

A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics.

THE IMPACT OF MONETARY POLICY ON LIQUIDITY AND BOND YIELDS AT
ISSUANCE: EVIDENCE FROM THE EUROZONE CORPORATE BOND MARKET
(2022–2024)

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Abstract

The current work examines the impact of Eurozone monetary policy changes on liquidity and bond yields in the corporate bond market, focusing on the aggressive tightening period from 2022 to 2024. Using bid-ask spreads as a proxy for liquidity, the analysis explores how interest rate changes influence secondary market liquidity and, in turn, bond yields at issuance. We provide evidence that the improved liquidity conditions in 2024, characterized by the first rate cut in years, mitigated the impact of liquidity constraints on bond yields at issuance compared to 2022 and 2023.

Title: The Impact of Monetary Policy on Liquidity and Bond Yields at Issuance: Evidence from The Eurozone Corporate Bond Market (2022–2024)

Keywords: Corporate Debt Market, Corporate Bonds, Bid-Ask Spread, Liquidity, Bond Yields, European Central Bank, Interest Rates, Monetary Policy, Roll Measure, Event-Study

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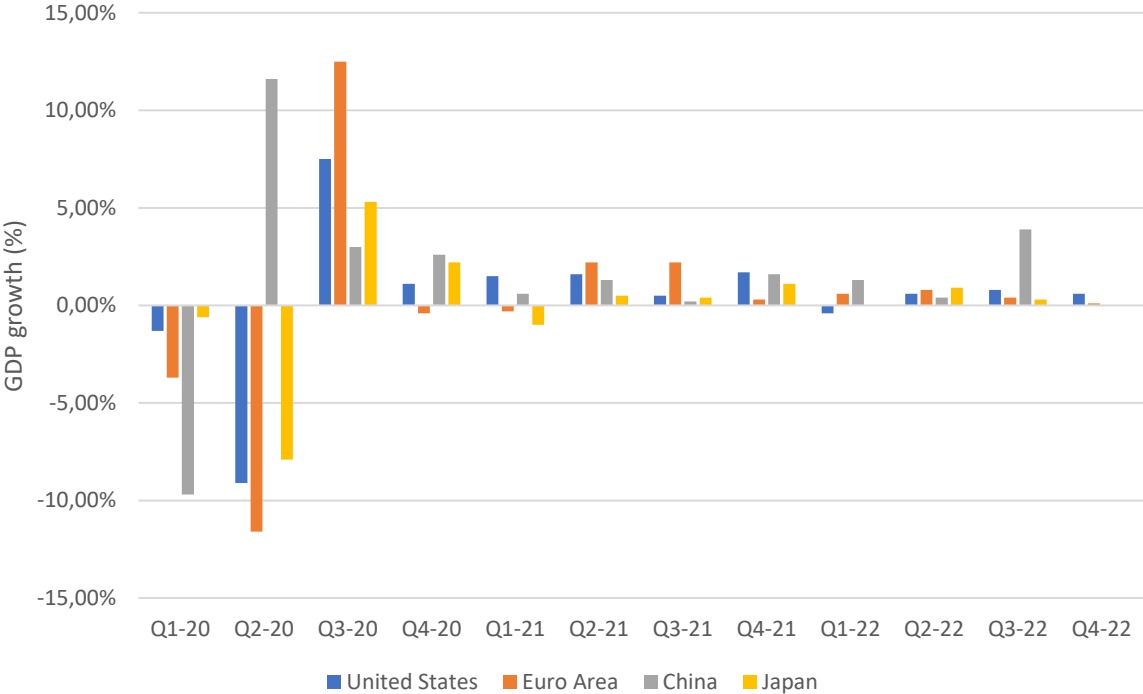
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Introduction

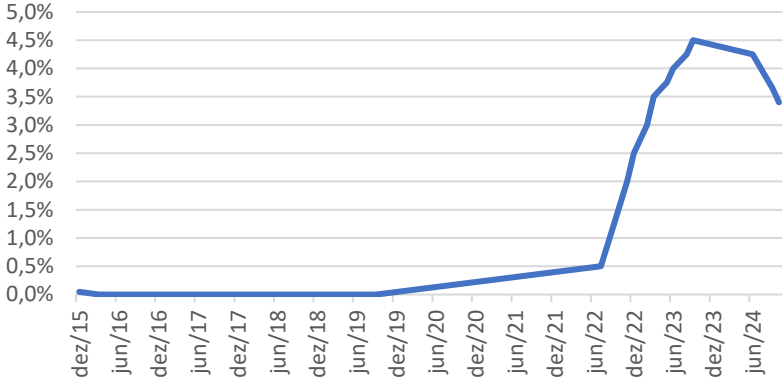
The European Central Bank has the mandate to maintain price stability in the Eurozone area by setting interest rates in response to what is happening in the economy (European Central Bank, 2024). In 2020, the pandemic crisis caused sharp decline on economic activity followed by a global supply disruption with no precedents, as shown in Figure 1, GDP decreased drastically in Q120, and private investment started setting pace again only in 2022. Eurozone inflation, therefore, rose from 1.9% in mid-2021 to a peak of 10.6% in 2022, well above the 2% target which was below over a decade (Bankowski, Bouabdallah, Checherita-Westphal, Freier, Jacquinot and Muggenthaler, 2023). European inflationary pressure was hit twice, first by the supply bottleneck and then the invasion of Ukraine, which represented a large and negative trade shock for the Euro area (Banque de France). Inflation was driven by large contributions of energy shocks (War in Ukraine), higher food prices and shortage of goods.

Figure 1- GDP growth, breakdown by zone



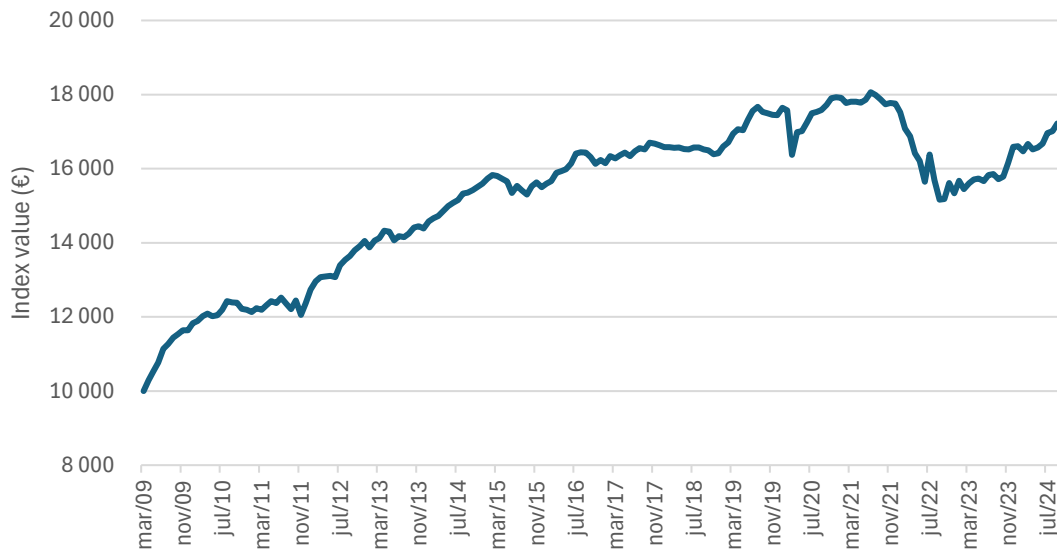
In July 2022, the ECB increased the deposit rate from -0.5% to 0.5%, and in less of a year the rates were already up to 4% in June 2023, being the fastest monetary tightening since the creation of the single currency (Albert, 2023), see Figure 2. In November 2022, ECB’s Financial Stability review highlighted that market liquidity in bond markets was relatively poor versus previous year, underlining the impact on portfolio management, asset repricing and raising financing (European Central Bank, 2022). These unprecedented developments form the primary motivation of this study, which aims to analyze the impacts of aggressive monetary tightening on the European Union, a critical economic bloc.

