Final report

Project information and reporting objectives

Project information

Project number:	294953
Project title:	Money Markets after the Global Financial Crisis: Functioning and Regulation
Activity / Programme:	FINANSMARKED
Project manager:	Rime, Dagfinn
Project owner:	STIFTELSEN HANDELSHØYSKOLEN BI
Project period:	2019.02.28 - 2025.01.01

Reporting objectives

1.	**Main page of the progress report:** Update progress report up to project completion date.	**Completed**
2.	**Final accounts:** Give a summary of the financial status of the project	**Completed**
3.	**Outcomes and impacts:** I understand that the information entered into the field for Outcomes and impacts will be made publicly accessible*	**Completed**
4.	**Results report:** Attach results report	**Completed**
5.	**Special reports:** Any requests for special reports must be fulfilled. Have special reports been submitted?	**Not applicable**
6.	**Final data management plan:** Has the final data management plan been uploaded?	**Not applicable**

Final accounts

Actual cost plan (Amount in NOK 1000)

Account	2025	2024	2023	2022	2021	2020	2019	Total sum
Payroll and indirect expenses	0	242	330	642	626	674	619	3,133
Procurement of R&D services	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	58	0	0	58
Other operating expenses	0	21	160	11	17	96	70	375
Sum	0	263	490	653	701	770	689	3,566

Actual cost code (Amount in NOK 1000)

Account	2025	2024	2023	2022	2021	2020	2019	Total sum
Trade and industry	0	0	0	0	0	0	0	0
Research institutes	0	0	0	0	0	0	0	0
Universities and university colleges	0	263	390	493	541	650	429	2,766
Other sectors	0	0	30	40	40	30	110	250
Abroad	0	0	70	120	120	90	150	550
Sum	0	263	490	653	701	770	689	3,566

Actual funding plan (Amount in NOK 1000)

Account	2025	2024	2023	2022	2021	2020	2019	Total sum
The Research Council	0	0	0	296	54	150	400	900
Own financing	0	242	230	472	433	415	354	2,146
Public funding	0	0	30	40	40	30	110	250
Private funding	0	0	0	0	0	0	0	0
International funding	0	0	70	120	120	90	150	550
Deviation	0	-21	-160	275	-54	-85	325	280
Deviation basis	0	263	490	653	701	770	689	3,566
Sum	0	242	330	928	647	685	1,014	3,846

Comment

Summary of the actual expenses:

- Research assistants: 187.287 RCN funded costs. The original budget was 240.000.
- Dagfinn Rime has been registered with a 10% work effort throughout the project. Sven Klingler has been registered with a 10% work effort until and including 2022. Both these positions are own financed. Total cost: 2.145.540.
- Norges Bank and the Bank of International Settlement (BIS) have contributed with an own financed effort equivalent to 250.000 each.
- Columbia Business School and the University of Zürich have contributed with an own financed effort equivalent to 150.000 each.

- A total of 354.474 was spent on data investments. RCN funded.
- A total of 20.512 was spent on travel for BI personnel. RCN funded.
- A total of 57.563 was spent on a dedicated project PC. RCN funded.

The total RCN funded costs were budgeted at 1.000.000. The final RCN funded costs were 379.969 lower than budgeted. The deviation is primarily due to fewer workshops and international travel costs throughout the project. The project has also invested in less data than budgeted.
Given that the project has not received the final 100.000, BI will refund the 279.969 of the received funding.

A total of 1.807.000 was included in the original budget as own financing from BI. The final own financing from BI is 2.145.540. The international funding (BIS, Columbia, Zürich) and the public funding (Norges Bank) were registered as budgeted, respectively 550.000 and 250.000.

Impacts and effects

Anticipated outcomes and impacts - from the grant application form

-

Achieved and potential outcomes and impacts - based on the project results

The results from the project has contributed to our understanding of the operation of money markets.

