTPs with residual maturity between four and six years (5-year BTPs), BTPs with residual maturity between six and eight years (7-year BTPs), BTPs with residual maturity between eight and twelve years (10-year BTPs), BTPs with residual maturities between twelve and seventeen and a half years (15-year BTPs), BTPs with residual maturities between seventeen and a half and twenty-five years (20-year BTPs), BTPs with residual maturities longer than twenty-five years (30-year BTPs), Green BTPs, BTPs with Euro-zone inflation-indexed coupons (BTP€i), bonds with floating coupons indexed to the 6-month Euribor benchmark (CCTeu) and Italian inflation-linked BTPs (BTP Italia) from February 2024.

The analysis below focuses on the main stylized facts, highlighting both short-term and long-term dynamics inherent in government bond trading activity[23].

[23] The Appendix analyses the performance of the following four metrics for each of the segments outlined above: (a) monthly volumes; (b) average size of filler-side flows; (c) average size of aggressor-side flows; (d) number of monthly flows. A flow (from the aggressor perspective) consists of the aggregation of deals realized at the same instant and with the same aggressor. For further details, see the *First and Second Reports on the Liquidity of the Secondary Market of Italian Government Bonds* (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html).

Focusing on the overall trading volumes on the MTS Italy platform (Figure 15), the monthly volumes sharply increased starting from April 2020 (notwithstanding the decline in 2022), peaking at the end of 2024[24]. The peak observed in October 2024 represents the record high for the monthly traded volumes on the platform (€850.7 billion, more than 1.5 times the €542.3 billion reached in November 2023). In 2024 the number of monthly flows increased as well and in this case the peak observed in September (24.2 thousand monthly flows) is the record high, slightly exceeding that of the beginning of 2008. In 2024 the average traded size per flow is higher than before 2008, when the number of monthly flows was similar, but the monthly traded volumes were lower.

Figure 15: All segments

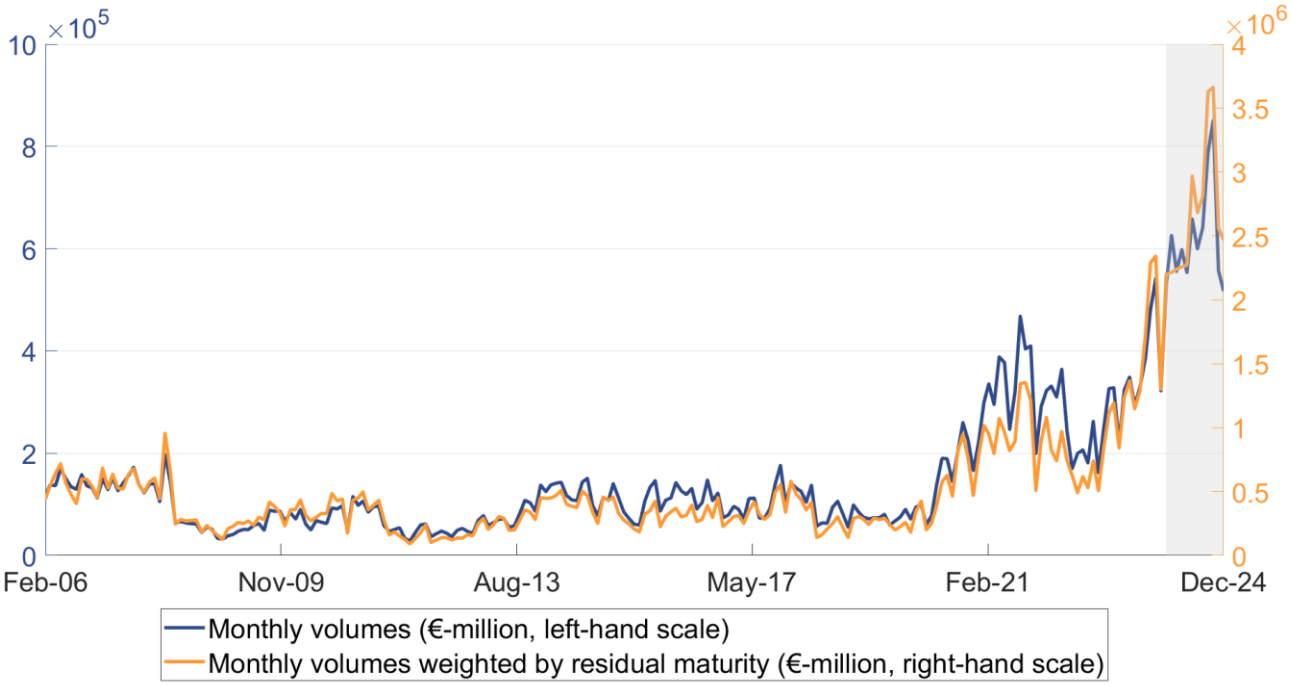


Notes: The figure shows on the right vertical axis the monthly traded volumes in million (blue line) and on the right vertical axis the number of monthly flows (orange line) for all segments (BOT, CTZ, BTP, BTP€i, CCTeu, and BTP Italia of different maturities). As an example, €1 million × $\mathbf{10^5}$ of monthly volumes corresponds to €100 billion and 1 × $\mathbf{10^4}$ monthly flows correspond to 10 thousand. The grey area points out the last year.

[24] Controlling for the outstanding amount of Italian government bonds (see Figure A.8 in Appendix), the increase in the ratio of monthly traded volumes to the outstanding amount confirms higher trading activity in bonds on the MTS Italy platform.

In Figure 16, we compute the monthly volumes weighted by residual maturity (on the right vertical axis). Our aim is to analyze the trend in monthly traded volumes taking into account a proxy of the duration risk of securities (i.e., we give more weight to traded volumes with longer residual maturity, hence higher risk). The above-mentioned increase in traded volumes in 2024 compared to the previous year is mirrored by the volumes weighted by their residual maturity. In that sense, the increase in traded volumes experienced in 2024 is quite homogeneous across the several segments and maturities and is also representative of a relevant increase in the traded risk in the market.

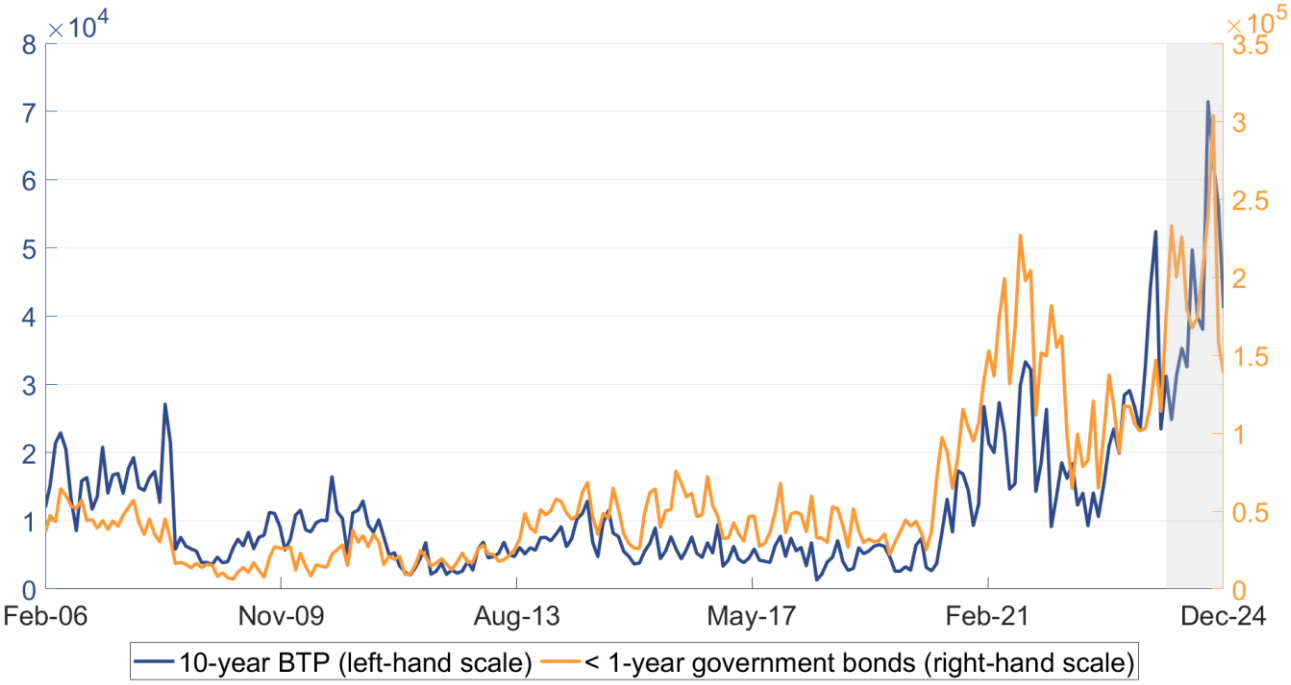
Figure 16: All segments



Notes: The figure shows on the left vertical axis the monthly traded volumes in million (blue line) and on the right vertical axis the monthly volumes weighted by residual maturity in million (orange line) for all segments (BOT, CTZ, BTP, BTP€i, CCTeu, and BTP Italia of different maturities). The monthly volumes weighted by residual maturity are calculated as the monthly sum of volumes by residual maturity of the bond traded. As an example, €1 million $\times$ $\mathbf{10^5}$ corresponds to €100 billion and €1 million $\times$ $\mathbf{10^6}$ corresponds to €1 trillion. The grey area points out the last year.

Looking at the 10-year BTPs and the government bonds with a residual maturity of less than one year, the increase in traded volumes is homogeneous across the segments in 2024. Figure 17 shows that the monthly volumes increased in 2024 for both segments: both the 10-year BTPs and the short-term government bonds reached their highest peak ever, almost tripling the levels at the end of 2023. The volumes of short-term government bonds significantly exceeded the 2020-2021 levels, peaking at 303.5 billion in October 2024.

Figure 17: Monthly volumes (€-million)

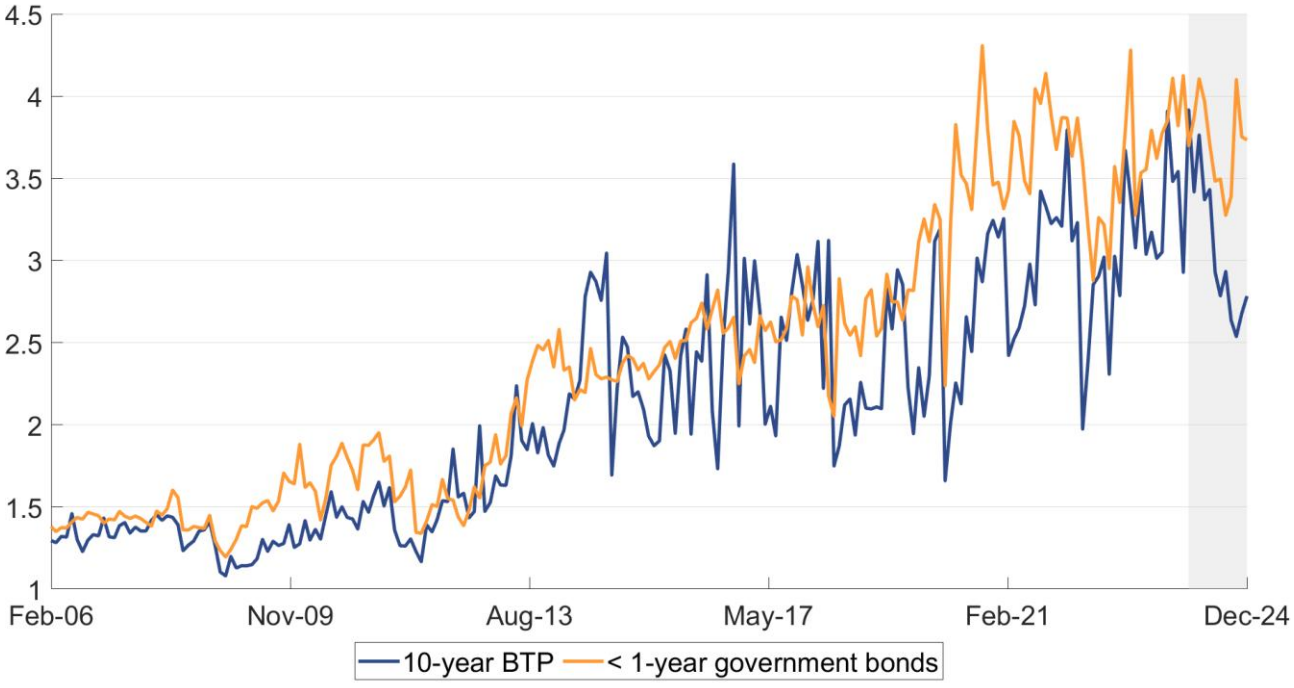


Notes: The figure shows the monthly traded volumes in million for the 10-year BTP on the left vertical axis (blue line) and for government bonds with a residual maturity of less than one year on the right vertical axis (orange line). As an example, €1 million × $\mathbf{10^4}$ corresponds to €10 billion and €1 million × $\mathbf{10^5}$ corresponds to €100 billion. The grey area points out the last year.

By analyzing the ratio between the average size of aggressor-side flows and the average size of filler-side flows, we assess two factors driving the trend in trading volumes: how much liquidity primary dealers offer in quoting activity and how much liquidity primary dealers exploit. In this context, we can highlight the strong interdependence between the choices made by market makers in terms of quoting strategies and the execution strategies of trading flows. For government bonds with a residual maturity of less than one year, this ratio increases over time but remains quite stable over the last two years. Conversely, for 10-year BTPs, the ratio appears to decline in 2024, suggesting a change in the execution of trades (Figure 18).

Focusing on the 10-year BTP, we try to analyze how the record high in traded volume in 2024 was reached. The ratio between the average size of aggressor-side flows and the average size of filler-side contracts decreases in 2024 as a consequence of the decreasing size of aggressor-side flows in relative terms vs. the average size of the filler-side contracts. Vice versa, the number of monthly flows increases strongly in 2024 (for more details, see Figure A.9 in Appendix). In other words, assuming the perspective of the aggressor, all the other things being equal (e.g., the average quoted quantity from the filler side), the record high in traded volumes in 2024 was arguably achieved through a different trading approach on MTS Italy by dealers: in order to execute a large-size flow, aggressors reduced the average size of each trading flow and increased the number of contracts that are necessary to trade the full size.

Figure 18: Average volume aggressor side/filler side

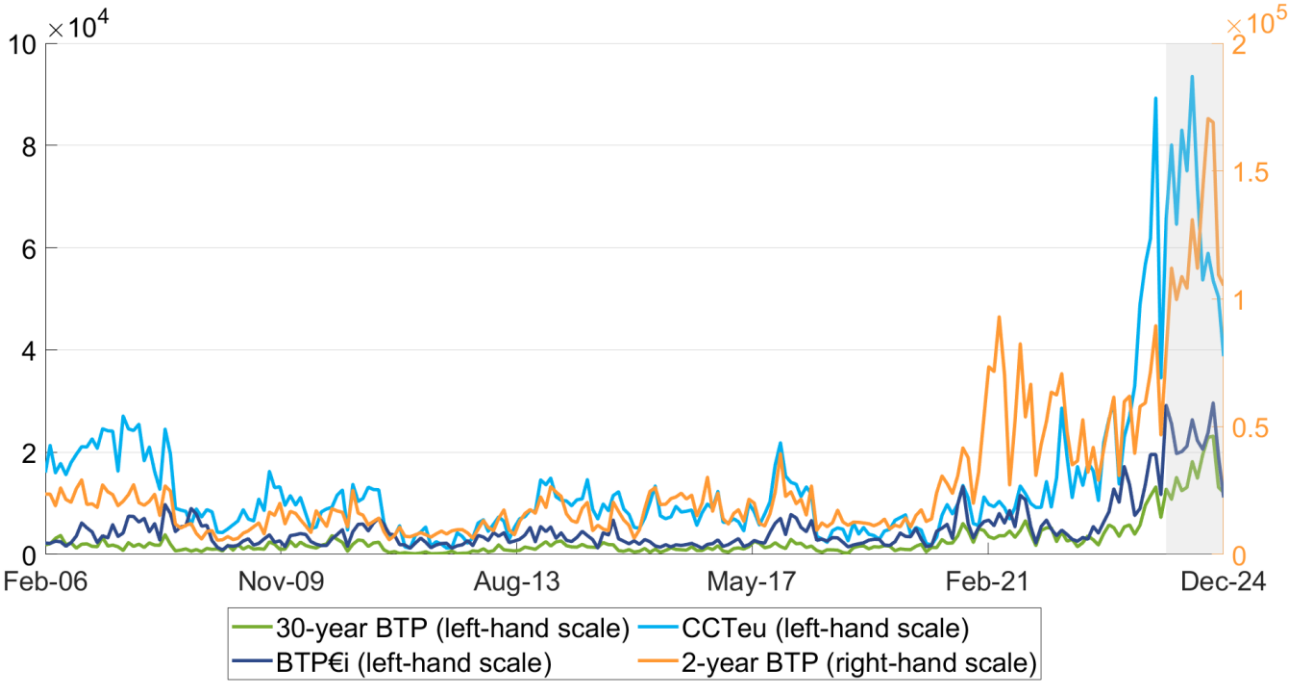


Notes: The figure shows the ratio between the monthly average volume of aggressor-side flows and the monthly average volume of filler-side flows for the 10-year BTP and government bonds with a residual maturity of less than one year. The grey area points out the last year.

Figure 19 shows the evolution of the monthly volumes traded on the platform for the 2-year BTP (on the right vertical axis) and for the 30-year BTP, CCTeu and BTP€i (on the left vertical axis). The nominal segments at the two maturity extremes continue the general upward trend in volumes in 2024, reaching the highest peak ever in trading activity in the second half of the year.

In the case of the floating-rate segments, both CCTs-eu and BTPs€i show a stabilizing trend in 2024. As regards the CCTeu segment, traded volumes grow strongly throughout 2023, peaking at the end of the year and confirming these levels in the first half of 2024. On the other hand, the BTP€i segment shows a weaker increase in the traded volumes in 2023, but it reaches the historical peak at the beginning of 2024 and stabilizes around this level throughout 2024. A possible explanation of this behavior is that the overall trading activity in 2024 in the floating-rate segments may reflect the greater relative interest of the end-investor community in BTPs€i compared to CCTs-eu, thanks lower inflation expectation within the Euro Area, which eventually led the ECB to start a well-anticipated cycle of rate cuts.

Figure 19: Monthly volumes (€-million)



Notes: The figure shows the monthly traded volumes in million for the 30-year BTP (green line), the CCTeu (light blue line) and the BTP€i (blue line) on the left vertical axis and for the 2-year BTP (orange line) on the right vertical axis. As an example, €1 million × $\mathbf{10^4}$ corresponds to €10 billion and €1 million × $\mathbf{10^5}$ corresponds to €100 billion. The grey area points out the last year.

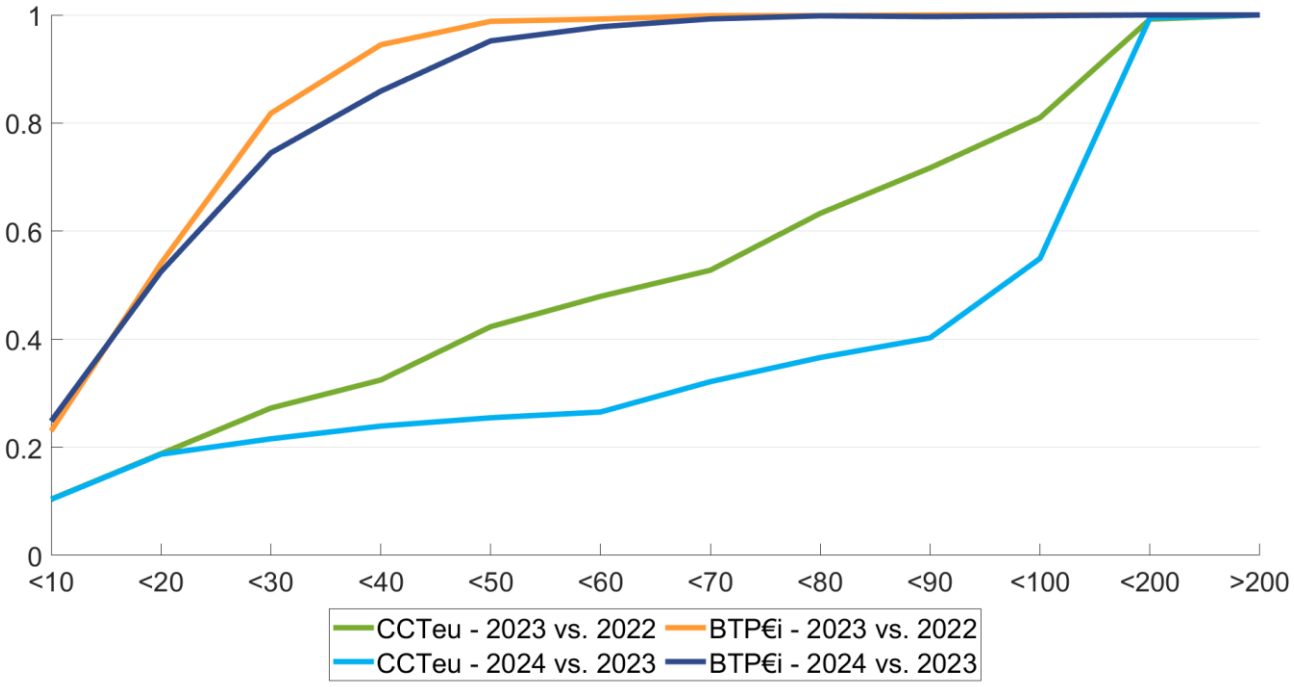
To investigate which categories of "flow size" contribute most to define the volume trend (comparing one year to the previous year), we develop a different analysis. Specifically, we define the following categories for different flow sizes (on the aggressor side): flows up to €10, €20, €30, €40, €50, €60, €70, €80, €90, €100 million; flows between €100 and €200 million; flows above €200 million. For each category, we examine whether and to which extent it contributes to the trend in volumes in 2024 compared to 2023.

Figure 20 shows this analysis for CCTs-eu and BTPs€i, which differ from the general trend observed for almost all segments of a quite homogeneous increase in volumes across the various categories of flow size in 2024 compared to 2023 (for more details, see Figure A.14 in Appendix).