Figure 2 - Fluctuation of the European Central Bank fixed interest rate



As a result of the tightening cycle, bonds prices fell significantly as yield rose, Figure 3 shows the Bloomberg Euro Corporate Index, a comprehensive benchmark that measures the performance of euro-denominated corporate bonds, where prices decreased in 2022 to lower levels than 2014. Lower prices offered attractive total return opportunities for investors within fixed income, as bond prices recover and pull closer to par as they approach maturity. Thus, the second motivation for this study is the unique opportunity to analyze a period of historically low bond prices and the implications of rising interest rates on both existing and newly issued bonds.

Figure 3 - Bloomberg Euro Corporate Index

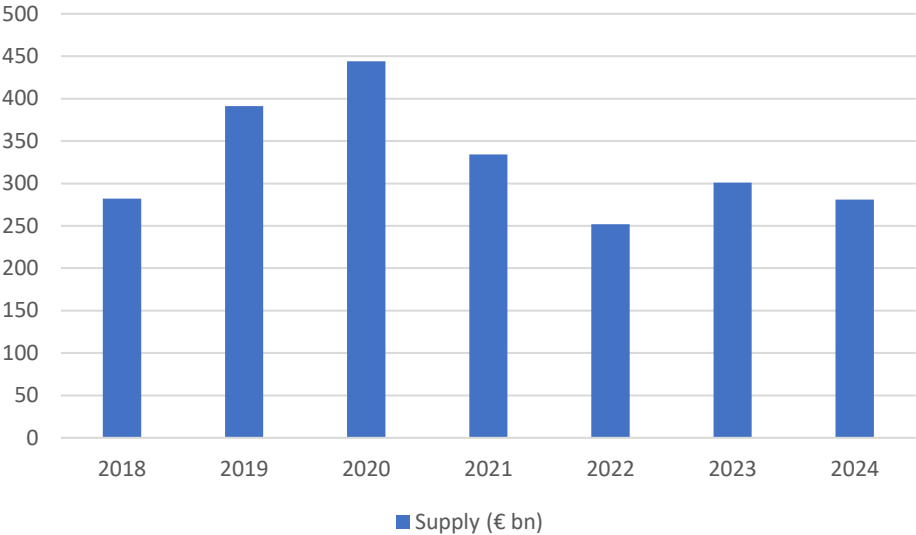


The bond market is primarily an institutional market, dominated by banks, mutual funds, pension funds and insurance companies (Goenka, 2024). Trading occurs over-the-counter (OTC) rather than on centralized exchanges and institutions can have access to security's indicative pricings quotes from multiple dealers, not final prices. In the investment-grade bond market, price movements are primarily driven by interest rate changes, where dealers usually quote yields for these bonds relative to similar-maturity Treasury securities, allowing them to make yield spread estimates based on characteristics like maturity, coupon rate, credit rating, and call features (Schultz, 2001).

The Eurobond market plays a crucial role in global financial markets, offering a unique and globally connected ecosystem with an outstanding value of over €13.2 trillion – where governments, supranational organizations and corporations can raise capital in over 50 currencies and under 85 governing laws (Kuhnel, 2024). Figure 4 highlights the issuance supply in the European Primary Market, where volumes in 2022 fell below 2018 levels. This drop reflects the challenging environment for bonds, as 2022 was considered the worst year for the asset class due to aggressive interest rate hikes by many central banks. Bond prices move inversely to interest rates — as rates rise, bond prices fall. This occurs as new bonds issued at

higher interest rates make outstanding bonds less appealing which lowers their market value (FasterCapital, 2024). This dynamic not only dampens investment returns but also constrains issuance volumes, as higher rates increase the cost of borrowing for issuers (Iacurci, 2023).

Figure 4 - European Corporate Supply per year



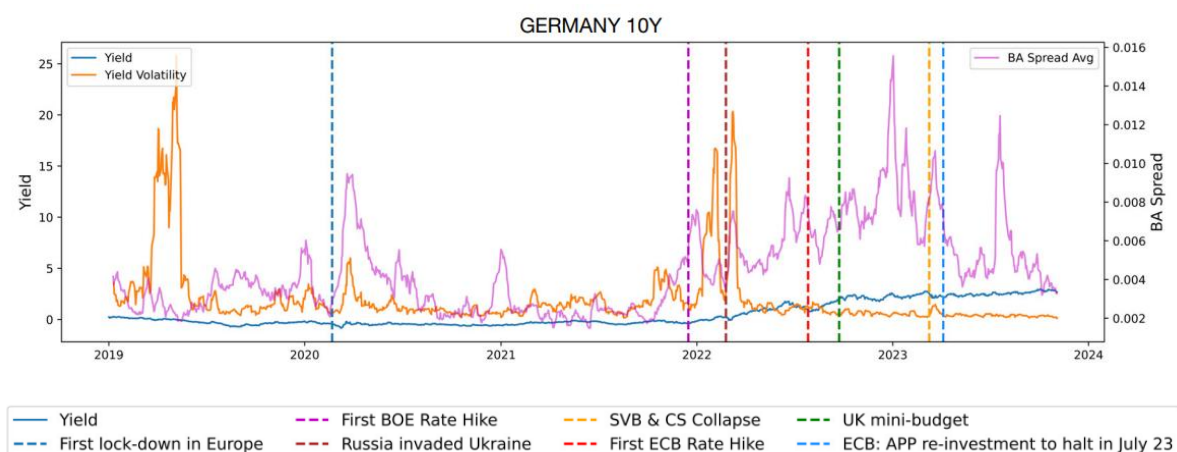
The current thesis will focus on a vital component of the global financial system, the corporate bond market, which plays a key role in financing economic activity by providing corporations with an alternative to traditional bank loans (Ulrich, Morgan and Yoshino, 2018). Unlike other asset classes, corporate bonds are uniquely sensitive to monetary policy changes, as interest rate fluctuations directly affect bond prices, yields, and issuance costs. Several studies support the notion that corporate bonds are particularly responsive to monetary policy changes compared to other asset classes. Guo and Kontonikas (2020) examine how monetary policy shocks affect excess returns on corporate bonds. Cloyne, Ferreira, Froemel and Surico (2023) highlight that corporate debt, especially for younger firms, is highly sensitive to changes in collateral values influenced by monetary policy. Consequently, understanding the relationship between monetary policy, liquidity, and bond market dynamics is essential for policymakers, issuers, and investors alike.