Results - Summary

Uploaded results - summary

Original filename: Final-report.pdf

File reference: RESULTAT_Sluttrapport11887592.pdf

Message to the Research Council of Norway

Special reports

Comment

Uploaded file

Final data management plan

Uploaded final data management plan

Progress report

Project information and reporting objectives

Project information

Project number:	294953
Project title:	Money Markets after the Global Financial Crisis: Functioning and Regulation
Activity / Programme:	FINANSMARKED
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Project period:	2019.02.28 - 2025.01.01
Report period:	2023.09.01 - 2025.01.01

Reporting objectives

1.	**Popular science presentation:** I understand that the text of the popular science presentation will be made publicly available*	**Yes**
2.	**Results:** Has information on publications been provided?	**Yes**
3.	**Performance indicators:** All results data that have emerged from the project are to be reported. Has this been done?	**Yes**
4.	**Fellowship grants:** Information regarding all fellowship grants must be complete and correct. Have you updated the man-months and other information for each fellowship-holder?	**No**
5.	**International cooperation:** The extent of international cooperation is to be indicated. Has any international cooperation taken place during the report period?	**Yes**
6.	**Special reports:** If any requests for special reports have been put forth by the case officer at the Research Council, these must be fulfilled.	**No**

Popular science presentation

Popular science presentation (Norwegian)

Pengemarkeder har en nøkkelrolle i det finansielle system. I pengemarkeder handles det instrumenter som ligger tett opp til penger -- gjeld med løpetid kortere enn et år. Disse markedene var sentrale i den siste finanskrisen, og var en av de viktigste grunnene til at Lehman Brothers gikk konkurs. Følgelig har pengemarkeder vært i fokus for regulerende myndigheter og en rekke reformer har blitt gjennomført i kjølvannet av finanskrisen. I dette prosjektet fokuserer vi på tre aspekter ved pengemarkeder i tiden etter finanskrisen.

Pengemarkeds-renter brukes ofte som tilnærming til den risiko-frie renten. Lærebøker i finans bruker den "risiko-frie" renten til å beskrive avkastningen på sikre verdipapirer og for å "tidsjustere" (diskontere) fremtidige kontantstrømmer. I teorien representerer den risiko-frie avkastningen det mest grunnleggende investeringsalternativet. I virkeligheten er det å bestemme den risiko-frie renten meget vanskelig, og det har ikke blitt noe lettere etter finanskrisen. Vi diskuterer en rekke alternativer og undersøker implikasjoner av senere tids reformer for de forskjellige alternativene. Klingler og Sundaresan (2020) ser på korte amerikanske statspapirer, og finner at avkastningen på disse papirene er betraktelig mer variabel enn andre mulige sammenligningsrenter. Videre, Klingler og Syrstad (2022) studerer alternative renter foreslått av regulerende myndigheter. Overskuddslikviditet i pengemarkedet, grunnet såkalte kvantitative lettelser, har presset en rekke pengemarkedsrenter ned mot nivået for risikofri rente. Dette er veldig tydelig i Sveits, Japan og EU, men ikke så tydelig i USA. Rime, Schrimpf og Syrstad (2022) ser på hvordan denne kompresjonen av renter har smittet over til USA via valuta-swap markedet. Syrstad og Viswanath-Natraj (2022) går mer i dybden av valuta-swap prising og ser nærmere på bidrag fra kvantitative lettelser og låneordninger mellom sentralbanker. Georgievska, Klingler, Rime og Syrstad (2023) følger opp Rime, Schrimpf og Syrstad og ser nærmere på hvordan banker med forskjellige karakteristika handler sammen for å nå sine kortsiktige finansieringsbehov.

