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Floating Rate Notes and Stakeholder Activities during Zero and Negative Interest Rate Regimes[☆]

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Abstract

We analyse the impact of stakeholder interactions with the market as a consequence of the negative interest rate regime on the pricing of selected Floating-rate notes (FRNs). The range of reactivity of financial markets and issuers to uncertainty caused by an untested boilerplate term in bond contracts are thoroughly outlined. The subject clause stipulates ‘not applicable’ as the minimum rate of interest, which raises confusion regarding payment obligations between issuers and investors. This is discussed from a legal perspective. Empirically, we find that markets do—to varying degrees—price stakeholder activities like court decisions, industry association statements, and public positions of sovereigns. In turn, issuers are willing to react to legal risks quickly, if costs of inertia are low. This is reflected also in the significant changes in the FRN issuance structure in the past few years. The announcement of further lower for longer rates in the Euro Area provides evidence that the FRN market appreciates the current protection of negative coupons even under a lower Euribor.

Keywords: Sovereign Bond Markets; Floating Rate Notes; Negative Interest Rates; Legal Uncertainties

JEL classification: C53; G17; Q14

1. Introduction

Eurozone key interest rates may stay lower for longer. Since the inception of the Global Financial and European Sovereign Debt Crises, the European Central Bank (ECB) reduced interest rates in the euro area to historically low levels. Since June 2014, the deposit facility rate has been brought into an unprecedented negative rate level. As of now, the deposit facility rate has been negative for over five years at currently -0.50% . Meanwhile, the Euro Interbank Offered Rate (EURIBOR) fixes in negative territory while

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main Euro area sovereign bonds trade with negative yields.¹ This dip impacted pricing and risk management across market segments and asset classes traditionally dependent on interest rates.

Sovereign Floating-rate notes (FRNs) have been subject to uncertainty. Much of the distress stems from one clause in the boilerplate bond contracts, which stipulates ‘not applicable’ (N/A) as the minimum rate of interest. FRNs worth up to EUR200bn are at risk of their coupon turning negative, which may allow for an interpretation that would reverse payment obligations in favour of the issuer. The structure of the market issuances in regard to the minimum interest of FRNs has changed to adapt to this risk.

Issuances of FRNs without an explicit minimum interest rate increase exponentially at the beginning of the low-interest period, only to come to a crawl upon entry into negative benchmark rates. In their stead, there has been a resurgence of FRNs with explicit minimum rates. We posit, that the interplay of a novel negative interest rate policy (NIRP) and a boilerplate clause untested by courts created a uniquely uneasy market environment. While negative coupons have not been charged to investors by sovereigns or sub-sovereign issuers yet at the time of writing, there are ample incentives for issuers to try.

On the other hand, attempting to enforce a payment from a noteholder carries crowding risks for the issuer, pushing investors into other FRNs. The aforementioned risks have led market stakeholders to attempt mitigating the lack of clarity surrounding FRNs without a minimum interest rate with a myriad of unconventional activities. A sovereign publicly announced their legal stances in the debate, clearing houses have released a united guidance document exclaiming the operational impossibility of reversing coupon payments, and a range of courts in the euro area have been circling in on the FRN issue through claims about International Swap Dealers Association (ISDA) collateral and retail loan cases.

The FRN market thus calls for a two-pronged investigation. First, into whether the industry found sufficient legal risks in the interpretation of the N/A clause to attempt rectification. While markets could cope with negative yields, the potential of negative coupons triggered key participants to argue that a reversal of a coupon payment is legally and operationally impossible. A series of court decisions in other financial segments of the Eurobond area² have highlighted the disagreement on this stance, and could warrant mitigatory action.³ The second prong is into the impacts on the financial aspects of FRN

¹This includes core sovereign fixed coupon bonds with maturities up to ten years. German sovereign bonds yield negative across the full yield curve; 30y Bunds reached negative territory beginning of August 2019.

²Eurobonds are securities issued outside the country of the issuer’s origin. Since the early 1960s it is the issuance format for bonds as a Global Note dematerialized format. They should not be confused with the debate on joint bond issuances from EA member states or a reference to specific currency only.

³For example, the Opinion of Advocate General Mengozzi delivered on 13 July 2016 affirming the

markets. Changes in the standard market practice of flooring coupons have required re-calibrating pricing and risk management of FRNs.

The interdisciplinary nature of the study—from a legal and a empirical perspective—supplies certain limitations to the depth of both legal and finance investigations. The legal discussion does not holistically analyse the contractual aspects associated with the boilerplate documents—the variety in legal treatment of bonds, negative interest rates, and related matters among different jurisdictions require individual investigation; nor do we explore the legal standing of certain stakeholder activities. Instead, we aim to highlight the sources of uncertainty across various European jurisdictions, gauge their impact on markets and bring the matter into the wider standard clause debate through juxtaposition with the discourse on the *pari passu* clause. Regarding determinants and the event study, the investigation on market structure uses the interest rate path and pricing relationships as core signifiers of impact to stakeholder events. The sampling for the empirical data also compromises between liquidity, market size, and closeness to negative coupons, resulting in sovereign FRNs issued by Italy as the main source of samples.

The remainder of the paper is structured as follows. Section 2 presents relevant literature from both legal and finance disciplines. Section 3 discusses legal uncertainty and finance challenges stemming from the low-interest rate period. Section 4 outlines an empirical study of FRN markets, available FRNs, and empirical results. Section 5 concludes and links the legal discussion with the empirical study.

2. Literature Review

In the following section, we outline the research on bond price sensitivity generally during ZIRP and NIRP, the pricing impacts of litigation and contractual terms, as well as stakeholder reactions to the aforementioned determinants.

Research concerning aspects of low rate regimes is manifold and includes topics such as monetary policy debates, financial stability and growth impacts as well as micro-economic impacts of factors like bank business models (Coere, 2014, Borio et al., 2017, Nucera et al., 2017). However, research on FRN markets under negative rates is limited to several bank research papers from a practitioner’s perspective that have drawn attention to the topic. Research is also scarce in providing general principles for FRN markets. Fabozzi & Mann (2000) provide an FRN specific framework explaining its characteristics and valuation principles. It is pointed out that margin based pricing of FRNs and the discount margin as an appropriate price determinant are of significant importance to markets.⁴ The calculation of the discount margin is lined out in the Appendix.

validity of Spain in limiting ‘floor’ clauses in bank loan contracts to retail consumers in judgments No 139/2015 (ES:TS:2015:1280) and judgment No 222/2015 (ES:TS:2015:2207).

⁴For reference to the commonly used margins as spread for life, adjusted simple margin, adjusted total margin, and discount margin refer to Fabozzi & Mann (2000).

In literature, it is generally agreed that pricing based on traditional approaches has changed during ZIRP and NIRP periods. Arteta et al. (2018) builds on these findings by highlighting that markets have also not been correct in their predictions in interest cuts. Xia & Wu (2018) have drawn a strict line denoting the increase of borrowing and lending costs upon reaching the negative zone. However, while Kim (2013) finds that interest rate ambiguity contributes to yields, it does not do so linearly, implying that conventional yield factors are not fully accountable for premia variation.⁵ Our investigation considers the low-interest rate period as a period of heightened market vigilance and uncertainty, where non-traditional factors like stakeholder activities and court decisions may have heavier impacts.

The effects of litigation and legal terms in contracts on pricing has only recently been addressed. Ahmed & Alfaro (2017) finds sovereign-debt related litigation chains have an impact on yields by benchmarking litigation filings and settlements against spreads in U.S. Treasury bonds in Latin American nations. Hébert & Schreger (2017) use an event study methodology around the dates of various litigation filings in certain countries to find a decrease in cumulative abnormal returns following the event. They further suggest the impact is derived from investor perceptions on the enforceability of contracts and altering creditor positions. However, the spillover effects to the regional market is negligible, and even positive in surrounding countries due to risk aversion tendencies. While these investigations confirm a pricing impact from litigation, they generally draw on U.S. related events and bonds—a more heterogeneous and connected market than the Eurobond area.