Assessment of Literature

Prior theory has suggested bond yield spreads reflect three types of risk: default risk; market risk and liquidity risk (Spyrou, 2013). The current work aims to investigate the latter, as liquidity and its resilience have been put to test in recent years on bonds markets. Liquidity is defined as the ability to execute buy or sell orders, at the desired time and size without significantly impacting the market price (ICMA, 2016). Liu (2006) offers one of the most widely recognized definitions of liquidity, describing liquid assets as those that can be traded in large volumes, quickly, at low cost, and with minimal price impact. This definition captures the dimensions of liquidity of depth, time and cost explained by Kyle (1985) and Harris (2003). The bond market became notably bigger over the past ten years. As of October 2024, the face value of European market debt is estimated at €21.99 trillion debt outstanding (European Central Bank, 2024), but at the same time, dealers' balance sheet on aggregate has stagnated, which saw desks reducing appetite for risks under volatile periods (ICMA, 2024). In bond markets, liquidity is provided by intermediating market-makers who facilitate immediacy and ensure fair value for investors looking to buy or sell bonds (ICMA, 2024). Therefore, the secondary market serves as a continuous and valuable source of pricing information for both existing and new issues.

Previous study on liquidity of European sovereign bond market has shown specific events where liquidity appears to be stretched: the first COVID-19 pandemic lock-down, the beginning of interest rate hiking cycles in the UK and Eurozone, the Russian invasion of Ukraine among other events (IMCA, 2024). As illustrated in Figure 5, the Bid-Ask spread is one of the metrics used to determine liquidity. The spread widened after 2020's first lock down in Europe (vertical dark blue dotted line) and tightened after ECB's first rate hike (vertical red dotted line).

Figure 5 - German 10y on-the-run liquidity analysis



The literature of bond-specific liquidity impact on yield is extense and supports the current work. Chen, Lesmond and Wei (2007) findings show that liquidity is priced in corporate yield markets, where more illiquid bonds earn higher yield spreads versus more liquid names, which have spreads reduced. This is explained by the liquidity costs associated with buying and selling these bonds, once the bond is costly to trade, investors are exposed to more risk as they can't easily buy or sell to adjust their portfolio, this way, they demand higher premium upfront and only buy the bond if they get at a lower price, which will lead to higher yield spreads versus liquid bonds with the same promised cash flows. (Chen, Lesmond and Wei, 2007).

Some researchers address liquidity proxies, and their findings suggest low correlation between them, indicating that they have substantial idiosyncratic movements and that the various proxies are measuring somewhat different aspects of liquidity empirically (Friewald, Jankowitsch and Subrahmanyam, 2012). Jankowitsch, Nashikkar, and Subrahmanyam (2011), introduce the price dispersion measure, which assesses bond market liquidity by examining how closely traded prices align with a market-wide consensus valuation. It is defined as the square root of the average squared difference of trade prices (Schestag, Schuster and Unrigh-Homburg, 2016). Low dispersion suggests low transaction costs and high liquidity, while high dispersion indicates the opposite. This measure captures the impact of market frictions, such as dealer inventory risk and investor search costs, on trading costs (Duffie et al., 2023). Another low-

frequency measure was developed by Roll (1984), which estimates the effective bid-ask spread by analyzing the negative serial correlation in adjacent price movements, interpreted as the "bid-ask bounce" (Huang, Sun and Yu, 2013). He builds on the idea that unanticipated information is received by market participants and a change in the price of the security will occur. As per formula below, the Δp_t is the change in prices from $t-1$ to t , and this bounce is the transitory price movement, as prices tend to bounce back and forth between the bid and ask, resulting in a negative serial correlation.

$$\text{Roll Measure} = 2\sqrt{-\text{Cov}(\Delta p_t, \Delta p_{t-1})} \quad (1)$$

This way, to produce meaningful results, the covariance between price changes must be negative, meaning that price changes are inversely related over consecutive periods. Christopoulos (2020), introduces, therefore, a novel adaptation of Roll (1984) using imaginary numbers, the Absolute Roll Measure, to avoid zero results for cases where there is positive autocovariance. Other models from Holden (2009) and Huang and Stoll (1997) measure low-frequency spread proxies showcasing the key role of liquidity in finance research (Goyenko, Holden, Trzcinka, 2009). In addition to prior literature, Goldstein, Hotchkiss and Pedersen (2019), focus on the impact of liquidity, measured by secondary trading activity, on primary market yields at issuance. Their findings suggest a significant negative relationship between expected secondary market liquidity and yields spreads at offering.

Finally, central to security transactions, price formation and liquidity is the bid-ask spread. It represents the difference between the quotes where market makers want to buy and sell specific bonds (Christopoulos and Barratt, 2020) which provide a valuable measure of liquidity as stated in Amihud (2002). The Bloomberg Generic bid-ask spread, is likely the most widely used liquidity measure (Longstaff, Mithal, and Neis, 2005; Chen, Lesmond, and Wei, 2007; Bao, Pan, and Wang, 2011). Schultz (2001) indicates that the difference between the trade price and bid price at the same point in time can be used to estimate the transaction cost. Affleck-Graves,

Callahan and Chipalkatti (2002), suggest that changes in the size of the spread are associated with the degree of information asymmetry, where market-makers widen the spread to protect themselves from the cost of providing liquidity to informed traders (Chae, 2005). From the several bid-ask spread metrics, we employ the observed bid-ask spread at the close of trading as is done by Mucklow and Ready (1993) and Brooks (1994).

Database

This chapter will disclose the process of collecting the data samples used for the analysis, the data preparation as well as an overview of the sample.

Collecting data

All data collected is from Bloomberg. First, it was extracted Corporate European bonds issued from 01 of January 2022 until 01 of September of 2024. This period was selected because of ECB's aggressive tightening cycle, where interest rates were close to zero at the beginning of 2022 and in July 2022 rose to 0.5%, the first increase since March 2016, and afterwards rates increased consecutively reaching in December 2023 a peak of 4.5% - highest since the 2008 global financial crisis. Rates stayed at those levels till May 2024, when in June 2024, ECB cut rates for the first time by 25bps (Statista, 2024).

