

ECB tiering and money market rates: The devil is in the details

by Dr. Luca Cazzulani, Deputy Head of FI Strategy (UniCredit Bank, Milan)

- Tiering has become a hot topic recently. One important issue is that it may create upward pressure on short-maturity money market and repo rates.
- Tiering has been implemented in other countries with no pressure on money market rates. However, the eurozone has important differences compared to these other countries.
- Tiering in the eurozone would have to consider two important aspects: that excess liquidity is not distributed evenly across the eurozone and that there are multiple collaterals (i.e. government bonds) with different repo rates.
- To minimize the impact on MM rates, especially in the periphery, the possibility to benefit from less negative deposit rates should be open only to banks with very large liquidity balances. This might be tricky as excess liquidity is concentrated in the core countries.

1. Tiering and short-term MM rates

Mario Draghi has recently indicated that the ECB is studying how to mitigate the direct costs that negative rates have on banks. One option would be via tiering of banks reserves.

Implementation of tiering in the eurozone is likely to be more complicated than in other countries because excess liquidity is not distributed smoothly across the area and because there are multiple collaterals, each with its own repo rate. One source of concern is that tiering may create upward pressure on short-maturity money market and repo rates.

Against this backdrop, it is not too surprising that comments and remarks from ECB officials indicate there is still no consensus regarding such a measure.

In this note we discuss how tiering has been implemented in other countries, how money market rates have responded and what lessons can be learnt. We also discuss how eurozone MM rates are likely to respond under different tiering scenarios.

2. Negative rates and tiering

Negative rates have been adopted by a number of central banks in the past five years to maintain monetary policy sufficiently accommodative. To name some, policy rates are currently negative in Switzerland, Japan, Denmark, Sweden and in the eurozone.

The motivation for the introduction of negative rates has been to preserve an easy monetary policy stance; in some cases this goal has been related to excessive currency appreciation.

Negative interest rates imply direct costs for banks, particularly when the amount of reserves becomes large. This weighs on their profitability and may affect the transmission of monetary policy. Because of this, along with the decision to cut rates into negative territory, a mechanism to alleviate this direct cost on banks has frequently been introduced, typically in the form of exempting a portion of banks excess reserves from negative rates (tiering).

The technicalities of tiering vary from country to country depending on the institutional framework. In each country in which negative policy rates have been adopted, the banking system holds reserves above required amounts, either as a result of QE or of large inflows from foreign investors. However, the way excess liquidity is held at the central bank differs across jurisdictions. In Japan, Switzerland and the euro area, the banking sector liquidity surplus is held as overnight deposits, whereas in Denmark and Sweden the central bank uses a combination of overnight and one-week liabilities. Because of this, Switzerland and Japan are more similar to the eurozone and are a better reference for how the ECB may decide to implement tiering. In the next section we will briefly analyze how tiering works in Switzerland and Japan and then we will focus on the eurozone.

3. The case of Switzerland and the SNB

The SNB cut rates below zero in January 2015 and at the same time introduced a tiering of reserves:

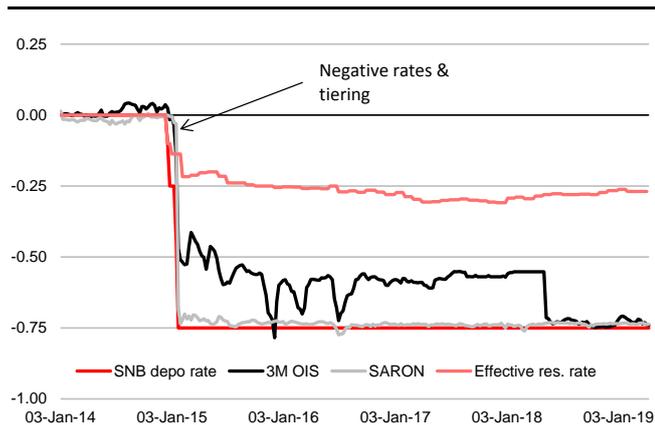
- Domestic banks are charged 0% up to 20 times the minimum reserve requirement for the reporting period 20 October 2014-19 November 2014. The level is adjusted to prevent account holders from substituting cash for sight deposits.
- Sight deposits of account holders that are not subject to the minimum reserve requirement (e.g. foreign banks and securities dealers) are charged 0% up to CHF 10mn.

Reserves in excess of these thresholds are charged the SNB rate (currently -0.75%). Hence, in Switzerland the difference between the best and the worst rate applied to reserves is 75bp.