Kortsiktig finansiering fungerer som et "smøremiddel" i det finansielle system. Banker og andre mellom-ledd i det finansielle system er viktige som tilretteleggere av tilbud og etterspørsel som ikke nødvendigvis faller nøyaktig sammen i tid, og dette er spesielt krevende i desentraliserte markeder (såkalte over-the-counter markeder). Som tilretteleggere bygger de opp beholdninger, som primært er finansiert i av kortsiktige pengemarkedslån. Dermed får kortsiktig finansiering direkte betydning for andre hvor lett det er å handle verdipapirer i andre markeder (markeds-likviditet). Dick-Nielsen, Poulsen og Rehman (2022) undersøker mer spesifikt hvordan nye reguleringer, som påvirker bankers evne til å holde kortsiktig gjeld, har slått ut i markeder for bedrifters gjeld (Corporate bonds). Klingler og Syrstad (2022) studerer bedrifters bruk av kortsikt finansiering fra pengemarkeder. Rehman (2022) sammenligner hvordan forskjeller i reguleringer av pengemarkedsfond i EU og USA påvirker i hvilken grad kundene ønsket å trekke ut pengene sine fra pengemarkedene i løpet av Covid-krisen.

Til slutt studerer vi pengemarkeders rolle for å gjennomføre pengepolitikken. Akram, Nyborg, Rehman, Rime og Syrstad (2023) bruker data for Norges Banks likviditets-auksjoner for å studere hvordan krav til sikkerhet, og hvilken sikkerhet bankene har tilgjengelig, påvirker pengemarkedsrenter. Natvik og Syrstad (2021) ser på hvordan sentralbankers kommunikasjon om fremtiden påvirker pengemarkeder.

Popular science presentation - Updated (Norwegian)

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Kortsiktig finansiering fungerer som et "smøremiddel" i det finansielle system. Banker og andre mellom-ledd i det finansielle system er viktige som tilretteleggere av tilbud og etterspørsel som ikke nødvendigvis faller nøyaktig sammen i tid, og dette er spesielt krevende i desentraliserte markeder (såkalte over-the-counter markeder). Som tilretteleggere bygger de opp beholdninger, som primært er finansiert i av kortsiktige pengemarkedslån. Dermed får kortsiktig finansiering direkte betydning for andre hvor lett det er å handle verdipapirer i andre markeder (markeds-likviditet). Dick-Nielsen, Poulsen og Rehman (2023) undersøker mer spesifikt hvordan nye reguleringer, som påvirker bankers evne til å holde kortsiktig gjeld, har slått ut i markeder for bedrifters gjeld (Corporate bonds). Klingler og Syrstad (2022) studerer bedrifters bruk av kortsikt finansiering fra pengemarkeder. Rehman (2024) sammenligner hvordan forskjeller i reguleringer av pengemarkedsfond i EU og USA påvirker i hvilken grad kundene ønsket å trekke ut pengene sine fra pengemarkedene i løpet av Covid-krisen.

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Rehman forsvarte i 2024 sin avhandling for PhD basert på de tre arbeidene som har vært del av dette prosjektet.

Popular science presentation (English)

Money markets are a cornerstone of the financial system that comprises 'money-like instruments' - debt securities with less than one year to maturity. These markets were at the epicenter of the financial crisis with dysfunctional money markets being one of the reasons for Lehman Brother's default. Consequently, money markets became the focus of financial regulators and went through major post-crisis reforms. In this research project, we focus on three roles of money markets in the post-crisis environment.

First, money market rates act as proxies for the risk-free interest rate. Virtually every textbook in financial economics uses the 'risk-free rate' to characterize the return on safe assets and for discounting of future cashflows. In theory, the risk-free rate characterizes the simplest possible investment opportunity. In practice, however, deciding which interest rate should be the "the risk-free rate" is a difficult question that became even more difficult after the financial crisis. Klingler and Sundaresan (2020) examine Treasury bill yields as candidate and find that Treasury yields are substantially more volatile than other benchmarks. Moreover, Klingler and Syrstad (2022) examine the alternative benchmark rates suggested by regulators. Excess liquidity, in the form of Quantitative easening (QE) by central banks, has compressed the level of different interest rates towards the level of the risk free rate (e.g., the central bank interest rate). This has particularly been the case in Switzerland, Euro-zone and Japan, but less so in the USA. Rime, Schrimpf and Syrstad (2022) study how this compression in one money market spill-over to the other money market (US) via the FX swap market. Syrstad og Viswanath-Natraj (2022) study in depth the contribution of quantitative easening and swap-lines between central banks contributed to FX swap pricing. Georgievska, Klingler, Rime og Syrstad (2023) follows Rime, Schrimpf and Syrstad and study in depth how banks with different characteristica trade in order to satisfy their short term funding.