The second data set also retrieved from Bloomberg with the help of Bloomberg's API Excel-Add in, was the daily bid-ask spread of the bonds outstanding on the secondary market from the same period of 01 of January 2022 until 01 of September of 2024. We calculated the realized bid-ask spreads per bond per day from the Bloomberg Generic Quote (BGC), an algorithm that produces accurate indications of bid ask quotes derived from hundreds of quality sources (Bloomberg, 2016). After pulling the outstanding corporate bonds' ISINs from Bloomberg, using Excel, the below formula was implemented to gather the daily bid-ask prices from January 2022 to September 2024:

`=BQL(BLQ.LIST(isin list),"px_bid,px_ask","dates=range(2022-01-01,2024-09-01)")` (2)

Data preparations and sample overview

The first sample consists of 5000 Corporate bonds issued in the European Primary Market from 01 of January 2022 until 01 of September of 2024. According to Merton (1973), corporate debt depends on the bond’s arrangement, such as maturity, call provisions and coupon, the probability of default and the risk-free rate. Therefore, the information collected was the issue date; issued yield; credit rating from Moody’s, S&P and Fitch; maturity date; amount issued; sector of the issuer and country. Within the database, the following filters were applied to the deals: EUR currency; benchmark size - €500m or above - as issue size impacts liquidity once larger trades tend to receive more favorable prices because dealers’ bargaining power diminishes (Pintér, Wang and Zou, 2024); corporate sector; and only rated bonds. Table 1 shows what exactly filters were inserted on Bloomberg’s SRCH function to get the data. Only rated bonds were included in the search, this way, 160 bonds were eliminated from the sample as they weren’t rated by none of the three agencies. Additionally, 332 bonds did not have data on the Yield at Issue, these bonds also were removed.

Table 1 - Filters applied on BBG terminal SRCH function

Created by LAURA MARQUES on 10/09/2024 18:30:39 GMT+0200 (CEST)			
SRCH Criteria			
Asset Classes: Corporates, Governments			
Sources: All Securities			
Security:			
AND	Security Status	Include	Bonds : Active
AND	Amount Outstanding	Greater than	500.0MM (EUR)

AND	BCLASS Classification	Include [Match Any]	Chemicals or Metals and Mining or Paper or Aerospace/Defense or Building Materials or Diversified Manufacturing or Construction Machinery or Packaging or Environmental or Automotive or Leisure or Gaming or Home Construction or Lodging or Retailers or Textiles or Restaurants or Consumer Cyc Services or Beverage or Consumer Products or Food or Healthcare or Pharmaceuticals or Supermarkets or Tobacco or Food and Beverage or Independent or Integrated or Oil Field Services or Refining or Midstream or Technology or Airlines or Railroads or Transportation Services or Cable Satellite or Media Entertainment or Wirelines or Wireless or Internet & Data or Other Industrial or Electric or Natural Gas or Distributors or Pipelines or Other Utility or Banking or Brokerage Assetmanagers Exchanges or Finance Companies or Non-Captive Consumer Finance or Non-Captive Diversified Finance or Life or P&C or Health Insurance or Apartment REITs or Healthcare REITs or Office REITs or Retail REITs or Other REITs or Other Financial
AND	Currency	Include	Euro Currency

Next, will be summarized the characteristics of the dataset as well as their relevance to the Euro Credit Supply (Table 2). First, issuances are skewed to Investment Grade, with 90% of the deals on the less risky class. The IG market differs from high yield on both issuer and investors sides as most institutions face different degrees of restrictions on holding “junk” bonds, in Europe, each country has its own regulation but in practice allocates a small percentage of their portfolio on non-investment grade. Also, there is clientele change when a corporate bond is downgraded to junk, forcing institutions to sell their exposure on this paper which can cause prices to drop by 2% during the first three months after the announcement of downgrade (Da, Gao, 2009). The mean yield (%) increased in 2024 to 4,27% versus 2,83% in 2022, showcasing the interest rate increase throughout the years, once yields move with interest rates. In 2024, there were more bonds issued on the Primary market, as till end of August 2024, 451 bonds were issued, representing almost all 2022 issuance.

Table 2 - Description of the Bond Sample Data

Year	Count	Mean Maturity (yrs)	Mean Yield (%)	Mean Amt Issued (€mn)	IG (%)
2022	464	5,35	2,83	843	98%
2023	624	5,97	4,76	807	94%
2024 (till Aug)	451	7,44	4,27	793	89%
Total	1 539	6	4	814	94%

Regarding the sector (Table 3), Financial represent 46% of total supply, followed by Consumer Non-Cyclical (15%) and Consumer, Cyclical (12%). The average bond maturity is 6.21yrs, tenors also play an important determinant of investor demand, as usually longer tenors offer higher coupon and some investors are entirely focused on specific tenors (Hillebrand, Mravlak, Schwendner, 2023).

Table 3 - Description of the Bond Sample Data per sector

Sector	Count	Sum Supply issued (€bn)	%	Mean Maturity	Mean Yield	IG (%)
Financial	672	597,04	46%	5,60	4,14	96%
Consumer, Non-cyclical	262	197,32	15%	7,13	3,79	89%
Consumer, Cyclical	211	159,84	12%	4,58	4,20	85%
Industrial	130	95,20	7%	6,31	3,84	88%
Utilities	127	100,92	8%	8,15	3,67	94%
Communications	89	70,85	5%	8,82	4,41	79%
Basic Materials	52	35,99	3%	6,17	4,06	87%
Energy	23	16,34	1%	8,89	3,99	91%
Technology	18	15,11	1%	5,72	4,23	89%
Total	1 584	1 288,61	100%	6,21	4,04	91%

The second data set is the daily average bid-ask spread of bonds outstanding. It is expected that the bid-ask spread to be related to the bond price and therefore to the determinants of debt value indicated above (Chakravarty, Sarkar 1999). We have 2,441,097 total observations of Bid and Ask prices from 01 of January 2022 until 01 of September of 2024. Therefore, the daily spread per bond was calculated as the difference between the Ask price (price seller is asking) and the

Bid price (what the buyer is willing to pay). Over the three years of data, there were approximately 4200 observations on average daily, this way, to create a robust test, days which had less than 100 observations were removed. The procedure, therefore, eliminated 12 days of data and 954 days remained (over the 3 years). Also, bonds which had missing Bid or Ask prices to calculate the spread were removed of the sample, on the data, only 3 bonds had the issue. Figure 6 shows the bid-ask spread throughout the years, where there is a decrease in the mean spread from 0.61 in 2023 to 0.47 in 2024. The dispersion of the distribution, measured in standard deviation, is about 0.07€ larger in 2022 versus 2024.