Using statistics on banks reserves published by the SNB, we can obtain a rough estimate of the effective rate charged to the banking system in aggregate. Because banks' reserves are charged 0% up to a certain (elevated) threshold, the effective cost of reserves is significantly less negative than the policy rate.

Chart 1 shows the behaviour of money market rates in the Swiss market. The main takeaway is that short-term money market rates appear to have been driven mainly by the marginal cost of excess reserves (the SNB rate) rather than by their average cost.

CHART 1: NEGATIVE POLICY RATES AND THE SHORT END – SWITZERLAND



The downward jump at the end of 2018 is merely technical and reflects the discontinuation of TOIS fixing and its replacement with SARON.

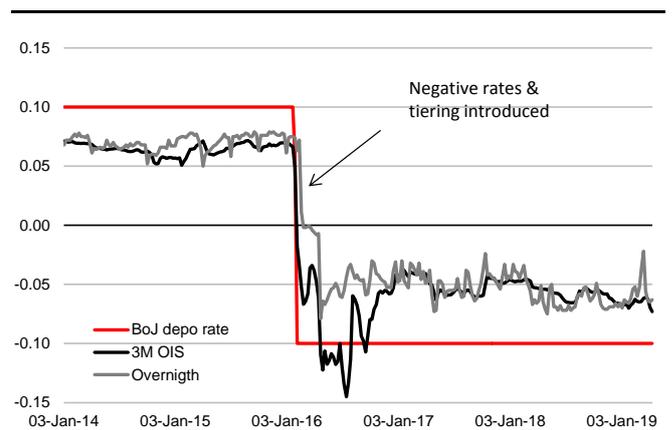
The effective reserve rate is based on our calculations.

Source: SNB, Bloomberg, UniCredit Research

The amount of reserves that are charged -0.1% is roughly JPY 5tn, which corresponds to about 2% of banks' reserves. Before July 2018 it was approximately JPY 10tn (around 4% of reserves).

Hence, we calculate that the banking system as a whole has continued to receive a positive rate on reserves even after the introduction of negative rates¹.

CHART 2: NEGATIVE POLICY RATES AND THE SHORT END – JAPAN



Source: BoJ, Bloomberg, UniCredit Research

4. The case of Japan and the BoJ

The Bank of Japan introduced negative rates in January 2016, along with a tiering of reserves, which, as stated by the BoJ, aims to encourage negative-interest-rate transactions in the money market. Current accounts at the Bank of Japan have been divided into three tiers:

- Banks receive a positive interest rate (+0.1%) on the balance held during the period Jan15-Dec15 (named basic balance).
- Banks are not charged on the required reserve, on some special operations related to the Great East Japan Earthquake and on an amount calculated as a certain ratio of their basic balance (this component is named Macro add-on). The rationale is to avoid changes in banks reserves related to QE leading to increases in the cost of reserves. The ratio is adjusted periodically by the BoJ.
- Banks are charged -0.1% on the amount of reserves that exceeds the sum of the basic balance and the Macro add-on.

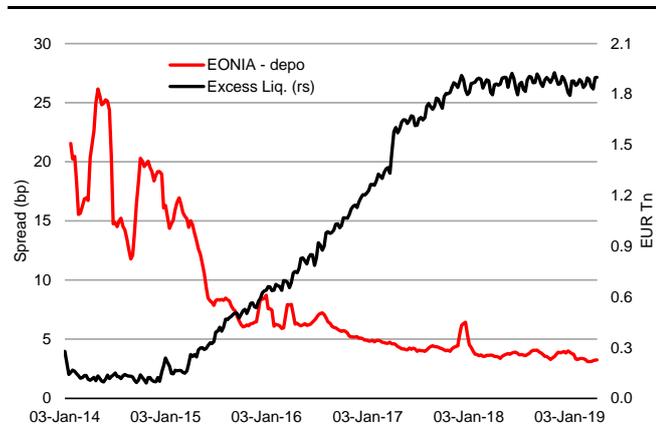
Chart 2 shows that, similar to what happened in Switzerland, MM rates in Japan have been driven by the marginal cost of reserves rather than by their average cost. The experience of Japan is particularly interesting as it shows that even a very small fraction of excess reserves charged at negative rates can be enough to push MM rates towards the policy rate. As a note caution, this could reflect country specific factors as well as the fact that the difference between the negative rate and the nearest deposit rate is very small (10bp).