Second, the role of short-term financing as a lubricant for the financial system. Security dealers play an important role in intermediating the demand and supply of securities that trade off centralized exchanges (the so-called over-the-counter securities). To provide this intermediation, dealers need to stock up their security inventories, which are mainly financed through short-term funding. Hence, a stable short-term financing market directly supports market liquidity - the ease of trading financial assets. Dick-Nielsen, Poulsen, and Rehman (2022) investigate the impact of post-crisis regulatory reforms on an important segment of over-the-counter market, the corporate bond market. In addition, Klingler, Syrstad, and Vuillemey (2021) examine firms usage of short-term financing. Rehman (2022) compare how the money market fund industry operate in EU and US in response to different regulations, and how this influences the customer's propensity to run on the funds.

Third, the role of money markets in implementing monetary policy. Akram, Nyborg, Rehman, Rime and Syrstad (2023) use Norwegian data on liquidity auctions - transactions in which banks pledge collateral with the central bank to obtain cash - and examine how Norges bank?s collateral policy (i.e. which collateral is accepted) affects money market rates. Natvik and Syrstad (2021) examine how central bank communication about the future impacts money markets.

Popular science presentation - Updated (English)

Money markets are a cornerstone of the financial system that comprises 'money-like instruments' - debt securities with less than one year to maturity. These markets were at the epicenter of the financial crisis with dysfunctional money markets being one of the reasons for Lehman Brother's default. Consequently, money markets became the focus of financial regulators and went through major post-crisis reforms. In this research project, we focus on three roles of money markets in the post-crisis environment.

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Second, the role of short-term financing as a lubricant for the financial system. Security dealers play an important role in intermediating the demand and supply of securities that trade off centralized exchanges (the so-called over-the-counter securities). To provide this intermediation, dealers need to stock up their security inventories, which are mainly financed through short-term funding. Hence, a stable short-term financing market directly supports market liquidity - the ease of trading financial assets. Dick-Nielsen, Poulsen, and Rehman (2023) investigate the impact of post-crisis regulatory reforms on an important segment of over-the-counter market, the corporate bond market. In addition, Klingler and Syrstad (2022) examine firms usage of short-term financing. Rehman (2024) compare how the money market fund industry operate in EU and US in response to different regulations, and how this influences the customer's propensity to run on the funds.

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During 2024 Rehman defended his dissertation for the PhD based on the papers which he participated in as part of this project.

Message to the Research Council of Norway

Results

Category: Academic monograph

Author(s)	Title	Publisher	Page number, from - to	Year	ISSN /ISBN	DOI
Nyborg, Kjell; Rehman, Obaidur; Rime, Dagfinn; Syrstad, Olav	Collateral Quality and Bidding Behavior in Central Bank Liquidity Auctions	Unpublished working paper		2024		
Georgievska, Ljubica; Klingler, Sven; Rime, Dagfinn; Syrstad, Olav	Maturity transformation in the FX swap market	BI		2024		
Rehman, Obaidur	Sponsor support and the run on Money Market Funds	BI Working Paper		2024		
Dick-Nielsen, Jens; Poulsen, Thomas; Rehman,, Obaidur	Dealer Networks and the Cost of Immediacy	Unpublished working paper		2023		
Gisle James Natvik; Olav Syrstad	International effects of forward guidance on money market rates	BI		2021		