Figure 6 - Daily Bid-Ask Spread

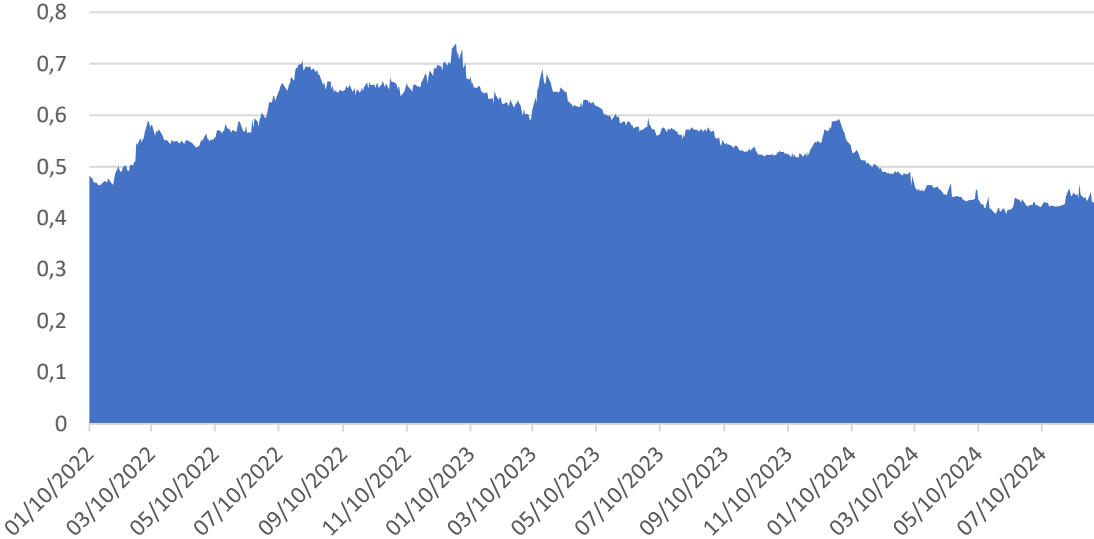


Table 4 provides further summary statistics, the median also declined, from 0.51 to 0.408, highlighting that the majority of observed spreads became smaller in 2024. In addition, the minimum spread in 2024 was very small (0.0010), indicating highly liquid bonds on the market. The skewness indicates the data is heavily right skewed, suggesting the presence of larger spreads for some bonds. The kurtosis of 67.3186 reflects a distribution with extreme outliers and the decrease in 2024 implies that extreme values became less frequent, contributing to a more balanced market.

Table 4 - Summary statistics: Bid-Ask spread data

Year	Number of distinct Bonds	Num of obs Spread	Mean Spread	Median Spread	Std Dev Spread	Skew Spread	Kurt Spread	Min Spread	Max Spread
2022	3 242	759 413	0,610	0,510	0,393	3,995	67,319	0,034	26,823
2023	4 002	933 056	0,584	0,493	0,375	3,102	30,221	0,001	15,952
2024	4 762	748 628	0,470	0,408	0,328	3,387	31,358	0,001	10,244

Hypothesis

In this section, we motivate and summarize our main testable hypotheses. As referred in our introduction, monetary policy is a critical tool and impacts financial markets and the real economy (Hildebrand, 2006). Friedman and Kuttner (2010) note that modern central banks primarily influence short-term interest rates through announcement effects rather than traditional liquidity effects, which rely on adjusting the supply of banking system reserves (Guthrie and Wright, 2000; Thornton, 2001). However, not all forms of communication are equally effective in shaping interest rate expectations. Enhancing the efficiency of policy communication remains a key challenge for central banks. Therefore, the current work aims to investigate whether monetary policy changes impact bond's market secondary liquidity and, therefore, bond yields at issuance. The proposed hypotheses are:

H1: Interest rate changes affect liquidity in the secondary market.

This hypothesis explores the premise that monetary policy adjustments, specifically interest rate changes by the European Central Bank (ECB), significantly impact the liquidity of corporate bonds in the secondary market. Liquidity, as measured by bid-ask spreads, often reflects market conditions where higher spreads signal lower liquidity and vice versa. Historical evidence shows that monetary tightening tends to reduce market liquidity as it increases funding costs for market participants and heightens risk aversion among investors (Amihud and Mendelson, 1988). Conversely, monetary easing often restores liquidity by lowering costs and

encouraging trading activity. This hypothesis is particularly relevant given the unprecedented pace of the ECB's rate hikes in 2022 and the subsequent cuts in 2024.

H2: Lower liquidity in the European Corporate Bond Market leads to wider bond yield spreads at issuance.

This hypothesis posits that reduced liquidity in the secondary market translates into higher issuance yields in the primary market. The rationale is that illiquid bonds expose investors to greater transaction costs and risks, compelling them to demand a higher yield premium as compensation (Chen, Lesmond and Wei, 2007). This premium is particularly pronounced during periods of market stress or uncertainty, as observed during the ECB's aggressive monetary tightening in 2022–2023. Empirical evidence from prior studies underscores the inverse relationship between liquidity and yield spreads, indicating that issuers face higher costs when liquidity is constrained. Testing this hypothesis involves linking liquidity proxies (e.g., bid-ask spreads, Roll measure) to bond yields at issuance while controlling for other determinants like credit quality, maturity, and market conditions.

H3: The impact of liquidity on bond yields changed in 2024 compared to 2023 and 2022 due to higher liquidity versus 2022 as interest rates move.

This hypothesis examines whether liquidity's influence on bond yields evolved over the study period. The improved liquidity conditions observed in 2024, following the ECB's first rate cuts in years, provide a natural experiment to evaluate how market dynamics adjust under different monetary regimes.

Methodology

In this section will be presented the two econometrics methodologies utilized: regression (multifactor OLS) and event study analysis. After extracting the data set on Bonds characteristics and their daily Bid-Ask Prices on Bloomberg, with Excel, the data was cleaned and formatted in addition to a new calculation file, which provides the daily spread per bond as well as the average of this daily spread, which will be needed for the regression and the event study.

Event-Study

The event-study methodology that accommodates event induced variance is used to investigate the abnormal bid-ask spread performance (Boehmer, Musumeci, and Poulsen, 1991). The main idea of the event-study is to measure the impact of an economic event on the value of an asset (Olbrys, 2021). A reach group of literature uses event-study methodology to examine monetary policy's announcements effects on asset prices (Sun, 2020), such as Bernake and Kutterner (2005) and Getler and Karadi (2015), which focus on financial markets response on Fed's policy changes.

Two event periods were selected, being the ECB's interest rate announcement and when the new Monetary Policy takes effect. The first date is the 21st July, 2022, when the ECB rose interest rate for the first time and the 27th July, 2022, when took effect; and the third date is the 6th June 2024, being the first cut after historical highs and 12th June 2024, when it took effect. Four different windows were studied, as Peterson (1989) suggests, the window can be defined by the researcher: [-1,1], [-5,5], [-10,10] and [-15,15]. This way, the different windows will allow us to understand the market reaction and whether or not the interest rates changes impact bid-ask spreads, being the proxies for liquidity. The daily bid-ask spread is the average spread for all bonds daily. If abnormal bid-ask spread changes are found around these events, it would imply that the interest rate decisions have a tangible impact on market liquidity and pricing

dynamics. Furthermore, will allow to explore whether ECB interest moves have a more pronounced effect in 2022 versus 2024, and whether abnormal spreads are more substantial following a ECB meeting.