Certain provisions in bond documentation may increase moral hazard, and thus borrowing costs, but the benefit of them provisions, like collective action clauses (CACs), outweigh the risk and increase demand (Bradley et al., 2010). Their findings show that spreads on sovereign debt is much higher several years after an upsetting court decision in Belgium, than preceding years, government positions in amici briefs increase the effect. Becker et al. (2003) uses a similar methodology to find that yields are also influenced by the activities of market stakeholders. The findings diverge from Petas & Rahman (1999) that legal terms affect pricing to a negligible extent. Literature generally points to clauses having a measurable effect on pricing, but necessitate a trigger factor; a court decision or stakeholder response unpredictable to markets.

Kim (2013) finds that bond yields asymmetrically respond to news from authorities, with stronger changes upon the day of bad news than good news.⁶ News on real GDP growth rate or inflation are weak indicators for future bond prices. Hallerberg & Wolff

⁵Conventional yield factors generally consist of Interest rate, inflation, debt to GDP ratio, deficit to GDP ratio, GDP growth rate, and equity indexes.

⁶For example, the Federal Open Market Committee issuing news on decreasing interest rates is considered bad news by bond market participants (Kim, 2013).

(2006), however, identifies that stronger institutions, and consistent compliance, and their examinations lower risk premia. This discussion also highlights the rise of asymmetric information risk-sharing premiums, which helps explain the variations in treasury market returns across countries (Dufour & Nguyen, 2012). Dufour & Nguyen (2012) also state that heterogeneity in European market maturity ranges, issuance tendencies, credit worthiness, and trading mechanisms indicate strong segmentation across sovereigns in attention to pricing factors. Peiers (1997) argues early on that sophisticated investors, with closer proximity to issuers are generally better informed and are price leaders. The research thus generally points to a high possibility of country-specific pricing impacts, with yield hikes dependent on locality and size of market.

Research on the effects of contractual terms causing uncertainty is sparse. Choi et al. (2011) find markets reacting generally slow to changes, with significant inertia costs. The potential risk arising from interpretation of stipulation from litigation is, by itself, not the most important factor in alterations of contracts. Markets also ignore historical evidence on clause interpretation on the basis of contemporaneous contextual differences, industry leaders and stakeholder interactions (Choi et al., 2017). While markets may react quickly in pricing activities, changes in contractual clauses may not have taken place because contractual clauses in standard clause persist until an exogenous factor requires change (Choi et al., 2011). Even with such an event, the change must be capable of overcoming the aggregated cost of ex-ante and ex-post inertia. The inertia costs attributed to the belated change in the *pari passu* cited by Gulati & Scott (2011) appear in four distinct categories: legacy debt costs, market reaction uncertainty, idiosyncrasy costs, and legal uncertainty. Gelpern et al. (2017) supports the stance from a qualitative investigation from the perspective of debt managers; reluctance to change derived from fear of markets misreading the signals from edited contracts, and a need to blend in with their cohort. Choi et al. (2017) posit that such a cost can be overcome only when market participants solve a collective action problem required to prevent the isolation of a single issuer implementing changes in standard agreements.

3. The Legal Uncertainties of the Low-interest Rate Regime

The *Final Terms* (FT) legally detail the individual bond characteristics. The FT of a bond's documentation contains a series of core transaction related information, like the International Security Identification Number (ISIN), bond pricing, governing law, and maturity details. They are publicly available for bond issuances, and are considered legal supplements to the prospectus, which they are subordinated to. They also contain the applicable minimum interest rate to the bond. As a market practice for FRN agreements there are two types of interest variations:

1. an *initial explicit floor*, stating a minimum rate of interest to the investor as of the issue date;

2. an *assumed implicit floor*, which does not explicitly state a minimum rate of interest.

These floors are denoted by express statements following the minimum interest rate clause of the document, as either 0% or above, or by the phrase ‘not applicable’ (N/A). In positive rate markets, the latter would generally be interpreted as providing for an implicit floor of 0%. However, in NIRP the intuitive inference of N/A would differentiate the meaning from the explicit floor of 0%, just by the variation in term construction. This surfaces the question of the meaning of the phrase among industry practitioners. A possible fringe interpretation is that there is no floor, and that interest rates can enter negative areas. Such an interpretation strongly differs from market practice, and brings challenges from both legal and financial perspectives.

Legally, the contractual core principles of bonds and securities are founded in debtor and borrower relationships. Negative interest rates can, *prima facie*, result in two unconventional alterations of this relationship. In the case of a loan, the borrower may receive interest on borrowed money, and a lender may have to pay the borrower this money. In the case of a deposit, the depositor may have to pay interest on his deposit, receiving less in output than input.

Applied to FRNs, if the floating rate coupon rate is negative, reversing the standard cash flow may result in debiting the bondholder. Other unconventional methods of settling coupon payments may also arise. An issuer could intend to redeem less than par at maturity to compensate for any theoretical negative coupons not imposed. Additionally, an issuer may consider adjusting positive coupons by compensating previous theoretical negative coupons over the bond’s lifetime. Any of these variants create legal risks ranging from a credit event (below par principal redemption) to lengthy legal discussions (e.g. averaging coupons). When issuing floating rate debt, the issuer faces the risk that the total coupon payments increase with the reference interest rate increasing. The issuer may also have conducted an interest rate swap agreement to protect the floating rate payment obligation against a rate increase. If the rates decrease below zero, both contracts may be affected. Myriad challenges would also transpose to derivative hedges and other related instruments.

The proposed reversal of payments has not yet materialized in practice; although there are exceptional instances of bonds with a negative fixed coupon, the question remains if negative coupon payments for implicitly floored FRNs could be legally enforced and who would carry the legal and financial burden. The stance of the legal industry is, generally, that an interpretation in favor of a ‘no-floor’ would be unlikely, given the aberrant nature of such a decision to the legal order, the lack of express indication of such intention in bond contracts, and operational limitations impinged upon. The evident vacuum left by a leading court is also allowing divergences across various legal systems, where bonds under

the negative facility rates could be considered outside the framework of a monetary loan.⁷ The situation becomes increasingly confusing regarding the vast amounts of structured bonds.

The state of the N/A interpretation issue parallels the infancy of the *pari passu* saga, in several salient ways. The *pari passu* chronology begins in 2000, when the Republic of Peru was taken to court in Brussels by a hedge fund on a claim of non-payment of debts. The court ruled, on an *ex parte* motion, that the Peruvian debt contracts contained a *pari passu* clause that prevented Peru from paying other creditors without paying a pro-rata share to the hedge fund (Cohen, 2011). Additionally, the hedge fund could place an injunction against the Euroclear financial clearing house, preventing payments to restructured bond holders lest the fund received its full payment on the unstructured amount. This reading of the *pari passu* clause received near-universal criticism from the international financial community, for providing a severely aberrant interpretation. However, even with the noise surrounding the clause, sovereign debt contract provisions were not modified to clarify the anomalous interpretation. Lawyers explained the lack of editing as unnecessary, as more authoritative courts in New York or London would never repeat such an interpretation.⁸

In 2011, in a similar case concerning Argentinian bond *pari passu* interpretation, a federal judge in New York decided the case the same way as the Brussels court. In 2012, in appeal, the Second Circuit court affirmed the previous interpretation, even in light of extensive amicus briefs from three different countries, industry organisations, and even a Nobel laureate expert in sovereign debt. The Supreme Court declined to hear the case. The *pari passu* saga was epilogued by a series of high-level meetings between the International Monetary Fund (IMF), the International Capital Market Association (ICMA), the World Bank, and G-20, all of them endorsing the necessary changes to the clause. The shocking interpretations of the courts were heralded as a major threat for the sovereign bond market, as it would make debt restructuring even more difficult, harming both sovereigns and creditors.