Category: Academic article

Author(s)	Title	Journal title	Page number, from - to	Volume	Year	ISSN /ISBN	DOI
Sven Klingler, Suresh Sundaresan	Diminishing Treasury Convenience Premiums: Effects of Dealers' Excess Demand in Auctions	Journal of Monetary Economics	55-69	135	2023		10.1016/j.jmoneco.2023.01.002
Dagfinn Rime; Andreas Schrimpf; Olav Syrstad	Covered Interest Parity Arbitrage	Review of Financial Studies			2022		rfs/hhac026
Olav Syrstad; Ganesh Viswanath-Natraj	Price-setting in the Foreign Exchange Swap Market: Evidence from Order Flow	Journal of Financial Economics		146	2022		10.1016/j.jfineco.2022.07.004
Sven Klingler, Olav Syrstad	Life after LIBOR	Journal of Financial Economics	783-801	141	2021		10.1016/j.jfineco.2021.04.017

Category: New publication in the media

Author(s)	Title	Location/Type	Year	ISSN/ISBN	DOI
Sven Klingler, Olav Syrstad	Research Digest: What Drives Alternative Reference Rates	SOFR Academy	2020		https://sofracademy.com/research-digest-what-drive

Category: Other publication

Author(s)	Title	Journal/Type/Publisher	Year	ISSN/ISBN	DOI
Klingler, Sven; Syrstad, Olav	Disclosing the Undisclosed: Commercial Paper as Hidden Liquidity Buffer		2021		

Performance indicators

Dissemination measures for the general public

New publication in the media (newspapers, radio, TV, etc..)

2019	2020	2021	2022	2023	2024	2025	Cumulative number
0	1	0	0	0	0	0	1

Dissemination measures for users

Reports, memoranda, articles, presentations held at meetings/conferences for project target groups (public sector, trade and industry, organisations)

2019	2020	2021	2022	2023	2024	2025	Cumulative number
1	0	0	0	0	0	0	1

Scientific/scholarly publications

Book/report

2019	2020	2021	2022	2023	2024	2025	Cumulative number
0	0	1	0	1	3	0	5

Article

2019	2020	2021	2022	2023	2024	2025	Cumulative number
0	0	1	2	1	0	0	4

Fellowship grants

Fellowship grants funded under the project

International cooperation

International cooperation funded under the project (in NOK 1000)

Amount in NOK 1000

Country	2019	2020	2021	2022	2023	2024	2025
Switzerland	130	60	80	80	50	0	0
United States	20	30	40	40	20	0	0

Special reports

Comment

Uploaded file

Money Markets after the Global Financial Crisis: Final report

Sven Klingler Dagfinn Rime Olav Syrstad

Money markets form the cornerstone of a well-functioning financial system, ensuring the smooth flow of capital to its most productive use and acting as a lubricant for financial operations. Before the Global Financial Crisis (GFC) of 2007-2009, the functioning of money markets was essentially taken for granted. However, as highlighted by the GCF, disruptions of money markets can occur with potentially disastrous consequences. As a consequence of the GCF, financial supervisory authorities around the world have tightened the regulation of money markets. These new regulations, combined with unconventional monetary policy (also known as quantitative easing), has had a significant impact on the functioning of these markets.

There are two different segments of fixed income markets: money markets, comprising of short-term instruments with maturities of one year or less, and capital markets, comprising of longer-term debt with more than one year to maturity. These are of course tightly connected. In addition, investors access money markets of different countries using foreign exchange (FX) swaps, the exchange of two currencies at different maturities.

In the U.S. alone, the outstanding volume of the main money market instruments (so-called repos and commercial papers) are approximately USD 5 trillion (more than one quarter of the U.S. GDP). In addition, uncollateralized interbank borrowing and lending rates such as the London Interbank Offered Rate (LIBOR) are the benchmark rates in various financial contracts with an approximated volume of 350 trillion USD (over 15 times the size of the U.S. GDP). According to the BIS the daily volume of the FX swap market was 3.8 trillion USD in 2022.

Given the sheer size of these markets, small distortions can have profound consequences. One such consequence are violations of the principle of no-arbitrage—arguably the most important concept in financial economics—which ensures that the price of two assets with identical cash flows is identical. Below, we describe the contributions to the three main topics that we set out to study in this project: (i) Risk-free rates; (ii) Monetary policy; and (iii) Links to other markets.