The computation of abnormal spread and the statistical procedures used to detect significant abnormal spread is not uniform (Affleck-Graves, Callahan and Ramanan 2000). This way, to simplify the calculation of the abnormal return, AR, which compares the actual spread versus an estimated spread, the later was calculated using the mean-adjusted expectation model. According to Affleck-Graves, Callahan and Ramanan 2000, the mean spread (\overline{SP}) is calculated using one year of daily data (ig.250 days), which the event window is not considered. For example, for a test period of -5 to +5, where the event date is 0, the estimation period are days -125 to -6 and +6 to +124. AR_t is the abnormal return for spread on day t , SP_t the actual spread on day t , we subtract the average indicated previously to get the abnormal returns:

$$AR_t = SP_t - \overline{SP} \quad (4)$$

The average abnormal return (AAR) over the event window (t_1 is the first day of the event and t_2 the last) is determined by taking the sum of the abnormal return (AR) for each bond i :

$$AAR = \frac{1}{N} \sum_{t=t_1}^{t_2} AR_t \quad (5)$$

Finally, the cumulative average abnormal return (CAAR) was calculated based on the sum of the average abnormal return (AAR).

$$CAAR = \sum_{t=t_1}^{t_2} AAR \quad (6)$$

In this analysis, both single-period abnormal spread t-tests and cumulative average abnormal return (CAAR) t-tests are employed to comprehensively assess the event's impact on bond spreads. The single-period t-test examines the abnormal spread for each day within the event window, testing whether the daily mean abnormal spread differs significantly from zero. This approach provides insight into immediate, day-specific reactions to the event, capturing any

short-term fluctuations in bond spreads. The t-statistic uses the sample mean $\overline{(x)}$ and standard deviation (σ) of the abnormal spreads over the event window, being N the number of observations.

$$H_0: AAR \text{ or } CAAR = 0, t = \frac{\bar{x}}{\sigma/\sqrt{N}} \quad (7)$$

Regression Analysis

Regression analysis is a popular statistical tool that allows monitoring of the dependencies between the analyzed variables for different types of functions (Verner and Tkáč, 2023). We propose to evaluate it using the method of multivariate OLS regressions as follows:

$$\begin{aligned} \text{Yield at issue} = & \beta_0 + \beta_1 \text{Maturity} + \beta_2 \text{Year}_{23} + \beta_3 \text{Year}_{24} + \beta_4 \text{HY} + \beta_5 \text{Spread}_{Lagged} \\ & + \beta_6 \text{Rf} + \beta_7 \text{Callable} + \beta_8 \text{Size} + \epsilon \end{aligned} \quad (8)$$

The dependent variable is the bond's yield at issue and one of the key variables in our empirical analysis is the Spread_{Lagged} , which we measure as the average spread across all bonds daily.

The second key variable is *Maturity*, as the bid-ask spread increases with maturity and actively traded bonds typically have a tighter spread (AxessPoint, 2021), it is important to control this variable on the performed regression. From the rated bonds, 45 were perpetual bonds, and had no maturity date, these bonds were eliminated from the sample. Table 5 provides a summary statistic of the maturity profile of the bonds. The increase in average maturity from 5.35yrs to 7.44yrs reflects an inclination towards issuing longer-term debt. And the decrease in standard deviation indicates that bonds issued in 2024 were more clustered around the mean maturity, showing a narrowing range in the terms of bond issuances.

Table 5 - Summary statistics: Maturity profile data

Year	Count	Mean	Std Dev	Min	Median	Max
2022	464	5,35	5,98	0,16	4,36	58,72
2023	624	5,97	6,18	0,13	4,93	59,89
2024	451	7,44	4,18	1,35	6,42	29,98

The variables $Year_{24}$ and $Year_{23}$ are dummy variables taking the value of 1 if the bond was issued in 2024 and 2023, respectively, otherwise zero. *Callable* is dummy variable equal to 1 when the bond is a callable bond, since investors demand more yield on a callable bond over a comparable bullet to compensate for the call risk (James, 2024). And *HY* is also a dummy equal to 1 - when the bond is not rated as investment grade by Moody's, S&P or Fitch – otherwise equal to zero. Finally, the *Size* is dummy variable equal to 1 when the bond's total amount issued is bigger than €1bn, to investigate whether the issue's size also impacts yield.

The next OLS regression performed, changed the key liquidity proxy variable from the lagged daily Bid-Ask Spread to a measure based on Roll's (1984) estimator of spread bounces, constructed with observed trade prices. Roll's measure was adapted to infer spread-related dynamics from the bid-ask data. First, the daily average spread for all bonds was computed and then the daily changes in the bid-ask spread (ΔS_t) from t to $t - 1$.

$$\Delta S_t = S_t - S_{t-1} \quad (9)$$

Afterwards, it was calculated the covariance of ΔS_t and ΔS_{t-1} , Schestag, Schuster and Unright-Homburg (2016), compute liquidity measures on monthly rather than weekly or daily to avoid noises and guarantee robustness, therefore, instead of calculating daily covariance, it was utilized a 30-day rolling window of consecutive daily spread changes, giving a more reliable estimate of the relationship between of ΔS_t and ΔS_{t-1} .

This way, out of 646 days of data, 612 had a negative rolling covariance between the consecutive changes in bid-ask spreads, showcasing a key feature of liquid financial markets

which reflects the bid-ask bounce effect. This phenomenon occurs as market makers adjust prices to balance supply and demand, resulting in alternating patterns of bid-ask spread changes. For instance, an increase in the spread due to a trade at the ask price is often followed by a decrease from a trade at the bid price. This predictable alternation creates a negative autocorrelation, indicative of tighter bid-ask spreads and efficient price adjustments. In the context of Roll's measure, negative covariance validates the application of its formula to estimate the effective bid-ask spread.

Finally, the Roll measure was computed as follows, where the Roll Bounce Spread measure is zero when the rolling covariance is positive.

$$Roll\ Measure = 2\sqrt{-Cov(\Delta S_t, \Delta S_{t-1})} \quad (10)$$

The daily Roll Bounce Spread was incorporated in the dataset, matching the bond's issue date to the daily spread calculated. From our Bonds data, it was not possible to calculate the Roll measure for the securities issued on the first 30 days of 2022, as there was no data collected for 2021 to capture the 30-day rolling covariance, eliminating 111 bonds out of 1584.

This way, the Roll Bounce Spread was added as an independent variable to the regression to enhance the model's explanatory power by accounting for a different measure of market liquidity.

$$Yield\ at\ issue = \beta_0 + \beta_1 Maturity + \beta_2 Year_{23} + \beta_2 Year_{24} + \beta_4 HY + \beta_5 Roll_{Bounce} + \beta_6 Rf + \beta_7 Callable + \beta_8 Size + \epsilon \quad (11)$$

Results

Event-Study

The event study examines the impact of ECB monetary policy decisions on bid-ask spreads, using the Average Abnormal Return (AAR) and Cumulative Average Abnormal Return (CAAR) metrics across varying event windows. Four key events were analyzed: the 2022 interest rate hike and its implementation, and the 2024 rate cut announcement and implementation. Results reveal that the 2022 rate hike significantly increased bid-ask spreads, reflecting tighter liquidity, with immediate and lasting effects observable across all event windows. In contrast, the 2024 rate cut decreased spreads, indicating improved liquidity, with stronger cumulative impacts over medium and long-term windows compared to short-term reactions.

