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EUROSYSTEM

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Stability and Security.

NOVEMBER 2018

The OeNB's semiannual Financial Stability Report provides regular analyses of Austrian and international developments with an impact on financial stability. In addition, it includes studies offering in-depth insights into specific topics related to financial stability.

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Contents

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Call for applications: Visiting Research Program

The Oesterreichische Nationalbank (OeNB) invites applications from external researchers (EU or Swiss nationals) for participation in a Visiting Research Program established by the OeNB's Economic Analysis and Research Department. The purpose of this program is to enhance cooperation with (preferably postdoc) members of academic and research institutions who work in the fields of macroeconomics, international economics or financial economics and/or whose research has a regional focus on Central, Eastern and Southeastern Europe.

The OeNB offers a stimulating and professional research environment in close proximity to the policymaking process. Visiting researchers are expected to collaborate with the OeNB's research staff on a prespecified topic and to participate actively in the department's internal seminars and other research activities. They will, as a rule, have access to the department's computer resources, and they will also be provided with accommodation on demand. Their research output may be published in one of the department's publication outlets or as an OeNB Working Paper. Research visits should ideally last between three and six months, but timing is flexible.

Applications (in English) should include

- a curriculum vitae,
- a research proposal that motivates and clearly describes the envisaged research project,
- an indication of the period envisaged for the research visit, and
- information on previous scientific work.

Applications for 2020 should be e-mailed to *eva.gehringer-wasserbauer@oenb.at* by May 1, 2019.

Applicants will be notified of the jury's decision by mid-June 2019.

Financial stability means that the financial system – financial intermediaries, financial markets and financial infrastructures – is capable of ensuring the efficient allocation of financial resources and fulfilling its key macroeconomic functions even if financial imbalances and shocks occur. Under conditions of financial stability, economic agents have confidence in the banking system and have ready access to financial services, such as payments, lending, deposits and hedging.

Recent developments

Financing to nonfinancial corporations and households in Austria is up as risk indicators improve

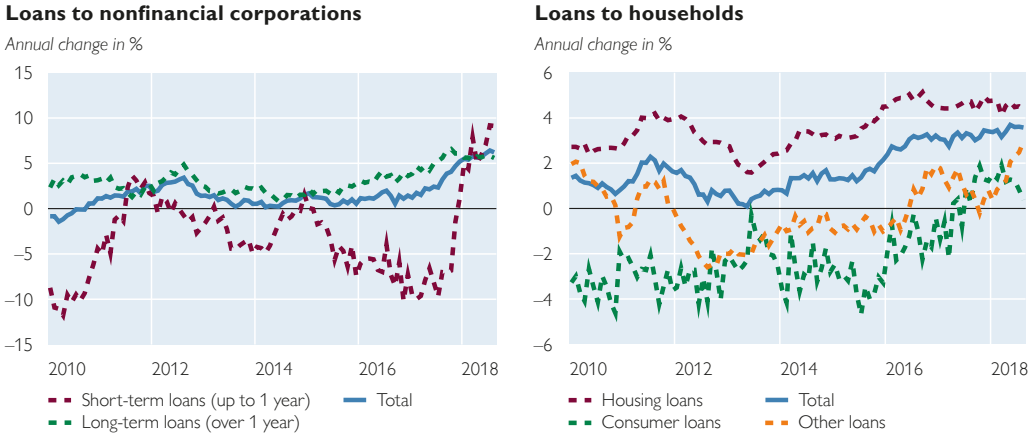
Lending by Austrian banks to domestic nonfinancial corporations gained further momentum over the course of 2018. In August 2018, lending reached an annual growth rate of 6.2% (adjusted for securitization, reclassifications, valuation changes and exchange rate effects). The strongest contribution to this upturn came from loans with longer maturities (over five years), which also account for the largest share in outstanding volumes. In terms of specific industries, the increase in corporate loans in the twelve months to August 2018 was strongly driven by real estate activity, which accounted for over half of total credit expansion (i.e. change in stocks).

Corporate loan demand continued the upward trend that began two years ago. Reflecting current cyclical conditions, the corporate sector's demand for funding to finance fixed investment was a major driver of increasing loan demand in the first three quarters of 2018, while internal financing continued to diminish loan demand, according to the euro area bank lending survey's results for Austria. In contrast, banks continued their cautious lending policies. While pressure from competition, especially from other banks, was cited most often as the reason banks have eased their credit standards in recent quarters, reduced risk tolerance contributed to a slightly more cautious stance.

Credit conditions remained favorable. Historically low bank lending rates continued to support lending to the corporate sector. This reflects the stance of monetary policy as well as narrower interest rate margins for average loans. Margins on riskier loans, however, were largely left unchanged during the last few quarters. This points toward differentiated risk pricing by banks.

Chart 1

MFI loans to Austrian nonfinancial corporations and households



Source: OeNB.

To a large extent, bank loans took the place of other forms of finance. In the first half of 2018, nonfinancial corporations' external financing was down by 17% on the year. Debt financing remained attractive due to low interest rates and thus provided the bulk of nonfinancial corporations' external financing, even

if its overall volume was down slightly on the year. Loans by domestic banks accounted for over one-third of debt financing in the first half of 2018. In contrast, debt financing from other nonfinancial corporations – in the form of both loans (to a large extent transactions within corporate groups) and trade credit – decreased markedly. According to financial accounts data, net corporate bond issuance was negative at EUR 0.5 billion in the first half of 2018, low corporate bond yields notwithstanding. Only 5% of nonfinancial corporations' external financing came in the form of equity financing.

Furthermore, firms drew down on credit lines that had been granted in the past. The total amount of undrawn credit lines available to enterprises – which had been increased steadily over the previous four years – decreased by EUR 6 billion in the first eight months of 2018. Yet, at close to EUR 27 billion, the levels of unutilized liquidity were still high by historical standards, especially if firms' transferable deposits, which continued to rise briskly (+11.7% year on year in August 2018), are taken into account. Moreover, increasing corporate profitability, as measured by growth in gross operating surplus, improved the corporate sector's internal financing potential (and at the same time facilitated debt servicing).

The debt sustainability of Austrian nonfinancial corporations improved in the first half of 2018. Compared to the same period of the preceding year, the corporate sector's debt-to-income ratio decreased by 6 percentage points to 381%. Corporate sector financial debt (measured in terms of total loans raised and bonds issued) grew at a slower pace (4.1%) than gross operating surplus (5.6%). The low interest rate environment, together with the economic recovery, continued to support firms' current debt servicing capacity. The ratio of interest payments on (domestic) bank loans to gross operating surplus continued to decline slightly in the first half of 2018, falling to 2.8%.

Austrian households continued to prefer liquid assets. Households' financial investments increased by 22% to EUR 9.2 billion in the first half of 2018. In the low nominal interest rate environment, households shifted EUR 12.4 billion into overnight deposits with domestic banks. As this figure exceeds the amount of total financial investments, this implies a considerable shift away from other financial assets. Net financial investments in capital market instruments were negative during this period. While households reduced their direct holdings of debt securities and listed shares, they continued to transfer funds into mutual funds. For all three asset categories, households posted (unrealized) valuation losses of EUR 2 billion in the first half of 2018, or 1.7% of the amount outstanding at the end of last year.

