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1 Methodology and main empirical findings on the effects of the APP in the Eurozone

The ECB announced the APP on January 22, 2015, involving the purchase of €60 billion of investment-grade assets per month, planned to continue until September 2016. The APP was announced in a period of good market functioning, where the EURIBOR–OIS[1] spread was stable at around 20 basis points. Altavilla et al. (2021) use a high-frequency event-study methodology to investigate how financial markets react to information about the APP. A compiled list of the 18 APP-related events is provided in Appendix B, covering all major moments when the ECB revealed new information between September 4, 2014 and March 9, 2015. They measure the high-frequency yield reactions to these events, using one- and two-day yield changes for the 5-, 10-, and 20-year maturities. In addition, a regression for yield changes at a five-minute interval is conducted for the key announcement date, which allows the authors to isolate the size-shock window (14:40–15:10) and the maturity-shock window (15:10–15:20) and to measure the instantaneous market reactions. The security-level (ISIN) regressions are used to record how the APP affects different transmission channels and allow the authors to link each bond's price reaction to its own purchase intensity, maturity, and credit rating.

The three transmission channels include the local supply channel, interest-rate risk (duration risk channel), and creditworthiness (credit risk channel). The empirical results show that the APP, amounting to around 10% of euro-area GDP, had substantial effects on sovereign yields, lowering GDP-weighted 10-year yields by roughly 60–65 basis points. The size of the estimated effects differs across the three channels. While the effect via the local supply channel is economically small and shows little evidence of spillovers, the credit-risk channel is much stronger. This channel has particularly large effects on bonds issued by lower-rated countries such as Spain, Italy, or Greece by reducing sovereign credit-risk premia in addition to term premia. The strongest effect of the APP operates through the duration-risk channel: by purchasing large quantities of long-maturity bonds, the ECB reduced the amount of duration risk held by private investors, raising bond prices and lowering yields across the maturity spectrum.

[1]The EURIBOR–OIS spread is the difference between the unsecured interbank rate (EURIBOR) and the near risk-free overnight indexed swap rate (OIS) between two parties, where one pays a fixed interest rate and the other pays the average of the overnight interest rates. It is commonly used as an indicator of credit and liquidity stress in money markets.

2 Anticipation- and Post-Announcement-Effects

Anticipation effects measure yield movements before the actual announcement of policies and therefore reflect market expectations. The anticipation effect is accounted for by using 18 APP-relevant events, including speeches, press conferences, and interviews, instead of only the official announcement. The one-day window mostly captures the immediate impact of the event but also part of the anticipation effect. The two-day window partly captures post-announcement effects and controls for macroeconomic news surprises, helping to absorb information released shortly before or after the events. Post-announcement effects measure yield movements after the announcement, showing how markets interpret or adjust to the new information. Since markets increasingly understood the ECB's reaction function and updated their expectations continuously, the event-study approach is most reliable around the initial APP launch.

3 Economic relevance of the APP program for Germany

The economic relevance of the APP for Germany is positive but smaller compared to France, Italy, Spain, and the Euro Area as a whole. Since German bond yields serve as the benchmark safe rate for the Euro Area and Germany is a high-rated, low-risk issuer, the credit risk channel plays almost no role, in contrast to lower-rated countries such as Spain or Italy where the credit risk channel is more important. Germany benefits mainly through the duration risk channel, which compresses term premia across the Euro Area and also pushes down German bond yields.

4 Overall effect in changes of the bond yield around the press conferences

Table 1 shows the yield reactions within the time frame of the six press conferences, from the 4th of September 2014 to the 5th of March 2015. For the 10-year yield, a stronger effect can be observed compared to the 5-year yield, which is in line with the findings of Altavilla et al. (2021) that the strongest effect is obtained through the duration risk channel. The cumulative decline of the 10-year yields for the observed countries lies between 11 and 17 basis points. Compared to the total effect on euro-area 10-year yields of a decline between 60 and 65 basis points, the effects around the press conferences are

small. This suggests that movements in bond yields during press conferences account for only 15 to 25 percent of the total APP impact. Therefore, the majority of the effect does not occur during the policy meetings themselves but rather through anticipation effects and other APP-related communication.