As regards CCTs-eu, all categories of flow size up to €200 million contribute to an increase in volumes in one year compared to the previous year. However, 60% of the increase in volumes in 2024 compared to the previous year is due to the higher trading activity of flows between €90 million and €200 million, in contrast to the increase in volumes in 2023 compared to the previous year, which is essentially homogeneous across the mid-size flow categories. The increase in trading activity through the execution of large flows may be due to the larger amount of short-term CCTeu bonds maturing in 2024[25].

Finally, the increase in volumes in 2024 compared to the previous year for the BTP€i segment is almost entirely related to the increase in flows up to €40 million (more than 80% of the increase is explained by the higher trading activity of flows up to €40 million), with a slightly smaller contribution from the small-size flow categories with respect to the increase in 2023 compared to the previous year.

Figure 20: Analysis by volume categories

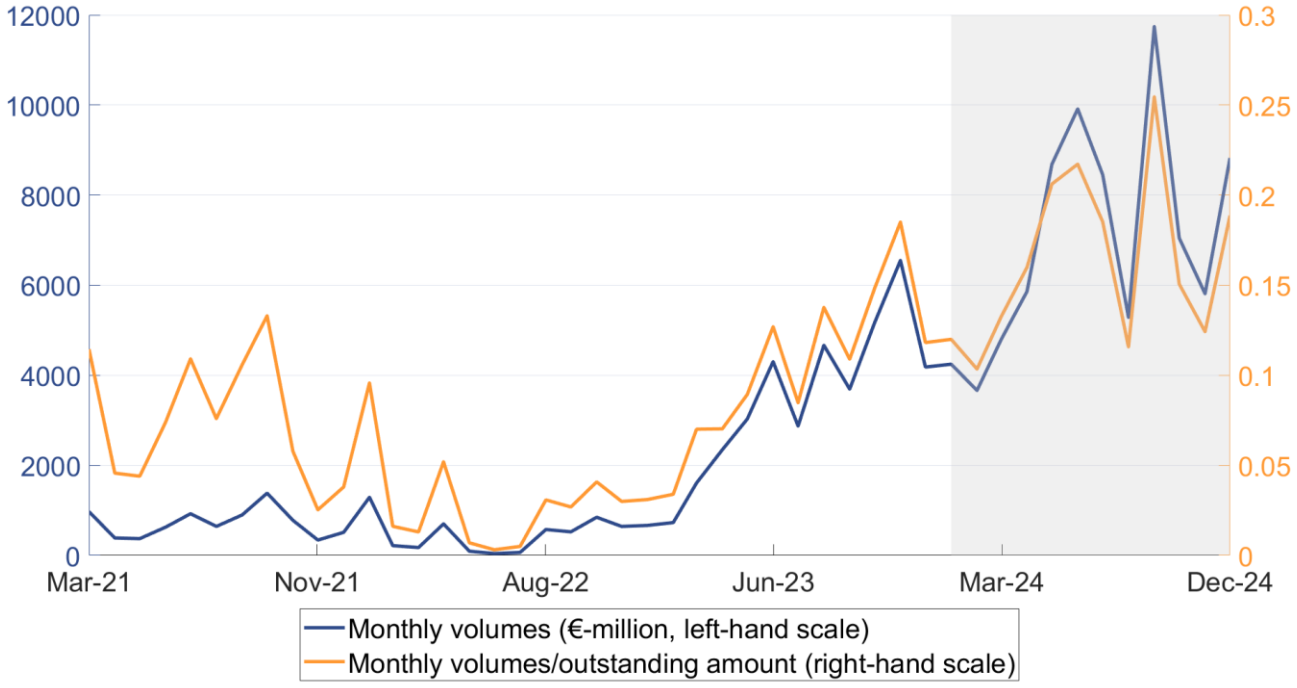


Notes: The figure shows on the horizontal axis the volume categories in million and on the vertical axis the relative cumulative sum (with respect to the total sum), summing up to 1, of the difference between the total volumes of aggressor-side flows for each volume category in 2023 and in 2022 and the difference between the total volumes of aggressor-side flows for each volume category in 2024 and in 2023, for the CCTeu and BTP€i. The positive slope denotes an increase in volumes in 2023 and 2024 compared to the previous years.

[25] At the end of 2023, €29,8 billion of CCTeu bonds were due to mature in 2024, compared with €20,8 billion in 2023 (see https://www.dt.mef.gov.it/en/debito_pubblico/dati_statistici/titoli_scadenza_prossimi_12_mesi/).

Regarding the other segments, Figure 21 shows the monthly volumes (on the left vertical axis) and the ratio between the monthly volumes and the outstanding amount (on the right vertical axis) for the Green BTPs. In May 2024, the Treasury issued €9 billion of the new green bond with a maturity of around 13 and a half years (the previous benchmark had a maturity of approximately 8 and a half years). Even though an upward trend has been observed since 2023, the traded volumes increased significantly after the issuance of the new Green BTP in 2024, reaching a peak in September (at €11.7 billion monthly traded volumes, almost double the previous peak in November 2023). Controlling for the outstanding amount of the whole group of green BTPs (no green bonds matured in 2024), the increase in the ratio relative to the outstanding highlights an increase in traded volumes due to a generalized higher trading activity in Green BTPs, not only due to the new bond issue.

Figure 21: Green BTP



Notes: The figure shows the monthly traded volumes in million on the left vertical axis (blue line) and the ratio between the monthly traded volumes and the monthly outstanding amount on the right vertical axis (orange line) for the Green BTP. The grey area points out the last year.

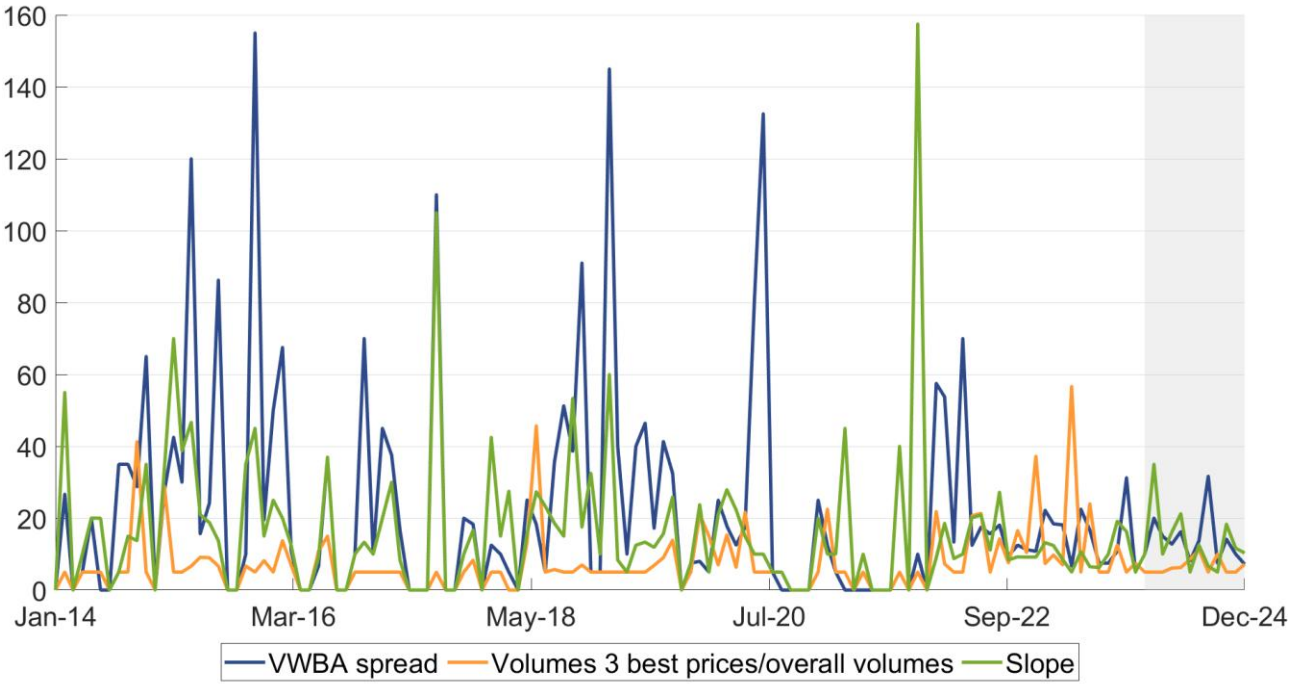
3.2 The resilience of market makers against medium-sized trading flows and directional fast market phases

This Report has so far analyzed the micro-liquidity dynamics by separating quoting activity from trading activity by market participants. In this section we propose a combined analysis of the two different dimensions of market liquidity and activity (quoting and trading). We particularly aim at

describing the impact on liquidity measures of the quoting activity of market makers against: (i) directional fast market phases[26]; (ii) medium-sized trading flows on MTS Italy[27].

Figure 22 shows how many minutes on average are needed for quoting conditions (evaluated through three selected liquidity measures, that is: the VWBA spread; the quoted volumes on the three best prices in proportion to the total quoted volumes; the slope) to restore the same level of the half-hour prior to a fast market event[28], for the 10-year BTP segment in the last ten years.

Figure 22: Effects on quoting liquidity measures of directional fast market phases



Notes: The figure shows on the vertical axis the minutes on average needed for the volume-weighted bid-ask (VWBA) spread, the quoted volumes associated with the three best prices as a share of the overall quoted volumes, and the slope to restore the same level of the half-hour prior to a fast market event for the 10-year BTP, on a monthly basis. The fast market event is defined as the variation in the yield to maturity, either positive or negative, of at least 3 basis points in the 5 minutes between two quoting book snapshots. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The slope is calculated as the ratio of the difference between the best and worst bid (ask) and the overall quoted volumes excluding those relating to the best bid (ask) by averaging bid side and ask side. The grey area points out the last year.

In recent years, the analysis does not detect any structural deterioration of the liquidity measures compared to previous years after phases of increasing market volatility. In contrast to the previous year, the relative depth measure does not show any negative peaks in 2024. The main negative spike for the VWBA spread measure in 2024 was observed in August (when it took more than 30 minutes to be back to a similarly narrow bid-ask spread of the quoting book). On average, it took

[26] The purpose is to assess the potential effect on market makers' quoting strategies when dealing with sudden changes in market volatility, which can lead to an increase in uncertainty as regards the fair value of the quoted financial asset (information asymmetries problem).

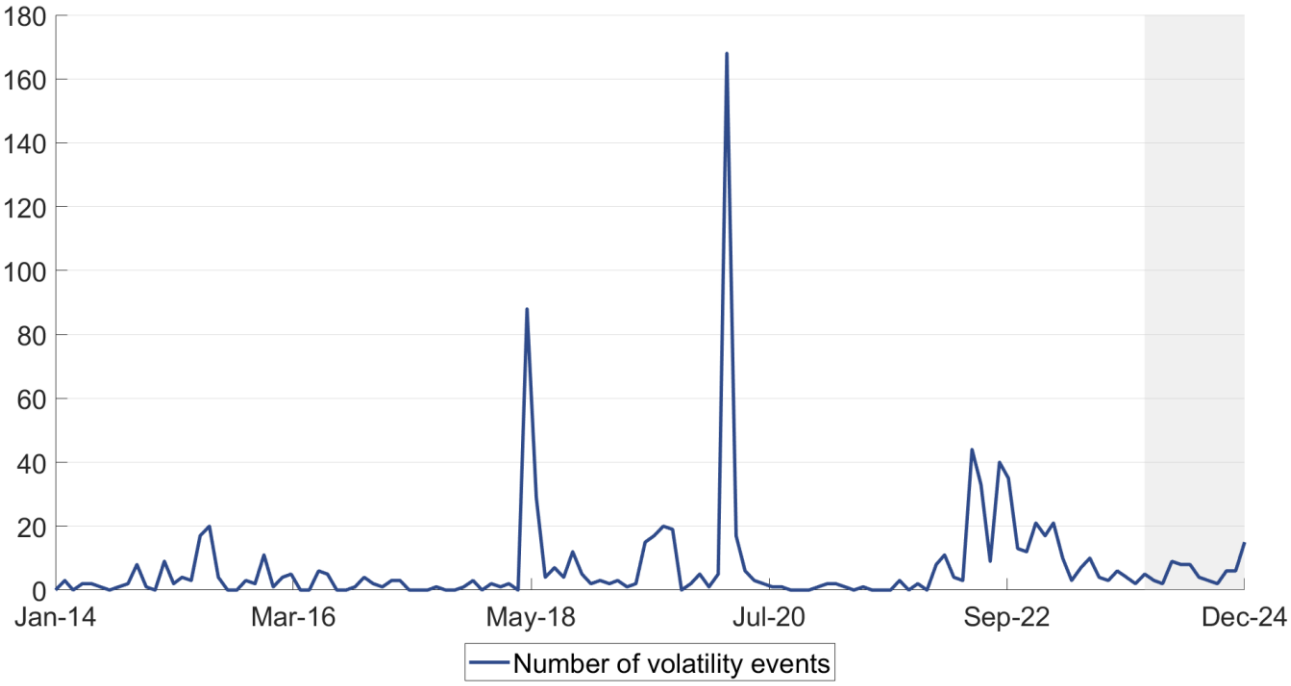
[27] The purpose is to assess the potential effect on market makers' quoting strategies when dealing with selling or buying flows, which may both alter the level of inventory held by market makers (inventory management problem) and change the valuation of the bond's fair value if this flow is believed to be a valuable source of information to assess the fundamental value of the asset traded, assuming that the flow (which remains anonymous for market makers) in itself produces better information about the bond's intrinsic value (again, a problem linked to information asymmetries).

[28] A fast market event is identified whenever the market records a variation in the yield to maturity, either positive or negative, of at least 3 basis points in the 5 minutes between two quoting book snapshots.

almost 14 minutes to return to a similar liquidity condition after a volatility event in 2024. Thus, from a general perspective, this analysis confirms the overall good liquidity conditions offered by primary dealers on MTS Italy, which do not seem particularly affected by volatility events.

However, as shown in Figure 23, since 2023 a structural reduction of volatility events (defined as a 3 basis points variation of the yield to maturity in absolute terms in a 5-minute time span) has taken place: in 2024 and 2023, the average number of volatility events was almost 6 and 9 per month respectively, compared with more than 17 events per month in 2022. In this sense, on the one hand, the overall more stable market conditions may have played a role in positively affecting the resilience of primary dealers in providing good liquidity conditions; on the other hand, the opposite may also be true: a more resilient quoting activity of primary dealers may have determined a structural reduction in idiosyncratic volatility in the BTP market. Further research is needed to identify the more convincing causal link, which may change over time as well.

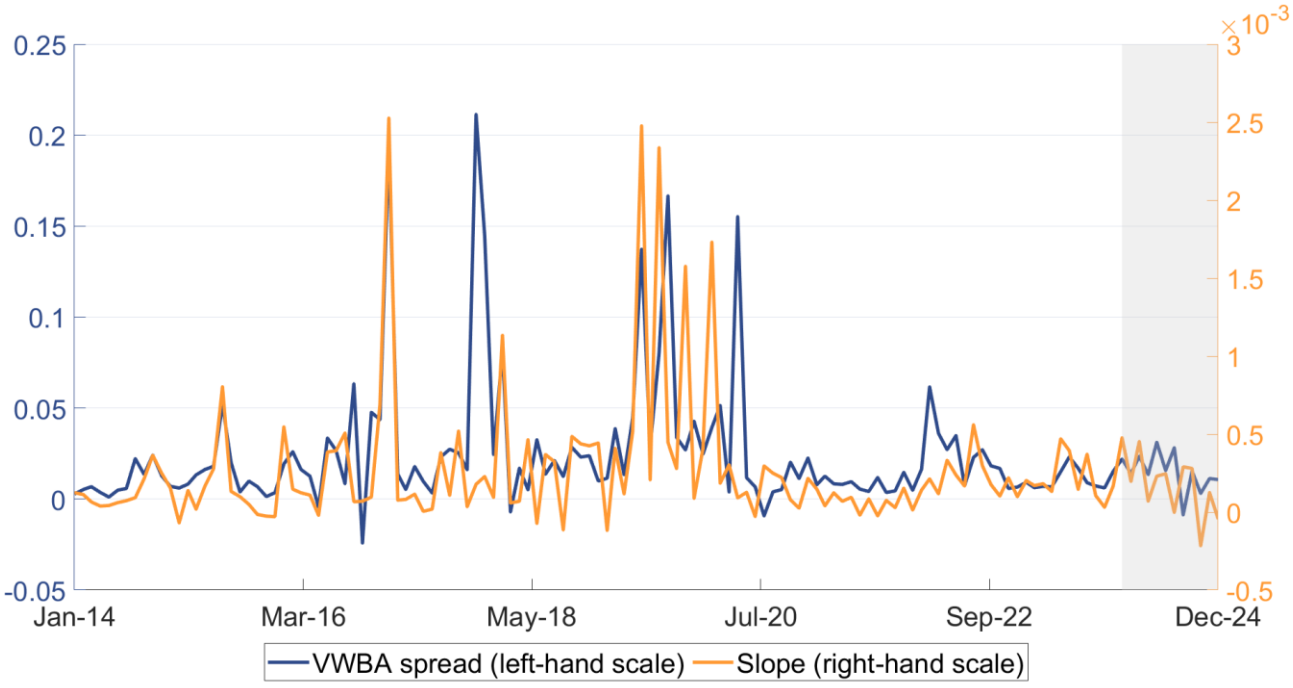
Figure 23: Number of high volatility events



Notes: The figure shows the monthly number of volatility events, defined as a 3 basis points variation of the yield to maturity in absolute terms in a 5-minute time span. The grey area points out the last year.

The second part of the analysis examines the impact of a medium-sized trading flow (defined as a buying or selling flow between €15,000 and €45,000 of the DV01 duration risk index[29]), on the quoting activity of the primary dealers (Figure 24). Filtering the market flows for the above-mentioned DV01 level (from the aggressor perspective), we quantify the impact on the selected liquidity measures (i.e., VWBA spread and slope) of the 10-year BTP after 5 minutes the flow occurred. Again, this analysis confirms the substantial stability of the quoting activity of primary dealers when they faced medium-size flows on MTS. For both measures there is no relevant deterioration in 2023 and 2024, with the average negative effect on the liquidity measures in both years remaining below the 2022 levels: for example, in 2024 the VWBA spread in the 5 minutes after a medium-size flow was negatively affected by 0.015% of the market price, compared to 0.023% observed in 2022.

Figure 24: Effects on quoting liquidity measures of medium-sized trading flows



Notes: The figure shows the variation after 5 minutes a medium-sized trading flow occurred of the volume-weighted bid-ask (VWBA) spread on the left vertical axis (blue line) and of the slope on the right vertical axis (orange line) for the 10-year BTP, on a monthly basis. The medium-sized trading flow is defined as a buying or selling flow between €15 000 and €45 000 of the DV01 duration risk index. The VWBA spread is calculated as the difference between the average prices weighted by the quoted volumes associated with each price for ask side and bid side against the mid-price of the bond. The slope is calculated as the ratio of the difference between the best and worst bid (ask) and the overall quoted volumes excluding those relating to the best bid (ask) by averaging bid side and ask side. As an example, $1 \times \mathbf{10}^{-3}$ corresponds to 0.001. The grey area points out the last year.

3.3 Algorithmic trading: basket trades and auto-hedging strategies

Over the last decade, the growing availability of technological tools has significantly shaped the work of financial operators, enhancing both the efficiency and effectiveness of their market activities. As for market makers, in addition to automated quotation systems, automated trading systems have

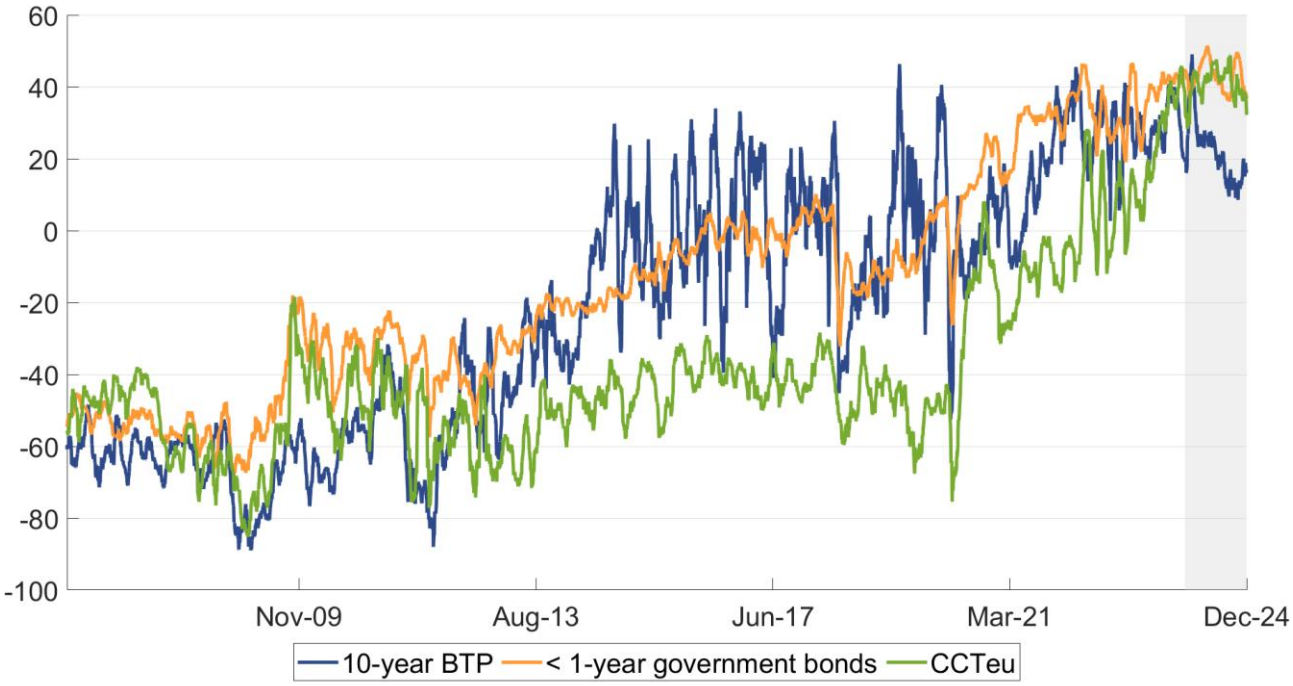
[29] The DV01 duration risk index is defined as the change in the price of the bond against one basis point change in the yield to maturity.

also become increasingly widespread over time[30]. In this section we analyze two phenomena of algorithmic trading, closely linked to the technological evolution of recent years: (i) the block or basket trades, i.e., the ability to execute large trading volumes by carrying out transactions involving multiple securities (typically with close maturities) almost simultaneously; (ii) the possibility of adopting auto-hedging strategies, which allow market makers, upon closing one or more contracts based on market quotes, to immediately enter offsetting contracts (buy or sell) in order to minimize the time spent hedging the risk associated with the previous transactions.