The growth rate of lending to households remained stable in recent months. In August 2018, bank loans to households (adjusted for reclassifications, valuation changes and exchange rate effects) increased by 3.6% year on year. While loans for all purposes showed positive year-on-year growth rates – consumer loans grew by 0.4% and other loans by 3.0% –, the main contribution to loan growth came from housing loans, which account for almost two-thirds of the outstanding volume of loans to households. Their growth rate reached 4.4% year on year in August 2018. According to the bank lending survey (BLS), banks' credit standards for housing loans to households tightened slightly in the first three quar-

ters of 2018, after remaining stable overall in 2017. At the same time, the slight but continuous increase in household demand for housing loans reported by banks in recent years abated over the course of this year.

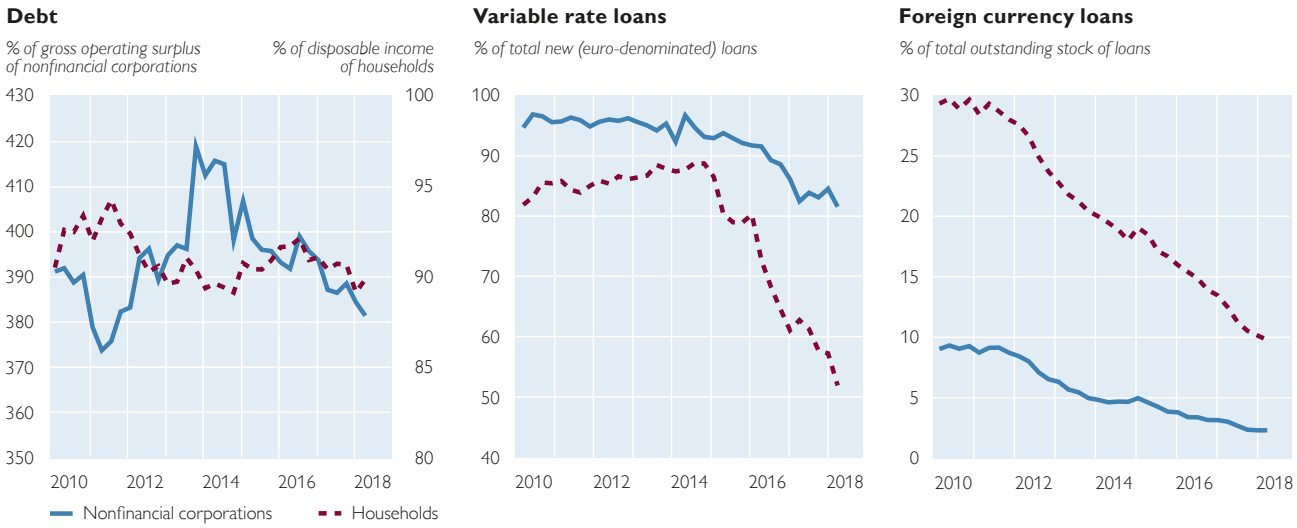
Conditions for housing loans remained favorable. Interest rates for new bank loans remained at the very low levels recorded in the preceding years. While banks reported in the BLS that margins for average loans were eased (i.e. lowered) further in the first three quarters of 2018 due to high competition, the margins on riskier loans were tightened slightly. Collateral requirements and other terms and conditions (such as noninterest charges, loan covenants, loan maturity and loan size) remained broadly unchanged during the same period.

Credit risk indicators in the household sector improved in the first half of 2018, but risks remain. Households' debt-to-income ratio remained broadly stable at 90%. The share of variable rate loans (loans with an initial rate fixation period of up to one year) continued to decrease in the first half of 2018. In the second quarter of 2018, they accounted for 52% of new lending (in euro) to households compared to 80% in the same quarter three years earlier; over the same period, variable rate loans as a share of housing loans fell by nearly half from 76% to 40%. Yet the share of variable rate loans is still quite high by international comparison. Likewise, despite decreasing further in the first half of 2018 to slightly below 10% of all outstanding loans to households (and to 12.5% of housing loans), foreign currency loans remain a risk factor.

Residential property prices in Austria continued to rise in the first half of 2018. Reflecting this pickup, the OeNB fundamentals indicator for residential property prices in Vienna increased slightly to 21.4% in the second quarter of 2018. For Austria as a whole, the indicator reached 11.1%, implying that the increasing overvaluation observed in recent years continued.

Chart 2

Risk indicators for Austrian nonfinancial corporations and households



Source: OeNB, Statistics Austria.

Austrian banks profit from benign environment but clouds are gathering on the horizon

In the first half of 2018, Austrian banks continued to benefit from a very benign macroeconomic environment with improving credit risk costs and strong loan demand. However, global downside risks persist and are starting to cloud the horizon after a long period of economic recovery. These downside risks include rising global debt levels, the ongoing sovereign-bank nexus combined with gradual monetary policy tightening and international challenges (e.g. Brexit, trade disputes, volatility spikes in certain emerging markets). In this challenging environment, the Austrian Financial Market Stability Board (FMSB) addressed a key national macroprudential issue by publicly communicating clear benchmarks for sustainable real estate lending standards.

Consolidation within the Austrian banking sector continued in the first half of 2018. The number of banks as well as the number of branches declined further in the first six months of the year. At the same time, the banking sector's total assets increased to around EUR 972 billion. CESEE exposures rose to EUR 245 billion, with the strongest increases occurring in the Czech Republic, Russia and Slovakia.

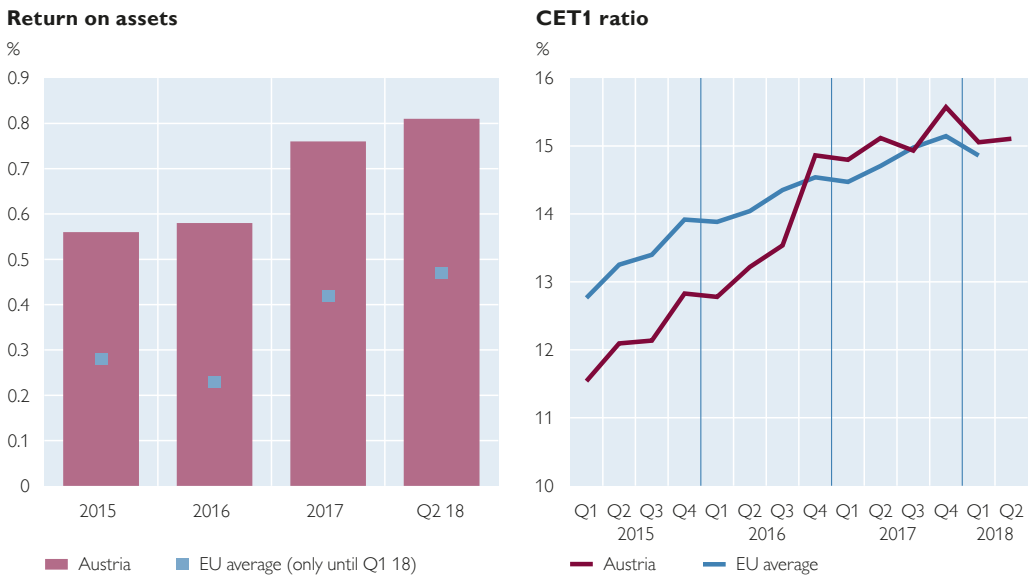
Austrian banks continued to raise their profits, supported by a release of risk provisions, with net profits increasing by nearly 7% year on year to EUR 3.6 billion in the first half of 2018. Even though net interest income was up for the first time since 2015, total operating income stagnated due to negative trading results and reduced other operating income. Operating expenses rose slightly, leading to a marginally weaker cost-to-income ratio of around 66%. Finally, net profits were propelled by negative risk provisioning – i.e. more provisions have been released than recognized – amid a favorable macroeconomic environment and improving credit quality. The return on average assets of the Austrian banking system remained constant at 0.8%. Despite this positive development in terms of overall profitability, banks must continue to improve their structural efficiency in order to maintain sustainable profitability in case the economy weakens and provisioning needs increase again.