Our analysis highlights similar points of inflection between N/A and *pari passu* clauses. First, both concern the reading of a boilerplate term, from the very standardized capital markets framework. The initial uncertainty in the meaning of *pari passu* was signalled by a decision in what was considered a minor court, lacking authority to change the vector of the markets. While courts generally have not been in favor implying payment obligations related to negative interest, there have been variations on the extent of this

⁷It has been proposed that a bond issued in a negative rate from the beginning could be considered a custody agreement, as it would result in a party entrusting money to another for a guarantee of solvency. See further: Endréo (2015).

⁸Instead, the market chose to ameliorate the issue by coordinating revision of the no-modification clauses in New York governed law bonds, to require the approval of only 75% instead of unanimity as a method of encumbering holdouts seeking a blocking position (Gulati & Scott, 2011).

attitude across jurisdictions.⁹ An attentive market would presumably be vigilant to such sentiments (Choi et al., 2011).

Second, the *pari passu* issuance ratio was not significantly affected by professional industry associations (Gelpern et al., 2017). Many of the contractual ambiguities have been elucidated in a collective effort by stakeholder in the form of various guidelines, explanatory notes, and practical proclamations. Industry organisations like ICMA and the International Swap Dealers Association (ISDA) have introduced the ISDA Collateral Agreement Negative Interest Protocol, updating and clarifying swap and derivative contracts on negative interest rates. The Loan Markets Association has introduced an option clause that can be implemented in loan agreements governed by English law (Frankel, 2014). The general solution offered has been to create floors for the interest rate or amend contracts. The impact of such endeavors remains to be explored later in the paper.

Third, in both cases, issuers have attempted to mitigate the uncertainty around a clause through methods beyond altering the contracts. For example, in Argentina’s petition for Supreme Court review of the 2nd Circuit Court of Appeals decision in favor of holdouts, France, Mexico, and Brazil submitted amicus briefs in its support (Frankel, 2014). In the case of the N/A discussion - the Italian government took a much stronger stance, and issued the Attorney General’s opinion on the action on coupons in the event of certain securities entering the “recent[ly]...inconceivable” phenomenon of negative coupon rates in the Official Gazette in 2016 (Ministry of Economy and Finance, 2016). The opinion notes that the issuances decrees have no explicit rule in assuming negative coupons, and there is a question about how they are interpreted. In accordance with the official’s opinion, the Italian Civil Code allows the maximum risk for the lender to be the “gratuitousness” of the contract. Concurrently, services qualified as interest must be for the account of the borrower, preventing them being on account of the lender. The attorney general concludes that “the regulation of the relationship includes an implicit provision, whereby, in the event of negative interest rates, the minimum coupon is equal to zero” (Ministry of Economy and Finance, 2016).

Similarly in the case of the N/A clause for the Eurobond markets, the two International Central Securities Depositories (ICSDs) Euroclear and Clearstream launched guidelines on securities held in their systems with negative interest rates. The guidelines described situations when coupons are negative as ones that would “usually” be considered floored, and claim that “in principle”, the ICSDs do not facilitate the collection of cash due to negative interests on coupons from their noteholders (ICMSA, 2015). Leading lawyers and institutions like the ECB also professed necessity of wider adaptation to the NIRP regime throughout the market (Coere, 2014).

⁹See for example the Austrian cases Decision on case OGH, March 21, 2017, 10 Ob 13/17k and Decision on case OGH, May 3 2017, 4 Ob 60/17b on negative interest rates in mortgage contracts.

The aforementioned similarities create a base for further investigation into current market reactions to stakeholder activities. There are, however, also several major differences. For one, the slow reaction of markets and issuers to the growing *pari passu* risks, by ignoring the recommendations of industry associations, and mistaking the earlier decisions, are inapplicable to the no-floor clause debate. Significant structural changes in the volume of issuances of FRNs took place within a relatively short period of ZIRP and NIRP. At the beginning of the low-interest period, N/A FRN issuances begin increasing exponentially, coming to a swift halt exactly at the dip of the benchmark rates into negative territory. The questions posed by Gelpern et al. (2017) and Gulati & Scott (2011) regarding the slow speed of issuer adaptation to risks in their contract forms, are made partly moot in this case. At first sight, the reaction of markets does not coincide with the collective action thesis of Choi et al. (2017); no traceable series of meetings between market players triggered the change. Instead, the decision appears endogenous to issuers. This can partly be explained by the anticipation of the dip by market participants, contrary to the aberrant decisions in the *pari passu* cases.

It also alludes to the different levels of encumbrance in altering the clause. The prospectus carries significant inertia costs. Investors, underwriters, and issuers alike cannot make any significant changes to the prospectus, especially without collective support (Gelpern et al., 2017). The FTs, on the other hand, are altered freely, allowing multiple types of characteristics under a single issuance, thus decreasing issuer fear of crowding risks.

The role of court decisions is another material difference between the two topics. The NIRP regime has provided a series of decisions in the Eurobond area, relevant to the interpretation of negative interest rate impacts on debt contracts. Unlike the *pari passu* saga, which revolved around several critical decisions concerning the terms' specific interpretation in regards to holdouts, none of the cases have tested the term in regards to bonds. The thematically closest case was decided in the English High Court, concerning the interpretation of a 1995 ISDA Credit Support Annex (CSA) in NIRP environments, in regards to how cash collateral should be paid under such a regime. The Netherlands lost to Deutsche Bank AG, as the judge found that the agreement as a whole did not include an obligation on the transferor if interest mount is negative, unless the obligation were "spelled out."¹⁰

As the ISDA 2013 Statement of Best Practices, allowing for negative interest obligations was not around at the time of contracting, it would not be applicable to the case. While the case is confined to a specific CSA and the derivatives market, the subject matter is in the orbit of bonds, and provides a vector for judicial sentiment - particularly

¹⁰Decision in the State of the Netherlands v Deutsche Bank AG [2018] EWHC 1935 (Comm) (25 July 2018).

important as it is an English court. For bonds issued in NIRP environments, the decision necessitated a review of whether N/A could be understood as sufficiently similar in meaning to explicit floored terms, to receive a similar finding from the court. The decision was also appealed, further increasing its possible relevance to bonds.¹¹ The appeal to the case affirms the previous decision, with certain derivations. First, the judges argue that on a more general level, while “the commercial background can be argued both ways,” the CSA does not intend to give the impression that negative interest is “contemplated or intended.” The court does allow more room for a reading that supports the aberrant position, instead confirming the decision of the previous court by reference to the relevant ISDA documentation depended on by the parties. The User’s Guide of the ISDA forms depended on by the contracting parties in 1999, makes no reference to negative interest being provided for, even though they were a possibility at the time. Only in the 2010 Best Practices statement amendment are interest rate accruals fixed from dropping into negative figures, highlighting that it was generally not anticipated that interest rate accrual should be negative significantly prior to 2010. As such, the appeal expands the area for interpreting negative interest payments in bonds, by setting the authority for analysing several levels of non-binding industry documentation to understand the possible extent of meeting of minds.¹²

While the aforementioned cases concern sophisticated parties and contracts in financial markets, several cases address the interpretation of negative interest rates towards consumers. Two Austrian Supreme court cases find that a bank cannot unilaterally fix an agreed reference rate to zero, even if it becomes negative.¹³ However, a reversal of payments could also not be enforced as the parties to the contract bilaterally agree on sharing the risks from fluctuations of reference interest rates. A Dutch Financial Services Complaints Tribunal, however, orders a bank to pay negative interest to its client on the basis of no interest rate floor in the agreement.¹⁴ The bank has also tried to introduce an implicit floor of 0%, which the tribunal found as an unreasonable interpretation without explicit stipulations to such an effect in the agreement. The variance among decisions on negative interest rates may be enough for markets to interpret uncertainty.