As regards the execution of basket trades, first, we analyze the evolution of the daily share of large flows (so-called large trades) in the overall traded volumes; second, we analyze the number of securities involved in each executed flow. In both cases, as the size analysis increases, so do the execution risks, which are typically managed by primary dealers using tools and technological processes developed in recent years.

As regards the analysis of the trend in large trades, Figure 25 shows the difference between the share of daily traded volumes in flows above €100 million and in flows up to €10 million for the following government bond segments: bonds with a maturity of less than one year, 10-year BTPs and CCTs-eu.

Figure 25: Difference between the daily shares of trading volumes executed in flows above €100 million and up to €10 million (%)



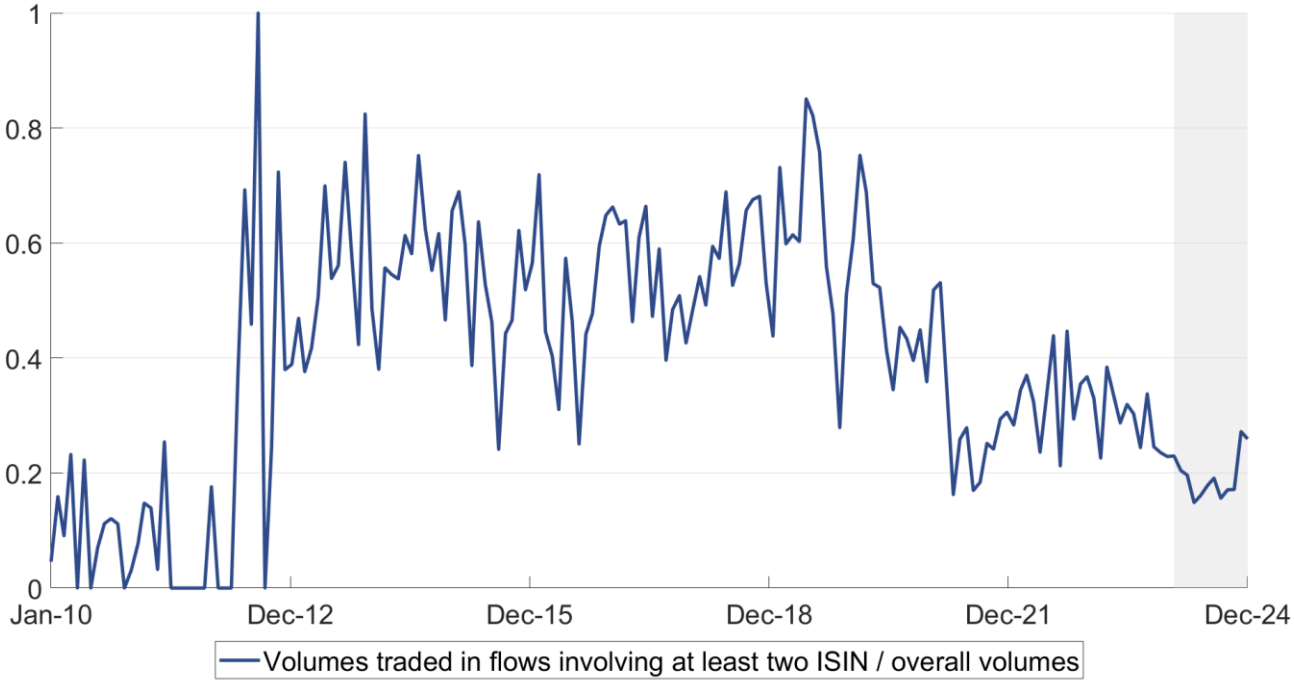
Notes: The figure shows the difference between the proportions of daily traded volumes in flows above €100 million and in flows up to €10 million out of the overall traded volumes in % for the 10-year BTP, government bonds with a residual maturity of less than one year, and CCTeu. The grey area points out the last year.

[30] These tools have been developed by banks, on the one hand, to allow for greater speed in updating quotations (given market movements, news and market-mover events, buying and selling flows, etc.) and, on the other, for the execution of orders according to specific algorithms that optimize the trading strategy and the time taken to send orders to the market and execute them.

The analysis reveals an upward trend for all selected segments in the share of daily traded volumes in flows above €100 million, which frequently involve multiple securities. Indeed, the trend started from a negative level in 2006 (i.e., the proportion of flows up to €10 million was higher than the proportion of flows above €100 million) and has turned positive in recent years. In 2024 the trend seems to stabilize around the high levels reached in 2023, in particular for government bonds with a maturity of less than one year and for CCTs-eu. For 10-year BTPs, on the other hand, the difference between the two shares seems to decrease after the peak (i.e., the proportion of flows above €100 million declines relative to the proportion of flows up to €10 million). The environment characterized by good liquidity conditions in terms of quoting may encourage the execution of large trades.

In this respect, Figure 26 shows the monthly average of the daily share of traded volumes in flows involving two or more securities out of the total traded volumes, taking into account only flows of size above €100 million, which in 2024 fluctuates almost in the same range (but slightly lower) as in recent years and remains below the levels recorded in the 2012-2019 period[31].

Figure 26: Share of trading flows larger than €100 million on multiple securities

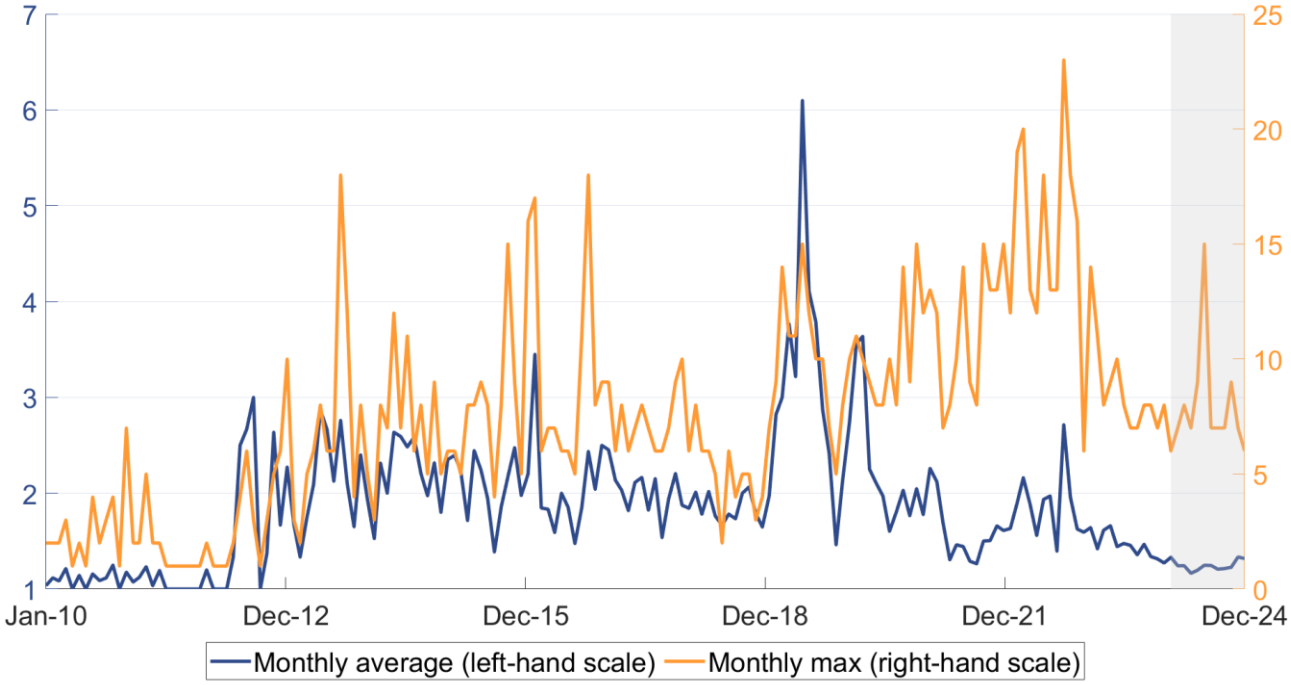


Notes: The figure shows the monthly average of the daily proportion of the volumes traded in flows involving two or more securities out of the total traded volumes for trading flows above €100 million. The grey area points out the last year.

[31] Here we aim to analyze the trend in large trades, which generate a greater effect on the market in terms of both the number of securities on which the contracts are executed and the size of the flows themselves, with a direct impact on primary dealers' inventories and in terms of signaling for all market participants. However, it is worth noting that the execution of orders on multiple securities is also associated with flows smaller than €100 million in size.

Consistently, Figure 27 shows the monthly trend of the average number of securities involved in a large single flow (on the left vertical axis) and the monthly maximum number of securities involved in a large single flow (on the right vertical axis). The average number of securities involved in large flows slightly declines and is less volatile in 2023 and 2024. The maximum number of securities involved in a large single flow stabilizes around 7 securities in 2023 and 2024 (except for the peak of 15 securities in June 2024), after the all-time high of 23 securities involved in September 2022 (and generally the 2021-2022 period in which the maximum monthly data was structurally higher than 10 securities). The limitation in the execution of basket trades may be affected by the beginning of a specific monitoring activity by the Italian Treasury in 2023.

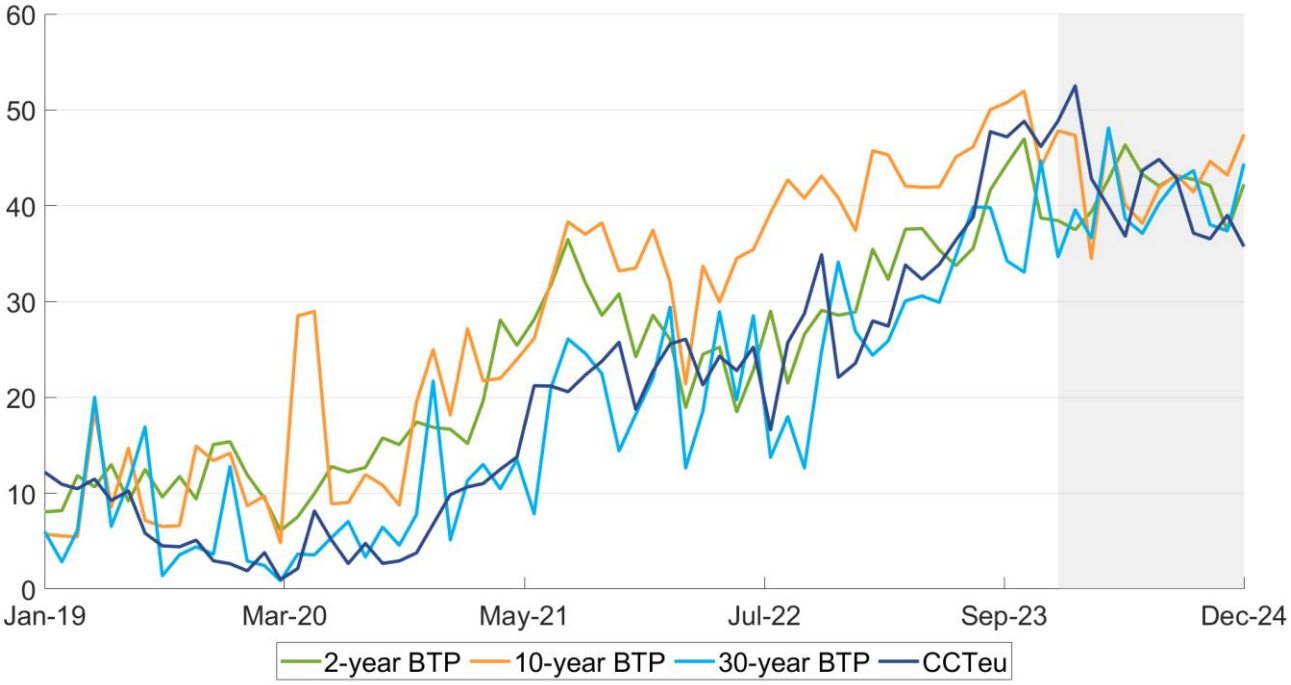
Figure 27: Number of securities in trading flows larger than €100 million



Notes: The figure shows on the left vertical axis the monthly average number of securities involved in a single flow (blue line) and on the right vertical axis the monthly maximum number of securities involved in a single flow (orange line) for trading flows above €100 million. The grey area points out the last year.

Regarding auto-hedging strategies, Figure 28 shows the share of monthly volumes generated by algorithmic trading activity out of the total volumes traded on the interdealer platform for the following government bond segments: 2-year BTP, 10-year BTP, 30-year BTP and CCTeu. In 2024, the analysis shows a stabilization of the volumes generated by such trading strategies in all the segments considered, halting the upward trend observed in the previous years. All segments reach their highest peak ever, either at the end of 2023 or at the beginning of 2024. In particular, the index for the 10-year government bond segment reaches almost 52% in November 2023, consistent with the idea that liquidity discovery is more pronounced in this area than in others. This may indicate that the activity of algorithmic trading reached its saturation point in 2024.

Figure 28: Monthly auto-hedging volumes as a percentage of total traded volumes (%)



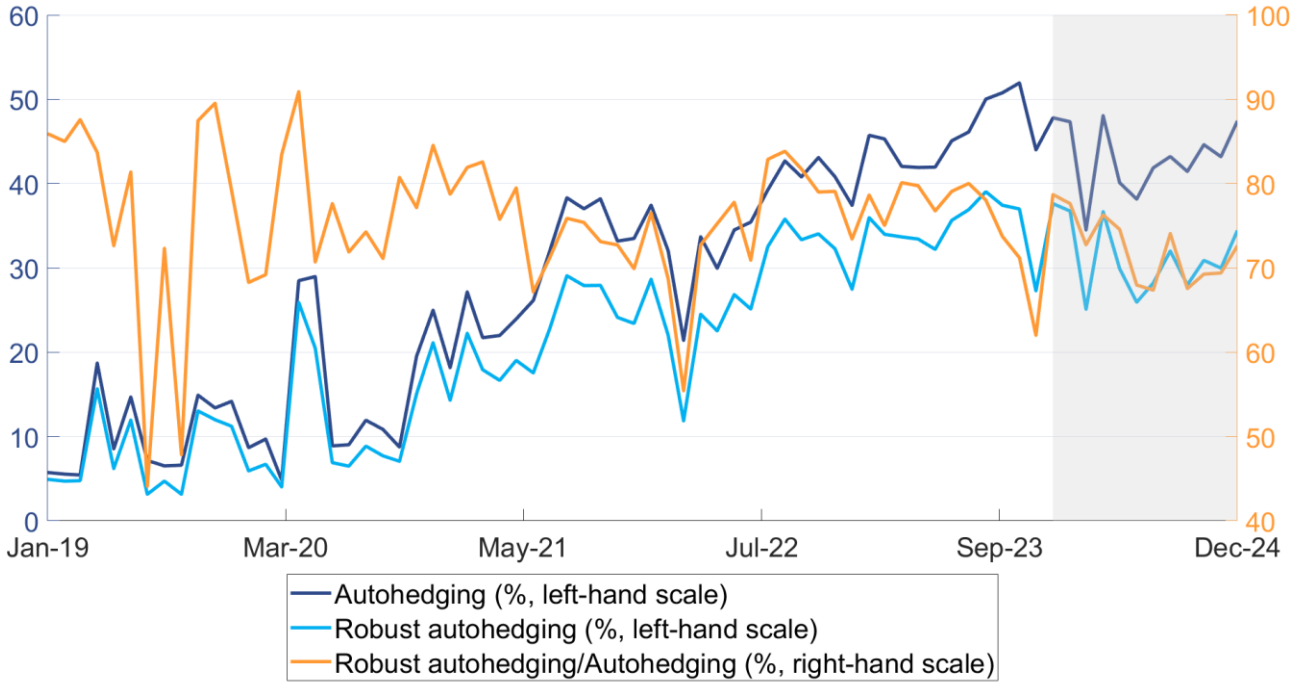
Notes: The figure shows the proportion of monthly volumes generated by auto-hedging activity out of the total traded volumes in % for the 2-year BTP, 10-year BTP, 30-year BTP, and CCTeu. The grey area points out the last year.

The positive correlation between the traded volumes generated by auto-hedging activity and the above-mentioned good liquidity conditions in terms of quoting activity in the last two years confirms the strong relationship among these two variables. Moreover, it is also true that IT developments and support have been a key factor for primary dealers over these years in managing the above-mentioned strong increase in traded volumes (and the corresponding increase in risk) on MTS Italy since 2020. There is no univocal conclusion as regards the effects of auto-hedging strategies on liquidity conditions on the MTS platform. The growth in auto-hedging activity affects the behavior of market makers by tightening the bid-ask spread. However, also the opposite relation is valid: thanks to tighter bid-ask spread the auto-hedging activity on MTS becomes more efficient in managing the liquidity risk for primary dealers. Finally, auto-hedging strategies have contributed to the growth in traded volumes.

The above analysis can be further developed by identifying as auto-hedging only those volumes where the market maker hit by the original flow of the aggressor immediately enters into one or more

contracts of opposite sign on the same security as the original aggressor. Figure 29 shows the share of monthly volumes generated by auto-hedging activity out of the total volumes traded on the interdealer platform for the 10-year BTP, distinguishing between auto-hedging strategies using any security and *pure* auto-hedging strategies using the same security as the original aggressor (hereafter referred to as robust auto-hedging). The robust auto-hedging mimics the evolution of the auto-hedging index, peaking at 39% in September 2023. The ratio between the robust auto-hedging and the auto-hedging is stable over time, fluctuating around 70%.

Figure 29: 10-year BTP – Monthly auto-hedging volumes as a percentage of total traded volumes (%)



Notes: The figure shows on the left vertical axis the proportion of monthly volumes generated by auto-hedging activity out of the total traded volumes in % for the 10-year BTP, when the activity is on any security (blue line) and on the same security as the original aggressor (light blue line), and on the right vertical axis the ratio between these two measures in %. The grey area points out the last year.

4. Special section on final client activity

In this special section of the Report, we aim at investigating the relationship existing between the liquidity in the secondary interdealer market (mainly MTS Italy) and the liquidity conditions that final investors face when they decide to buy or sell an Italian government bond.

We present this analysis following three different approaches: (i) from a general perspective, we analyze the dynamics of primary dealers' traded volumes with final clients, comparing it with the main trends in terms of quoting and trading activities observed on the interdealer market MTS Italy (Section 4.1); (ii) we analyze the liquidity conditions on BondVision[32], the dealer-to-client trading platform operated by MTS Spa, using a set of liquidity indicators specifically designed to assess how liquidity has evolved on this business-to-customer (B2C) trading venue (Section 4.2); (iii) lastly, we provide a first analysis in terms of interaction between client activity on BondVision and liquidity conditions (both in terms of quoting and trading) on MTS Italy (Section 4.3). In particular, while Section 4.1 aims at identifying the observable trends in the final client activity, irrespective of the trading venue through which this activity is carried out (electronic platforms, over-the-counter transactions, etc.), Sections 4.2 and 4.3 propose a first analysis of liquidity conditions on a client-based electronic platform and its interaction with the interdealer market, using a case study based on BondVision data.

To carry out these analyses, we rely on two additional databases provided by MEF and MTS, which contain all the relevant information regarding final clients' activity on the Italian government bonds. In particular:

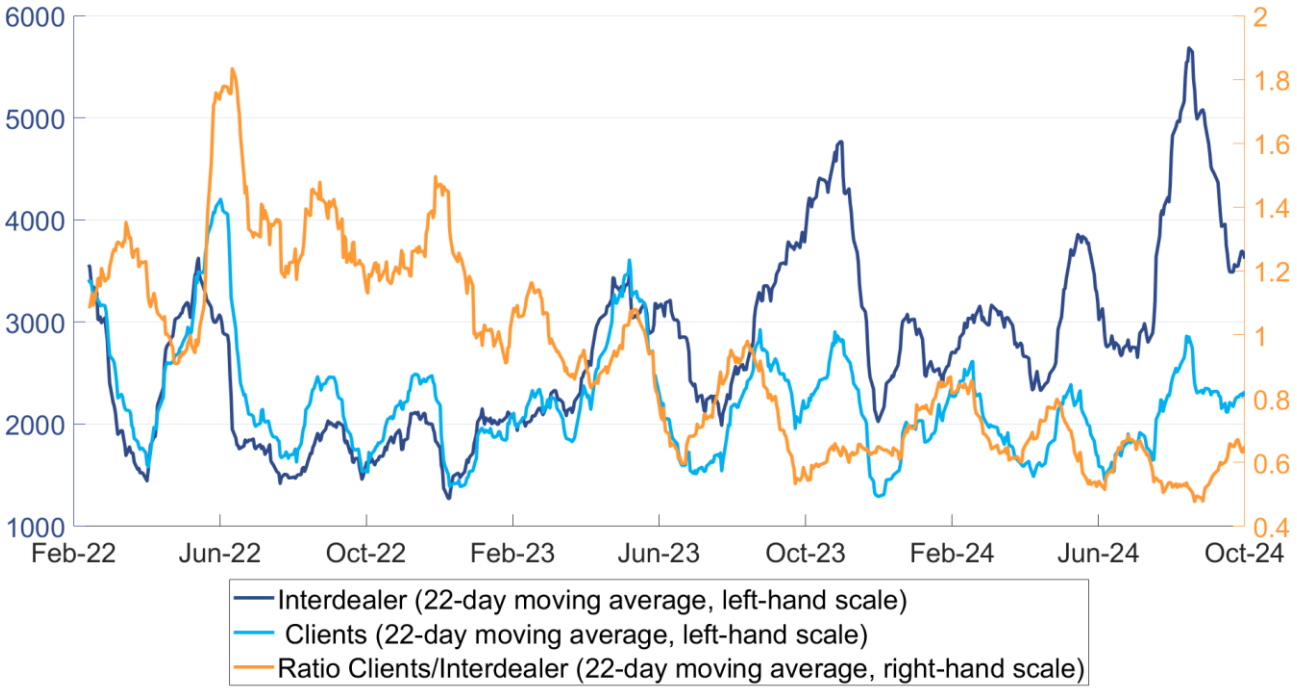
- the primary dealers' Harmonized Reporting Format (HRF) database, which contains, for each bond (identified by ISIN and description), all details on volumes traded with counterparties—Debt Management Office (DMO), final clients, other dealers—, trading venues, market side (buy or sell from the perspective of the primary dealer). The data are aggregated on a daily basis for each primary dealer and the period covered by the database runs from February 2022 to October 2024;
- the whole list of requests-for-quote (RFQs) in BondVision from clients on Italian government bonds, with information concerning the identification of the security (i.e., ISIN, description), the market side, the price and yield of the contract, the date and time with second accuracy of both the creation and the expiry of the RFQ, the outcome of each RFQ (actually traded, not traded, rejected by client, rejected by dealer, expired, etc.), all the quotes provided by the selected counterparties in the RFQ.