The credit quality of the Austrian banking system improved further in the first half of 2018, as the overall NPL ratio of Austrian banks decreased to 3.1%. The improvement was especially pronounced in corporate loan portfolios, while the quality of consumer loans weakened slightly. Due to provision releases, the coverage ratio of NPLs deteriorated slightly. Nonetheless, at 51%, it is still well above the European average of 46% reported by the European Banking Authority. The potential for further loan quality improvements is expected to moderate, which is one reason why the credit rating agency Moody's reduced its outlook for the banking system from positive to stable in August 2018.

The increase in the capitalization of Austrian banks subsided in the first half of 2018. The common equity tier 1 (CET1) capital ratio of Austrian banks was 15.1% at the end of both the first and second quarters of 2018, slightly above the EU average of 14.9% (this figure refers to the first quarter). Although Austrian banks increased their capital in absolute terms, risk-weighted assets also grew, driven by a pickup in loan growth in Austria and in CESEE.

Chart 3

Profitability and capitalization of banks



Source: OeNB, ECB.

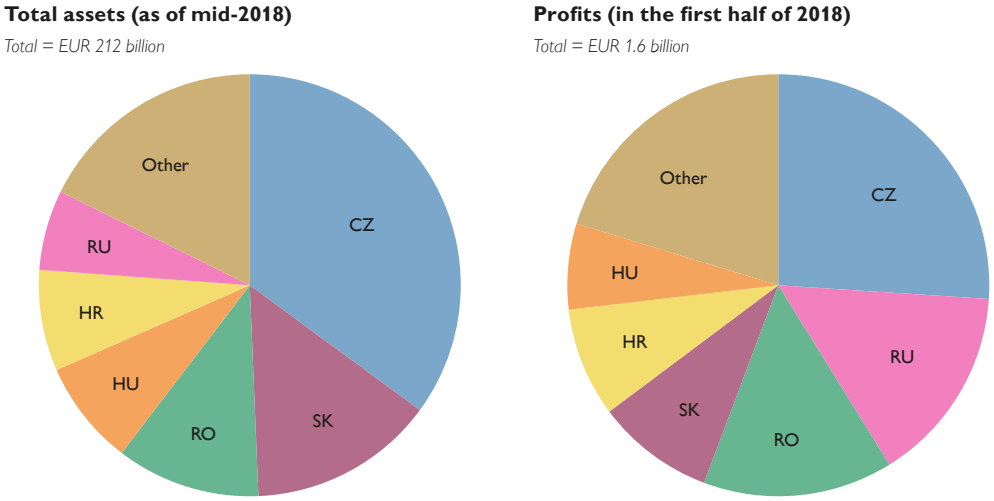
After several years of restructuring, activities of Austrian banking subsidiaries in CESEE are fairly concentrated, albeit in EU Member States. Over a third of these subsidiaries' total assets are located in the Czech Republic. When assets in Slovakia, Romania, Hungary and Croatia (in descending order) are added, these five countries account for over three-quarters of the total. The picture is similar for profits in the first half of 2018, even though the Russian host market gains in importance due to its high return on assets: Subsidiaries in the Czech Republic account for slightly over one-quarter, and when Russia, Romania, Slovakia and Croatia are added, these five countries account for nearly three-quarters of all profits.

Austrian banking subsidiaries in CESEE earned EUR 1.6 billion in the first half of 2018, aided by continued loan growth and net provision releases. These profits were 3.6% higher in year-on-year terms and translate into a 1.5% annualized return on average assets. While the main source of operating income, i.e. net interest income, was higher due to loan growth (with the net interest margin remaining broadly flat), lower trading income as well as higher operating costs meant that operating profits were virtually unchanged year on year. The release of loan loss provisions helped push profits higher, with net provision releases in nearly three quarters of all CESEE host markets.

The asset quality of all loans granted by Austrian banking subsidiaries in CESEE continued to improve, while capitalization levels remained stable. The decline of the NPL ratio to 3.9% as of mid-2018 marks the continuation of an established trend, while the coverage ratio for NPLs rose to 64%. It is worth noting, however, that a quarter of all gross loans granted by Austrian CESEE subsidiaries were issued to central banks, credit institutions and governments, i.e. counterparties that have negligible NPL ratios. The aggregated CET1 ratio of Austrian subsidiaries in CESEE remained stable at 15%.

Chart 4

Total assets and profits of Austrian banking subsidiaries in CESEE



Source: OeNB.

Intra-group liquidity transfers to CESEE credit institutions rose substantially in the first half of 2018, while local funding positions remain sustainable. These liquidity transfers amounted to EUR 26 billion in mid-2018. The increase was dominated by transfers to credit institutions in the Czech Republic, which make up two-thirds of the total, as the positive yield differential to the euro area continues to attract intra-group funds. At the same time, the local funding positions of all foreign subsidiaries of Erste Group Bank and Raiffeisen Bank International are considered to be sustainable (in accordance with the Austrian supervisory Sustainability Package[1]), and the aggregated loan-to-local stable funding ratio remained stable year on year. At 76%, the latter is substantially below 110%, which Austrian authorities consider to be an early warning threshold at the individual entity level.

Macroprudential supervision has contributed substantially to reducing systemic risks in the past few years. In July 2018, the FMSB adopted three recommendations[2] to the Austrian Financial Market Authority (FMA) concerning macroprudential capital buffers. First, the FMSB concluded that the systemic risk buffer is key to countering long-term, noncyclical systemic risks in the Austrian banking system. In particular, banks should be able to absorb potential shocks stemming from stress at other banks (systemic vulnerability), i.e. risks stemming from the risk-sharing mechanism in the financial system, and from reputational effects. Second, having re-evaluated the systemic importance of individual banks, the FMSB recommended that the buffer for other systemically important banks be applied to seven Austrian banks. In addition, the FMSB concluded that banks may also be systemically relevant at the unconsolidated level. Standard & Poor's upgrade of the Austrian banking system (Banking Industry Country Risk Assessment in

[1] *For more details, see https://www.oenb.at/en/financial-market/financial-stability/sustainability-of-large-austrian-banks-business-models.html.*

[2] *For more details, see https://fmsg.at/en/publications/warnings-and-recommendations/2018.html.*

May 2018) underpins the success of macroprudential activities. Austrian banks and, by extension, the Austrian economy may consequently benefit from lower risk premiums.

In September, the FMSB decided to enhance its public communication regarding sustainable lending standards. The share of a borrower's down payment/own funds in real estate financing should not be below a benchmark of 20%. Maturities at origination of new mortgage loans should exceed 35 years only in exceptional cases. In order to limit borrowers' debt service expenses (including interest payments), the FMSB expects banks to assess borrowers' income and living expenses in a prudent manner. Only regular, verified and sustained sources of income should be acknowledged in the loan granting process. As a benchmark, debt service expenses should not exceed 30% to 40% of a household's net income.