¹¹Decision in Appeal on *The State of the Netherlands v Deutsche Bank AG* [2018] EWHC 1935 (Comm) (25 July 2018).

¹²Decision in Appeal on *The State of the Netherlands v Deutsche Bank AG* [2019] EWCA Civ 771 (2 May 2019).

¹³Decisions OGH, March 21 2017, 10 Ob 13/17k and OGH, May 3 2017, 4 Ob 60/17b, respectively.

¹⁴Judgment (Binding Advice) Nr. 2016-143 of the Dutch Financial Services Complaints Tribunal (Geschillencommissie Financiële Dienstverlening).

4. An empirical analysis of floating rate debt markets

4.1. Changes in market structure

Floating rate debt securities are traditional financial products. They replaced bank loans as a major borrowing form in the early 1980's along with the development of the swap market. The gross issuance of sovereign bonds in 2017 reached around EUR 2.5 trillion with a total outstanding of around EUR 10 trillion. The average daily trading volume for sovereign bonds amounts to around EUR 57 billion per day. The outstanding amount of FRN sovereign bonds amounts to around EUR 180 billion. This quantity increases to well above EUR 200 billion when non-sovereign floating-rate note issuers are included (Association for Financial Markets in Europe, 2017). Due to their resetting coupon nature which regularly adjusts the coupon to an on-market level (e.g. every six months), their interest rate sensitivity is naturally very low. Thus, FRNs are often considered risk conservative products.

We analyse FRN market tensions through the lens of two market segments - comparing an issuer's fixed coupon market and the FRN market. We use two price parameter variables under a given data sample of FRNs, outlined below in greater detail. In addition, we include FRN market structures during the ZIRP and NIRP cycles. In doing this we reduce the sample set to selected liquid FRNs to complement our legal argumentation with price and market structure changes.

We note particular changes in FRN issuance activities regarding volumes in relation to interest rate changes and changes in the contractual design of FRN issuances highlighted below in Fig. 1.

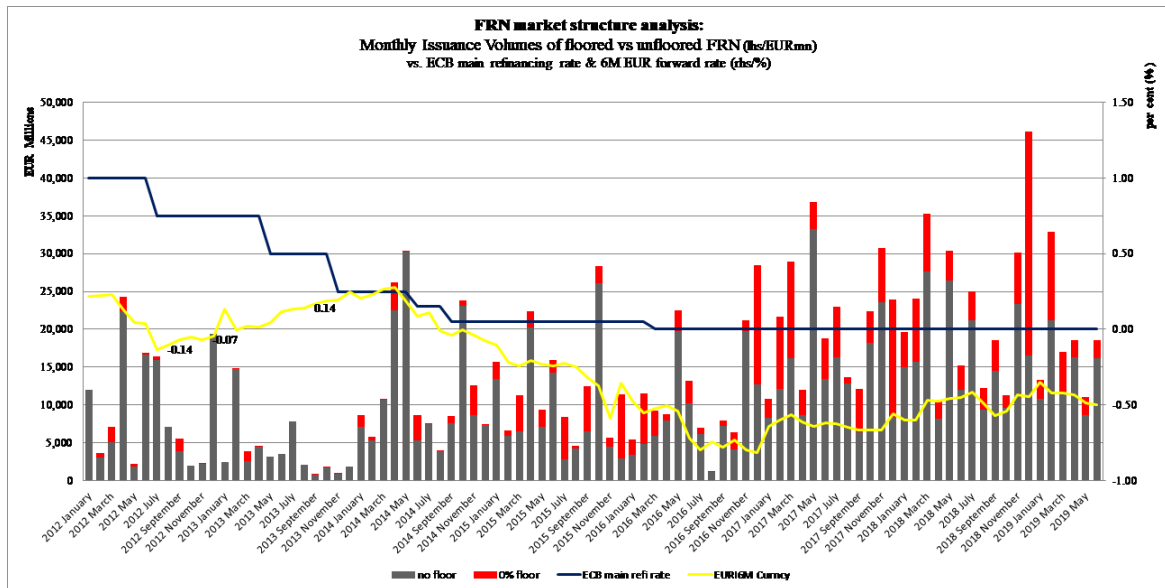


Figure 1: FRN Market Structure Analysis and issuance volume (bar charts), interest rate path (blue line), and 6M implied forward (yellow line) from January 1, 2012 to June 30, 2019.

We find that monthly averaged FRN issuance volumes stand around EUR 14bn over the time series. The average issuance volumes until March 2016, when ECB rates (ex-

pressed as the main refinancing operations rate) turned to 0%, are EUR 9.8bn. representing around 74% of the total average volumes. Issuance volumes doubled from April 2016 onwards and result in a much higher average monthly issuance volume of EUR 19.5bn. being 1.99 times above the total monthly average.

We added the 6M EUR forward rate (EURI6M) in Fig. 1. This forward rate became negative in July 2012 and the overall monthly issuance volumes decrease until April 2014, which is also observable in the decrease in grey bars around that time. Meanwhile, issuance activity since 2017 increased to over EUR 21bn. per month and continued to hold around these levels until the end of the observation period. As shown in Fig. 1, floating rate debt issuance volumes remains high while the forward rate tends lower in 2016/17 and oscillates around -0,5% .

Floored vs. unfloored issuance structure

Until the end of 2014 explicit floors were underrepresented with only 7% of total volumes applying zero floored coupon in the final terms. During the next two years of time series (January 2015-2017) this share increases to 26% of FRN using explicit floors and remains around this level until end of November 2018. Notably, apart from one outlier in the typically quiet summer period (August 2016), we find around 28% of monthly FRN issuances include explicit floored coupons. Peak month even reach over 60% of total issuance sizes.¹⁵

FRN market structure analysis findings

First, the analysis of Fig. 1 indicates that issuance structures changes. Monthly average volumes increase during the observation time (shown on the left hand scale). Until the end of 2014, the share of explicit floors includes around only 7% of total FRN volumes issued. From March 2014 onwards, the implicitly floored issuances fall sharply, and a gradual increase in explicitly floored bonds emerges. The change in behavior towards explicit rates suggests a lack of certainty in the applicability of the N/A clause. However, as implicitly floored notes keep being issued at varied rates, the certainty is either not affecting the market at an equivalent rate, or the costs of altering documentation are too high. Notwithstanding, FRN with implicit floors are being issued at varied rates.

Second, regarding the interest rate path correlation with the implied 6M forward rate, we find no direct match between rates turning negative and decrease in issuance activities. However, changes in issuance behaviours include lagging effects. These effects may stem from time needed to interpret the market rate expectations, as at this point in time EURIBOR was low but still positive as the 3M EURIBOR turned negative in April 2015 and 6M in November 2015, respectively.

¹⁵A breakdown into monthly data show peaks of floored coupons in H2/2017 and December 2018 between 47-64%.

Third, from a game theory perspective, the results require further analysis. Why would issuance activities in FRN increase when issuers open themselves to wider exposure to higher and, most importantly, uncapped interest rate risks? The cost burden for issuers increases when reference rates increase. Concurrently, an issuer will not benefit on the downside in case rates decrease further. An answer could be found in the trade off decision issuers have to conduct. On the one hand, opportunistic cheap funding appears attractive, depending on the credit spread expressed in the quoted margin - in the best case, at zero cost. On the other, the instrument's characteristics of being implicitly floored rate notes but to the upside, still floating rate notes, bears legal and financial risks. These one way risks are stemming from a unilateral change of the final terms using the non-applicable phrase of the interpretation that with rates negative issuers cannot benefit to the one side while being fully exposed to the other side of the rate movement spectrum. As investors should have increased demand for floored FRN—independent whether the floor is implicit or explicit—the trade off to secure funding while paying only the increased interest rate risk can be favorable. The practical problem is that a hedging instrument such as an interest rate swap (IRS) bears additional risks as negative rates apply in standard interest rate derivatives.