Topic 1: Risk-free rates

Two pre-crisis paradigms, (i) collateralized loans (which is safer than an uncollateralized loan) should have a lower interest rate than comparable uncollateralized loans and (ii) U.S. Treasury yields should be below other proxies of the risk-free interest rate, are not valid anymore. Because interest rates on collateralized loans and Treasury yields are common proxies of the risk-free rate, this changing paradigm raises the following question: Which rate should we use as a proxy for the risk-free interest rate? Because financial institution, corporations, and investors all use the risk-free interest rate – either directly or indirectly – in their investment

decisions, understanding the benefits and limitations of different risk-free rate proxies is of paramount importance.

U.S. Treasuries are arguably the world's safest and most liquid financial assets and investors attach a "liquidity premium" or "convenience yield" to holding these assets (e.g., Longstaff (2004), Krishnamurthy and Vissing-Joergensen (2012), or Nagel (2016), among many others). The idea behind convenience yield is that investors cannot hold large amounts of cash and therefore need to place their money into safe assets with low trading costs. Since there is only a limited supply of Treasuries, investors' demand for safety and liquidity lowers Treasury yields. Hence, previous research suggests that Treasury yields are even lower than the risk-free interest rate. The cleanest proxy for the risk-free rate to date is the fixed rate in an overnight index swap (OIS)—contracts in which a fixed rate is exchanged against the average overnight bank lending rate. Taken together, these arguments suggest that the spread between the fixed rate in an OIS and Treasury yield with the same maturity (henceforth OIS-Treasury spread) should be positive.

The convenience yield of U.S. Treasuries was substantial before the financial crisis. However, after the financial crisis, the U.S. OIS-Treasury spreads regularly drop below zero. A negative OIS-Treasury spread suggests that the convenience yield has diminished considerably and questions the "safe haven" status of these assets. Klingler and Sundaresan (2023, JME) construct a new measure of dealers' balance sheet constraints for providing intermediation in U.S. Treasury markets, and trace these diminishing convenience premiums to primary dealers' ability to act as intermediaries. Even after accounting for Treasury supply, levels of interest rates, and other controls, falling excess demand of primary dealers in Treasury auctions, their increased Treasury holdings, and balance sheet constraints post-2015, remain key variables in explaining the diminishing convenience premiums.

Klingler and Syrstad (2021, JFE) examine alternative reference rates that are set to replace the London Interbank Offered Rate (LIBOR). The LIBOR used to be a widely used benchmark rate but after indication of collusion in benchmark setting regulators decided that the LIBOR should stop being used as benchmark by the end of 2021. Klingler and Syrstad (2021) show that (i) the level of the alternative benchmarks depend on the tightness of regulatory constraints imposed on the marginal lenders; (ii) increases in the amount of government debt outstanding increase the alternative benchmarks, more so for collateralized rates; and (iii) more central bank reserves lower the alternative benchmarks. Finally, the term rates based on the alternative reference rates can be detached from banks' marginal funding costs.

Topic 2: Monetary policy

Monetary policy traditionally has involved setting the central bank interest rate. This short-term rate is often viewed as *the* risk-free rate, although not accessible to a wide audience, and naturally influences the rest of the money market rates. With CB rates approaching zero following the GFC, many central banks has used excess liquidity, in the form of Quantitative easing (QE), in order to influence the interest rates relevant to a wider audience of the economy. This has compressed the level of different interest rates towards the level of the central bank interest rate, particularly in Switzerland, Euro-zone and Japan, and less so in the USA.

Rime, Schrimpf, and Syrstad (2022, RFS) study how this compression in one money market spill-over to the other money market (US) via the FX swap market. Participants in, e.g., Switzerland use their access to cheap funding in home market and swap into the US market, where they face relatively higher funding cost. Dealers in the FX swap market thereby need to elicit an opposite flow out of the US market in order to avoid inventory imbalances. In the process an Covered Interest Parity (CIP) arbitrage opportunity arises for a few high-rated

banks with access to cheap US funding. For most market participants, the no-arbitrage relation holds fairly well when implemented using marginal funding costs and risk-free investment instruments. Arbitrage trades are difficult to scale, however, because funding costs increase as soon as arbitrageurs increase positions. Georgievska, Klingler, Rime, and Syrstad (2024) follows Rime, Schrimpf and Syrstad and use detailed data from CLS to study in depth how large highly-rated banks utilize the FX swap market to obtain short-term funding and lend to Non-bank financial institutions (NBFIs) that need USD at longer maturity.