Foreign currency loans in Austria continued to trend downward in 2018. In the first half of 2018, the volume of foreign currency (FX) loans to domestic nonbank borrowers declined by more than 7% to EUR 21 billion. FX loans as a share of total loans fell to 6%. However, this legacy issue continues to be a concern, since around three-quarters of FX loans to households are bullet loans coupled with repayment vehicles. Due to unfavorable exchange rate movements and the underperformance of repayment vehicles, these loans may face a funding shortfall at loan maturity. At the end of 2017, the estimated total shortfall stood at EUR 4.4 billion or 29% of the outstanding loan volume. Therefore, the OeNB strongly recommends that banks and borrowers intensify their bilateral negotiations to find sustainable, tailor-made solutions in order to mitigate risks stemming from these loans. Austrian banks' CESEE subsidiaries also continued to reduce their FX loan volumes. In the first half of 2018, the outstanding FX loans to households and nonfinancial corporations fell by 4.2% to EUR 29.8 billion. The euro is by far the dominant currency in the FX loan segment of CESEE subsidiaries, accounting for 81% of total FX loans.

The current benign market environment – featuring robust economic growth, improving credit quality and rising interest rates in important host markets – provides banks with a "Goldilocks economy" that may not persist in the long run. For that reason, Austrian banks should consistently comply with sustainable lending standards and ensure that they have enough room for maneuver in the case of a future downturn. The OeNB therefore recommends that banks take the following measures to strengthen financial stability:

- safeguard sustainable profitability by enhancing structural efficiency in order to further increase capitalization levels and to invest in information technology;
- comply with the FMSB's expectations regarding sustainable lending standards in real estate financing;
- continue to reduce nonperforming loans; and
- continue to comply with the supervisory minimum standards for foreign currency and repayment vehicle loans as well as the Sustainability Package.

Box 1

Results of the 2018 OeNB LSI and system stress tests and of the EBA EU-wide stress test

Over the last years stress tests have evolved into a standard tool employed by different stakeholders that serves various purposes. *Central banks tend to take a system-wide view when assessing the implications of various scenarios for financial stability.[1] Bank supervisors use stress tests to identify risks and determine capital requirements and expectations within the Supervisory Review and Evaluation Process (SREP).[2] The OeNB conducts annual stress tests for all Austrian banks under its legal mandates for banking supervision and financial stability assessment. Stress tests are also performed at the European level. As one lesson learnt from the last financial crises, the European Banking Authority (EBA) was mandated to initiate and coordinate EU-wide assessments.[3] The results of the 2018 stress test exercise, in which two Austrian significant institutions (SIs) participated, has recently been published by the EBA.[4]*

Whereas the EBA/ECB setup requires active contributions from the participating banks (bottom-up approach), the OeNB runs its stress tests based on available reporting data (top-down approach). *This allows a full coverage of all Austrian banks and provides a solvency and liquidity perspective. Therefore, the OeNB's stress tests do not only support banking supervision but also provide a systemic perspective for the whole Austrian banking sector to facilitate an assessment of financial stability. In running its stress tests, the OeNB follows the stress test methodology developed by the EBA for the EU-wide stress test and makes targeted adjustments to account for the specificities of the Austrian banking sector. Such adjustments include an increased coverage of risks stemming from foreign currency loans, risks from participations in other banking entities and enhanced assumptions on the modeling of sight deposits.*

Also in 2018, the OeNB conducted stress tests for the entire Austrian banking system, focusing on less significant institutions (LSIs). *Both the OeNB stress test and the EBA/ECB exercise are based on the same macrofinancial scenarios. The baseline scenario uses the ECB's December 2017 forecast, while the hypothetical adverse scenario, which was provided by the ESRB for this purpose, assumes a severe deterioration of the economic outlook over a horizon of three years. For Austria, it includes a contraction of GDP of 9.2 percentage points relative to the 2020 baseline projection or –2.7% versus the 2017 year-end level.[5] The shock to the Austrian real estate market under this scenario is significant: prices for residential real estate would drop by 33.3% (19.1% EU), prices for commercial real estate would drop by 26.3% (20.0% EU). This shock is driven by historical volatility and current valuation levels, with the latter explaining the more severe shock in Austria compared to the EU average. The shocks to other macro variables of the Austrian economy are more in line with or below the EU average, most notably unemployment, which would increase by 2.1 percentage points over three years versus the 3.0 percentage point increase in the EU average. The adverse scenario implies severe shocks to most CESEE countries as well: the aggregate GDP of CEE and SEE countries would decrease by 11.4 and 9.6 percentage points, respectively, versus the 2020 baseline projection. It is important to note that a stress test is a hypothetical "what if" analysis, not a forecast.*

[1] *Article 44c Federal Act on the Oesterreichische Nationalbank mandates the OeNB to maintain financial stability and reduce systemic risk "by analyzing the financial market facts relevant for financial stability and reducing systemic risk and by identifying threats to financial stability."*

[2] *Article 100 of the Capital Requirements Directive IV requires competent authorities (i.e. the ECB for the six Austrian significant institutions (SIs) and the FMA and the OeNB for the remaining less significant institutions (LSIs)) to carry out as appropriate but at least annually supervisory stress tests on institutions they supervise.*

[3] *Article 32 Regulation (EU) No. 1093/2010.*

[4] *http://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing/2018/results.*

[5] *All subsequent figures related to the adverse scenario are available in the ESRB's document "Adverse macro-financial scenario for the 2018 EU-wide banking sector stress test" of January 2018, available on the EBA's website at http://www.eba.europa.eu/documents/10180/2106649/Adverse+macroeconomic+scenario+for+the+EBA+2018+Stress+Test.pdf*

The results of the two Austrian SIs participating in the EU-wide stress test are in line with supervisory expectations, given the scenario and the methodological assumptions underlying this exercise. *Erste Group Bank (EGB) and Raiffeisen Bank International (RBI) report hypothetical post-stress common equity tier 1 (CET1) ratios of 8.5% and 9.7%, respectively, well above their results in the 2016 EU-wide stress test. However, while both banks have significantly improved their capitalization they are still lagging behind their peers compared to the EU-average. The full results including the underlying data are available on the EBA website.*[6]

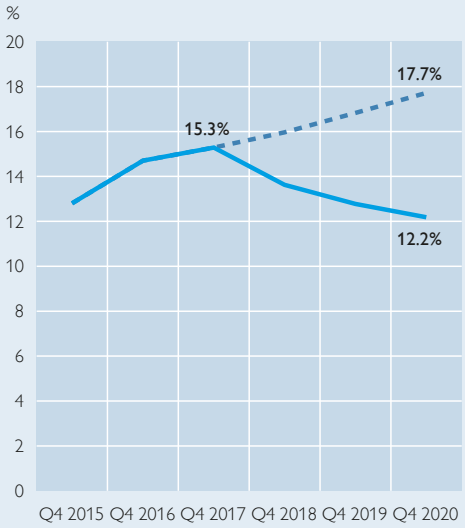
The OeNB stress test shows that the Austrian banking sector has improved its risk-bearing capacity, with post-stress capital ratios above last year's stress test.

The aggregate Austrian banking sector started from a CET1 ratio of 15.3% at end-2017,[7] *an improvement of 0.6 percentage points compared to end-2016. In the baseline scenario, this ratio improves to 17.7% by end-2020, while in the adverse scenario, it decreases to 12.2%, down by 3.1 percentage points versus the starting point.*

Compared to the OeNB's 2017 results, this year's stress test reveals a moderately higher impact, which can be attributed to several partially offsetting factors. While risk factors are stressed more pronouncedly than in the past due to the more severe calibration of the adverse scenario, the overall economic environment – i.e. the baseline scenario – has improved considerably. Therefore, the adverse scenario unfolds from a better starting position than last year, resulting in better bank profitability, which provides a bigger cushion against losses incurred in the adverse scenario.