4.2. Data sets and bond matching

We obtain Bloomberg data on an ISIN basis by filtering for EUR denominated, plain vanilla¹⁶ active FRN from corporate and governments issuers. While the regression aims to complement the legal argumentation, we filter for FRN governing law groups related to the legally and regulatory events as described in the event study section. These issuers include – amongst others - the largest and most liquid FRN sovereign issuer, the Republic of Italy (Italy), as well as the SSA¹⁷ regular FRN issuer European Investment Bank (EIB) and the European Financial Stability Facility (EFSF). Narrowing down further, we include only FRNs with a minimum outstanding amount of EUR500mn. Applying this filter set reduces the applicable securities from over 14,000 FRNs to 169 securities. We retrieve standard FRN descriptive data labels including the quoted margin (QM) and the discount margin (DM). Importantly, we obtain whether the FRN has an explicit floor included. For the main regressor data set we retrieve for each regressed issuer the generic 2 year fixed coupon bond yields against the 2 year EUR IRS rate as a basis point differential.

We apply similar bond matching techniques outlined in Osvaldo Picarelli et al. (2018). Notably, analysing floating rate debt has caveats regarding data available compared to the fixed income sovereign bonds. Floating rate debt has limited bonds available within

¹⁶This means we include standard FRN bonds with floating rates vs. EURIBOR and exclude all non standard payment FRN (e.g. amortizing, non bullet bonds) as well as FRNs explicitly including any embedded options (e.g. capped or floored FRN).

¹⁷Supranational Sub-Sovereigns and Agencies (SSA) define a dedicated issuer segment of the bond market.

issuer groups (e.g. sovereigns), small outstanding FRN issue amounts (often insufficient under corporate FRNs thus we excluded them from filtering) as well as less pricing sources and turnover data. Further, different as for fixed coupon bonds, we are not aware of any generic reliable FRN datasets. This results in different time series sets available depending on the issuer type and frequency.

To cope with the aforementioned we identify the following key issuers as proxy sets for the FRN market. We look to set issuer proxies for sovereign, sub-sovereign and agency issuers. These proxies need to coincide with relevant stakeholder decisions we identified for jurisdictions in Italy, Austria, Germany. Additionally, for the sovereign sector we analyse Italy as the largest and most liquid issuer with their FRN issuances ('CCTS'). Further, for sub-sovereign class issuers, we consider the EIB and EFSF and lastly Erste Group Bank as a financial institution issuer for AT in absence of any further applicable FRN outstanding.

Applying this issuer selection results in a list of securities 23 FRNs (from 169 in the previous step). Next, we selected three FRNs per issuer including four different governing laws (IT, AT, LU, EN), implicit and explicit coupon floors as well as FRNs which would de facto bear a negative coupon and those FRN close to become coupon negative. Cross checking the data sets for Austria as the only additional sovereign for which we identified a key decision event, we decide to neglect this sovereign with only one FRN outstanding. Similar for the EFSF FRNs which do not provide sufficient data samples due to their illiquidity.

Our empirical strategy is to estimate market tension impacts (tensing/relaxing market conditions) of identified key events. We measure this using the price path determining spread for FRNs. Consequently we seek out time series data for the pre-selected FRN market proxies, which we retrieve via Bloomberg from the 2nd January 2012 until the 30th of June 2019. We obtain historical daily data sets for each FRN by retrieving the DM (in bps), the bid and ask price (in %) on an end of day basis.

While working on an ISIN basis we experience data issues as bonds were issued at different dates during the recent path. This makes the data sampling inconsistent yet still employable, as historical data can be retrieved between 2012-2016 thus covering at least two years of data. For the main market proxy, Italy, we build a time series by including one matured bond to be able to test data prior to 2016.

4.3. Methodology

First, we identify key stakeholder events and apply a basic event study methodology to identify in the analysis if floating rate debt markets reacted on these events. Second, we apply a multi linear regression onto a pre-defined data set. We study potential changes in the regression linearity at exemplary key event days. Third, with findings arising from the regression model, we construct a simple outperformance indicator to interpret changes in

pricing of floating debt on certain key events in the event study. Changes in FRN pricing rates are compared against comparable fixed rate bonds to measure the FRN's relative performance. Where possible, from a data feeding perspective,¹⁸ we aim to use historical data from the beginning of zero/negative interest rate regime which we set as the 1st of January 2015. The objective is to understand if and how this dedicated market segment reacted compared to the standard bond market.

Event study methodology

Our event study methodology for assessing market reactions to non-standard events draws on the key event study of the US Federal Reserve maturity extension program utilized by Foley-Fisher et al. (2016). We also apply a simple event study for our analysis similarly to Jorgensen & Kirshnamurthy (2011) for impact caused by quantitative easing (QE) programs. The aforementioned authors identified key events (e.g. rate decisions, QE announcements) and studied market reactions on the aforementioned. Noteworthy, the difficulty of selecting 'market impacting events' can be challenging. Markets may react to even the most trivial events (from a legal or economic impact perspective) while severe 'confirmed and published' events can be a market wise non-event in case the market already 'priced in' the event outcome. Particularly for our studies, the question when markets react on negative rates is challenging. Do markets immediately react when rates turn negative or when the discussion or anticipation (e.g. via the forward rates) imply negative rates is a key question. Thus, the event study approach looks at an event k on a certain date t and describes market price changes of assets.

Key events that might have an impact on FRNs and tested subsequently are presented in Tab. 1.

We study these events by analysing whether the observed FRN market segment of a certain issuer shows pricing impacts around the dedicated event. We categorize events in the findings by two impact types stemming from the legal and regulatory narratives outlined above. First, we investigate events which should contribute to legal/regulatory certainty and thus shall result in an increased demand of the FRN segment which consequently should be reflected in the relative (out-)performance. Second, events which may contribute to increased market insecurity or uncertainty which shall lead to an underperformance of the FRN market against the fixed coupon bond market.

These events are thus classified across four major categories. First, we analyse statements of industry associations and participants like ISDA, Euroclear and Clearstream with express relevance to the relationship between negative interest rates and bonds. Second, market shifting events, like publication days of movement into negative interest rates

¹⁸We refer to the first times where EURIBOR rates as the FRNs underlying reference rate turned negative. Notably, the ECB's deposit facility rate was set to -0.10% on June 30, 2014 and the main refinancing rate in the euro area was reduced to the current level of 0.00% on March 31st 2016.

Table 1: Key event dates and description used in this research.

Event	Entity	Date	Event type
1	International Swaps and Derivatives Association	12/05/2014	Publication of ISDA 2014 Collateral Agreement Negative Interest Protocol
2	European Central Bank	30/04/2015	Entry into NIRP of (3M) Euribor
3	Euroclear and Clearstream	11/08/2015	Publication of Guidelines concerning negative interest rate securities held through Euroclear Bank and Clearstream Banking ('the ICSDs')
4	European Central Bank	30/11/2015	Entry into NIRP of 6M Euribor
5	Republic of Italy	21/03/2016	Publication in Official Gazette of Italian Government Determination in Case of Negative Interest Rates
6	Austrian Supreme Court	21/03/2017	Publication of Decision on case OGH, March 21 2017, 10 Ob 13/17k
7	Austrian Supreme Court	03/05/2017	Publication of Decision on case OGH, May 3 2017, 4 Ob 60/17b
8	English High Court	25/07/2018	Publication of decision in case The State of the Netherlands v Deutsche Bank AG [2018] EWHC 1935 (Comm)
9	English Court of Appeal	26/09/2018	Publication of submission of Appeal on The State of the Netherlands v Deutsche Bank AG [2018] EWHC 1935 (Comm)
10	English Court of Appeal	02/05/2019	Hadning in its judgement in the State of Netherlands v Deutsche Ban [2019] EWCA Civ 771
11	European Central Bank	18/06/2019	Sintra Speech of ECB President Draghi hinting interest rate expectations of lower for longer lower rate environment

for the 3M and 6M Euribor. Third, we test the declaration of Italy regarding practicing zero-floors for its issued bonds. Last, we assess various court decisions and filings from the United Kingdom and Austria, as well as the ECB's announcement signalling further rate cuts which are in the theme of negative interest rates, but are not specifically related to FRN bonds. Pricing impacts are measured via the Outperformance Index (OI) detailed in the section below.