The study underscores the importance of bid-ask spreads as proxies for liquidity and confirms that monetary policy decisions materially influence secondary market conditions, aligning with the hypothesis that interest rate changes are a key driver of bond market liquidity.

The events chosen were, therefore:

- Event 1: 21st July 2022, first interest hike by ECB.
- Event 2: 27th July 2022, new deposit rates took effect.
- Event 3: 6th June 2024, the first interest rate cut in nearly five years is announced.
- Event 4: 12th June 2024, new deposit rate took effect.

Table 6 shows the results for Event 1 and Event 2 performed for each window analyzed. The event study results demonstrate that ECB's first interest rate hike had a statistically significant impact on bid-ask spreads, reflecting its influence on market liquidity. On both events 1 and 2, the Average Abnormal Return (AAR) tests indicate that daily abnormal spreads were consistently significant across all event windows at 5% significance level, including the narrow [-1,1] window, this confirms an immediate market reaction on liquidity to the rate hike. The

positive Cumulative Average Abnormal Return (CAAR) indicates that during event windows surrounding the ECB interest rate hikes bid-ask spreads increased cumulatively compared to their expected levels based on the previous 250-day average. A positive CAAR reflects a widening of bid-ask spreads, which is a key indicator of reduced market liquidity, demonstrating, therefore, that the bond market is sensitive to monetary policy changes, supporting Hypothesis 1 of the current work. The CAAR's p-value for the [-1,1] window was not statistically significant ($p = 0.091$ for event 1 and $p = 0.082$ for event 2), suggesting that the cumulative impact over such a short period was not strong enough to be conclusive. As the event window widens to [-5,5], [-10,10], and [-20,20], both AAR and CAAR tests reveal highly significant results, rejecting the null hypothesis of no impact. This implies that the rate hike had a lasting and cumulative effect on bid-ask spreads. Notably, the implementation of the rate hike (Event 2) exhibited slightly stronger cumulative impacts compared to its announcement (Event 1), as seen in the higher mean CAAR values and t-stat.

Table 6 - Event Study 1 & 2 Results and stats

Event 1 - Interest hike decision

Event Window	Type of Event	N	Mean	σ	Degrees of Freedom	t-stat	p-value
[-1,1]	AAR	9 151	0,048	0,008	2	10,237	0,009
[-1,1]	CAAR	9 151	0,091	0,051	2	3,086	0,091
[-5,5]	AAR	33 552	0,054	0,014	10	12,489	2,00425E-07
[-5,5]	CAAR	33 552	0,288	0,179	10	5,332	0,0003
[-10,10]	AAR	61 020	0,062	0,021	20	13,508	1,63429E-11
[-10,10]	CAAR	61 020	0,550	0,380	20	6,465s	2,64319E-06
[-20,20]	AAR	125 098	0,058	0,034	40	11,069	9,52025E-14
[-20,20]	CAAR	125 098	0,864	0,790	40	7,002	1,86454E-08

Event 2 - Interest hike took effect

Event Window	Type of Event	N	Mean	σ	Degrees of Freedom	t-stat	p-value
[-1,1]	AAR	9 159	0,069	0,005	2	26,072	0,001
[-1,1]	CAAR	9 159	0,135	0,071	2	3,274	0,082
[-5,5]	AAR	33 565	0,068	0,015	10	14,981	3,53984E-08
[-5,5]	CAAR	33 565	0,370	0,240	10	5,110	0,000457513
[-10,10]	AAR	64 106	0,068	0,018	20	17,148	1,99204E-13
[-10,10]	CAAR	64 106	0,660	0,444	20	6,806	1,28746E-06
[-20,20]	AAR	125 216	0,062	0,026	40	14,969	5,48158E-18
[-20,20]	CAAR	125 216	1,080	0,846	40	8,176	4,57348E-10

The next event study performed were the dates where ECB cut interest rates for the first time after almost 5 years (Table 7). Notably, both AAR and CAAR are negative, this reflects a contraction on bid-ask spreads (compared to their expected levels) following the ECB interest rate cut decision, signaling improved liquidity on the secondary bond market. The narrowing of spreads supports the idea that rate cuts typically lower borrowing costs and reduces market uncertainty, which encourages trading activity and enhances liquidity, therefore, sustaining the Hypothesis 1 of the current work.

ECB's announcement (Event 3) and implementation (Event 4) had distinct impacts on bid-ask spreads, highlighting differences in market reactions over time. Event 3 triggered significant immediate and short-term responses, with a noticeable decrease in daily abnormal spreads (AAR) and a strong cumulative effect (CAAR) over medium- and long-term windows, indicating that markets reacted quickly to the announcement. The shorter windows were

significant at 5% significance level, and the [-10,10] ,[-20,20] windows were significant at 1% level. Conversely, Event 4 showed muted immediate and short-term reactions, with no statistical significance at any significance level for both AAR and CAAR in narrow event windows. However, its impact became more pronounced over medium and long-term windows, [-10,10] and [-20,20], where daily abnormal spreads are significant on the longer window [-20,20] and the and cumulative abnormal spreads on both [-10,10] and [-20,20], suggesting the implementation of the interest rate cut had a delayed but substantial influence on market liquidity.

Table 7 - Event Study 3 & 4 Results and stats

Event 3 - Interest cut decision							
Event Window	Type of Event	N	Mean	σ	Degrees of Freedom	t-stat	p-value
[-1,1]	AAR	13 585	-0,009641	0,003173	2	-5,262	0,034
[-1,1]	CAAR	13 585	-0,019951	0,010168	2	-3,399	0,077
[-5,5]	AAR	49 745	-0,003	0,005	10	-2,216	0,051
[-5,5]	CAAR	49 745	-0,023	0,015	10	-4,973	0,001
[-10,10]	AAR	94 779	-0,006	0,010	20	-2,750	0,012
[-10,10]	CAAR	94 779	-0,105	0,051	20	-9,519	7,1992E-09
[-20,20]	AAR	184 382	-0,004	0,008	40	-3,326	0,002
[-20,20]	CAAR	184 382	-0,114	0,083	40	-8,725	8,45597E-11

Event 4 - Interest cut took effect							
Event Window	Type of Event	N	Mean	σ	Degrees of Freedom	t-stat	p-value
[-1,1]	AAR	13 610	-0,00076	0,004089	2	-0,322	0,778
[-1,1]	CAAR	13 610	-0,004178	0,001876	2	-3,858	0,061
[-5,5]	AAR	49 868	0,006	0,012	10	1,785	0,104
[-5,5]	CAAR	49 868	0,005	0,032	10	0,551	0,594
[-10,10]	AAR	49 868	-0,002	0,010	20	-0,805	0,430
[-10,10]	CAAR	95 036	-0,057	0,030	20	-8,659	3,36173E-08
[-20,20]	AAR	184 913	-0,006	0,008	40	-4,712	2,9527E-05
[-20,20]	CAAR	184 913	-0,162	0,080	40	-13,015	5,81294E-16

The findings support the hypothesis that interest rate changes affect bid-ask spreads and, by extension, liquidity. Both rate hikes and rate cuts significantly impacted bid-ask spreads, as evidenced by the consistent significance of AAR and CAAR across multiple event windows. The positive spread reaction to the hike in 2022 reflects reduced liquidity, while the negative reaction to the cut in 2024 suggests improved liquidity.