Chart 1

CET1 ratio of the Austrian banking system



Source: OeNB.

Credit risk is still the most important risk factor for Austrian banks by far; the 2018 stress test's adverse scenario generally translates into more pronounced shocks to PDs (probabilities of default) compared to last year, but shocks to LGD (loss given default) parameters are slightly lower than last year. This is despite the substantial shock the adverse scenario implied for Austrian real estate prices as banks only incur losses when they must foreclose and sell real estate collateral, i.e. when borrowers actually default on their mortgages. The shock to unemployment in Austria – a more important driver than the general GDP shock, specifically for mortgage default rates – is less pronounced over the three-year scenario, contributing to the lower LGDs. In addition, risks from foreign currency loans have been reduced further, and banks have continued to reduce NPLs, which overall results in credit losses that are comparable to those in last year's OeNB stress test.

Overall, both exercises confirm that banks should continue their efforts to improve their capital base. *The OeNB's stress tests reveal that the Austrian banking system has further improved its risk-bearing capacity. These results are confirmed by the EU-wide stress test carried out by the EBA. However, the stress test outcome also needs to be interpreted within the context of the current positive economic conditions and policy measures taken over the last years, both of which contributed to an extremely benign environment of historically low credit risk parameters and the availability of ample central bank liquidity. To be able to successfully weather less favorable conditions and to be prepared for unexpected events, banks should therefore continue their efforts to further improve their structural efficiency and capitalization.*

[6] *http://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing/2018/results.*

[7] *The system-wide 2017 year-end CET1 ratio in this section deviates from the one in other parts of this report due to a slightly different composition of the sample of banks that were subjected to the stress test.*

Special topics

Nontechnical summaries

European retail payments market integration and fintech: a case study approach

Katharina Allinger

Retail payments are frequently reported to be the financial segment most affected by recent financial innovations (fintech) such as mobile payments, near field communication (NFC)-enabled cards, cheaper solutions for cross-border money transfers or real-time settlement.

We discuss fintech, its drivers and the resulting structural changes, focusing i.a. on the relation between the use of selected payment innovations and the use of cash as well as on changes in the ecosystem of payments market participants.

We present case studies for selected European countries with different national retail payments market structures: Sweden, Austria, Estonia and Bulgaria. We find that fintech can support rapid changes in retail payments markets, which in turn may lead to new policy issues and responses. In Sweden, for example, fintech has accelerated the decline in cash usage, calling into question the central bank's current monetary regime.

We find that the implications fintech may have for payments market integration are twofold: On the one hand, the digitalization of retail payment services may foster payments market integration by lowering barriers to cross-border sales and cross-border business expansion. On the other hand, fintech might increase barriers such as lacking interoperability between providers, consumers and other stakeholders and the insufficient harmonization of related rules and regulations. Based on the case studies, the paper illustrates how fintech might contribute to the fragmentation of the European retail payments market.

Our main conclusions are: First, we need better data on structural changes in retail payments markets as well as a proper definition of the fintech industry. Second, monetary authorities and regulators should continuously monitor trends within and across national retail payments markets, given the potential speed at which fintech may spread. Finally, all stakeholders need to cooperate to ensure that best practice is implemented and structural barriers do not increase.

Ultimately, whether fintech will contribute to higher market integration or to higher fragmentation will most likely depend on the appropriate policy responses and on continued efforts to establish a single market for retail payments.

Nonperforming exposures of Austrian banks – decomposing aggregate measures

Petra Bärnthaler, Helmut Elsinger, Pirmin Fessler, Elisabeth Woschnagg

Austrian banks' average nonperforming loan (NPL) ratios are lower and their coverage ratios are higher than those of their European peers. To unveil the heterogeneity across banks, this report uses disaggregated data from a sample of 18 Austrian banks that report according to International Financial Reporting Standards.

Since Q3 2014 the volume of nonperforming loans and exposures has declined by more than half, coming down to EUR 20 billion or 3.6% of outstanding loans. Broken down by borrower types, Austrian banks' largest exposures in Q4 2017 were toward nonfinancial corporations (EUR 244 billion; NPL ratio: 5.3%) and households (EUR 164 billion; NPL ratio: 3.8%). In line with European data, both collateralized debt and debt owed by small and medium-sized enterprises show higher NPL ratios than the overall sector.

Exposures to both households and nonfinancial corporations have stayed rather constant since Q3 2014, with NPL ratios decreasing. Taking a closer look at household loans, we find that consumer loans, though constantly decreasing, invariably showed higher NPL ratios than collateralized household loans.

Exposures to nonfinancial corporations are more often identified as nonperforming due to the default trigger "unlikeliness to pay," while loans to households predominantly turn nonperforming if they are past due more than 90 days.

If we look at exposures broken down by economic sectors, we find that higher NPL ratios recorded for different economic sectors do not seem to be concentrated in sectors in which banks have large exposures. The only sector that has an elevated NPL ratio and accounts for a relevant exposure is the wholesale and retail trade sector.

Austrian parent banks record the major part of the outstanding amounts, while NPL ratios are mainly driven by subsidiaries' exposures. Subsidiaries' NPL ratios are by about 2 percentage points higher than those of parent institutions (7% compared to 5% for exposures to nonfinancial corporations and about 5% compared to 3% for exposures to households).

We conclude that elevated financial vulnerabilites stem from loan origination in Central, Eastern and Southeastern Europe, the region that mainly accounts for nonperforming loans in the portfolios of Austrian banks' subsidiaries.

Funding growth and innovation in Austria – financing conditions for SMEs and start-ups

Helmut Gassler, Wolfgang Pointner, Doris Ritzberger-Grünwald

In Austria, like in all other EU Member States, small and medium-sized enterprises (SMEs) make up over 99% of all domestic businesses. As a result, their ability to finance investments plays a key role in spurring aggregate demand. Bank loans and credit lines play a decisive role in SME financing. In contrast, debt financing based on bonds or commercial paper requires companies to reach a certain size, the costs associated with these types of financing exceed the means of most SMEs. Compared with banks in other European countries, Austrian banks do not take a restrictive approach to granting business loans. When SMEs in Austria apply for loans, few applications are rejected, and most businesses receive the full amount they applied for. Moreover, there is a minimal spread between interest rates on SME loans and interest rates on loans to large firms in Austria.

The situation is different for young, innovative SMEs with growth-oriented business models – so-called start-ups: it is much harder for them to obtain bank credit because of their elevated risk profile. Start-ups are generally very new businesses, and this makes it difficult for banks to assess how successful their products will be and how effectively they are being managed. The more innovative and technology-intensive a product is, the more difficult it is for banks to judge a start-up's market prospects, because banks often lack the technical expertise required to make such an assessment. Furthermore, start-ups often have very little capital that can serve as loan collateral, or the capital they do have often takes the form of intangible assets such as patents and copyrights, which are not well-suited for use as loan collateral.

For these reasons, start-ups tend to rely on financing from business angels and venture capital funds as well as funding from the public sector. Austria has a well-developed system of public funding, and business angel activity is also quite brisk in comparison with other countries. However, venture capital fund investment in domestic start-ups is lower in Austria than in similar countries. To boost financing for start-ups, the Austrian government launched a "start-up package" in 2016. It is still too early to assess in detail whether and how this initiative is making an impact.

Improved own funds levels: effects on banks' "problem probability"

Stefan Kerbl, Christoph Leitner

Supervisors expect banks to be better able to absorb losses if they increase their own funds ratio. Measuring a bank's own funds, this ratio indicates a bank's financial strength. A bank with a high own funds ratio is generally considered less likely to fail. But how large is the effect of an increased own funds ratio on banks? This study investigates the empirical relationship between banks' own funds levels and their probability of entering financial difficulties, i.e. "problem probability."