Using a dummy regression, we measure the daily changes in each FRN's discount margin ($\Delta DM_{i,t}$) against the changes in regressed variables being the daily change in the swap spread ($\Delta SWSPR_{i,t}$) of the generic fixed coupon bond for an issuer, further as control variables the daily 3M and 6M EURIBOR fixings ($EUR3M_t$, $EUR6M_t$) as well as the daily change in EURUSD exchange cross rate ($EURUSD_t$) and against the changes in the Euro Stoxx Index ($EURST_t$).

For asset i , the regression for p possible dummy dates reads

$$\Delta DM_{i,t} = \beta_0 + \sum_{j=1}^p \beta_j D_{j,t} + \beta_{p+1} \Delta SWSPR_{i,t} + \sum_{j=1}^p \beta_{p+1+j} \Delta SWSPR_{i,t} * D_{j,t} + \beta \Delta Controls + \varepsilon_{i,t}, \quad (1)$$

where $D_{j,t}$ denotes the dummy variable $j = 1, \dots, p$ which is 1 after dates of interest and 0 otherwise. First differences are defined as $\Delta Var_t = Var_t - Var_{t-1}$ for each variable $DM_{i,t}$, $SWSPR_{i,t}$, and controls: $EUR3M_t$, $EUR6M_t$, $EURST_t$, and $EURUSD_t$.

In addition to using discount margin changes, we set up a simple outperformance indicator (OI). The objective is to study whether and how much the FRN market segment

of an observed issuer has reacted differently to the fixed coupon bond market. In applying this logic we form the hypothesis that the stakeholder key events shall impact FRN markets particularly while the fixed coupon bond market would not be impacted. The OI shall further eliminate exogenous impacts such as rating changes in the issuer market.

Notating the OI follows the simple formula:

$$OI_{i,t} = \Delta DM_{i,t} - \Delta SWSPR_{i,t}. \quad (2)$$

For each issuer i and events $k = 1, \dots, 11$, we sum $OI_{i,t}$ five days prior and past the event date (t) as

$$E_i^k = \sum_{s=t-5}^{t+5} OI_{i,s}. \quad (3)$$

Given the above formula, the lower the OI the higher the outperformance of the FRN; meanwhile the more positive the higher the underperformance (the lower the outperformance) of the FRN relative to fixed coupon markets.

4.4. Empirical results

The results confirm the significance of the issuer's fixed coupon market ($SWSPR$) on the FRN market segment (DM). Detailed results for an example regression using the data for the largest FRN sovereign market Italy and other issuers described in what follows. We run several key event dates with $p = 2$ dummy variables; dates used in this example are 24/03/2016 and 25/07/2018. The results for other key events are qualitatively the same and available upon request.

Table 3 provides example estimation results for the dummy regression defined in Eq. (1) for three choices of benchmark FRNs of Italy and exemplarily of the EFSF, EIB, and Austria.¹⁹ For Italian FRNs, the regression results from January 2012 until the first dummy date (24/03/2016) confirm the explanatory significance of the issuer's fixed income market segment ($SWSPR$, measured with β_3) in explaining the changes of the FRN market segment. Further, we find that with the first event date, 24/03/2016, the explanatory impact of the $SWSPR$ decreases (from a factor load of $\beta_3 = 0.6524$ by $\beta_4 - 0.2171$ to 0.4353 for the Italy DM_1) with strong significance levels in relating p values. From a legal narrative, the key event studied is the announcement of the Italian Ministry of Finance to skip the right to enforce negative coupons from its investors. The decrease in explanatory significance suggests to us that the FRN market reacted on this event by decoupling from the remaining market segment and increased its own dynamics. This event is categorized to increase demand for FRNs and findings on the OI values shall deliver details on the magnitude and direction of the event.

¹⁹We only present selected FRNs. Results for all FRNs analysed in this study are available upon request.

As for the next break point observed on 25/07/2018, regressing the time frame from 24/03/2016 until the 25/07/2018, we see a reversing effect which coincides with a court ruling of the non-applicability of negative rates under the collateralization of swap agreements. We find that the second dummy date triggers a change in the linearity of the regression which counteracts the aforementioned event ($\beta_5 = 0.1602$). While from a legal and regulatory narrative this event should also contribute to clarity and increased demand we find that the FRN market increases its correlation with the fixed coupon market. Further, the results show no significance in the controls apart from the stock market control (*EURST*). The regression results for the other issuer segments in the sample show no significance albeit using the same set of variables. The observed effects seem to be valid only for Italian FRNs. For FRNs issued by EFSF, EIB, or Austria, no such effects are identifiable and the regressors surprisingly fail to provide *any* explanatory power of the discount margin of the respective FRNs.

Table 3: Parameter estimations of the regression outlined in Eq. (1) for six selected FRNs and $p = 2$ selected dates for the dummy variables, 24/03/2016 and 25/07/2018, respectively. Daily $DM_{i,t}$ observations end on 30/11/2018 while the start dates vary by FRN (Italy: DM_1 02/01/2012, DM_2 26/04/2016, DM_3 27/10/2016; EFSF 25/11/2013; AT 03/06/2014; EIB 02/01/2012).

	Italy DM_1	Italy DM_2	Italy DM_3	EFSF DM	AT DM	EIB DM
β_0	-0.1765 (0.12811)	0.1427 (0.1572)	0.1905 (0.1914)	-0.0186 (0.9376)	-0.0094 (0.0718)	-0.0500** (0.0692)
β_1	0.4351** (0.2017)	—	—	0.0193 (0.1598)	-0.0003 (0.0925)	0.0162 (0.0338)
β_2	-0.1722 (0.3098)	-0.1734 (0.2910)	-0.1869 (0.3226)	-0.6130 (0.7152)	0.0107 (0.1066)	0.0864* (0.0506)
β_3	0.6524*** (0.0137)	0.4870*** (0.0151)	0.4265*** (0.0163)	-0.0249 (0.9197)	-0.0406 (0.0474)	0.0047*** (0.0039)
β_4	-0.2171*** (0.0208)	—	—	0.0645 (0.1288)	-0.0369 (0.0374)	0.0632* (0.0346)
β_5	0.1602*** (0.0347)	0.1892*** (0.0324)	0.2156*** (0.0000)	-0.1685 (0.2751)	0.0901 (0.0854)	-0.1192 (0.0836)
β_6	0.2329 (0.6405)	0.4370 (1.4448)	0.068 (1.9213)	-0.1882 (0.4702)	0.4986 (0.3173)	0.1275 (0.1046)
β_7	0.5847 (0.6125)	0.8964 (1.0401)	0.9034 (1.2671)	0.1912 (0.4231)	-0.3600 (0.3174)	0.0837 (0.1000)
β_8	-0.0266*** (0.0000)	-0.0290*** (0.0040)	-0.0419*** (0.0006)	-0.0008 (0.0017)	0.0002 (0.0011)	-0.0002 (0.0004)
β_9	-27.762* (15.474)	-25.747 (26.009)	-51.239 (31.290)	6.5291 (8.9263)	2.7343 (6.7542)	0.7059 (2.5584)
R_{adj}^2	0.6810	0.683	0.6510	0.0055	0.0037	0.0189
n	1 948	822	690	1 453	1 317	1 948

Note: The regression including two dummy variables read $\Delta DM_{i,t} = \beta_0 + \beta_1 D_{1,t} + \beta_2 D_{2,t} + \beta_3 \Delta SWSPR_{i,t} + \beta_4 \Delta SWSPR_{i,t} * D_{1,t} + \beta_5 \Delta SWSPR_{i,t} * D_{2,t} + \beta \Delta Controls + \varepsilon_{i,t}$. Robust standard errors are given in parenthesis. ***, **, and * denote the 1%, 5%, and 10% level of significance, respectively.