[32] BondVision is a request-for-quote (RFQ) platform that provides the possibility for final investors to send RFQs to a limited number of participants (typically primary dealers but not limited to these operators) in order to get the best quote to execute a buy/sell contract on a specific bond and for the desired amount. The final clients who send RFQs are defined as buy-side participants, while the operators who can reply to incoming RFQs are defined as sell-side participants. The RFQ is configured as an auction through which a final investor tries to optimize its execution cost to buy/sell a specific amount of a security (or more securities) involving a limited group of sell-side players who offer their best quote in order to effectively execute the deal.

4.1 Aggregate volume activity of final investors

This section provides general evidence on the activity of final investors on Italian government bonds. Based on primary dealers' HRF database, we restrict the analysis to 10-year area BTPs (i.e., those BTPs with a residual maturity between 8 and 12 years). In Figure 30, we compare the 22-day moving average of the volumes traded in the interdealer market[33] and the volumes traded by primary dealers with final investors (thus excluding transactions with the DMO). From this first chart, we can clearly identify three elements: (i) a high correlation exists between the trading activity with final investors and that in the interdealer segment; (ii) traded volumes in the two sectors are of a similar order of magnitude[34]; (iii) finally, from the second half of 2023, there was a relevant increase in the interdealer market activity without a significant increase in traded volumes with final investors, in turn the ratio of traded volumes in the two segments fell steadily below 1.

Figure 30: Traded volumes with final clients and in the interdealer market (€-million)



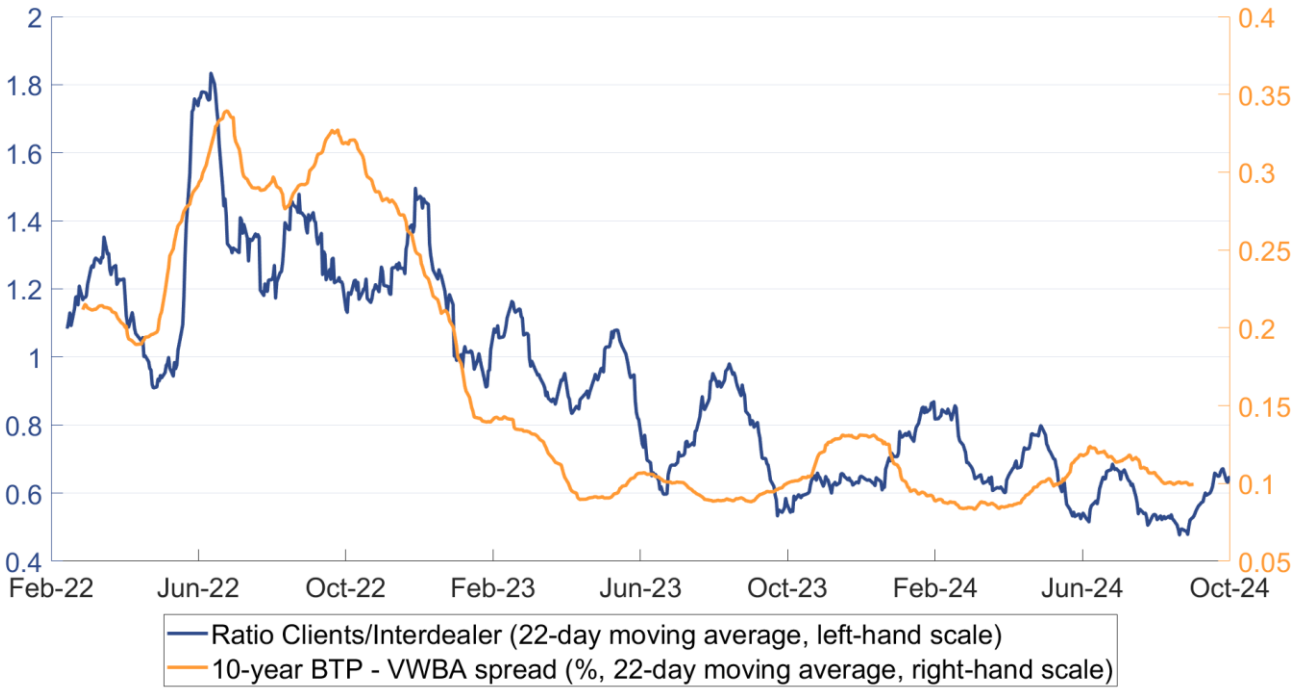
Notes: The figure shows the 22-day moving averages of traded volumes in the interdealer market (blue line, €-million) and with final investors (light blue line, €-million), on the left vertical axis, and the ratio between the 22-day moving average of traded volumes with final investors and the 22-day moving average of traded volumes in the interdealer market (orange line), on the right vertical axis, for the 10-year area BTP.

[33] The interdealer market is defined as all transactions made between two dealers, regardless of the trading venue (MTS Italy, OTC and other platforms).

[34] Over the last three years, daily traded volumes with final investors in the 10-year area BTPs ranged between €1.5 billion and €4.0 billion, which is similar to the range of daily traded volumes in the interdealer market.

Moreover, Figure 31 shows that the ratio between traded volumes with final investors and in the interdealer market is negatively correlated with the liquidity conditions on MTS Italy: the better the liquidity conditions on MTS Italy (e.g., narrower volume-weighted bid-ask spread, higher concentration of the quoted volumes in the three best prices, lower slope, etc.), the higher the trading activity on MTS Italy relative to client activity (see also Figure A.16 in Appendix for further insight).

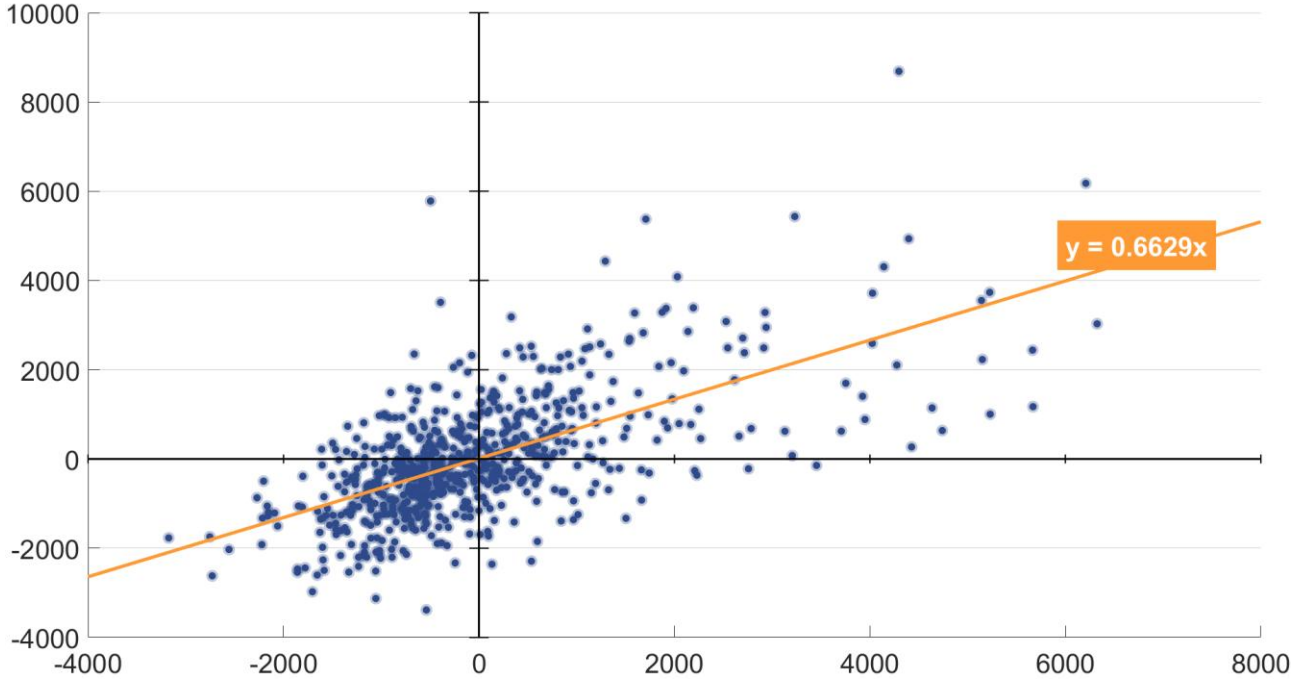
Figure 31: Ratio of final investors traded volumes to interdealer traded volumes and quoting liquidity measures on MTS Italy



Notes: The figure shows on the left vertical axis the ratio between the 22-day moving average of traded volumes with final investors and the 22-day moving average of traded volumes in the interdealer market for the 10-year area BTP (blue line) and on the right vertical axis the 22-day moving average of the volume-weighted bid-ask (VWBA) spread for the 10-year BTP (orange line, %).

To deepen the analysis of the correlation between the volumes traded with final investors and those traded in the interdealer market, in Figure 32 we present a scatter plot with the daily deviation of the final investors' volumes from their average in the 22 preceding days on the X-axis and the daily deviation of the interdealer volumes from their average in the 22 preceding days on the Y-axis. The analysis aims at quantifying the correlation between the deviations of traded volumes, with respect to the monthly average, in the two segments. Though a causal identification of the mechanism is beyond the scope of this analysis, a reasonable interpretation of the positive correlation in Figure 32 is that it highlights the way primary dealers manage the risk arising from final investors' flows by spreading this risk in the interdealer market.

Figure 32: Scatter plot: clients' traded volumes (X-axis, daily deviation from 22-day prior average, €-million) **vs. interdealer traded volumes** (Y-axis, daily deviation from 22-day prior average, €-million)



Platform	Coefficient
MTS	0.1884
Other platforms	0.1165
OTC	0.3580

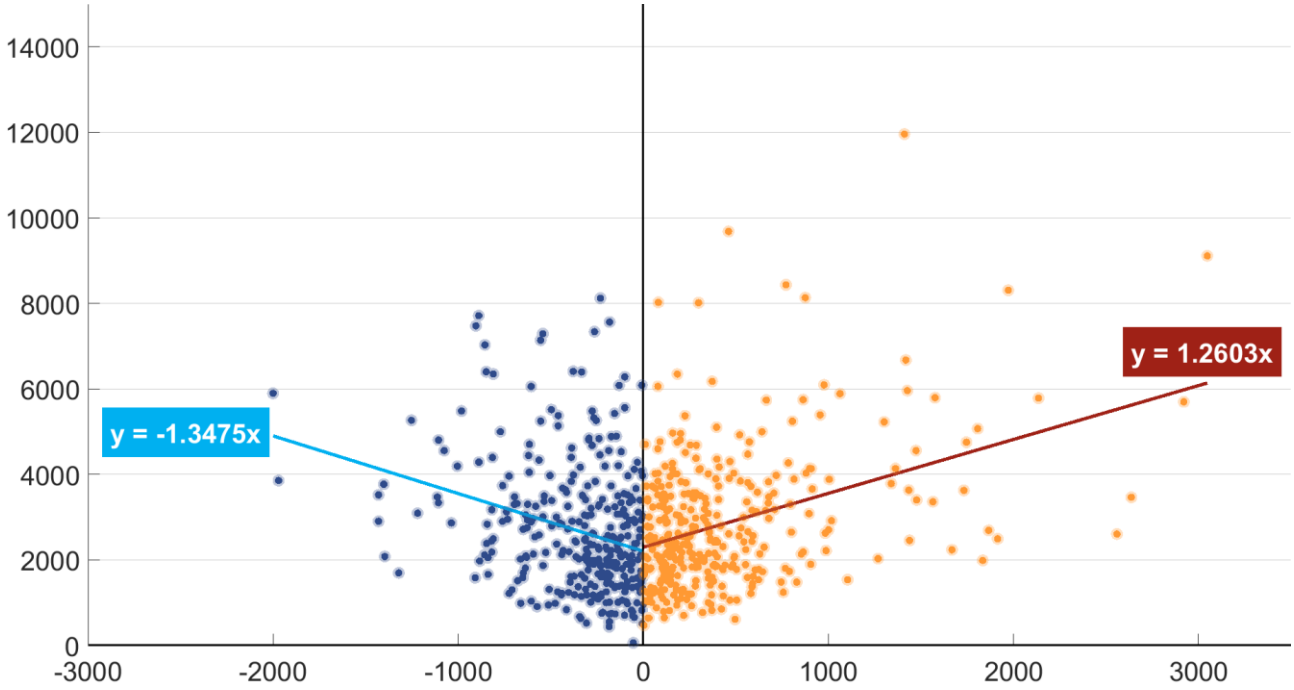
Notes: The figure shows on the X-axis the daily deviation from 22-day prior average of dealers' traded volumes with clients (€-million), while on the Y-axis the daily deviation from 22-day prior average of dealers' traded volumes in the interdealer market (€-million). The table shows the coefficients of the linear regressions between the two variables, considering different trading venues through which dealers trade in the interdealer market (MTS, other platforms or OTC).

The analysis finds a correlation coefficient of 0.6629, which means that if on a specific day the clients' trading volume increases by €1 billion (compared to the monthly average), the trading volume in the interdealer market increases by €0.6629 billion. In addition, we break down the overall effect on the interdealer market by main transaction venues, that is: MTS platform; other platforms; over-the-counter (OTC). The table below Figure 32 shows that the main channel affected by the increase in volumes traded with clients are OTC transactions (correlation coefficient of 0.358); MTS is the

second channel positively affected by the increase in volumes traded with clients (correlation coefficient of 0.1884); other electronic platforms are the least used channel (correlation coefficient of 0.1165).

Finally, in Figure 33 we show the correlation between the daily variation of primary dealers' inventories (defined as an index for the whole group of primary dealers, calculated as the net value between buying and selling activity from final investors and DMO) and traded volumes in the interdealer market. Through this exercise, we argue that the trading activity in the interdealer market is more affected by the net imbalances resulting from final investors' market flows than by the pure traded volumes with final investors (as shown by the higher correlation coefficients in absolute terms). Indeed, if trading volumes in the interdealer market reflect the risk management activity of primary dealers in response to final investors' flows, then the net imbalances of the activity with clients should represent the part of these flows that requires to be managed effectively through the trading activity in the interdealer market. In other words, what matters most is not how much is bought or sold overall by final clients, but the extent to which buying and selling flows are out of balance, which is what dealers need to manage by trading in the interdealer market.

Figure 33: Scatter plot: primary dealers' inventories (X-axis, daily variation, €-million) **vs. interdealer traded volumes** (Y-axis, €-million)



Platform	PDs inventories increase	PDs inventories decrease
MTS	0.429	-0.526
Other platforms	0.214	-0.242
OTC	0.618	-0.579

Notes: The figure shows on the X-axis the daily variation of dealers' inventories (€-million, split in positive and negative daily variations), while on the Y-axis the daily traded volumes in the interdealer market (€-million). The table shows the coefficients of the linear regressions between the two variables (splitting the analysis for positive and negative daily variations in primary dealers' inventories), considering different trading venues through which dealers trade in the interdealer market (MTS, other platforms or OTC).

This analysis highlights that the correlation between the daily variation of primary dealers' inventories is positively correlated with interdealer volumes. Moreover, this relationship appears to be asymmetric. It is slightly stronger (in absolute terms) when the variation in imbalances is negative (namely, the buying activity of clients is higher than the selling activity). This behavior suggests that primary dealers might have a different approach when hedging risks arising from the selling or buying activity of final investors. Again, analyzing which transaction venue primary dealers prefer to hedge risks, the recourse to the interdealer OTC market is greater than to MTS or other electronic platforms when dealers face selling flows from final investors (inventories increase from the perspective of primary dealers). However, when primary dealers face buying flows from final investors, they tend to be equally active in the interdealer OTC channel and in the MTS market.

4.2 Liquidity measures for a B2C platform: the BondVision case study

Final investor trading activity is typically carried out alternatively through OTC transactions (when the client agrees directly with a counterparty the price at which they can execute their transaction) or through B2C platforms. B2C platforms provide final investors with a comfortable market environment through which they can get the best available quotes from sell-side operators, supported by a well-designed technological infrastructure and a market environment that guarantees the best execution evidence and stable market conditions. BondVision is the B2C electronic platform operated by MTS Spa and provides us with a perfect case study to assess the most recent trends in market liquidity on these B2C platforms. Considering the specific market features of B2C platforms, we first introduce a list of liquidity measures specifically defined for B2C markets, based on existing academic literature and practitioners' suggestions:

- the *total traded volumes* or *total number of contracts* provide clear evidence on the effective trading volumes of final investors; the higher these measures, the better the liquidity conditions provided by sell-side operators;
- the *ratio of total traded volumes (contracts) to total requested volumes (RFQs)*; given that one possible outcome of a RFQ is that it does not actually lead to a transaction (e.g., because buy-side clients desire to get better quotes than those provided by sell-side operators), this ratio quantifies the amount of activity with a positive outcome; the higher the ratio, the better the liquidity conditions;
- the *standard deviation of quotes received from the selected sell-side operators for each RFQ*; the higher the dispersion, the higher the uncertainty about the fair value of the bond and the lower the perceived liquidity conditions from clients' perspective;
- the *execution time* – i.e., how many seconds pass between the creation time and the closing time of RFQs actually traded; the lower the time taken for a client to receive and accept the quotes proposed by sell-side operators, the better the liquidity conditions;
- the *average size per RFQ*; if final investors set increasing amounts of their RFQs, it might mean that they trust in the overall efficiency of the market microstructure (e.g., sell-side operators avoid misbehaving with clients); the larger the size, the better the liquidity conditions;

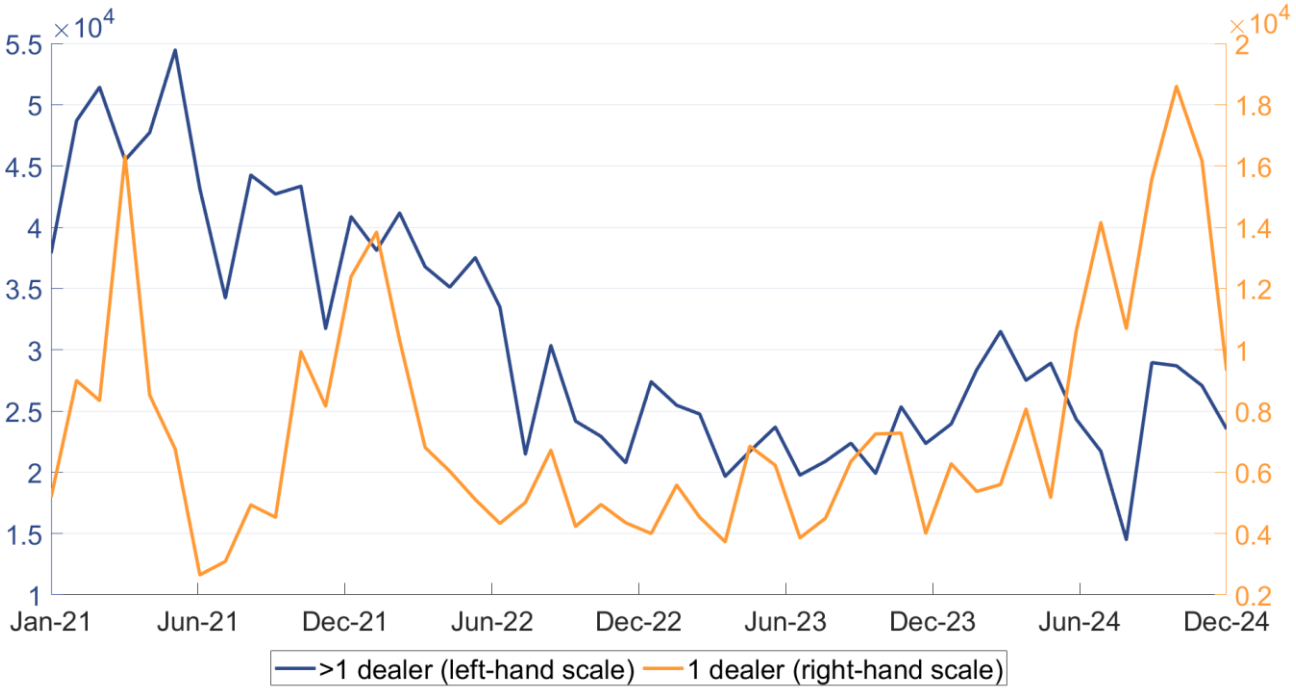
- the *effective execution cost* – i.e., the difference between the execution price and the mid-market level (which is a measure of the fair value of the bond) provides a measure of the opportunity cost of execution from the buy-side perspective; the lower the execution cost, the better the liquidity conditions;
- the *ratio between the number of quotes effectively obtained by sell-side operators and the number of operators involved in the RFQ*; the lower the ratio, the worse the liquidity conditions, as the final investor faces a lower level of competition coming from the selected counterparties (having fewer actual quotes to choose from);
- the *ratio between the number of RFQs involving just a single sell-side operator and the number of RFQs involving two or more sell-side operators*; final investors might decide to agree a transaction with a sell-side counterparty in the OTC market and then execute it through a B2C platform (e.g., to manage the booking in the IT systems); therefore, this measure does not clearly identify if there is a worsening or an improvement of market liquidity, but it describes a phenomenon that is not strictly related to the specific market liquidity conditions of the RFQ platform.