Many tools used in modern banking supervision focus on own funds requirements, which is why knowledge about this relationship is essential for effectively assessing own funds requirements in the context of supervision and financial stability.

A key contribution of our study is the use of a broad definition of "problem." The definition we use also includes government aid and rescue measures taken by the banking sector.

We find the relationship to be economically and statistically significant. Our results suggest that a bank that increases its own funds ratio reduces its problem probability. The effect is stronger for banks with a higher risk profile or with a lower initial level of own funds.

Therefore, in the long run and for the financial system as a whole, improved own funds levels markedly reduce the expected number of banks entering difficulties.

Lending to households in CESEE with regard to Austrian banking subsidiaries and macroprudential measures addressing credit-related risks

Tina Wittenberger

Central, Eastern and Southeastern Europe (CESEE) is the most important foreign market for Austrian banks. The macroeconomic environment in CESEE improved significantly in 2017, which is also reflected in Austrian banking subsidiaries' lending activity in the region. In 2017, their credit growth amounted to 7%.

Austrian banking subsidiaries' total outstanding loans in CESEE equaled EUR 119 billion in the first half of 2018. Since 2014, the focus has been on household loans (which outweigh loans to non-financial corporations). In the household segment, the outstanding volume of mortgage loans was twice as high as that of consumer loans. Consumer loans grew faster than mortgage loans, however.

Credit growth of Austrian banking subsidiaries in CESEE is based on local funding, and lending in local currency prevails. Both developments are in line with the macroprudential recommendations published by the Oesterreichische Nationalbank (OeNB) and the Austrian Financial Market Authority (FMA) – the Sustainability Package and the "guiding principles."

As Austrian banks' exposure (and profits) in CESEE are concentrated in the Czech Republic, Slovakia, Romania, Croatia, Hungary and Russia, the focus of this study is on these countries. The study shows the relative importance Austrian banking subsidiaries have for the host markets in terms of lending to households.

Austrian banking subsidiaries' household loans expanded at a faster pace than the market in the Czech Republic, Slovakia, Hungary and Russia. Market shares in the Czech Republic and Slovakia are significant, but moderate in Hungary and very small in Russia. Due to the already high outstanding loan volumes, growth rates in the Czech Republic and Slovakia matter more. In Romania, Croatia and Hungary, Austrian banking subsidiaries concentrated on consumer lending (while mortgage loan growth was negative) in 2017. In the case of Romania and Hungary, the market instead focused on (government-subsidized) mortgage lending.

All CESEE countries analyzed in this study have implemented macroprudential measures. These measures are either legally binding or recommendations and address household lending-related risks. Some of these countries are already faced with high growth rates, while others want to prevent risks from accumulating once credit growth surges again. The measures comprise mainly debt cap tools, such as loan-to-value ratios or debt service-to-income ratios, as well as measures aimed at discouraging foreign currency lending and countercyclical capital buffers.

Nontechnical summaries in German

Die Integration des europäischen Massenzahlungsmarkts und Fintech: eine Analyse anhand von Fallstudien

Katharina Allinger

Der Massenzahlungsverkehr gilt als das von aktuellen Finanzinnovationen (Fintech) – wie Mobiltelefonzahlungen, Karten für kontaktloses Bezahlen (NFC), günstigeren Lösungen für grenzüberschreitende Überweisungen – am stärksten betroffene Finanzmarktsegment.

Die Studie untersucht Fintech, die relevanten Einflussfaktoren und die daraus resultierenden strukturellen Veränderungen. Insbesondere werden der Zusammenhang zwischen dem Einsatz ausgewählter Zahlungsinnovationen und der Verwendung von Bargeld sowie Veränderungen im Ökosystem der Zahlungsverkehrsteilnehmer beleuchtet.

Dabei werden Fallstudien für vier europäische Länder – Schweden, Österreich, Estland und Bulgarien – mit unterschiedlichen nationalen Marktstrukturen für Massenzahlungen vorgestellt. Es zeigt sich, dass Fintech raschen Veränderungen auf den Massenzahlungsmärkten Vorschub leisten und dadurch neue politische Fragestellungen und Lösungen hervorbringen kann. In Schweden hat Fintech z. B. den Rückgang der Bargeldverwendung beschleunigt und somit das aktuelle Währungsregime der Notenbank in Frage gestellt.

Auf die Integration des Massenzahlungsmarkts kann sich Fintech auf zwei Arten auswirken: Einerseits kann die Digitalisierung von Massenzahlungsdiensten die Marktintegration fördern, weil dadurch Hindernisse für grenzüberschreitenden Handel und grenzüberschreitende Geschäftsausweitungen abgebaut werden. Andererseits könnte Fintech bestehende Barrieren wie die fehlende Interoperabilität zwischen Anbietern, Konsumenten und sonstigen Marktteilnehmern sowie die unzulängliche Harmonisierung der entsprechenden gesetzlichen Regelungen noch verstärken. Die Studie zeigt anhand der Fallstudien einige Beispiele dafür auf, wie Fintech zur Fragmentierung des europäischen Massenzahlungsmarkts beitragen könnte.

Die Studie kommt zu folgendem Ergebnis: Erstens besteht Bedarf an besseren Daten zu strukturellen Veränderungen auf den Massenzahlungsmärkten sowie an einer geeigneten Definition des Fintech-Sektors. Zweitens sollten die Zentralbanken und Aufsichtsbehörden angesichts der potenziellen Verbreitungsgeschwindigkeit von Fintech die nationalen und grenzüberschreitenden Trends auf den Massenzahlungsmärkten kontinuierlich beobachten. Drittens ist die Zusammenarbeit aller Marktteilnehmer erforderlich, um sicherzustellen, dass bewährte Methoden angewandt und strukturelle Schranken nicht erhöht werden.

Ob Fintech zu einer stärkeren Integration oder einer stärkeren Fragmentierung der Märkte beitragen wird, hängt aller Wahrscheinlichkeit nach von angemessenen politischen Reaktionen sowie dem steten Bemühen um die Errichtung eines einheitlichen Marktes für Massenzahlungen ab.

Notleidendende Kredite österreichischer Banken – ein Blick hinter das Aggregat

Petra Bärnthaler, Helmut Elsinger, Pirmin Fessler, Elisabeth Woschnagg

Während die Quoten notleidender Kredite (NPL-Quoten) im österreichischen Bankensektor unter dem europäischen Durchschnitt liegen, sind die Deckungsquoten der heimischen Banken höher. Um die Heterogenität auf Ebene der einzelnen Banken aufzuzeigen, werden im vorliegenden Beitrag disaggregierte Meldedaten 18 österreichischer nach IFRS bilanzierender Banken verwendet.

Seit dem dritten Quartal 2014 ist das Volumen der notleidenden Kredite und Risikopositionen auf 20 Mrd EUR bzw. 3,6% der ausstehenden Kredite und somit auf weniger als die Hälfte zurückgegangen. In einer Betrachtung nach Kundensegmenten wurden die größten Risikopositionen der österreichischen Banken im vierten Quartal 2017 gegenüber nichtfinanziellen Unternehmen (244

Mrd EUR) und Privathaushalten (164 Mrd EUR) verzeichnet, die jeweils NPL-Quoten von 5,3% bzw. 3,8% auswiesen. Im Einklang mit Vergleichsdaten auf europäischer Ebene werden sowohl für besicherte Forderungen als auch für Risikopositionen gegenüber kleinen und mittleren Unternehmen höhere NPL-Quoten verzeichnet als für das gesamte Kreditportfolio.