5. Excess liquidity and MM rates: The eurozone experience

The ECB cut the deposit rate below zero in June 2014 to stimulate the eurozone economy and to contribute to a return of inflation rates to levels closer to 2%. Back in June 2014, excess liquidity in the eurozone was fairly low. Indeed, MM rates were trading relatively close to the refi rate and moved towards the depo rate only with the start of PSPP, which led to a sizable increase in excess liquidity.

¹See https://www.boj.or.jp/en/announcements/release_2016/k160129b.pdf for more details

CHART 3: HIGH EXCESS LIQUIDITY PUSHED EONIA TOWARDS THE DEPO RATE



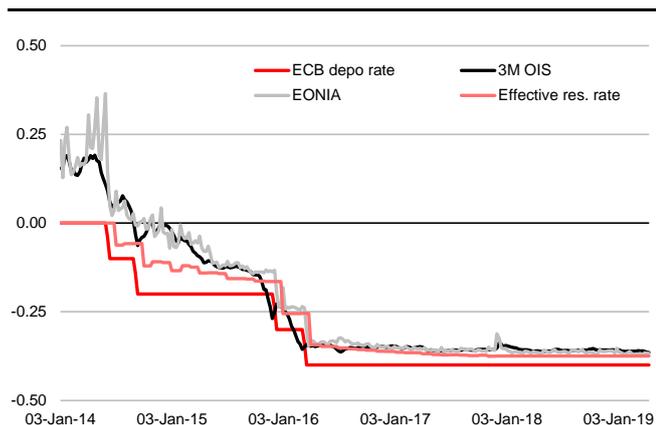
Source: ECB, Bloomberg, UniCredit Research

Unlike the SNB and the BoJ, the ECB did not introduce a tiering mechanism when it cut rates into negative territory. However, the minimum reserve requirement (which represents around 5% of total reserves in the eurozone) is charged 0%, which already represents a “tiering” mechanism, although a mild one.

The difference between the best and the worst rate applied to reserves is currently 40bp; we calculate that the effective cost of banks’ reserves is slightly less negative than the depo rate (by around 5bp).

Chart 4 illustrates the behaviour of MM rates in the eurozone.

CHART 4: NEGATIVE POLICY RATES AND THE SHORT END – EUROZONE



The effective reserve rate is based on our calculations.

Source: ECB, Bloomberg, UniCredit Research

The following table provides a comparison of MM rates in the three jurisdictions:

TABLE 1: MONEY MARKET RATES: CHF, JPY AND EUR

		SNB	BOJ	ECB
	Share of reserves charged lowest rate	30%	2%	95%
Rate	Central bank deposit rate	-0.75	-0.10	-0.40
	Estimated effective rate on reserves	-0.23	0.07	-0.35
	Overnight	-0.74	-0.06	-0.36
	3M OIS	-0.72	-0.06	-0.36
	3M Libor	-0.73	-0.06	-0.32
Spread vs. policy rate	Estimated effective rate on reserves	52	17	5
	Overnight	1	4	4
	3M OIS	3	4	4
	3M Libor	2	4	8

Data refer to the average of the last 12 months

Source: Bloomberg, UniCredit Research

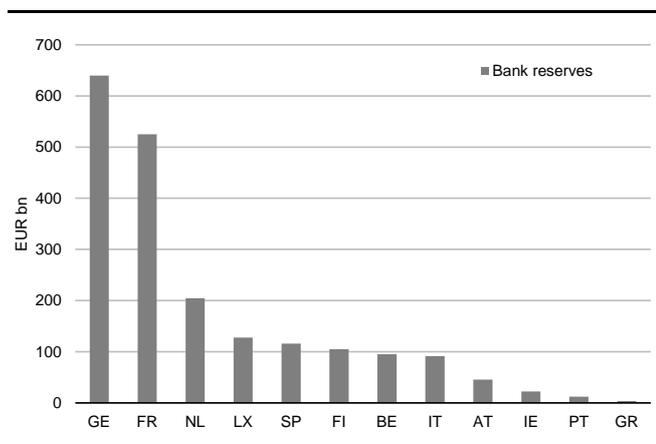
In all the three cases, MM rates trade at negative levels and with a small spread to the policy rate. This is true also for Switzerland and Japan, where a relatively large amount of banks reserves are not charged negative rates due to tiering. In this respect, one may argue that in the eurozone, the share of banks’ reserves that is charged at the most negative rate is considerably higher than in other countries. Hence, there should be room for the ECB to introduce tiering without putting upward pressure on MM rates.