Maturity	**Germany**	**France**	**Spain**	**Italy**
5-Year	-1.75	-7.05	-7.05	-8.15
10-Year	-11.00	-11.20	-11.60	-16.60

Table 1: Cumulative Yield Changes During APP Press Conferences in basis points, between September 2014 and March 2015 (The data only contained changes for the 5- and 10- year yields, but not for the 20-year yields.

5 Effects of quantitative tightening on bond rates

Maturity	**Germany**	**France**	**Spain**	**Italy**
5-Year	-2.00	-4.41	-8.30	-16.10
10-Year	-10.20	-13.50	-14.80	-22.70

Table 2: Cumulative Yield Changes During QT Press Conferences (in basis points), for the five QT-related ECB press conferences between October 2022 and June 2023.

Table 2 shows the results when applying the same methodology as in Section 4 following Altavilla et al. (2021) to the Euro Area QT dates listed in the appendix of Du et al. (2024). The cumulative yield changes for the four European countries are negative. In contrast, the findings of Du et al. (2024) suggest that QT has a positive cumulative effect on yields, leading to an increase of roughly 15 to 20 basis points. **Table 3** shows the immediate reactions to the five relevant Euro Area QT dates taken from the appendix of Du et al. (2024). Comparing these results again reveals differences, with the exception of the initial QT announcement on 2022-12-15, where yields increase across countries. The differences in results can be explained by the content of the announcements and the nature of the events. The first QT-related press conference did not contain any concrete tightening measures

and was largely qualitative, leading markets to revise down their expectations. In contrast, the 2022-12-15 announcement marked concrete steps and was clearly interpreted as hawkish. The following meetings again contained limited QT surprises, and in each case the QT message was either already anticipated or accompanied by dovish guidance on the future policy outlook. Therefore, yields declined in the immediate press-conference window even though QT was conducted. The negative intraday responses reflect the mixed communication in the press conferences rather than the true medium-run effect of QT on yields.

Date	**DE5**	**DE10**	**FR5**	**FR10**	**ES5**	**ES10**	**IT5**	**IT10**
2022-10-27	−5.30	−5.05	−5.44	−6.00	−5.85	−6.70	−9.35	−10.60
2022-12-15	15.40	8.05	14.00	7.60	12.60	8.30	11.90	9.00
2023-02-02	−3.90	−3.70	−5.22	−4.90	−5.30	−5.90	−9.05	−8.50
2023-05-04	−0.45	−1.45	0.25	−1.55	−1.70	−0.70	−0.35	−1.40
2023-06-15	−7.75	−8.00	−7.98	−8.65	−8.10	−9.80	−9.30	−11.10

Table 3: High-Frequency Yield Reactions to QT Announcements (in basis points)

6 Interpretation of findings

The empirical findings from Sections 4 and 5 suggest that the effects of monetary easing (QE or APP) and monetary tightening (QT) are not symmetric. In the case of APP, even narrow high-frequency windows capture sizeable reductions in long-term yields across countries. This is consistent with the literature, which highlights strong effects through various transmission channels. In contrast, QT produces more heterogeneous immediate yield reactions. Using the high-frequency data, the cumulative effects are even slightly negative, suggesting that most QT announcements were either already anticipated or accompanied by dovish policy-rate guidance. Only in the broader one- and two-day windows used in Du et al. (2024) does QT lead to the expected moderate increase in yields of around 15 to 20 basis points. This indicates that QT effects materialise more slowly and are easily overshadowed by other elements of ECB communication. These findings support the idea that QE is a powerful monetary policy tool, especially in low interest-rate and low-inflation environments where conventional monetary policy may be constrained by the zero or effective lower bound. The results also suggest that QE appears to have a stronger effect compared to

QT, and the asymmetry implies that central banks face fewer risks when reversing QE, since the effects of QT are gradual. This makes QE a viable normal policy tool during downturns, but policymakers should not expect an equally strong effect from QT. Therefore, after QE, central banks should rely on a combination of QT, interest rate increases, and forward guidance rather than QT alone.

References

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