We carry out an analysis of these liquidity measures on BondVision, which is one of the most relevant B2C electronic platform in the case of Italian government bonds[35], based on a database (described in detail above) that provides us with all the relevant information on RFQs in the period January 2021-December 2024. The Appendix includes some charts illustrating the dynamics of the above-mentioned liquidity measures applied to BondVision. In this section, we present key evidence on the evolution of these measures and analyze the existing relationship between the liquidity measures of a RFQ platform and the liquidity measures of MTS Italy.

[35] Considering B2C transactions, the market share of BondVision in the period January-October 2024 is approximately 15% of the total volumes traded on several electronic trading venues.

Figure 34 shows the monthly dynamics of overall traded volumes on BondVision over the past four years, divided into those involving more than one sell-side operator and those involving just a single one the RFQs. While traded volumes involving two or more dealers have decreased since 2021, stabilizing in 2024 at a level similar to that observed in the 2022-2023 period, volumes traded through RFQs with just one dealer have increased significantly in the second half of 2024 compared to the 2021-2023 period. As mentioned above, this phenomenon does not necessarily reflect a variation in the liquidity conditions offered by the RFQ platform. On the contrary, it might represent the ability of the platform to attract OTC client flows as it provides good IT solutions and infrastructure for managing booking and post-trade for the two counterparties involved in a transaction. Lastly, a possible explanation for this phenomenon might be related to the narrower bid-ask spreads on MTS Italy: tighter spreads, good liquidity conditions on MTS Italy and low market volatility encourage final clients to engage with dealers in non-competitive transactions.

Figure 34: Total volumes traded in BondVision (€-million)

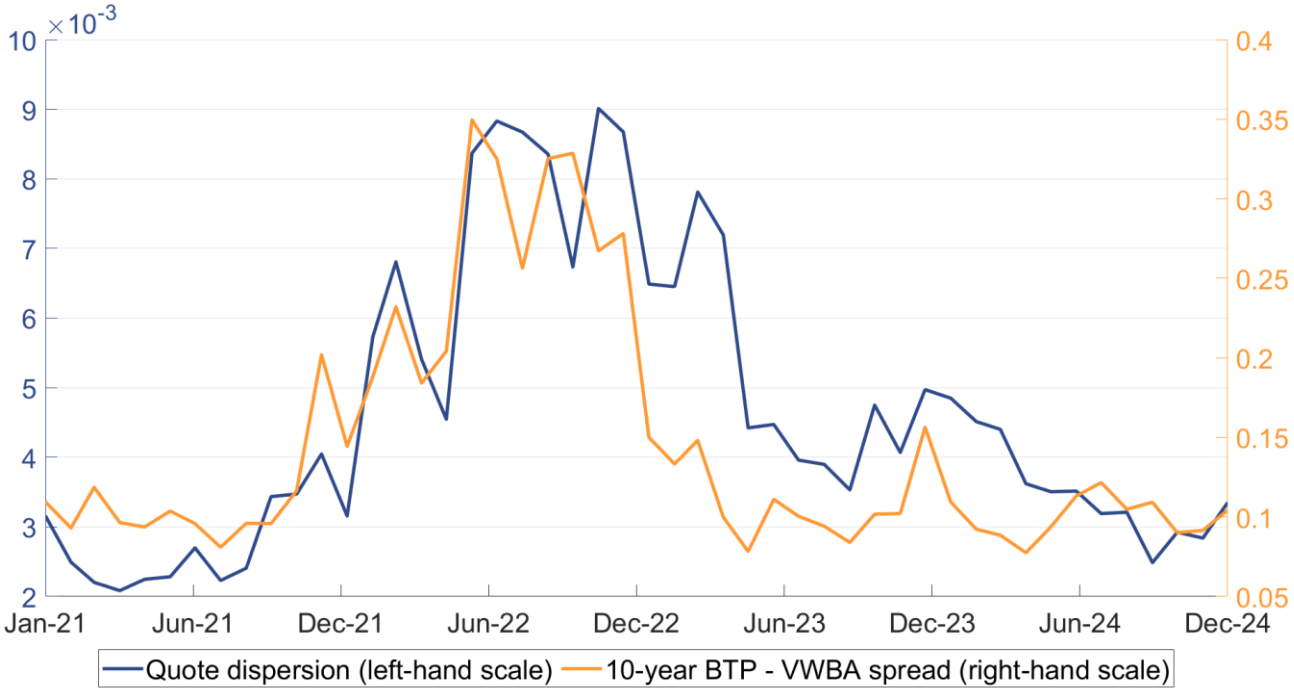


Notes: The figure shows on the left vertical axis the monthly total volumes of RFQs with two or more dealers involved in the RFQ (blue line, €-million) and on the right vertical axis the monthly total volumes of RFQs with a single dealer involved in the RFQ (orange line, €-million). As an example, €1 million × $\mathbf{10^4}$ corresponds to €10 billion.

In broad terms, the general trend observed in the liquidity measures applied to BondVision shows good and stable liquidity conditions in 2024, after the slight deterioration experienced in 2022 due to market volatility, which was triggered by the restrictive monetary policies adopted by Western central banks in response to the inflation shock experienced in 2021-2022. In this section, we focus on some evidence regarding the correlation between liquidity conditions in RFQ markets (in our case, BondVision) and MTS Italy. In particular, the deterioration of liquidity conditions in 2022 provides an interesting case study through which to explore the existing relationship between these two markets further.

Figure 35 compares the monthly average of the VWBA spread for the 10-year BTP benchmark on MTS Italy with the dispersion of quotes in RFQs (i.e., the monthly average of standard deviation of quotes for each RFQ, with a risk-adjustment according to the risk measure of the bond object of the RFQ) for 10-year area BTPs. These two measures are affected by several factors impacting the quoting decisions of primary dealers, in particular the degree of uncertainty regarding the fair value of the bond and the different risk aversion of sell-side operators. It is worth noting that these two measures moved in a synchronized way during the general trend of deterioration of market liquidity experienced in the first half of 2022, but the recovery path of liquidity conditions was clearly different. Specifically, on MTS Italy the recovery was faster and in the first half of 2023 the VWBA spread reached similar levels of those observed in 2021. The quotes' dispersion measure for BondVision took much longer to fully recover from the deterioration experienced in 2022. In this sense, this analysis offers first clear evidence that RFQ markets and liquidity conditions for final investors took more time than the secondary interdealer market to recover from the negative evolution of market liquidity.

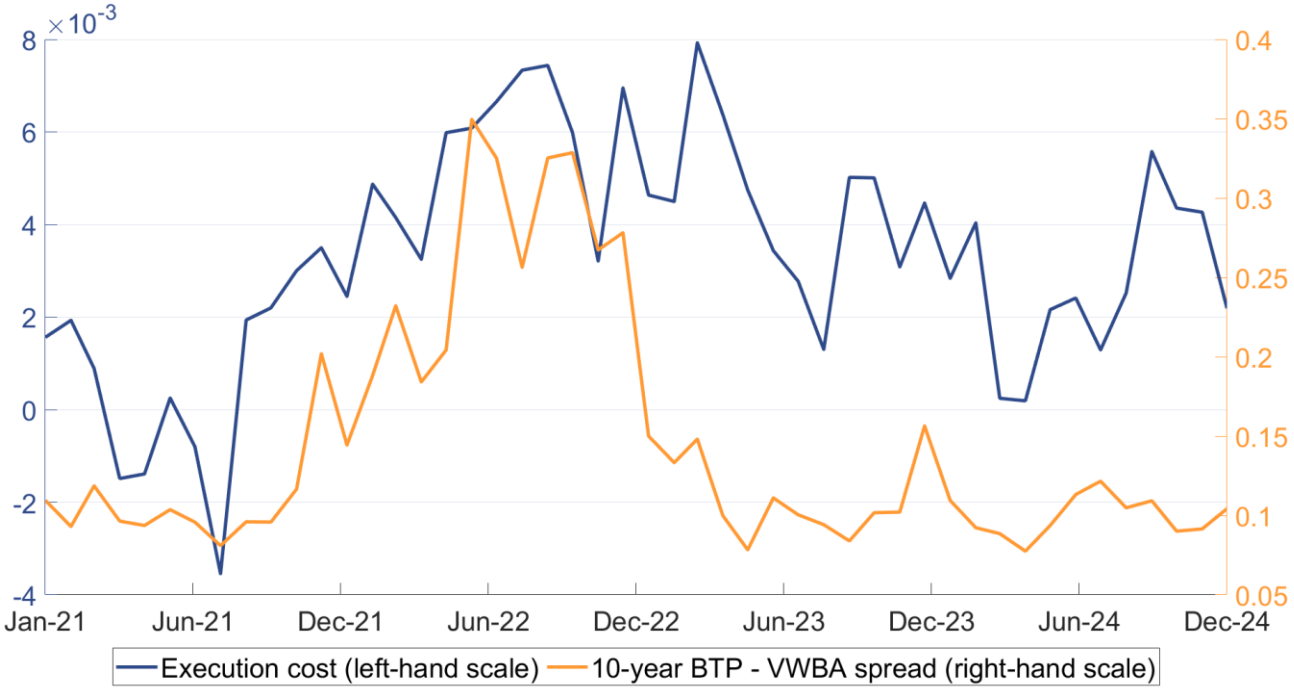
Figure 35: Quote dispersion in traded RFQs (standard deviation, risk weighted, 10-year area BTPs) **and 10-year BTP volume-weighted bid-ask spread** (%)



Notes: The figure shows on the left vertical axis the monthly average (weighted for the DV01 factor) of quotes' dispersion (standard deviation) in each traded RFQ for 10-year area BTPs (blue line; 10-year area BTPs are defined as BTPs with a residual maturity of between 5 and 15 years) and on the right vertical axis the monthly average of the volume-weighted bid-ask (VWBA) spread for the 10-year BTP (orange line, %). As an example, $2 \times \mathbf{10}^{-3}$ corresponds to 0.002.

Similar evidence is provided by Figure 36, which shows the dynamics of the monthly average of the RFQ execution cost in comparison with the VWBA spread on MTS Italy. Also in this case, in the second and third quarters of 2022 there were clear signs of deterioration of market liquidity for final investors (namely, higher execution costs), but it took more than one year for the market to recover to the zero-cost condition observed in 2021.

Figure 36: RFQ execution cost (bps x DV01) **and 10-year BTP volume-weighted bid-ask spread** (%)



Notes: The figure shows on the left vertical axis the monthly average (weighted for DV01) of RFQ execution cost (blue line, basis points x DV01) and on the right vertical axis the monthly average of the volume-weighted bid-ask (VWBA) spread for the 10-year BTP (orange line, %). As an example, $2 \times \mathbf{10}^{-3}$ corresponds to 0.002.

In previous editions of this Report[36], we pointed out the existing asymmetry between negative shocks to market liquidity conditions, which typically occur with fast depletion movements, and the slow recovery path to restore good liquidity conditions. Now, this analysis adds two more pieces of evidence: (i) the deterioration of market liquidity for clients follows a similar path of that observed in the interdealer market, but (ii) the recovery is even slower on B2C platforms, making transactions more costly for final investors for a longer period after a deterioration in market liquidity.

4.3 Impact of BondVision RFQs on quoting and trading activity on MTS Italy

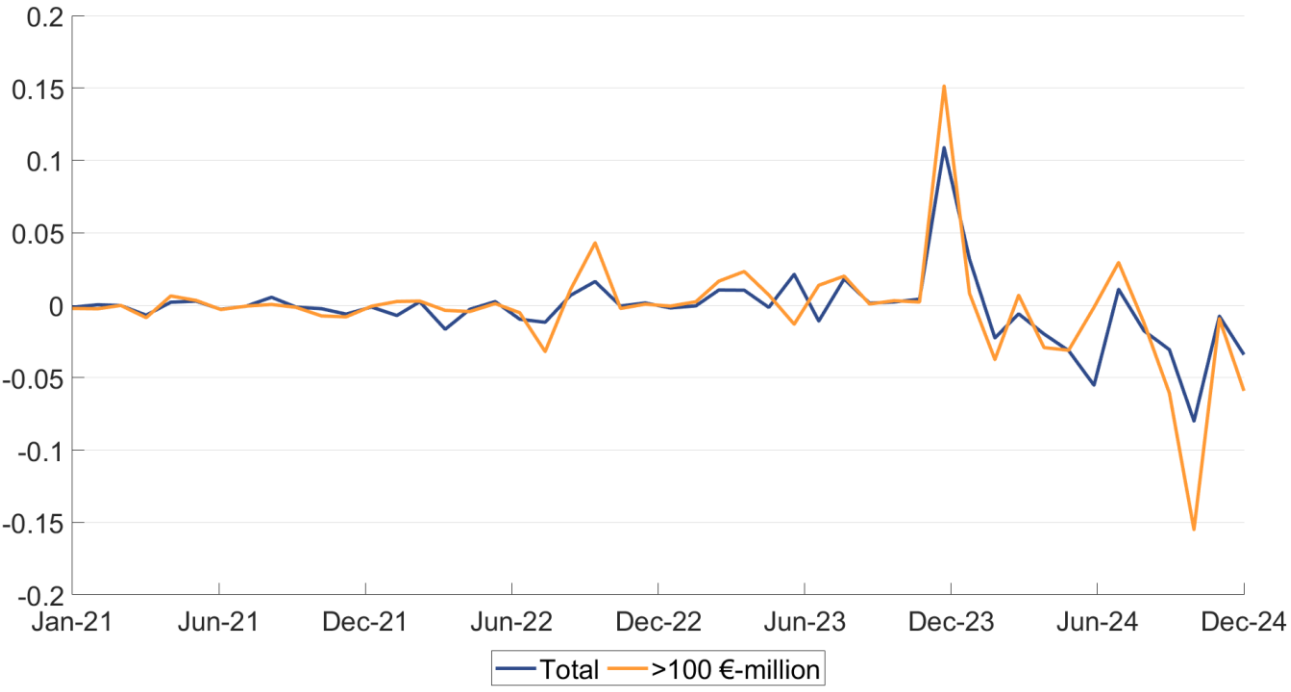
In this special section of the Report, we have so far analyzed the dynamics of liquidity conditions for final investors on a B2C platform (BondVision), as well as the dynamics of macro variables related to final investor market activity (e.g., traded volumes and imbalances). In some cases, we compare the trend of these variables with market liquidity conditions on MTS Italy (e.g., by comparing traded volumes on the interdealer market with quoting liquidity measures on MTS Italy). In this section, we

[36] See the *First and Second Reports on the Liquidity of the Secondary Market of Italian Government Bonds* (available at: https://www.dt.mef.gov.it/en/debito_pubblico/presentazioni_studi_relazioni/archivio_presentazioni/elem_0010.html).

propose a more specific analysis to investigate the relationship between the execution of a RFQ (in BondVision) and liquidity conditions in the interdealer market (specifically, MTS Italy). This analysis is divided into two parts: (i) similar to Section 3.2, we quantify the impact of executing a RFQ on MTS Italy's quoting liquidity measures after 5 or 30 minutes; (ii) we identify the amount of traded volumes on MTS Italy that are related to the execution of a RFQ.

Regarding the first analysis, which is limited to the 10-year BTP benchmark, in Figure 37 it is possible to identify a negligible impact on the volume-weighted bid-ask spread on MTS Italy (also confirmed by the analysis of other quoting liquidity measures) up to the end of 2023, while in 2024 a more evident relationship emerges between the execution of a RFQ and narrower bid-ask spreads after 5 minutes (or 30 minutes). This relationship appears stronger with an increasing size of RFQs: in the figure the blue line represents the average impact considering the whole group of RFQs, while the orange line shows the impact determined by RFQs of €100 million or more.

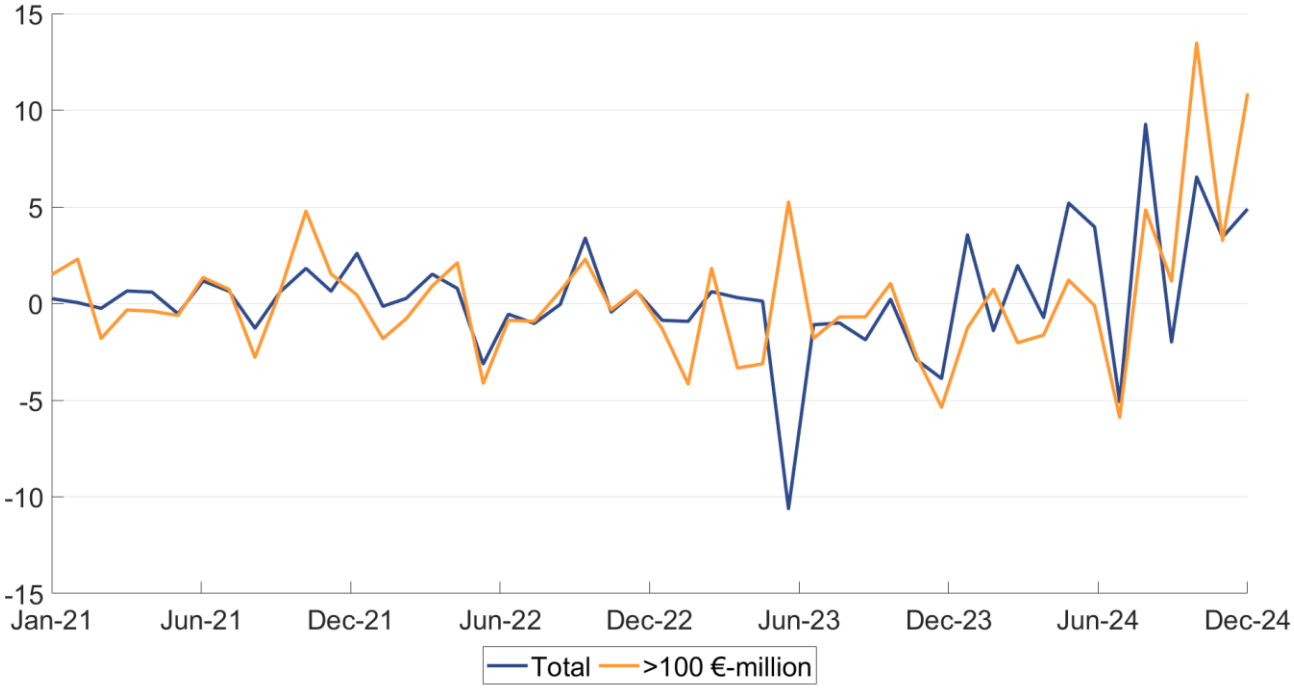
Figure 37: RFQ price impact after 5 minutes on 10-year BTP volume-weighted bid-ask spread



Notes: The figure shows the variation after 5 minutes a RFQ occurred in BondVision of the volume-weighted bid-ask (VWBA) spread for the 10-year BTP, on a monthly basis. The blue line represents the variation on the VWBA spread when the whole group of RFQs are considered, while the orange line represents the impact on the VWBA spread when only RFQs with an amount greater than €100 million are considered.

Similar results are obtained when different quoting liquidity measures on MTS Italy are considered. Figure 38 shows the dynamics of the impact (computed as a monthly average) of RFQs on total quoted volumes. In 2024, the positive and increasing impact means that, after the execution of a RFQ in BondVision, total quoted volumes increased, making the quoting book in MTS Italy for the 10-year BTP benchmark more liquid (greater depth available at the best prices).

Figure 38: RFQ price impact after 5 minutes on 10-year BTP total quoted volumes



Notes: The figure shows the variation after 5 minutes a RFQ occurred in BondVision of the total quoted volumes on MTS Italy for the 10-year BTP, on a monthly basis. The blue line represents the variation on the total quoted volumes when the whole group of RFQs are considered, while the orange line represents the impact on the total quoted volumes when only RFQs with an amount greater than €100 million are considered.

As a first result, we can thus conclude that, in 2024, there was evidence that the activity on BondVision led to better liquidity conditions on MTS Italy. The higher potential impact in 2024 of BondVision activity on MTS Italy liquidity conditions might also represent a decreasing risk warehousing capacity of dealers, which determines a greater reliance on the interdealer market when a dealer needs to manage the risk coming from a client flow. If this is the case, at this stage we cannot disentangle whether this is a general trend for the whole group of dealers or, alternatively, if dealers, who were more active with final clients, in 2024 had a lower risk warehousing capacity than in 2023.

Regarding the second part of the analysis, we try to identify a causal relationship between RFQ activity on BondVision and traded volumes on MTS Italy (Figure 39). This analysis has been carried out by dividing the entire time series (from January 2021 to December 2024) into 30-minute windows and randomly selecting 50% of these (7978 windows selected). We then identified which of these windows had RFQs on BondVision, and/or traded volumes on MTS Italy. We found that a RFQ on BondVision increases the probability of trading activity on MTS Italy from 37.5% to 41.2%. This increase is negatively related to the size of the RFQ: considering the group of RFQs representing

the first quartile in terms of size dimension (RFQs with a size of up to €2 million), the probability of observing trading activity on MTS Italy is close to 45%, while if we consider RFQs in the fourth quartile in terms of size (€20 million or greater), the probability decreases to 37.6%.

Figure 39: Traded volumes on MTS Italy and BondVision RFQs

	Total		1st quartile (€2 mln)	2nd quartile (€10 mln)	3rd quartile (€20 mln)	4th quartile (>€20 mln)
Selected cases	7978					
BV RFQ = Yes	1891					
MTS deal = Yes	3062					
BV RFQ = Yes ***MTS deal = Yes***	779	**41.20%**	**44.97%**	**43.23%**	**39.08%**	**37.60%**
BV RFQ = No ***MTS deal = Yes***	2283	**37.50%**				

Notes: The selected period (from January 2021 to December 2024) has been divided into 30-minute windows and it has been randomly selected 50% of these time windows. The table shows the probabilities to find in the selected time windows a trade executed on MTS Italy and/or a RFQ on BondVision (for the whole selected database or for different quartiles of the distribution of the size of RFQs).

Lastly, we quantify whether a different relationship exists between the two markets when a RFQ is effectively executed or not. Figure 40 shows that the probability of observing trading activity on MTS Italy is higher when RFQs are not traded effectively (both if the whole sample is considered or if the analysis is carried out for different quartile distributions in terms of RFQ size). This result arguably means that trading activity on MTS Italy is affected by activity on BondVision through two channels: (i) a sort of mechanical effect determined by the opportunity to hedge on MTS Italy the risk coming from the execution of RFQs; (ii) an information effect simply determined by the fact that a RFQ is launched on BondVision, offering information to those dealers involved in the RFQ about final investor activity (in case, with the possibility for those dealers to take advantage of this information regarding potential future market activity).