Syrstad and Viswanath-Natraj (2022, JFE) study in depth how the contribution of quantitative easening and swap-lines between central banks contributed to FX swap pricing using transaction level data from the inter-dealer FX swap market. They find that the price impact of imbalances in the FX swap increased from less than one basis point prior to 2008 to about five basis points after 2008. The increase in price impact was confined to periods of elevated dispersion in funding costs and over quarter-ends. Central bank swap lines reduced the imbalance in the FX swap market. Around quarter-ends dealer-banks face tighter regulatory constraints and use price more aggressively, i.e., create larger CIP-deviations, in order to curb flow into the US.

With central bank interest rates close to zero several central banks has also turned to communication in order to attempt to influence the relevant interest rates in the economy, so-called forward guidance. Natvik and Syrstad (2021) examine how central bank communication about the future impacts money markets.

Central banks decide which assets banks can pledged as collateral against funding and Nyborg (2016) argues that central banks collateral policy is as an important and integral component of monetary policy. For example, a wider range of pledgeable collateral makes it easier for banks to obtain liquidity. An example of such an easing is the allowance by Norges Bank of covered bonds as collateral during the GFC.

Norges Bank offers (or withdraw) liquidity using auctions. Using detailed data on banks bidding behavior, coupled with detailed data on their characteristics and use of collateral, Nyborg, Rehman, Rime, and Syrstad (2024) study the impact of collateral policy on auction outcomes. Banks strategically choose to pledge collateral with lower outside option with the central bank. Moreover, smaller banks with worse financial health and possessing lower-quality collateral tend to draw disproportionally larger liquidity in central bank liquidity auctions but not at higher prices.

Topic 3: Money markets and links to other markets

Security dealers play an important role in intermediating the demand and supply of securities. To provide this intermediation, dealers need to stock up their security inventories, which are mainly financed through short-term funding. Hence, a stable short-term financing market directly supports market liquidity—the ease of trading financial assets. Short-term financing, i.e., the money market, therefore act as a lubricant for the whole financial system.

Given the low interest rate regime since the onset of the financial crisis, the US corporate bond market has enjoyed an exponential growth in issuances, and it currently stands in the neighborhood of USD 7.8 trillion.[1] However, this development has been concurrent with a noticeable decrease in turnover,[2] which has elevated concerns about liquidity deterioration in the corporate bond market. This sentiment is also widely echoed in the views shared by many buy-side firms, who find themselves increasingly constrained due to arising illiquidity in the

[1] 2018 SIFMA Fact Book.

[2] Turnover is defined as total principal amount traded as a percentage of aggregate amount outstanding. According to estimates from MarketAxess, aggregate tunrover in the US corporate bond market has approximately fallen by 30% for the period 2010 to 2017

corporate bond market.[3] Given the sheer size and significance of corporate bond market to real economic activity, any possible deterioration in liquidity warrants a careful examination.

According to data collected by Federal Reserve Bank of New York, primary dealers net inventory of corporate bond securities have dramatically declined since the onset of financial crisis. The sharp decrease in inventory holdings of dealer banks has ushered a debate among academics and policy makers on whether the post-crisis regulatory reforms that primarily aim to restrict risk-taking capacity of dealer banks have unintentionally hampered their market-making capacity, and consequently worsened liquidity in corporate bond market. A core tenet of Basel III capital requirements is the supplementary leverage ratio (SLR), which is defined as the ratio of equity capital to total assets irrespective of their riskiness.[4] By imposing an indiscriminate capital surcharge against all assets, critics argue that SLR has inadvertently impaired liquidity in low margin activities such as Treasury repos (Duffie, 2018).