Die Risikopositionen gegenüber Privathaushalten und nichtfinanziellen Unternehmen blieben seit dem dritten Quartal 2014 weitgehend konstant; die NPL-Quoten sind zurückgegangen. Bei den Krediten an Privathaushalte zeigt sich, dass die Verbraucherkredite zwar konstant zurückgegangen sind, aber die ihnen zuordenbaren NPL-Quoten nach wie vor höher liegen als jene für besicherte Kredite an Haushalte.

An Privathaushalte vergebene Kredite werden überwiegend dann als notleidend klassifiziert, wenn Zahlungen tatsächlich mehr als 90 Tage überfällig sind. Bei Risikopositionen gegenüber nichtfinanziellen Unternehmen finden wir vergleichsweise häufig als Begründung für die Einstufung, dass eine Rückzahlung unwahrscheinlich ist („unlikeliness to pay"). Zu einem Zahlungsverzug muss es in diesem Fall noch nicht gekommen sein.

Eine Betrachtung nach Wirtschaftssektoren deutet darauf hin, dass höhere NPL-Quoten nicht in Sektoren konzentriert sind, denen gegenüber Banken große Risikopositionen haben. Der einzige Wirtschaftszweig, der eine erhöhte NPL-Quote aufweist und dem gegenüber der österreichische Bankensektor signifikant exponiert ist, ist der Groß- und Einzelhandel.

Die ausstehenden Beträge sind größtenteils den österreichischen Mutterinstituten zuzuordnen, während für die NPL-Quoten hauptsächlich die Risikopositionen der Tochterbanken verantwortlich sind. Die NPL-Quoten der Tochterunternehmen liegen etwa 2 Prozentpunkte über jenen der Mutterinstitute (7% im Vergleich zu 5% für Risikopositionen gegenüber nichtfinanziellen Unternehmen und etwa 5% im Vergleich zu 3% für Kredite an Privathaushalte).

Wir gelangen zu dem Ergebnis, dass sich erhöhte finanzielle Risiken aus der Kreditvergabe in Zentral-, Ost- und Südosteuropa ergeben – jener Region, die den größten Anteil an notleidenden Krediten in den Portfolios der Tochterinstitute österreichischer Banken ausmacht.

Wachstum und Innovation in Österreich – die Finanzierung von KMUs und Start-ups

Helmut Gassler, Wolfgang Pointner, Doris Ritzberger-Grünwald

Kleine und mittlere Unternehmen (KMUs) machen in Österreich – ähnlich wie in allen anderen EU-Staaten – mehr als 99% aller Unternehmen aus. Ihre Finanzierungbedingungen sind daher von wesentlicher Bedeutung für die gesamtwirtschaftliche Nachfrage. Bankkredite und Kreditlinien spielen bei der Finanzierung von KMUs eine entscheidende Rolle, während die Ausgabe von Anleihen oder anderen handelbaren Wertpapieren eine gewisse Mindestgröße voraussetzt, da die damit verbundenen Fixkosten die Möglichkeiten der meisten KMUs übersteigen. Im europäischen Vergleich zeigt sich, dass Banken in Österreich bei der Kreditvergabe nicht restriktiv vorgehen: es werden kaum Kreditanträge von KMUs abgelehnt, und die meisten KMUs erhalten den beantragten Kreditbetrag zur Gänze. Auch der Unterschied bei den Zinsen für Kredite an KMUs gegenüber jenen für Kredite an Großunternehmen ist in Österreich sehr gering.

Für junge, innovative KMUs mit wachstumsorientierten Geschäftsmodellen, so genannte Start-ups, ist der Zugang zu Bankkrediten deutlich schwieriger, da sie mit höheren Risiken behaftet sind. Start-ups sind sehr junge Unternehmen, daher können Banken nicht gut einschätzen, wie erfolgreich deren Produkte sind und wie professionell das Management agiert. Je innovativer und technologieintensiver ein Produkt ist, desto schwieriger ist es für Banken, denen oft das technische Know-how fehlt, die Marktchancen eines Start-ups einzuschätzen. Darüber hinaus haben Start-ups oft auch noch sehr wenig Kapital akkumuliert, das zur Besicherung von Krediten dienen könnte, bzw. halten

sie viel Kapital in Form von immateriellen Vermögenswerten, wie etwa Patenten oder Copyrights, die sich nicht gut zur Besicherung von Krediten eignen.

Aus diesen Gründen sind Start-ups eher auf Finanzierungen durch Business Angels oder Venture-Capital-Fonds sowie auf Unterstützungen der öffentlichen Hand angewiesen. Während öffentliche Förderungen in Österreich gut ausgebaut sind und die Aktivitäten der Business Angels im internationalen Vergleich ebenfalls gut abschneiden, fallen die Investitionen von Venture-Capital-Fonds in heimische Start-ups geringer aus als in vergleichbaren Ländern. Als wirtschaftspolitische Maßnahme wurde daher 2016 das so genannte Start-up-Paket initiiert; ob und wie diese Initiative wirkt, lässt sich aber noch nicht konkret abschätzen.

Auswirkungen erhöhter Eigenmittel auf die Problemanfälligkeit einer Bank

Stefan Kerbl, Christoph Leitner

Bankenaufsichtsbehörden gehen davon aus, dass Banken, die ihre Eigenmittelquote erhöhen, besser in der Lage sind, Verluste auszugleichen. Die Eigenmittelquote einer Bank gibt Auskunft über deren Finanzkraft. Verfügt eine Bank über eine hohe Eigenmittelquote, gilt sie als weniger ausfallgefährdet. Wie stark wirken sich höhere Eigenmittel aber tatsächlich aus? In diesem Beitrag wird auf Basis empirischer Beobachtungen die Problemanfälligkeit von Banken untersucht. Konkret wird dabei der Zusammenhang zwischen der Höhe der Eigenmittel einer Bank und der Wahrscheinlichkeit, dass die Bank in finanzielle Schwierigkeiten gerät, beleuchtet.

Viele der von der Bankenaufsicht heute eingesetzten Instrumente konzentrieren sich auf die Eigenmittelanforderungen. Dabei handelt es sich um Vorschriften, in welchem Ausmaß Banken ihre Risiken mit Eigenkapital absichern müssen. Für eine gezielte Beurteilung dieser Anforderungen ist ein besseres Verständnis über den Zusammenhang zwischen der Eigenmittelquote und der Problemanfälligkeit einer Bank von enormer Bedeutung.

Ein wesentlicher Beitrag dieser Studie besteht in der Verwendung einer weit gefassten Definition von „Problem". So wird unter anderem auch die Inanspruchnahme einer Bank von Hilfsmaßnahmen durch den Staat oder den Bankensektor in dieser Definition mitberücksichtigt.

Das Verhältnis zwischen Eigenmittelquote und Problemanfälligkeit kann angesichts der Ergebnisse als wirtschaftlich und statistisch signifikant eingeschätzt werden. Die vorliegende Untersuchung lässt darauf schließen, dass eine Bank durch die Erhöhung ihrer Eigenmittelquote ihre Problemanfälligkeit senken kann. Dieser Effekt ist bei Banken mit einem höheren Risikoprofil und Banken mit einem niedrigeren anfänglichen Eigenmittelniveau stärker ausgeprägt.