Before reaching this conclusion, we need to take a closer look at how bank reserves are distributed in the eurozone.

6. Peculiarities of the eurozone and implications going forward

Unlike Switzerland and Japan, the eurozone is not a single country, which creates a number of peculiarities. The first one is that the excess liquidity created by QE is not uniformly distributed across the area but is highly concentrated in the core countries. As illustrated in Chart 5, Germany, France and the Netherlands account for about 70% of reserves.

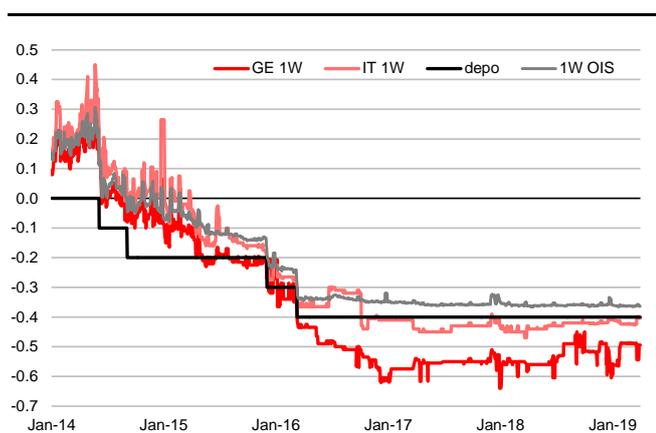
CHART 5: BANK RESERVES ARE UNEVENLY DISTRIBUTED



Source: ECB, UniCredit Research

The second is that there are multiple collaterals (the government bonds issued by the various countries), which have different repo rates. Chart 6 shows the General Collateral (GC) repo rate for German and Italian bonds, along with the 1M OIS.

CHART 6: GERMAN AND ITALIAN REPO RATES



Data are adjusted to remove end of quarter effect

Source: Bloomberg, UniCredit Research

Repo rates reflect availability of collateral (the less collateral is available, the lower the repo rate) as well as the amount of liquidity in the system (high excess liquidity tends to lower repo rates).

German repo rates are well below the ECB depo rate as the combination of ECB QE purchases and regulation has created scarcity of collateral. Banks owning German collateral should be able to make a profit from repo-ing it and depositing cash at the ECB. The volume of such transactions is probably relatively small and not enough to push repo rates back toward the ECB deposit rate. On the other hand, banks that are long liquidity have no incentive to lend it at rates that are well below the ECB depo.

Italian repo rates are very close to the ECB depo rate. Because collateral scarcity is less of an issue, there is no strong pressure to the downside.

At the same time, when repo rates climb above the deposit rate, there is an incentive for banks to deploy some liquidity in the repo market, which pushes repo rates back towards the depo.

When designing a tiering mechanism, the ECB will have to balance the trade-off between offering relief to banks (which requires that a relatively large amount of reserves is exempted from the negative rate) and avoiding unwarranted tightening (which requires that enough reserves are charged negative rates).

Chart 5 suggests that the impact on MM rates in core countries is likely to be relatively limited. Germany, France and the Netherlands have a large amount of excess reserves. Even if a portion of it is charged at a cheaper rate than the depo, the remaining amount should be enough to ensure that EONIA and other MM rates remain close to the depo rate. Because of collateral scarcity, the German repo rate would likely also remain tight.

The situation is potentially different for the periphery given that excess reserves are lower and that banks hold a relatively high stock of government bonds.

The impact of tiering on repo rates in countries where banks hold lower amounts of excess liquidity will ultimately depend on how it is designed.

If the setup is similar to the one adopted by the SNB and BoJ (reserves are exempted up to a certain threshold), banks will have the possibility to deposit some liquidity at the higher rate regardless of the total they hold. This would be more likely to put upward pressure on repo rates as banks will have a higher incentive to repo their bonds and place the liquidity at the cheaper ECB rate; and will have lower incentive to give liquidity at rates that are lower compared to the best level they can get from the ECB with tiering.

If, on the other hand, banks are charged the depo rate on their reserves with an exemption only above a certain threshold, then only the ones that hold very large liquidity balances will have access to the cheaper rates. This would likely reduce the case for upward pressure on repo rates.

Judging a possible threshold is tricky, as data on reserve requirements are not available for all eurozone countries (and certainly not at single-name level).

Table 2 shows the amount of the minimum reserve requirement in some countries, along with some hypothetical scenarios for tiering: Scenario 1 which is the same setting adopted in Switzerland and Scenario 2 where the lower rate would be applied only to the reserve requirement and on reserves beyond a certain threshold.