The analysis confirms the statistical relevance of the FRN market expressed by its discount margin pricing against the fixed coupon swap spread for the Italian market. Bearing this caveat in mind we run a performance measurement for the four issuers expressed by the OI index over the bond sample as described in the bond matching section. As mentioned in the data set and bond matching section we find that due to the data availability and reliability no sufficient findings to interpret for the likes of EIB,

EFSF and AT. The table below shows the OI values for the issuer sets from which we conclude to focus on the most reliable data set from the Italian market analysis.

Table 4: Outperformance index for eleven key dates for different FRNs.

Outperformance Index in bps					
Event	Date	OI IT	OI EIB	OI EFSF	OI AT
1	12/05/2014	0.049	-0.478	n.a.	n.a.
2	30/04/2015	4.007	-0.389	n.a.	-3.379
3	11/08/2015	-4.348	0.782	n.a.	2.942
4	30/11/2015	6.191	-1.706	3.504	-2.913
5	21/03/2016	-5.570	3.869	2.899	3.321
6	21/03/2017	0.937	1.233	0.480	-15.467
7	03/05/2017	4.132	1.058	0.561	-0.030
8	25/07/2018	9.373	-1.326	-0.248	-2.408
9	26/09/2018	4.305	-0.796	0.209	6.946
10	02/05/2019	-0.173	0.986	-0.635	1.513
11	18/06/2019	-12.640	1.151	-0.002	-1.910

Next we combine the OI values for Italy in Tab. 5 with the expected market impacts stemming from the legal narrative. Shown in (i) is the legal narrative interpretation of each event categorized by either relaxing or tensing market uncertainty for FRN markets. We then link this impact assumption into a relative value financial impact of the market segment in (ii) where we categorize if FRN markets to either out-/underperform against the fixed coupon bond market. The simple logic is to assume increased demand due to (i) and hence higher prices, lower yields which is put in a relative value analysis in the OI turning (iii) more negative.

Table 5: Expected market impacts of decisions made on the identified key dates.

Event No.	Date	(i) legal narrative	(ii) financial impact	(iii) OI IT
1	12/05/2014	relaxing FRN uncertainty	FRN outperformance	0.049
2	30/04/2015	tensing FRN uncertainty	FRN underperformance	4.007
3	11/08/2015	relaxing FRN uncertainty	FRN outperformance	-4.348
4	30/11/2015	tensing FRN uncertainty	FRN underperformance	6.191
5	24/03/2016	relaxing FRN uncertainty	FRN outperformance	-5.570
6	21/03/2017	tensing FRN uncertainty	FRN underperformance	0.937
7	03/05/2017	relaxing FRN uncertainty	FRN outperformance	4.132
8	25/07/2018	relaxing FRN uncertainty	FRN outperformance	9.373
9	26/09/2018	tensing FRN uncertainty	FRN underperformance	4.305
10	02/05/2019	relaxing FRN uncertainty	FRN outperformance	-0.173
11	18/06/2019	relaxing FRN uncertainty	FRN outperformance	-12.640

We find for the eleven events observed in (iii) the out-/underperformance of the FRN market in basis points. From a pure pricing change perspective movements of less than one basis point are neglectable. Thus we observe three events (1, 6 & 10) without any impact. Six events match along the legal narrative. However, we also find a contrary market pricing move in two events (7 & 8).

Market reactions are observed and to understand their impact we use a simple significance test with the expected value (μ) and the standard deviation (SD) for each category of OI indicators. First, for positive OI values (implying tensing market uncertainty and FRN underperformance) we find μ at 4.14bps while the SD is at 2.89bps. This indicates

significance for the OI under tensing market uncertainty. Second, for relaxing market uncertainty and FRN outperformance, we retrieve $\mu = -5.68\text{bps}$ with the SD at 4.49bps . This result indicates non-significance.²⁰

In conclusion, we find that while the statistical significance of the break dates holds, the findings of the second analysis (OI values) impose a caveat. The OI is introduced based on the author’s practical approach trade/price FRN markets.²¹ The OI categorizes events by positive/negative values under a price pattern narrative. Under the applied samples the statistical significance can be obtained only for events under tensing market uncertainty and—consequently—positive OI values. With the available data set, for relaxing market uncertainty and negative OI values price reactions can be identified. However, they cannot be considered statistically significant.

With regard to the legal analysis, the publication of Italy to skip the right to enforce negative coupons (event 5) led to an outperformance of 6bps , yet stays below our expectations as this was considered to be the key event for outperformance. Confirming our expectations of outperforming FRN markets is the July ECB press conference (event 11) indicating lower rates for longer. This event resulted in the largest outperformance in FRN markets seen in the case study. As for other event results we find mismatches within our narrative in the court ruling on negative interest application on collateral agreements (events 7-8) while event 8 reveals the highest underperformance score. Though the ruling offered significance as a potential authority in the interpretation of bond documentation in future litigation, markets did not connect the outcome to a notable change risk.

5. Concluding Remarks

This contribution aims primarily to analyse the impact of stakeholder interactions with the market on the pricing of selected FRNs during the negative interest rate regime. Secondly, we analyse the range of reactivity of financial markets and issuers to uncertainty caused by an untested boilerplate term—N/A minimum rate of interest. Sovereign issuers react similarly to avoid the costs of moral hazard and expensive sovereign debt litigation. For this, we measure the change of FRN prices in the intra-bond market segment to differentiate them from other bond classes—namely the fixed coupon bond market segment.

Our findings suggest that attention has been placed on stakeholder activities, confirming our hypothesis with a caveat. We find that the markets gauge stakeholder activities regarding the N/A clause, but only to a limited extent. The Italian event concerns the Italian issuances, which also make up the majority of the FRN market. A notable pricing effect presents itself, tied to an endogenously instanced event. The English decisions

²⁰For brevity, we do not report details here. These results are available upon request.

²¹Notably, the market practice is to solely quote and trade FRN markets based on the discount margin.

illuminate the stances of courts in the orbit of negative interest rates of a dominating governing law, to which price reactivity indicates market sense toward court inclinations, albeit limited to the hard ruling of the court without particular care for argumentative nuances.

The announcement of further lower for longer rates in the Euro Area (event 11) shows the highest outperformance. We interpret this as evidence that the FRN market appreciates the current protection of negative coupons even under a lower Euribor. Consequently, the markets crowds into FRN markets while yields on comparable bonds decrease and a debate on potential negative fixed coupons sparks again while rates trend lower. Thus, while the Eurobond area is harkened as a legally convergent market with an appetite for harmonization, our findings suggest that markets have not reached the same conclusion.