Figure 40: Traded volumes on MTS Italy and BondVision RFQs

	Total		1st quartile (€2 mln)		2nd quartile (€10 mln)		3rd quartile (€20 mln)		4th quartile (>€20 mln)	
Traded RFQ =	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
BV RFQ = Yes **MTS deal = Yes**	**40.50%**	**47.71%**	**43.97%**	**52.63%**	**42.95%**	**47.20%**	**38.46%**	**38.89%**	**36.90%**	**44.93%**

Notes: The selected period (from January 2021 to December 2024) has been divided into 30-minute windows and it has been randomly selected 50% of these time windows. The table shows the probabilities to find in the selected time windows a trade executed on MTS Italy and a RFQ on BondVision. The probabilities are computed for different quartiles of the distribution of the size of RFQs and dividing the database for those RFQs effectively traded and for those non-traded.

Appendix

As regards the quoting activity of market makers on the secondary market of Italian government bonds, the Report analyses the following six indicators of liquidity:

a. best bid-ask spread, a measure of liquidity ascribable to the tightness of the quoting book, which may calculate the cost to be borne when executing a buy or sell order against the mid-price of the bond;

b. volume-weighted bid-ask (VWBA) spread, a measure that calculates the average price weighted by the quoted volumes associated with each price for both sides of the market (bid and ask) against the mid-price of the bond. The VWBA spread is a multidimensional indicator of liquidity, i.e., it is able to capture changes in the quoting book by traders both in terms of quoted bid-ask spread and quoted volumes;

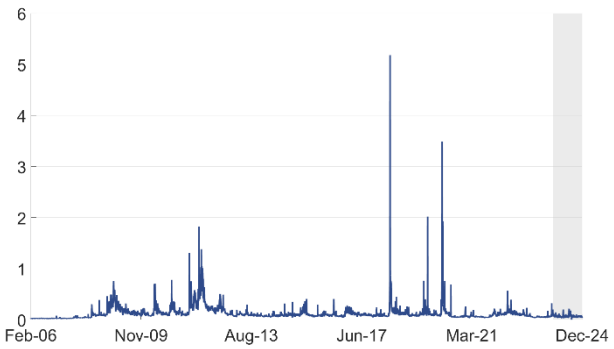
c. volume-weighted bid-ask spread in relation to the daily volatility of the bond (VWBA spread/volatility), a multidimensional liquidity measure capable of quantifying the extent of the variation in the VWBA spread justified by different market volatility rates and the extent relating to a more conservative market maker approach in terms of liquidity provision. The volatility index used for each bond is the daily variation between the minimum and maximum mid-price;

d. two indicators of quoting book depth: (i) the overall volumes quoted on the platform and (ii) the quoted volumes associated with the top three best prices as a percentage of the overall quoted volumes. This measure aims to calculate the proportion of volumes quoted at relatively competitive prices;

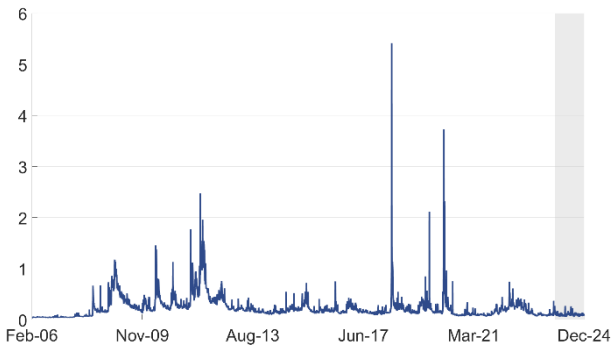
e. slope, a multidimensional indicator calculated as the ratio of the difference between the best and worst bid (ask) and the overall quoted volumes excluding those relating to the best bid (ask). This measure allows assessing the marginal cost for the execution of a sell (buy) order at the worst bid (ask) price compared to the best market price.

Figure A.1: 10-year BTP portfolio (2006-2024 period)

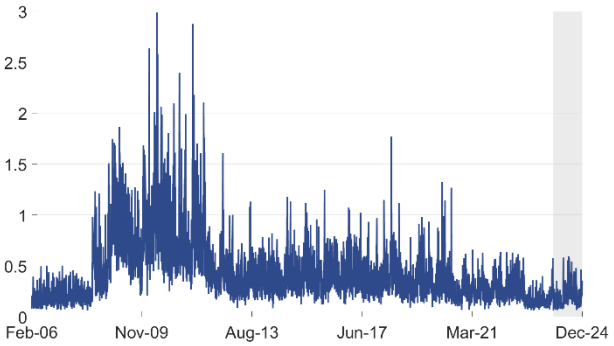
Best Bid-Ask Spread (%)



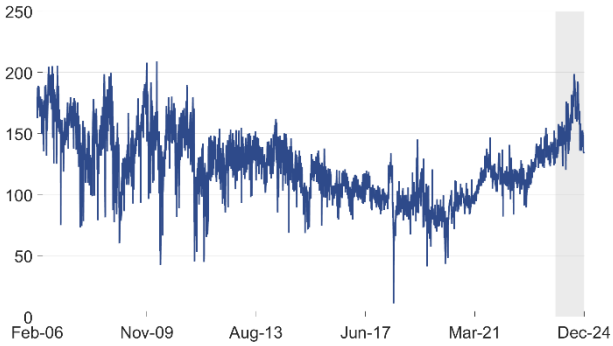
Volume-Weighted Bid-Ask Spread (%)



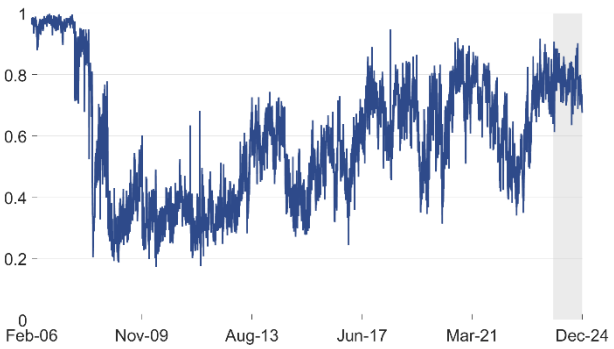
Volume-Weighted Bid-Ask Spread/Volatility (%)



Overall volumes - average Bid/Ask (€-million)