To minimize impact on MM rates, under Scenario 1 the central bank should set a low threshold while in Scenario 2 a high threshold should be chosen.

TABLE 2: RESERVES ARE EXEMPTED UP TO A CERTAIN THRESHOLD

			IT	SP	FR	GE	Tot.	Effective rate on reserves
		Res. req.	15	13	25	35	88	
		Reserves	90	115	525	620	1350	
		Ratio	6	9	21	18	15	
Scenario 2	5 times the res. req.	Exempted	75	65	125	175	440	-0.27%
		Depo	15	50	400	445	910	
Scenario 2	10 times the res. req.	Exempted	90	115	250	350	805	-0.16%
		Depo	0	0	275	270	545	
Scenario 2	5 times the res. req.	Exempted	15	50	125	175	365	-0.29%
		Depo	75	65	400	445	985	
Scenario 2	10 times the res. req.	Exempted	0	0	275	270	470	-0.26%
		Depo	90	115	250	350	880	

Scenario 1: exemption up to a given threshold

Scenario 2: beyond a given threshold

All values in EUR bn. Reserves are calculated as the sum of the current accounts and the deposit facility. The last column, "Total", refers to the four countries in the table. Under Scenario 2, the minimum reserve is considered exempted.

Source: Bloomberg, UniCredit Research

Under scenario 1, with an exemption threshold of five times the reserve requirement, the amount of reserves charged at the depo in the four countries analyzed would be around EUR 900bn, likely enough to keep EONIA and other MM rates anchored to the depo. In Italy and Spain, however, a significant amount of reserves would be charged at 0%, with potential implications for domestic repo rates. With a higher exemption threshold (10 times the reserve requirements), excess liquidity charged at the depo rate would still be fairly large for Germany and France. For Italy and Spain, the amount of reserved exempted from the depo rate would increase even further.

Under Scenario 2, a high exemption threshold would ensure that a high level of excess liquidity is charged at the depo rate, which would minimize upward pressure on MM rates. The benefit in terms of interest-rate savings for banks would be more limited than in the previous case.

The table helps to illustrate that, because excess liquidity is unevenly distributed, the benefits of the two different setups would also be distributed unevenly. This makes tiering a complicated decision.

Author

Dr. Luca Cazzulani,
 Deputy Head of FI Strategy
 (UniCredit Bank, Milan)
 +39 02 8862-0640
luca.cazzulani@unicredit.eu

Previous editions of Rates Perspectives

- » Who are the foreign investors in Italian government debt? A breakdown by geography and institution - 3 April 2019
- » Bund-swap has lagged Schatz in cheapening: why we expect a correction - 18 March 2019
- » Keeping in place the Fed's current monetary policy framework will likely benefit USTs - 4 March 2019
- » Euribor und ESTER: Wo stehen wir, wohin gehen wir - 19 February 2019
- » Euribor and ESTER: Where we stand, where we're going - 15 February 2019
- » Our scorecard for EMU countries: A useful tool for detecting misalignments in EGBs valuations - 30 January 2019
- » Six years after the introduction of CACs in the eurozone: Analyzing the effect on pricing - 10 January 2019
- » Supply Outlook 2019: primary market activity to gradually shift to shorter maturities - 6 December 2018
- » Scarcity of Bunds to keep real yields low - 29 October 2018
- » Measuring rating expectations for BTPs - 4 October 2018
- » Scarcity of Bunds (and safe eurozone paper) will remain an issue in 2019 - 17 September 2018
- » CCTs: a good buying opportunity on a medium-term horizon - 30 July 2018
- » ECB QE reinvestments: maturity matters - 18 July 2018
- » ECB forward guidance: we like 5/30Y flatteners and sovereign credit-risk exposure - 2 July 2018
- » Investing in USTs: to hedge or not to hedge? - 18 June 2018
- » Who holds the BTPs? Dissecting Italian public debt investor base - 5 June 2018
- » Italy funding, progress, cost and outlook: as good as it gets - 17 May 2018
- » A model for POLGB yields - 3 May 2018
- » 10Y BTP-SPGB spread: wide compared to fundamentals but convergence to fair value is tricky - 19 April 2018
- » T-LTRO II early repayments: why we are not concerned - 5 April 2018
- » US 10Y fair value model part II: breakeven inflation - 22 March 2018
- » Upside risks to the US term premium - 8 March 2018
- » US real yields are in line with our fair-value model - 26 February 2018
- » Foreign ownership of EM local currency debt: trends, indices and effects on FX and yields - 8 February 2018
- » EUR-USD cross currency: no normalization in sight - 25 January 2018
- » Italy's 2018 funding: how to trade it - 11 January 2018
- » We prefer credit to duration risk, especially at the longer maturities - 7 December 2017
- » CEE rates are unlikely to spike in 2018 - 23 November 2017
- » UST market: will foreign investors come to the rescue? - 9 November 2017
- » Utilizing typical Bund futures trading patterns around major events - 25 October 2017
- » Real natural rate (r^*) estimates suggest that 10Y real Bund yields and swap rates trade at 'absurdly' low levels - 12 October 2017
- » The empirical trade-off between rating and credit spreads - 28 September 2017
- » PSPP reinvestment will pick up next year, partly offsetting tapering - 14 September 2017
- » European bond markets: macro revision trend remains a key ingredient for timing purposes - 1 September 2017
- » The 'T-word': lessons from the US experience - 20 July 2017
- » 10/30Y spreads the two sides of the Atlantic: play it tactically - 7 July 2017
- » Inflation-linked bonds: striking the right balance between inflation projections and current ILB valuations - 23 June 2017
- » A hit-and-run bond-market approach that is based on economic-surprise indices - 13 June 2017
- » Even with tapering, QE will buy most of next year net supply - 26 May 2017
- » ECB's QE: Is scarcity of German paper for real? - 16 May 2017
- » The best way to track ECB rate-hike expectations - 27 April 2017
- » Don't panic: the wide gap between economic policy uncertainty and implied equity volatility is an opportunity... - 6 April 2017
- » EUR-USD cross currency swap: why we expect a return to more negative levels - 23 March 2017