We are also alerted by the significant changes in the FRN market structure. Despite very low interest rates, issuers increase their activities while bearing additional risks in hedging transactions. This supports the strand of scholarship finding that markets are limited by reputational or legal factors, adding that these issues do not need to be urgent, or post-factum in the case of a finding negative coupon applicable. We can also add to the findings of change in boilerplate terms in bond markets. The speed and relative severity of changes in issuances of FRNs with N/A in the NIRP timeline accentuates a high issuer awareness of potential legal risks, and a willingness to change legal documentation when inertia costs connected to sticky standardized documents with many stakeholders are not involved. Even more noteworthy is that the timing of the structural shift coincided closely to the dip into negative territory, highlighting, at the very least, consciousness of the associated risks, if not also opportunistic foresight to take advantage of the cheap funding in the prior ZIRP period. Our findings thus suggest a limit to the power of financial boilerplate in halting change.

Our study also provides implications for the broader debate on integration. Even with a single internal market and strides in the banking union, convergence in capital markets union is lagging behind in regards to their core behaviors. In the eyes of the market, different sovereigns, their activities, and legal positioning are still capable of forming isolated islands. As risk sharing is becoming a growing priority to secure the international role of the euro, further legal harmonization is necessary to connect the islands. This is particularly important considering current Brexit debates. Concurrently, the experiences on the EURIBOR benchmark reform matter after the experience that the first reform attempt—solely left to the industry—failed. Our research highlights that the themes of the aforementioned debates are capable of having material repercussions in markets. They are important to building a more secure euro area but necessitate deeper analysis.

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Appendix A. FRN pricing basics and discount margin (DM) computation

Consider a classic fixed coupon bond has the advantage that the cash flows are known; thus standard yield measures (e.g. yield to maturity) can be computed. However, FRN cash flows are unknown and as a result, in bond trading, there are different margin measures computed to express the FRN return/price. The most common ones called spread for life (also called ‘simple margin’) and, more importantly, the discount margin.²² A FRN’s coupon rate can be generally expressed as follows:

$$\text{Coupon FRN} = \text{reference rate} \pm \text{quoted margin.}$$

The quoted margin is simply an adjustment to the reference rate expressed in basis points (e.g. 6M EURIBOR +4bps (QM)). From a required yield perspective, the quoted margin which was fixed at issuance represented the additional credit spread required by the market at the time of issuance.

Now, assume a FRN would trade at a premium or discount to par value – this means the required yield is unequal to the QM + reference rate. For pricing, we need to consider this variation to par-value as it implies an additional income/loss for a bondholder due to changes in the required yield. In practice, FRNs are usually quoted using their DM as it is one common method of measuring potential return that employs discounted cash flows (Fabozzi & Mann, 2000, p.358).

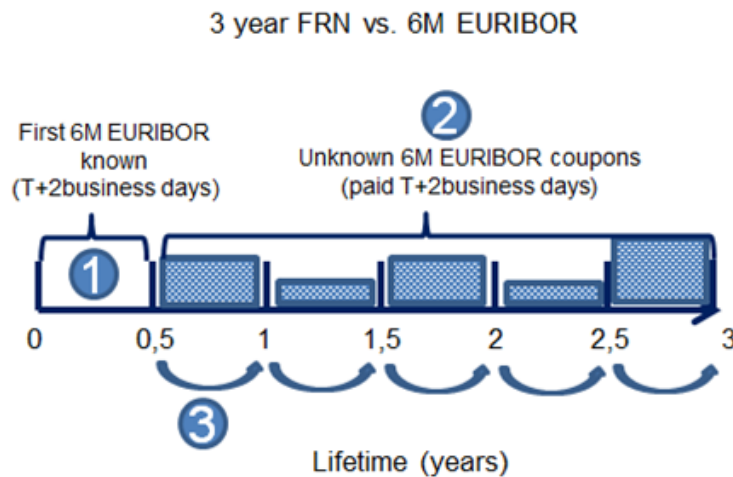


Figure A.2: Cash flow principles of a floating rate note.

In Figure A.2, we mark the initial known EURIBOR coupon (1), the unknown next coupons (2) and the resetting nature (3). The value determined on the day when the reference rate is applied (‘T’ is the fixing/reset day) is used to calculate the FRN’s coupon payment. Being indexed, the FRN coupon rate generally moves in the same direction as the underlying reference rate moves. As a result, a bondholder expecting rate increases would choose a FRN over straight coupon bond and vice versa. Interestingly, being the topic of this paper, the investors is protected to the downside due to a floored 0% coupon. FRN allow, different to fixed coupon bonds, no ex-ante yield to maturity calculation. To price a FRN we apply the same principle of discounting cash flows as for fixed coupon bonds. The assumption is for FRN pricing that a presumed same EURIBOR coupon for the remaining life of the FRN. As shown in Figure A.3 above, for FRN pricing we

²²There are further variations possible such as effective margin or total adjusted margin which we neglect for the purpose of this work

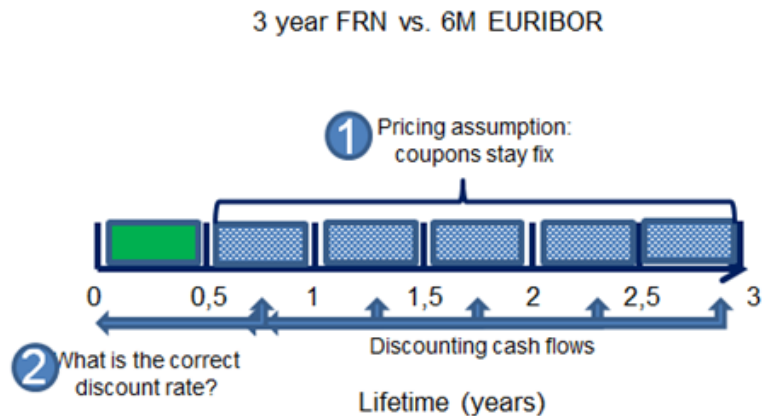


Figure A.3: Cash flow discounting principles of a floating rate note.

assume one constant coupon (1) which is then discounted. The challenge is to find the correct discount rate (2). As a result, in bond trading, there are different margin measures computed to express the FRN return/price. The way FRN prices are quoted in markets is by using the DM quotation (in bps). Figure A.4 below shows the main principle of identifying the correct discount (rate) margin. Computing the DM follows a recursive

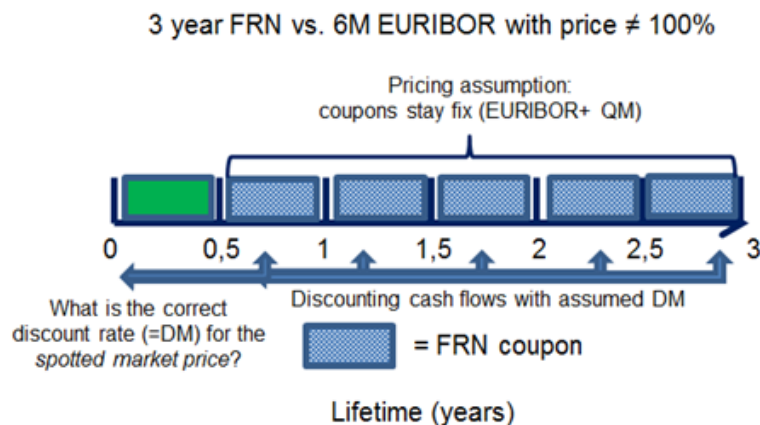


Figure A.4: Cash flow discounting principles of a floating rate note.

approach:

- a) Cash Flows: Defining the cash flows by applying a constant reference rate over the FRN lifetime;
- b) Define a DM: Add/deduct a DM to the assumed constant reference under a);
- c) Compute present value (PV): Discount the cash flows a) with the applied rate including the DM of b);
- d) Identify market price, then market price comparison: the PV of c) is compared with the market price in d). If $c) \neq d) \rightarrow$ adjust the assumed margin chosen in b) and iterate the steps until we compute the market price spotted;
- e) If $c) = d)$: once the PV c) equals the market price d) we identified the corresponding DM