Regression Analysis

Based on the regression results, the findings highlight the critical role of liquidity conditions in shaping bond yields at issuance during varying interest rate environments. The analysis reveals that improved liquidity conditions in 2024 significantly mitigated the impact of liquidity constraints on bond yields compared to 2022 and 2023, supporting Hypothesis 3.

The first regression, using the $Spread_{Lagged}$, had R-squared of 0,697, indicating that the 69.7% of the variation in bond yields at issuance is explained by the independent variables in the regression model (Table 8). Among the significant predictors, the $Spread_{Lagged}$ had strong positive effect on yields, with a coefficient of 2.7822, suggesting that an increase by 1-unit (EUR) the yield increases 2.7822 percentage points with a p-value of 0.000 indicating is statistically significant at all significance levels. The bond maturity also has a positive effect on yields, with each additional year increasing yields by 0.0135 percentage points on average, also significant at all significant levels. The Risk-Free rate also had a positive coefficient of 1.3047 on yields. Regarding the dummy variables, bonds issued in 2024 exhibited significantly lower yields compared to the base year (2022), with a negative coefficient of 0.3404, and statistically significant at all significance levels (p-value:0.004), suggests that improved market conditions and more liquidity in 2024 allows smaller yields on bonds issues. The dummy for High-yield (HY) were associated with substantially higher yields, increasing yields by 2.3562 percentage points when the bond is under this umbrella, reflecting the higher credit risk premium demanded by investors. Callable bonds exhibited a small increase in yields of 0.1676 percentage points, reflecting their embedded option risk, with a p-value of 0.001, also significant at all significance levels.

Conversely, a couple of variables were not statistically significant in explaining yields. Bonds issued in 2023, relative to the base year 2022, showed a slight reduction in yields (-0.0791), but this effect was not significant at any significance level, suggesting limited impact of issuance

year on yields for 2023. Lastly, bond size, represented by issuance amounts over €1bn, showed a minor negative effect on yields (-0.0531%), but this result was not statistically significant, indicating that size may not be a major determinant of bond yields in this dataset.

Table 8 - Regression Analysis on Bond Yields at issue with Lagged Bid-Ask spread

	dependent variable		
	Yield at issue		
	Coef	p-value	t-test
Maturity	0,014	0,000	3,594
Year_2023	-0,079	0,362	-0,911
Year_2024	-0,340	0,040	-2,891
HY	2,356	0,000	30,608
Lagged_spread	2,782	0,000	6,337
rf	1,305	0,000	25,207
Callable	0,168	0,001	3,298
Size	-0,053	0,294	-1,049

The second regression, using the variable $Roll_{Bounce}$, has R-squared of 0,608, with results revealing that liquidity, as proxied by the Roll measure, has a positive but marginally significant impact on bond yields at issuance. The coefficient for the Roll measure is 12.44, suggesting that a 1-unit increase, which indicates lower liquidity, is associated with a 12.44 percentage points increase in bond yields, holding other factors constant. However, the p-value of 0.054 indicates significance at the 10% level but not at the more conventional 5% or 1% level. Other variables, such as bond maturity, high-yield classification, and callable status, show strong statistical significance, with expected directions of influence on yields.

Table 9 - Regression Analysis on Bond Yields at issue with Roll Bounce spread

	dependent variable		
	Yield at issue		
	Coef	p-value	t-test
Maturity	0,013	0,010	2,585
Year_2023	-0,220	0,017	-2,395
Year_2024	-0,869	0,000	-8,870
HY	2,395	0,000	27,953
Roll Measure	12,440	0,054	1,931
rf	1,379	0,000	21,127
Callable	0,143	0,009	2,626
Size	-0,029	0,606	-0,516

Regarding the dummy variables $Year_{23}$ and $Year_{24}$, both are statistically significant (at 5% significance). Bonds issued in 2023 have on average -0.22 percentage points on yields versus 2022, and those issued in 2024 have on average -0,869 percentage points on yields. This infers that more liquidity in 2024 decreases bonds yields at issuance versus previous years where there was less liquidity.

Comparing both regressions, the main difference is that the dummy $Year_{23}$ becomes significant when we use the Roll measure as proxy for liquidity. This indicates that the lagged spread may share a stronger correlation with other variables, such as $Year_{23}$, leading to multicollinearity that obscures the independent effect of the year dummy. Additionally, the Bid-Ask Spread, being a short-term measure, might not capture structural changes effectively. In contrast, the Roll Measure, derived from price autocorrelation, reflects more persistent liquidity dynamics and reduces multicollinearity, allowing the model to better isolate the impact of $Year_{23}$. These results emphasize the critical role of selecting the different liquidity proxies for regression analysis.

Conclusion

The current work explores the impact of Eurozone monetary policy changes on liquidity and bond yields in the corporate bond market, with a focus on the aggressive tightening period from 2022 to 2024. The combination of regression analysis and event study methodologies allowed the findings to provide robust evidence of the interplay between monetary policy, secondary market liquidity, and bond issuance dynamics.

First, monetary policy significantly affects secondary bond market liquidity. The 2022 ECB rate hikes widened bid-ask spreads, reflecting tighter liquidity conditions, while the 2024 rate cuts narrowed spreads, signaling improved liquidity. These findings strongly support the hypothesis that interest rate changes influence secondary market liquidity. Second, liquidity in the secondary bond market emerges as a critical determinant of bond yields at issuance. The regression analysis demonstrates that wider bid-ask spreads and higher Roll measures—indicators of reduced liquidity—lead to higher bond yields, underscoring the cost of illiquidity for issuers. Finally, the analysis reveals that improved liquidity conditions in 2024 mitigated the impact of liquidity constraints on bond yields compared to 2022 and 2023. The negative coefficient for the 2024 dummy variable in the regression analysis reflects the market's adjustment to restrictive monetary policy, highlighting the dynamic nature of liquidity's influence on bond pricing.

These findings have important implications for policymakers, issuers, and investors. For policymakers the findings are useful in order for them to acknowledge the effects of restrictive monetary policies on liquidity-sensitive assets and therefore yields, and consider measures to mitigate adverse impacts on market stability. For corporate issuers, the results highlight the need to strategize bond issuance timing and structure, particularly during periods of tight liquidity, to optimize pricing and reduce funding costs and to consider liquidity as an important factor on market conditions in addition to credit strength, equities, futures yields. Investors, on

the other hand, can benefit from closely monitoring liquidity proxies, such as bid-ask spreads, to better price liquidity risks and adjust portfolios accordingly.

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