Legal Notices

Glossary

A comprehensive glossary for many of the terms used in the report is available on our website: [link](#)

Disclaimer

Our recommendations are based on information obtained from or are based upon public information sources that we consider to be reliable, but for the completeness and accuracy of which we assume no liability. All information, estimates, opinions, projections and forecasts included in this report represent the independent judgment of the analysts as of the date of the issue unless stated otherwise. We reserve the right to modify the views expressed herein at any time without notice. Moreover, we reserve the right not to update this information or to discontinue it altogether without notice. This report may contain links to websites of third parties, the content of which is not controlled by UniCredit Bank. No liability is assumed for the content of these third-party websites.

This report is for information purposes only and (i) does not constitute or form part of any offer for sale or subscription of or solicitation of any offer to buy or subscribe for any financial, money market or investment instrument or any security, (ii) is neither intended as such an offer for sale or subscription of or solicitation of an offer to buy or subscribe for any financial, money market or investment instrument or any security nor (iii) as marketing material within the meaning of applicable prospectus law. The investment possibilities discussed in this report may not be suitable for certain investors depending on their specific investment objectives and time horizon or in the context of their overall financial situation. The investments discussed may fluctuate in price or value. Investors may get back less than they invested. Fluctuations in exchange rates may have an adverse effect on the value of investments. Furthermore, past performance is not necessarily indicative of future results. In particular, the risks associated with an investment in the financial, money market or investment instrument or security under discussion are not explained in their entirety.

This information is given without any warranty on an "as is" basis and should not be regarded as a substitute for obtaining individual advice. Investors must make their own determination of the appropriateness of an investment in any instruments referred to herein based on the merits and risks involved, their own investment strategy and their legal, fiscal and financial position. As this document does not qualify as an investment recommendation or as a direct investment recommendation, neither this document nor any part of it shall form the basis of, or be relied on in connection with or act as an inducement to enter into, any contract or commitment whatsoever. Investors are urged to contact their bank's investment advisor for individual explanations and advice.

Neither UniCredit Bank AG, UniCredit Bank AG London Branch, UniCredit Bank AG Milan Branch, UniCredit Bank AG Vienna Branch, UniCredit Bank Austria AG, UniCredit Bulbank, Zagrebačka banka d.d., UniCredit Bank Czech Republic and Slovakia, ZAO UniCredit Bank Russia, UniCredit Bank Czech Republic and Slovakia Slovakia Branch, UniCredit Bank Romania, UniCredit Bank AG New York Branch nor any of their respective directors, officers or employees nor any other person accepts any liability whatsoever (in negligence or otherwise) for any loss howsoever arising from any use of this document or its contents or otherwise arising in connection therewith.