Vol. 3 best prices/overall volumes - average Bid/Ask



Slope - average Bid/Ask

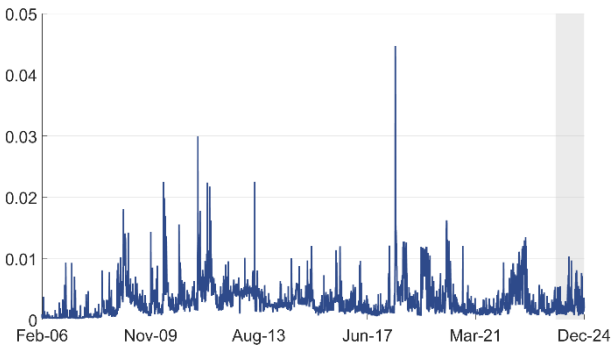


Figure A.2: BOT

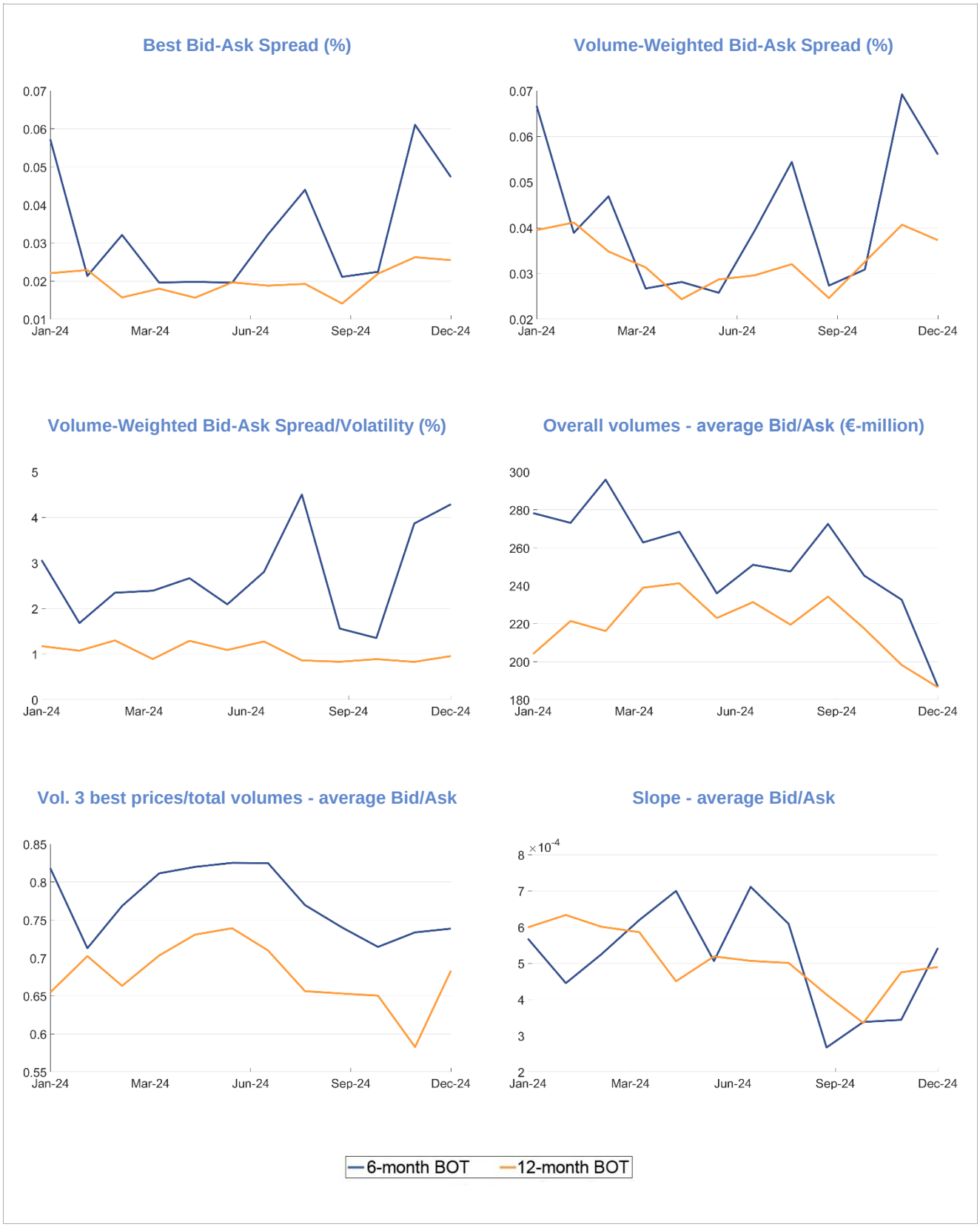


Figure A.3: < 10-year BTP

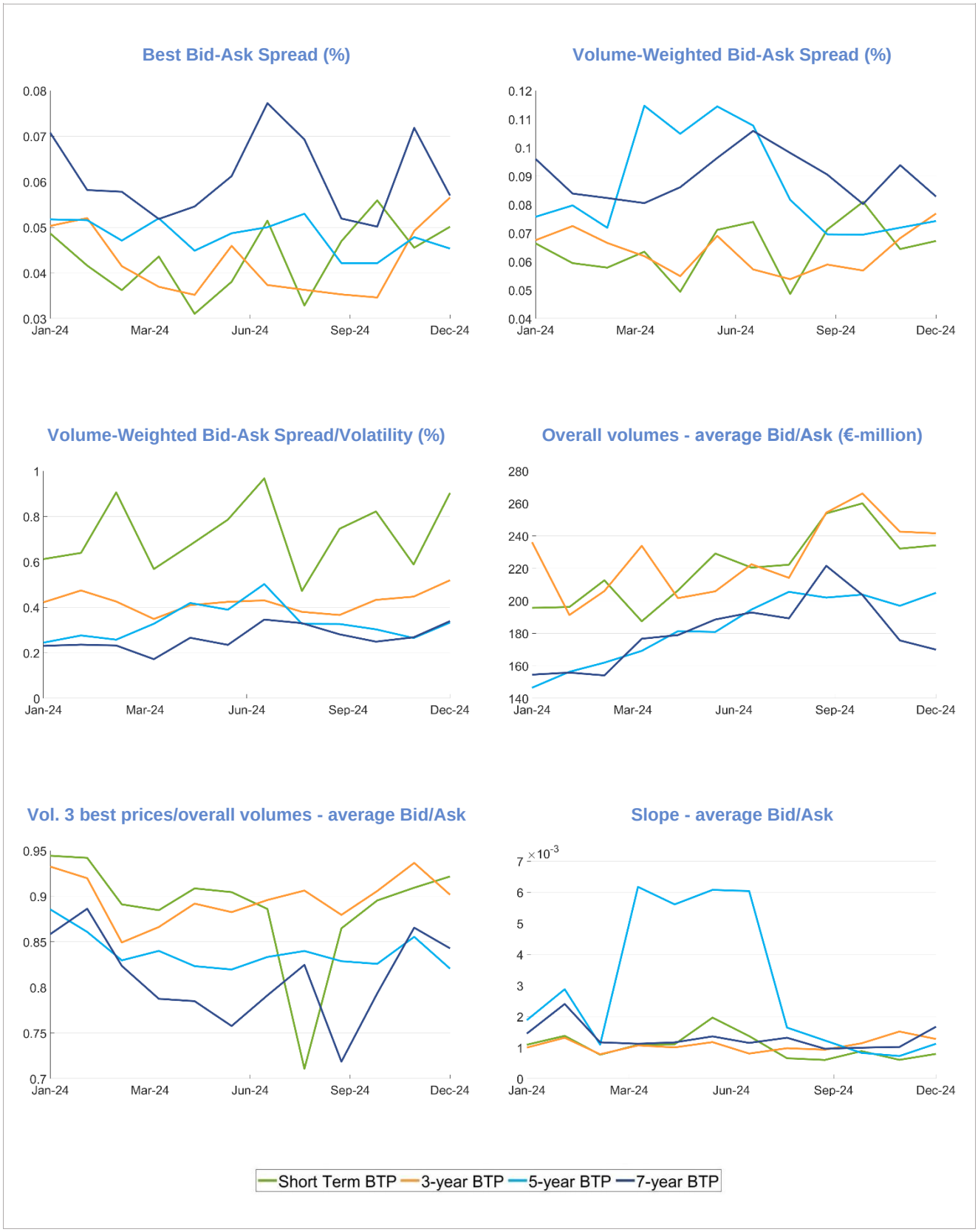


Figure A.4: ≥ 10-year BTP

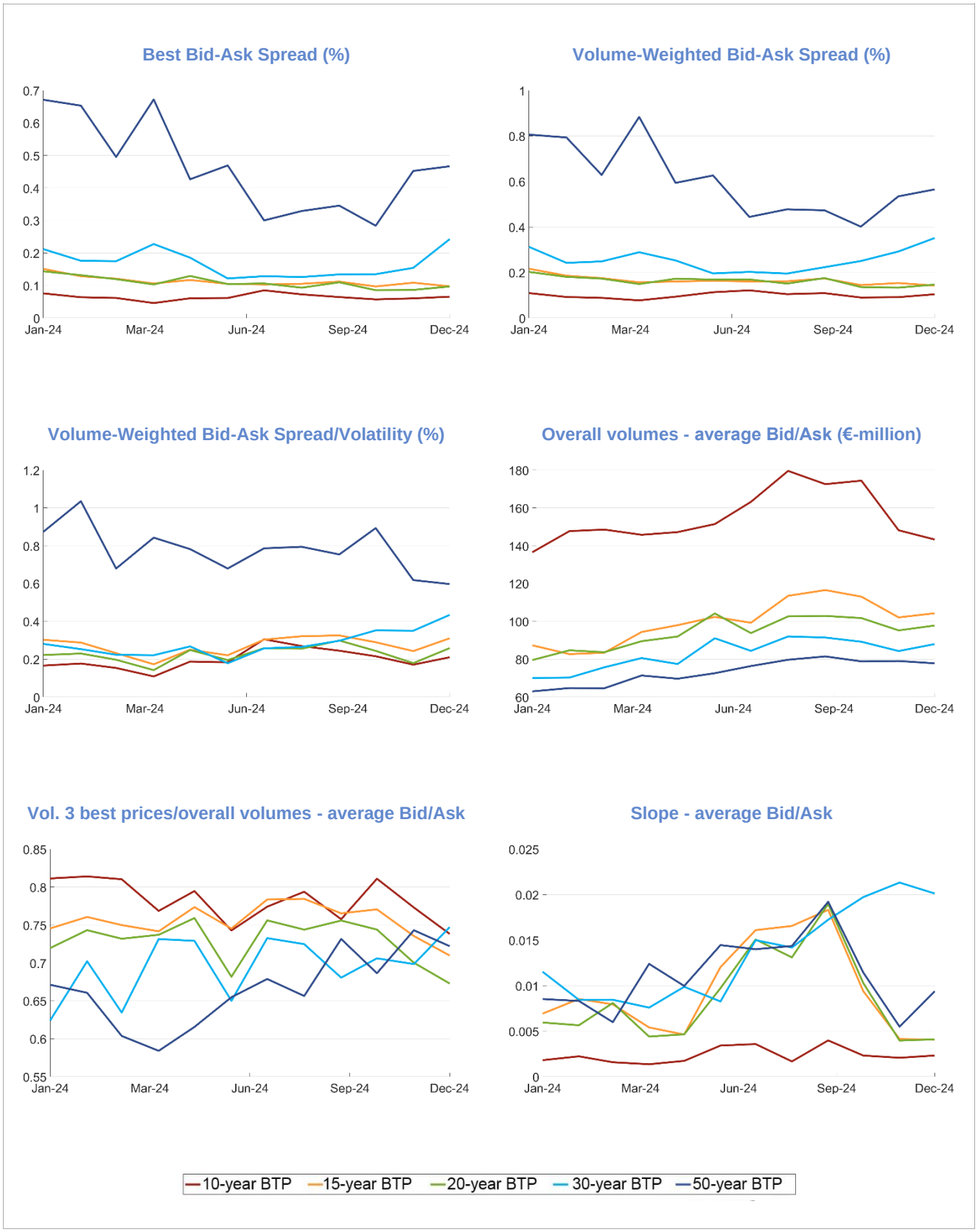


Figure A.5: Green BTP

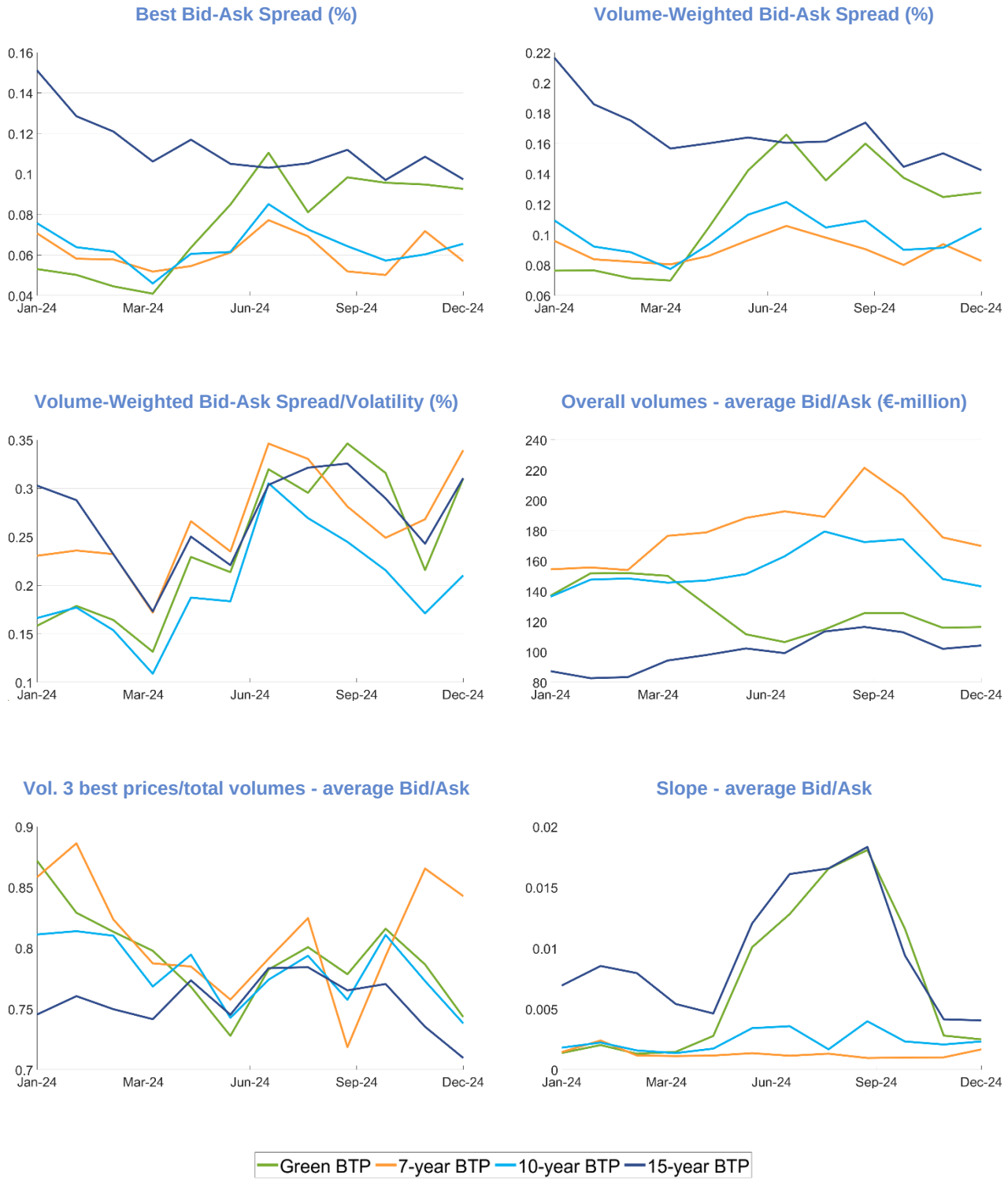


Figure A.6: BTP€i

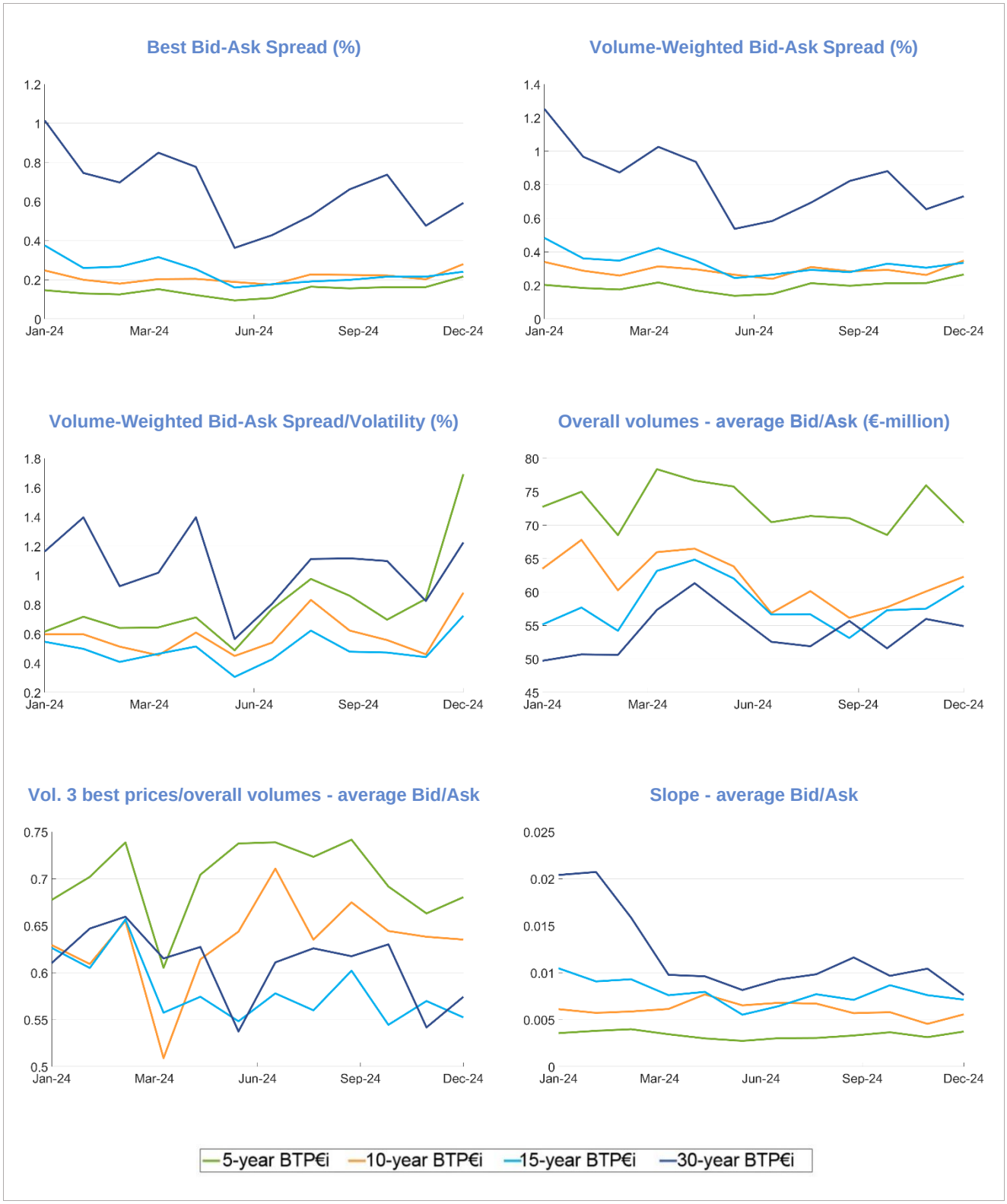
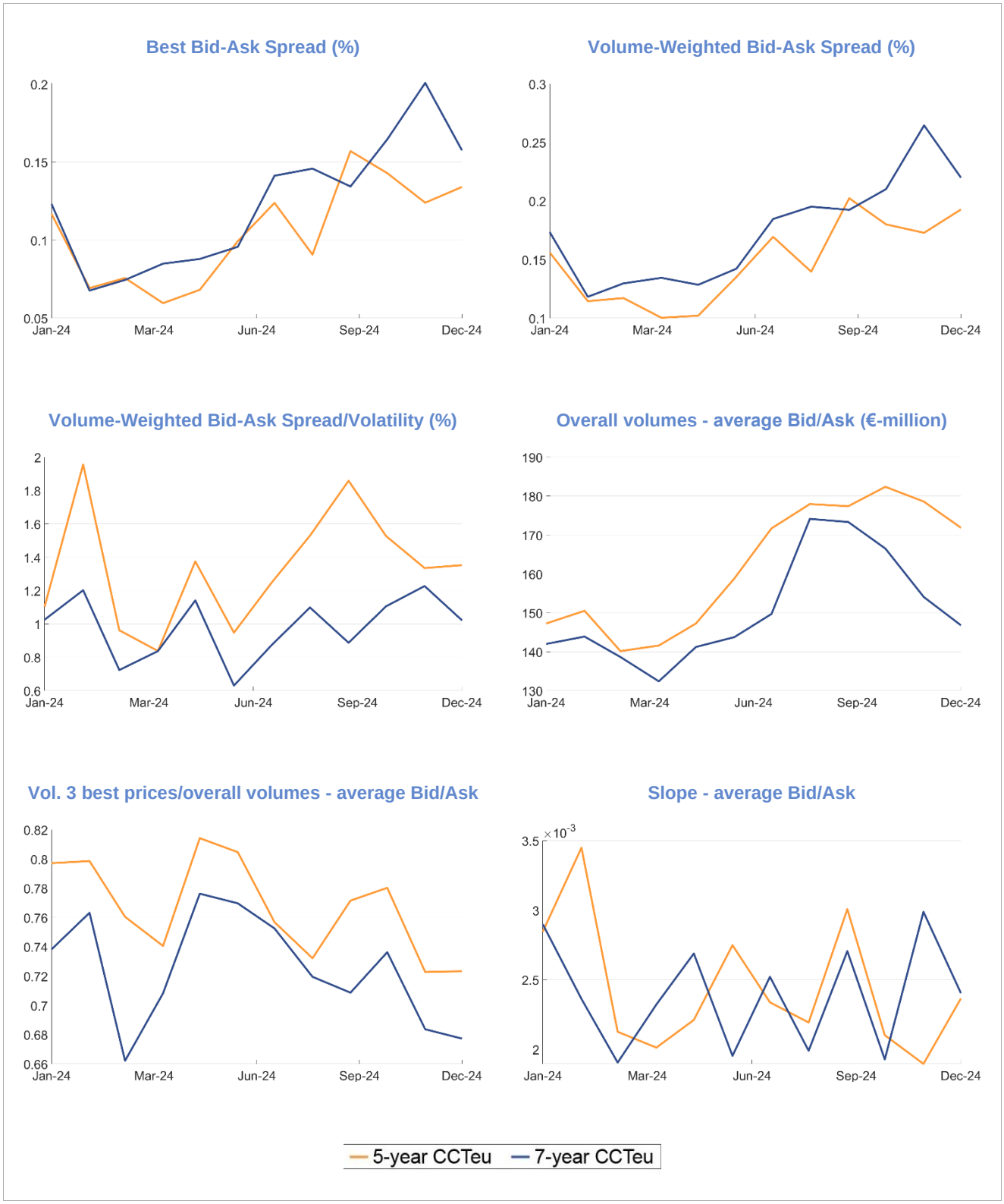


Figure A.7: CCTeu



As regard the trading activity on the secondary market of Italian government bonds, the Report analyses the following metrics: (a) monthly volumes; (b) average size of filler-side flows; (c) average size of aggressor-side flows; (d) number of monthly flows. The analysis of the average size (both from the aggressor and market liquidity providers' standpoint) and of the monthly number of flows allows investigating the factors that mostly contribute to the trend in volumes.