Dick-Nielsen, Poulsen, and Rehman (2023) investigate the impact of post-crisis regulatory reforms on dealers capacity to provide liquidity in the corporate bond market. Dealers with a central positions within the network of the market provide more liquidity and can better manage their inventory from liquidity provision than than peripheral dealers do. Customers benefit by this, while other more peripheral dealers face higher cost in interdealer trading with core dealers. These findings support recent network models in which central dealers have a comparative advantage in managing inventory. Post-crisis regulatory reforms increased the cost of holding inventory. Higher inventory costs increased the comparative advantage of core dealers in managing inventory and also increase the incentive for dealers to become better connected.

Prime money market funds (MMFs) play a crucial role in money markets as holder of securities issued by institutions with short-term borrowing needs. Prior to the GFC MMFs were regarded as safe, as an alternative to cash. However, the GFC showed that in periods where investors want safety (cash) MMFs may not be able to provide the cash lent (i.e., the funds "broke the buck"). In order to avoid "run on funds" US regulators have allowed fund sponsors, owners of the funds, to support their funds during periods of acute market stress. While sponsor support can help restore investor confidence in the fund, it also poses a moral hazard by distorting the market discipline of fund managers. Rehman (2024) compare how the money market fund industry operate in EU and US in response to different regulations, and how this influences the customer's propensity to run on the funds, by exploiting the Covid crisis of March 2020 as a special case. US-based prime MMFs affiliated with strong sponsors engage in higher ex-ante risk-taking behavior. During the Covid crisis, investors do not deem the safety net of strong sponsors as credible, and run more intensely on their affiliate funds. EU based prime funds are prohibited from seeking sponsor support, and the analysis show no differences between sponsor strength, ex-ante risk-taking behavior, or the crisis outcomes for EU-based prime funds.

References

Dick-Nielsen J., Poulsen T., and Rehman O. (2023). Dealer networks and the cost of immediacy. Tech. rep., BI.

Duffie D. (2018). Financial regulatory reform after the crisis: An assessment. *Management Science*, 64(10), 4835–4857.

[3] A 2016 Greenwich Associates study reports that among 400 credit investors interviewed, more than 80% indicated that reduced liquidity in corporate bonds constrains their investment strategies.

[4] The largest US bank holding companies are required to have a minimum leverage ratio of 5%.

Georgievska L., Klingler S., Rime D., and Syrstad O. (2024). Maturity transformation in the FX swap market. Tech. rep., BI.

Klingler S. and Sundaresan S. (2023). Diminishing treasury convenience premiums: Effects of dealers' excess demand and balance sheet constraints. *Journal of Monetary Economics*, 135, 55–69.

Klingler S. and Syrstad O. (2021). Life after LIBOR. *Journal of Financial Economics*, 141(2), 783–801.

Krishnamurthy A. and Vissing-Jorgensen A. (2012). The aggregate demand for treasury debt. *Journal of Political Economy*, 120(2), 233–267.

Longstaff F.A. (2004). The flight-to-liquidity premium in U.S. treasury bond prices. *Journal of Business*, 77(3), 511–526.

Nagel S. (2016). The liquidity premium of near-money assets. *Quarterly Journal of Economics*, 131(4), 1927–1971.

Natvik G.J. and Syrstad O. (2021). International effects of forward guidance on money market rates. Tech. rep., BI.

Nyborg K., Rehman O., Rime D., and Syrstad O. (2024). Collateral quality and bidding behavior in central bankliquidity auctions. Tech. rep., BI.

Nyborg K.G. (2016). *Collateral Frameworks*. Cambridge University Press.

Rehman O. (2024). Sponsor support and the run on money market funds. Tech. rep., BI.

Rime D., Schrimpf A., and Syrstad O. (2022). Covered interest parity arbitrage. *Review of Financial Studies*, 35(11), 5185–5227.

Syrstad O. and Viswanath-Natraj G. (2022). Price-setting in the foreign exchange swap market: Evidence from order flow. *Journal of Financial Economics*, 146(1), 119–142.