This report is being distributed by electronic and ordinary mail to professional investors, who are expected to make their own investment decisions without undue reliance on this publication, and may not be redistributed, reproduced or published in whole or in part for any purpose.

Responsibility for the content of this publication lies with:

UniCredit Group and its subsidiaries are subject to regulation by the European Central Bank

a) UniCredit Bank AG (UniCredit Bank, Munich or Frankfurt), Arabellastraße 12, 81925 Munich, Germany, (also responsible for the distribution pursuant to §34b WpHG). Regulatory authority: "BaFin" – Bundesanstalt für Finanzdienstleistungsaufsicht, Marie-Curie-Str. 24-28, 60439 Frankfurt, Germany.

b) UniCredit Bank AG London Branch (UniCredit Bank, London), Moor House, 120 London Wall, London EC2Y 5ET, United Kingdom. Regulatory authority: "BaFin" – Bundesanstalt für Finanzdienstleistungsaufsicht, Marie-Curie-Str. 24-28, 60439 Frankfurt, Germany and subject to limited regulation by the Financial Conduct Authority, 12 Endeavour Square, London E20 1JN, United Kingdom and Prudential Regulation Authority 20 Moorgate, London, EC2R 6DA, United Kingdom. Further details regarding our regulatory status are available on request.

c) UniCredit Bank AG Milan Branch (UniCredit Bank, Milan), Piazza Gae Aulenti, 4 - Torre C, 20154 Milan, Italy, duly authorized by the Bank of Italy to provide investment services.

Regulatory authority: "Bank of Italy", Via Nazionale 91, 00184 Roma, Italy and Bundesanstalt für Finanzdienstleistungsaufsicht, Marie-Curie-Str. 24-28, 60439 Frankfurt, Germany.

d) UniCredit Bank AG Vienna Branch (UniCredit Bank, Vienna), Rothschildplatz 1, 1020 Vienna, Austria. Regulatory authority: Finanzmarktaufsichtsbehörde (FMA), Otto-Wagner-Platz 5, 1090 Vienna, Austria and subject to limited regulation by the "BaFin" – Bundesanstalt für Finanzdienstleistungsaufsicht, Marie-Curie-Str. 24-28, 60439 Frankfurt, Germany. Details about the extent of our regulation by the Bundesanstalt für Finanzdienstleistungsaufsicht are available from us on request.

e) UniCredit Bank Austria AG (Bank Austria), Rothschildplatz 1, 1020 Vienna, Austria. Regulatory authority: Finanzmarktaufsichtsbehörde (FMA), Otto-Wagner-Platz 5, 1090 Vienna, Austria

f) UniCredit Bulbank, Sveta Nedelya Sq. 7, BG-1000 Sofia, Bulgaria. Regulatory authority: Financial Supervision Commission (FSC), 16 Budapeshta str., 1000 Sofia, Bulgaria

g) Zagrebačka banka d.d., Trg bana Josipa Jelačića 10, HR-10000 Zagreb, Croatia. Regulatory authority: Croatian Agency for Supervision of Financial Services, Franje Račkoga 6, 10000 Zagreb, Croatia

h) UniCredit Bank Czech Republic and Slovakia, Želetavská 1525/1, 140 92 Praga 4, Czech Republic. Regulatory authority: CNB Czech National Bank, Na Příkopě 28, 115 03 Praga 1, Czech Republic

i) ZAO UniCredit Bank Russia (UniCredit Russia), Prechistenskaya nab. 9, RF-119034 Moscow, Russia. Regulatory authority: Federal Service on Financial Markets, 9 Leninsky prospekt, Moscow 119991, Russia

j) UniCredit Bank Czech Republic and Slovakia, Slovakia Branch, Šancova 1/A, SK-813 33 Bratislava, Slovakia. Regulatory authority: CNB Czech National Bank, Na Příkopě 28, 115 03 Praha 1, Czech Republic and subject to limited regulation by the National Bank of Slovakia, Imricha Karvaša 1, 813 25 Bratislava, Slovakia. Regulatory authority: National Bank of Slovakia, Imricha Karvaša 1, 813 25 Bratislava, Slovakia

k) UniCredit Bank Romania, Bucharest 1F Expozitiei Boulevard, 012101 Bucharest 1, Romania. Regulatory authority: National Bank of Romania, 25 Lipsani Street, 030031, 3rd District, Bucharest, Romania

l) UniCredit Bank AG New York Branch (UniCredit Bank, New York), 150 East 42nd Street, New York, NY 10017. Regulatory authority: "BaFin" – Bundesanstalt für Finanzdienstleistungsaufsicht, Marie-Curie-Str. 24-28, 60439 Frankfurt, Germany and New York State Department of Financial Services, One State Street, New York, NY 10004-1511

Further details regarding our regulatory status are available on request.