Figure A.8: All segments

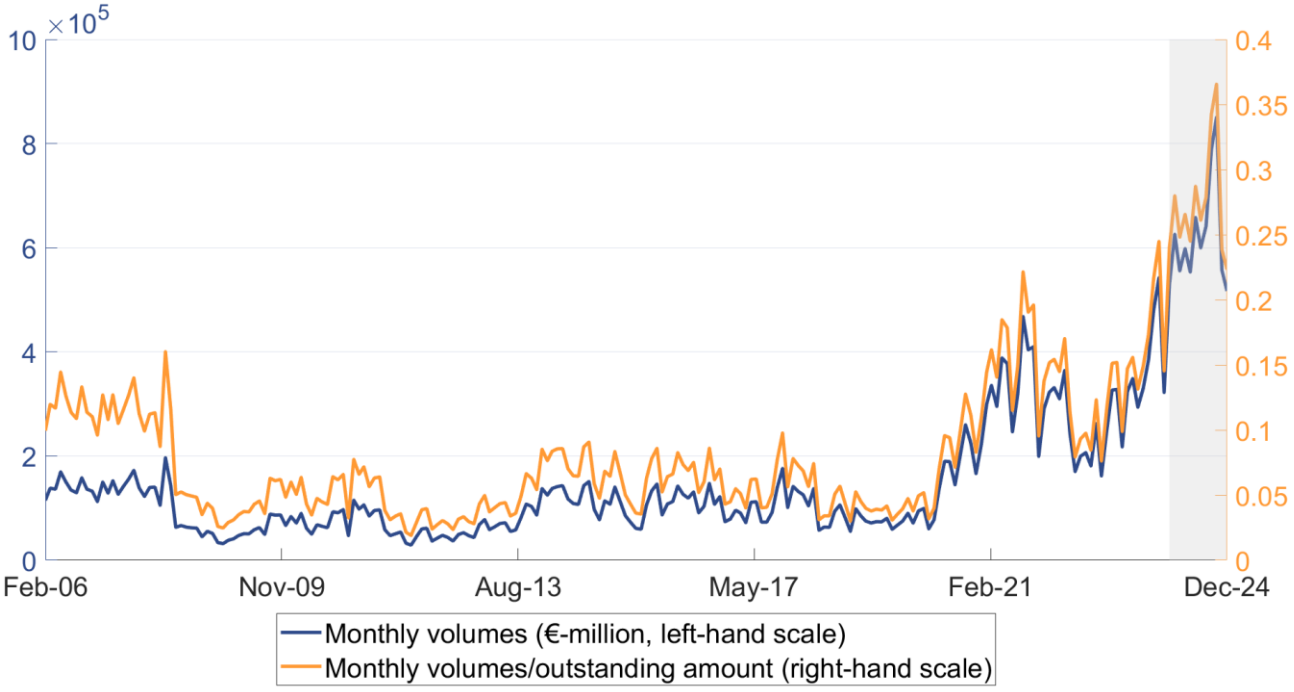


Figure A.9: 10-year BTPs and < 1-year government bonds

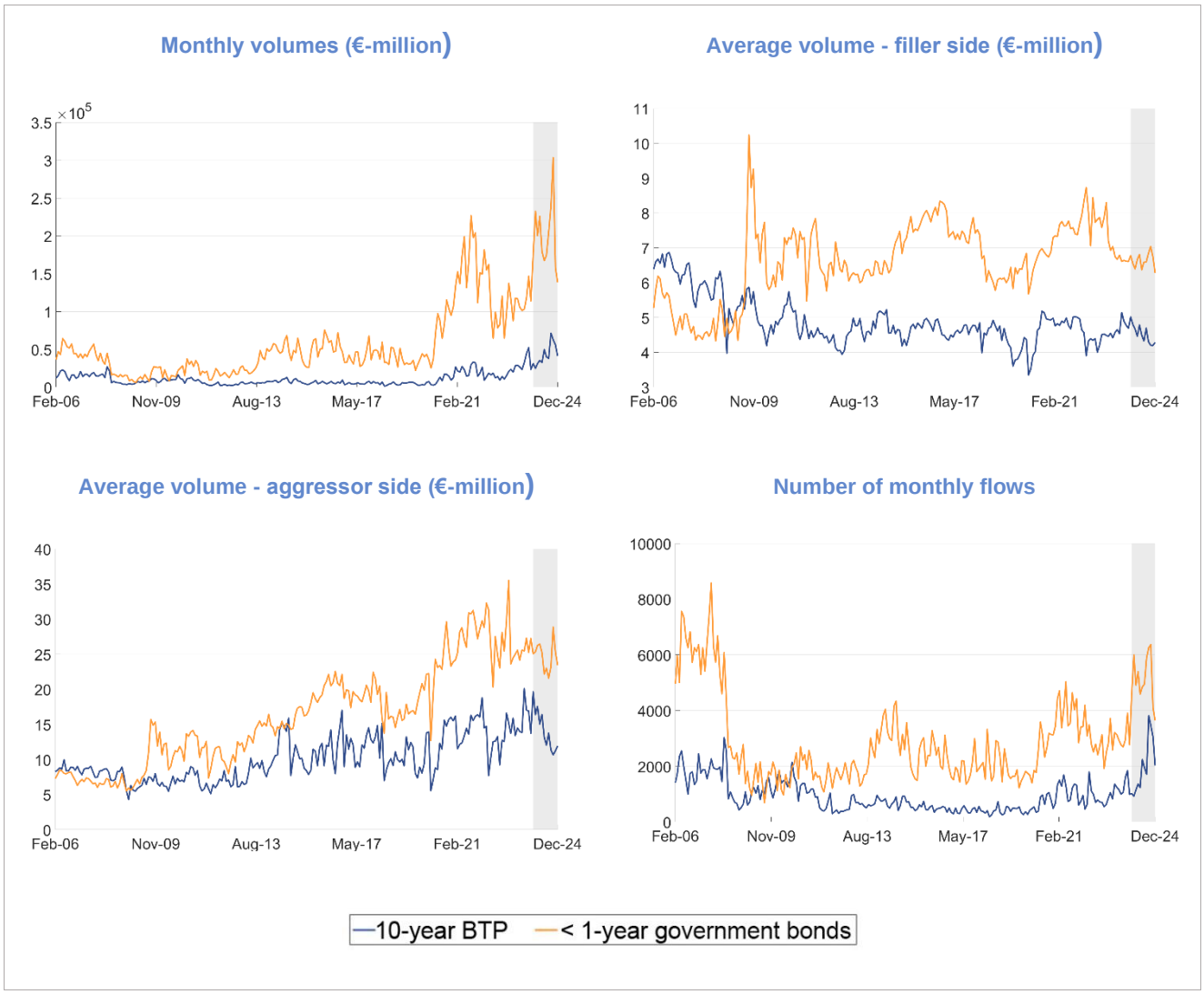


Figure A.10: < 10-year BTP

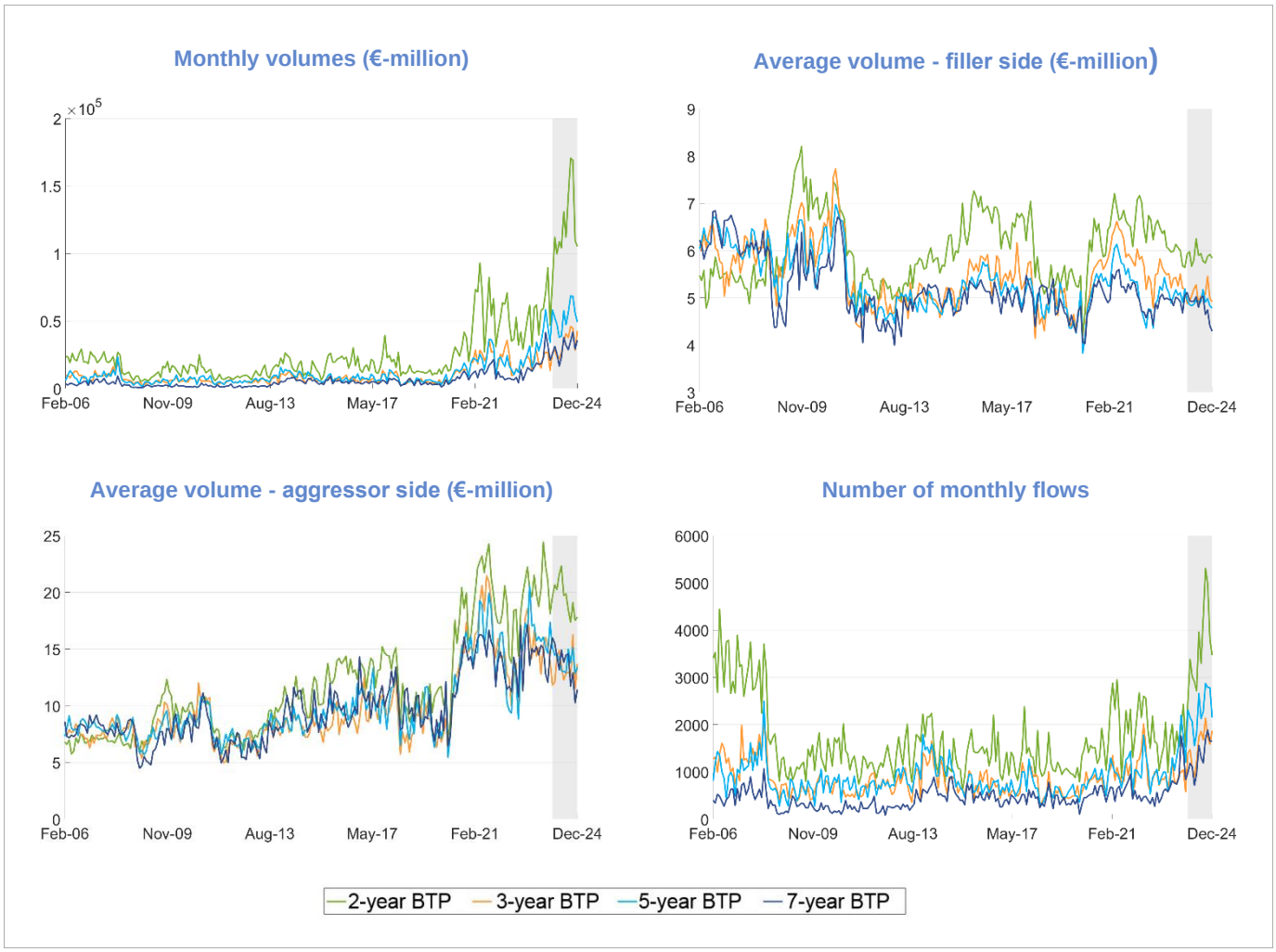


Figure A.11: > 10-year BTP

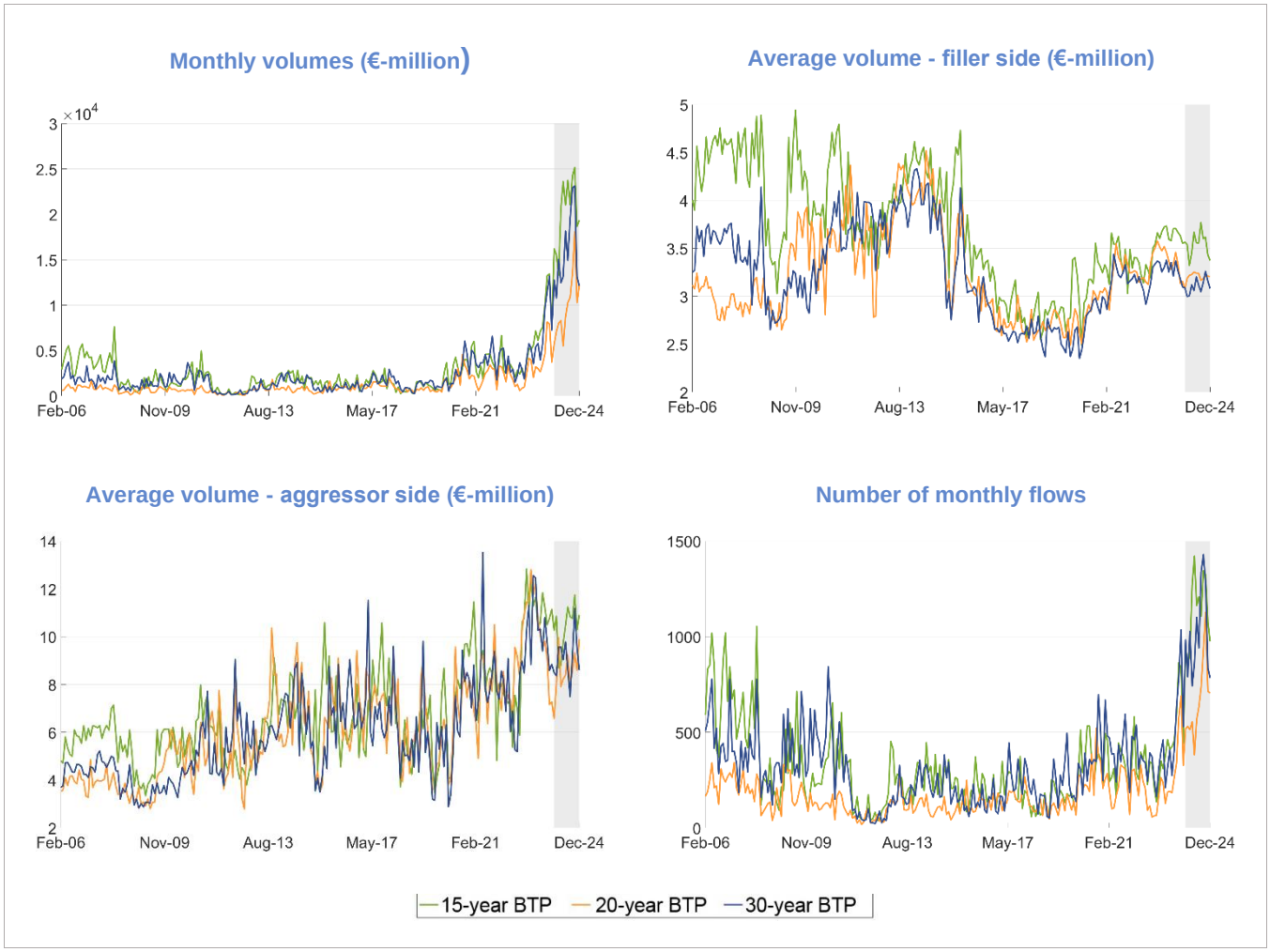


Figure A.12: Green BTP

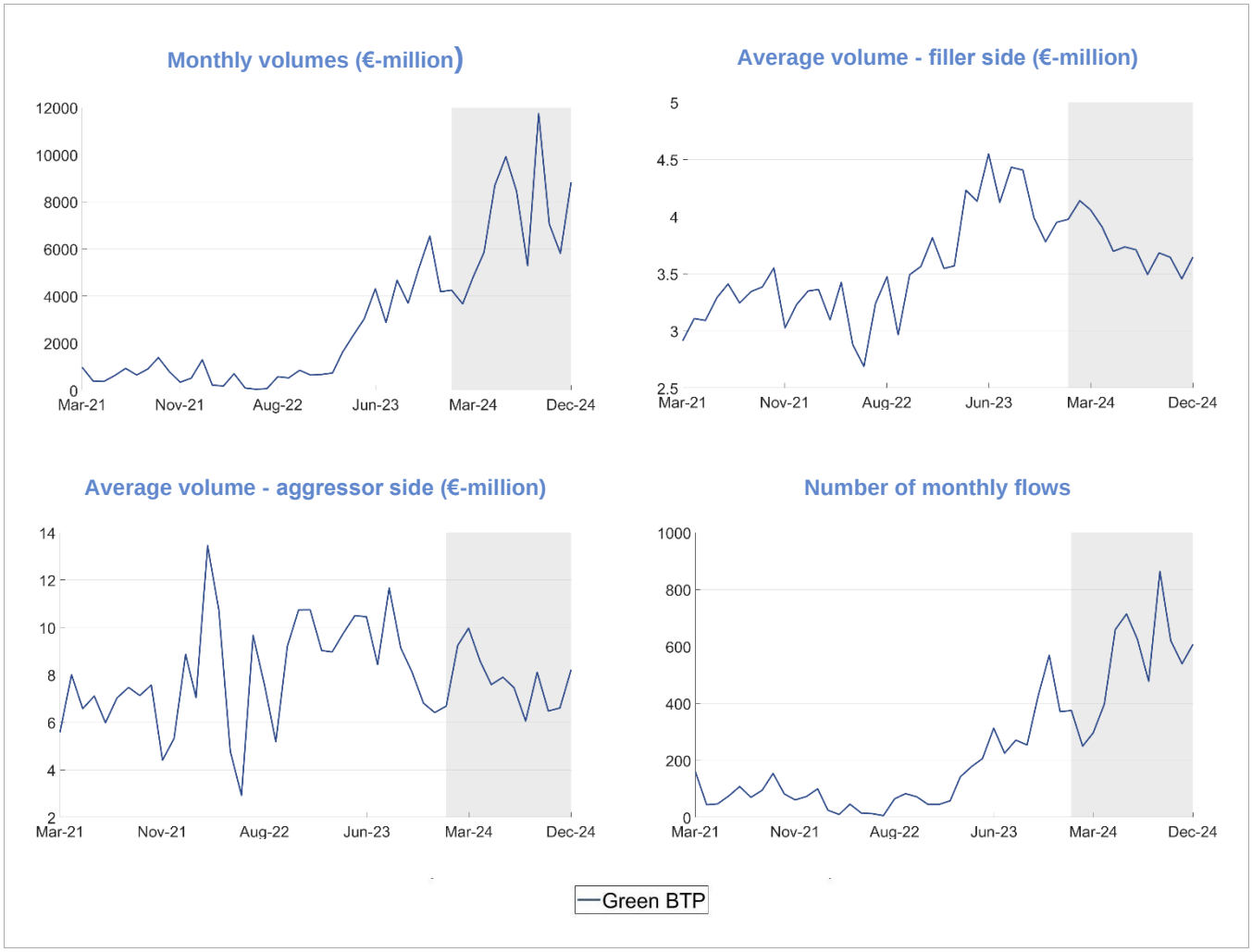


Figure A.13: CCTeu and BTP€i

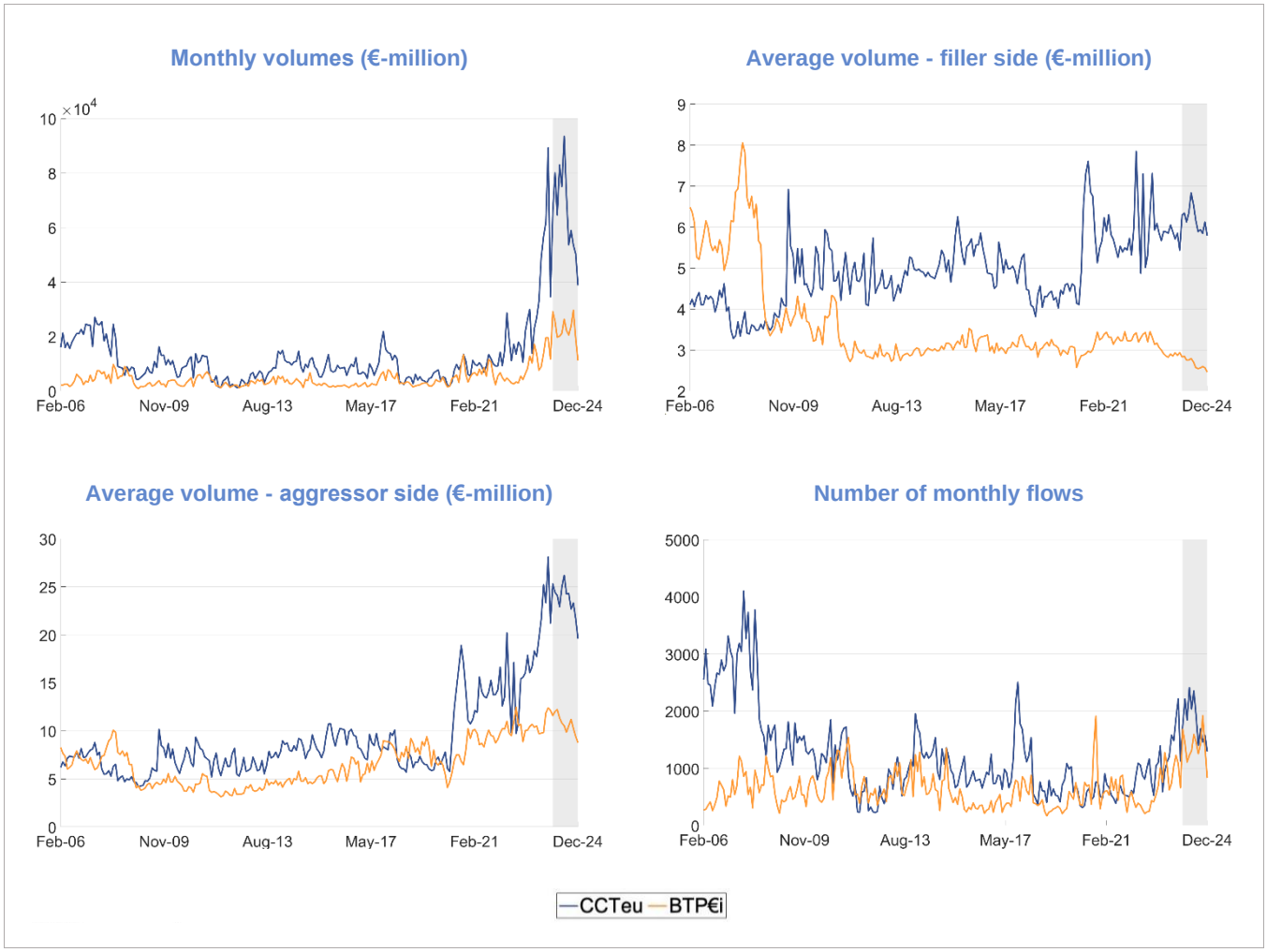
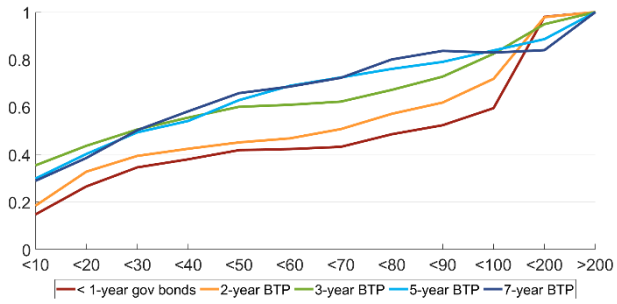
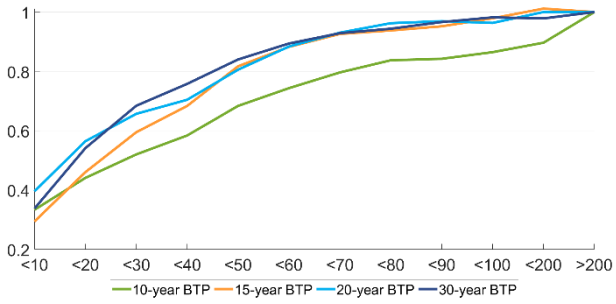


Figure A.14: Analysis by volume categories (2024 vs. 2023)

< 10-year Government bonds



≥ 10-year Government bonds



Floating-rate government bonds

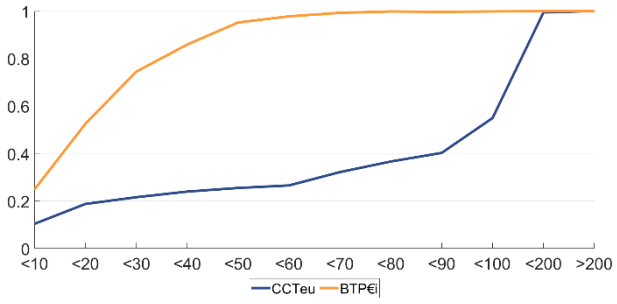


Figure A.15: BTP Italia

Figure A.16: Ratio of final investor traded volumes to interdealer traded volumes and quoting liquidity measures on MTS Italy

Figure A.17: BondVision – Ratio of total traded volumes to total requested volumes

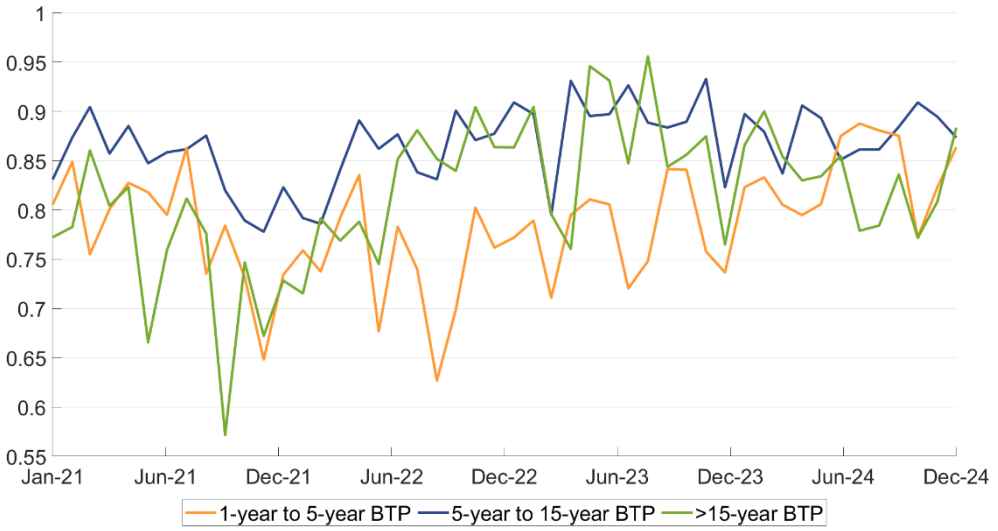


Figure A.18: BondVision – Total number of traded contracts

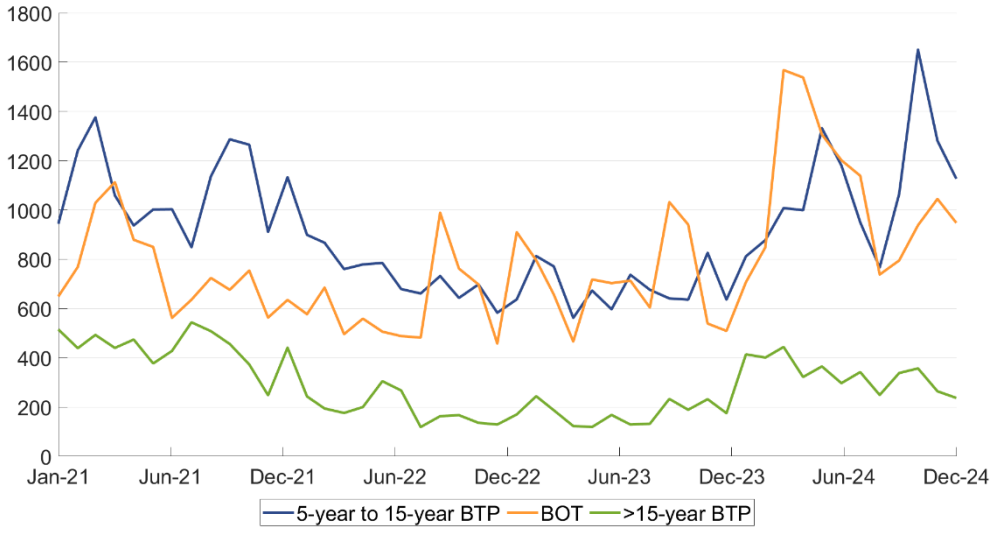


Figure A.19: BondVision – Average size of RFQs (€-million)

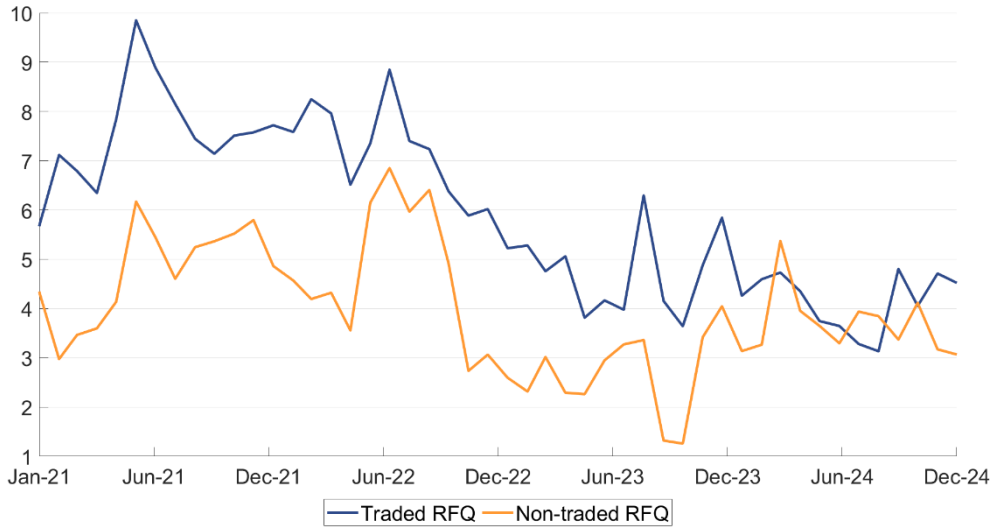


Figure A.20: BondVision – Quote dispersion in traded RFQs (standard deviation, risk weighted)

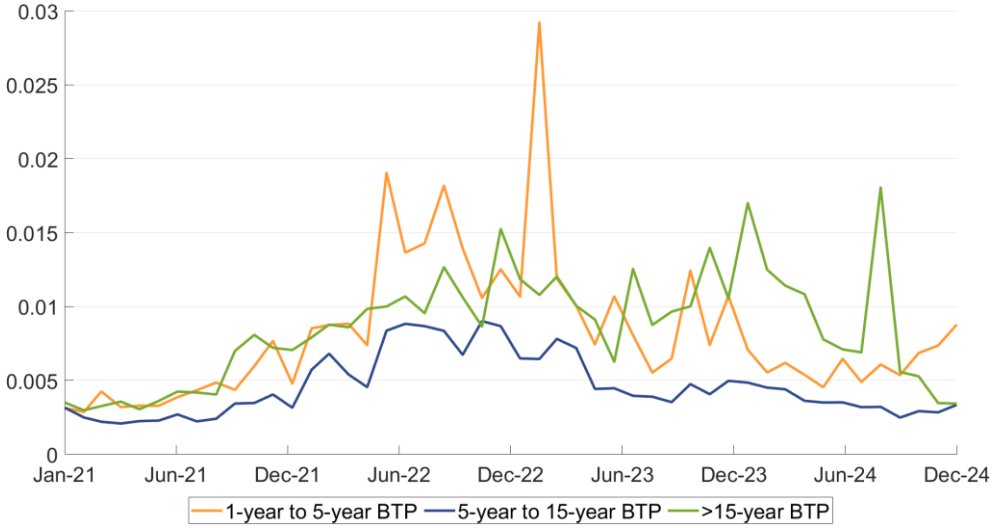


Figure A.21: BondVision – Quote dispersion in non-traded RFQs (standard deviation, risk weighted)

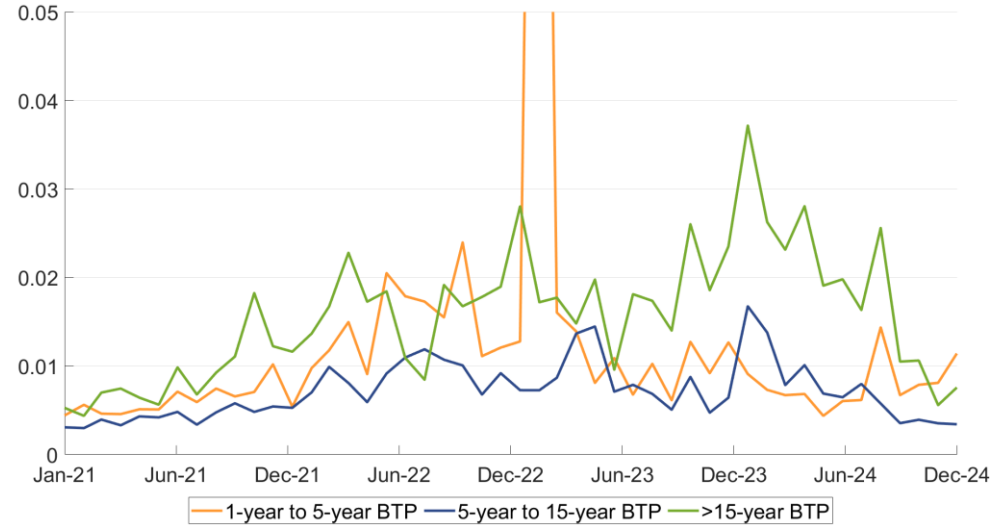


Figure A.22: BondVision – Ratio between traded RFQs involving one dealer and two or more dealers

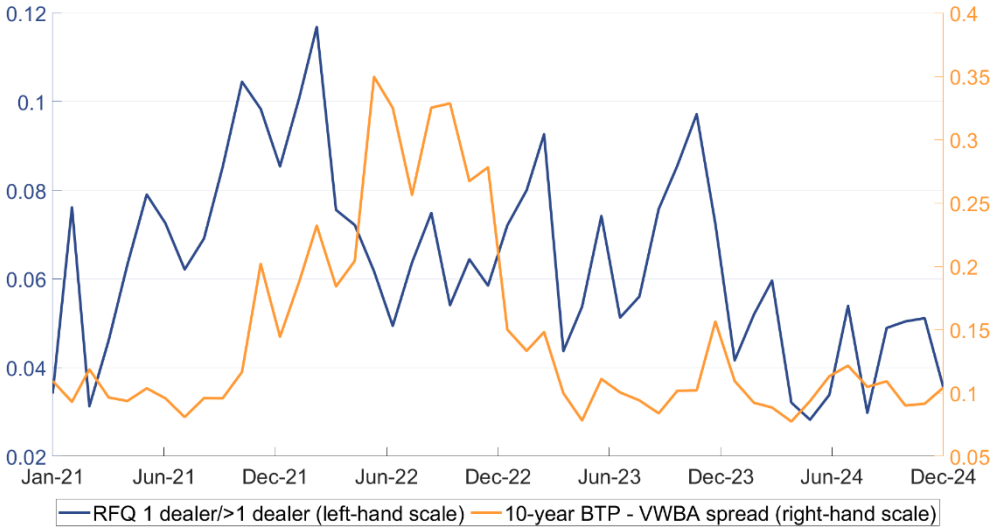


Figure A.23: BondVision – Ratio between the number of quotes effectively obtained and the number of operators involved in traded RFQs

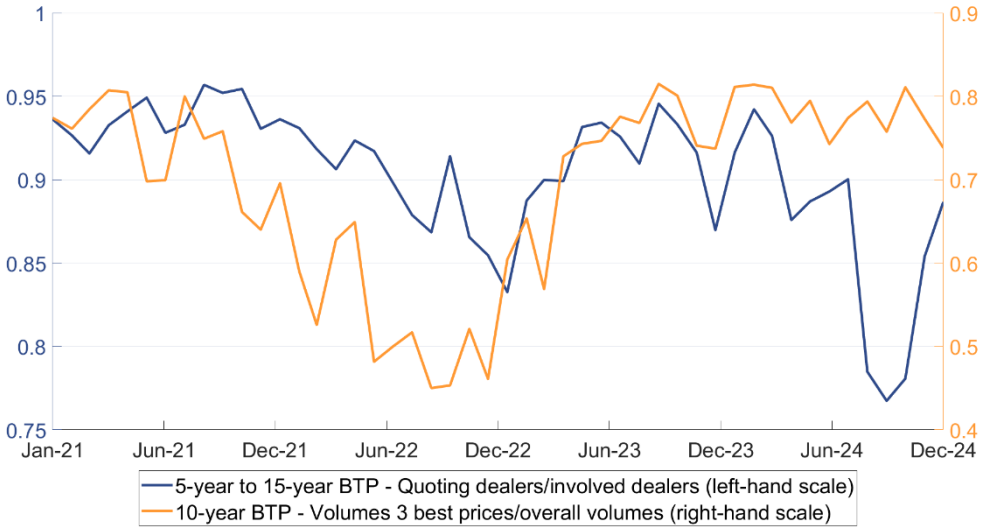


Figure A.24: BondVision – Execution cost (bps x DV01)