ANALYST DECLARATION

The analyst's remuneration has not been, and will not be, geared to the recommendations or views expressed in this report, neither directly nor indirectly.

All of the views expressed accurately reflect the analyst's views, which have not been influenced by considerations of UniCredit Bank's business or client relationships.

POTENTIAL CONFLICTS OF INTERESTS

You will find a list of keys for company specific regulatory disclosures on our website <https://www.unicreditresearch.eu/index.php?id=disclaimer>.

RECOMMENDATIONS, RATINGS AND EVALUATION METHODOLOGY

You will find the history of rating regarding recommendation changes as well as an overview of the breakdown in absolute and relative terms of our investment ratings, and a note on the evaluation basis for interest-bearing securities on our website <https://www.unicreditresearch.eu/index.php?id=disclaimer> and <https://www.unicreditresearch.eu/index.php?id=legalnotices>.

ADDITIONAL REQUIRED DISCLOSURES UNDER THE LAWS AND REGULATIONS OF JURISDICTIONS INDICATED

You will find a list of further additional required disclosures under the laws and regulations of the jurisdictions indicated on our website

<https://www.unicreditresearch.eu/index.php?id=disclaimer>.

UniCredit Research*

Strategy Research



Erik F. Nielsen
Group Chief Economist
Global Head of CIB Research
+44 207 826-1765
erik.nielsen@unicredit.eu



Dr. Ingo Heimig
Head of Research Operations
& Regulatory Controls
+49 89 378-13952
ingo.heimig@unicredit.de

Head of Strategy Research



Dr. Philip Gisdakis
Head of Strategy Research
+49 89 378-13228
philip.gisdakis@unicredit.de

FI Strategy Research



Michael Rottmann
Head
+49 89 378-15121
michael.rottmann1@unicredit.de



Dr. Luca Cazzulani
Deputy Head
+39 02 8862-0640
luca.cazzulani@unicredit.eu



Francesco Maria Di Bella
FI Strategist
+39 02 8862-0850
francescomaria.dibella@unicredit.eu



Chiara Cremonesi
FI Strategist
+44 207 826-1771
chiara.cremonesi@unicredit.eu



Kornelius Purps
FI Strategist
+49 89 378-12753
kornelius.purps@unicredit.de

FX Strategy Research



Kathrin Goretzki, CFA
FX Strategist
+44 207 826-6076
kathrin.goretzki@unicredit.eu



Kiran Kowshik
EM FX Strategist
+44 207 826-6080
kiran.kowshik@unicredit.eu



Roberto Mialich
FX Strategist
+39 02 8862-0658
roberto.mialich@unicredit.eu

Credit Strategy Research



Dr. Philip Gisdakis
Head
+49 89 378-13228
philip.gisdakis@unicredit.de



Dr. Stefan Kolek
EEMEA Corporate Credits & Strategy
+49 89 378-12495
stefan.kolek@unicredit.de

Equity Strategy Research



Christian Stocker, CEFA
Lead Equity Sector Strategist
+49 89 378-18603
christian.stocker@unicredit.de



Elia Lattuga
Deputy Head of Strategy Research
Cross Asset Strategist
+44 207 826-1642
elia.lattuga@unicredit.eu

Cross Asset Strategy Research

UniCredit Research, Corporate & Investment Banking, UniCredit Bank AG, Am Eisbach 4, D-80538 Munich, globalresearch@unicredit.de
Bloomberg: UCCR, Internet: www.unicreditresearch.eu

SR 19/1

*UniCredit Research is the joint research department of UniCredit Bank AG (UniCredit Bank, Munich or Frankfurt), UniCredit Bank AG London Branch (UniCredit Bank, London), UniCredit Bank AG Milan Branch (UniCredit Bank, Milan), UniCredit Bank New York (UniCredit Bank, New York), UniCredit Bank AG Vienna Branch (UniCredit Bank, Vienna), UniCredit Bank Austria AG (Bank Austria), UniCredit Bulbank, Zagrebačka banka d.d., UniCredit Bank Czech Republic and Slovakia, ZAO UniCredit Bank Russia (UniCredit Russia), UniCredit Bank Romania.