Wenn Banken höhere Eigenmittel halten, verringert sich also die Anzahl jener Banken, die in Schwierigkeiten geraten, spürbar – und das langfristig für das gesamte Finanzsystem.

Kreditvergabe an private Haushalte in CESEE im Hinblick auf österreichische Tochterbanken und makroprudenzielle Maßnahmen zur Hintanhaltung von Kreditrisiken

Tina Wittenberger

Zentral-, Ost- und Südosteuropa (CESEE) ist der wichtigste Auslandsmarkt für österreichische Banken. Im Jahr 2017 verbesserte sich das gesamtwirtschaftliche Umfeld in CESEE erheblich, was sich auch in der Kreditvergabe österreichischer Tochterbanken in der Region widerspiegelt. Diese verzeichneten im Jahr 2017 ein Kreditwachstum von 7 %.

Die ausstehenden Kredite österreichischer Tochterbanken in CESEE beliefen sich in der ersten Jahreshälfte 2018 auf insgesamt 119 Mrd EUR. Seit 2014 liegt der Schwerpunkt der Kreditvergabe auf Krediten an private Haushalte (im Gegensatz zur Kreditvergabe an nichtfinanzielle Unternehmen). Im privaten Haushaltssegment war das ausstehende Volumen der Hypothekarkredite Ende Juni 2018

doppelt so hoch wie jenes der Konsumkredite. Das Wachstum bei Konsumkrediten fiel jedoch tendenziell stärker aus als jenes bei Hypothekarkrediten.

Das Kreditwachstum österreichischer Tochterbanken in CESEE basiert auf lokalen Einlagen. Die Kreditvergabe erfolgt vornehmlich in lokaler Währung. Dies steht in Einklang mit den makroprudenziellen Empfehlungen im Rahmen des Nachhaltigkeitspakets und der „Guiding Principles", die von der Oesterreichischen Nationalbank (OeNB) und der Finanzmarktaufsichtsbehörde (FMA) veröffentlicht wurden.

Da sich die ausstehenden Kreditvolumina (und die Gewinnbeiträge) der österreichischen Tochterbanken in CESEE auf die Tschechische Republik, die Slowakei, Rumänien, Kroatien, Ungarn und Russland konzentrieren, liegt der Analysefokus der Studie auf diesen Ländern. Zudem wird die Bedeutung, die österreichische Tochterbanken bei der Kreditvergabe an private Haushalte für das jeweilige Gastland haben, beleuchtet.

Die Analyse zeigt, dass österreichische Tochterbanken ein höheres Kreditwachstum bei privaten Haushalten verzeichneten als die Gesamtmärkte in der Tschechischen Republik, der Slowakei, Ungarn und Russland. Während österreichische Tochterbanken bedeutende Marktanteile in der Tschechischen Republik und der Slowakei aufweisen, sind die Marktanteile in Ungarn moderat und in Russland äußerst gering. Angesichts der bereits hohen ausstehenden Kreditvolumina fallen die Wachstumsraten in der Tschechischen Republik und der Slowakei vergleichsweise stärker ins Gewicht. In Rumänien, Kroatien und Ungarn lag der Fokus der österreichischen Tochterbanken im Jahr 2017 auf der Konsumkreditvergabe (während die Wachstumsraten bei Hypothekarkrediten negativ ausfielen). Im Gesamtmarkt in Rumänien und Ungarn bestimmten (staatlich geförderte) Hypothekarkredite die Kreditvergabe.

Die in der Studie analysierten CESEE-Länder haben bereits makroprudenzielle Maßnahmen ergriffen. Hierbei handelt es sich entweder um rechtsverbindliche Maßnahmen oder um Empfehlungen, die der Hintanhaltung von Risiken in Bezug auf Haushaltskredite dienen. Während einige der untersuchten Länder bereits mit hohen Kreditwachstumsraten konfrontiert sind, haben andere die Maßnahmen eingeführt, um eine Zunahme von Risiken im Falle eines Anziehens des Kreditwachstums zu verhindern. Zu den eingeführten makroprudenziellen Maßnahmen zählen insbesondere Verschuldungsobergrenzen, wie beispielsweise Beleihungsquoten oder Schuldendienstquoten, Maßnahmen zur Reduktion von Fremdwährungskrediten sowie antizyklische Kapitalpuffer.

European retail payments market integration and fintech: a case study approach

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Refereed by: Sylvain Bouyon, Centre for European Policy Studies

The segment of retail payments has been among the most affected by technology-enabled innovations in financial markets (fintech). This study looks at the digitalization of retail payments markets in Europe. We develop a framework and collect supportive indicators to discuss the connection between fintech and retail payments market developments. We apply our framework to four small European economies – Sweden, Austria, Estonia and Bulgaria – and discuss what conclusions, if any, can be drawn for the integration of European retail payments markets and fintech from the developments observed in the case study countries. While there are many channels through which digitalization may facilitate the creation of a single market for retail payments, this study discusses whether fintech might also contribute to stronger retail payments market fragmentation.

JEL classification: E42, G21, G18, L16, O33
Keywords: payment systems, financial intermediaries, financial regulation, structural change, technological change

Retail payments are an essential aspect of everyday economic life and are frequently reported to be the financial segment most affected by recent financial innovations referred to as fintech (BIS, 2018; EBA, 2017a; CEPS-ECRI, 2017; McKinsey, 2015). The term fintech is defined as technology-enabled innovation in financial services, regardless of the nature or size of the provider of the services. In retail payments fintech comprises, for instance, mobile payments, near field communication (NFC)-enabled cards and cheaper solutions for cross-border money transfers or real-time settlement. While technology-enabled innovations are clearly not a new phenomenon, their speed and diversity has increased over the past years, drawing considerable attention to the topic.

In this study, we develop a simple framework that relates potential drivers of fintech innovations, various examples of fintech and the related structural changes in retail payments markets. By structural changes we mean e.g. shifts in consumers' use of payment methods (cash, cards, fintech innovations) as well as changes in the types of companies that offer payment services (e.g. incumbent[2] banks, telecommunication companies, start-ups).

Ideally, we would apply our framework to all European economies. Given data limitations and the need to collect highly qualitative information, however, we opted for selecting four small European economies to perform exploratory case studies on: Sweden, Austria, Estonia and Bulgaria. While this is only a small subset of European countries with heterogeneous national retail payments market structures, our case studies nonetheless illustrate a series of interesting developments in fintech and payments structures. In Sweden, for example, fintech has accelerated

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[2] *The term "incumbent" refers to traditional financial service providers, mostly banks. Incumbents may also offer fintech services and products. Companies that base most or all of their business on fintech, by contrast, are referred to as fintechs. These are mostly small start-ups, even though some companies have already matured and exited the start-up phase.*

the decline in cash usage, calling into question the current monetary regime of the central bank, which now considers issuing a digital currency (Ingves, 2018).

Finally, the study discusses potential implications of fintech for retail payments market integration. Theoretically, this issue is ambiguous. The digitalization of retail payment services may foster retail payments market integration by lowering barriers for cross-border sales and cross-border business expansion. It provides many opportunities, e.g. to sell and market financial products online, increases transparency through comparison websites and reduces the need for the extensive and costly physical presence of businesses in the countries of operation (European Commission, 2016). However, given the complexity and speed of fintech developments, they might also increase barriers such as lacking interoperability between providers, consumers and other stakeholders within and across countries and the insufficient harmonization of related rules and regulations (European Commission, 2016). In section 4, we provide some examples that are connected to the case studies and show how fintech might contribute to increasing barriers to retail payments market integration.

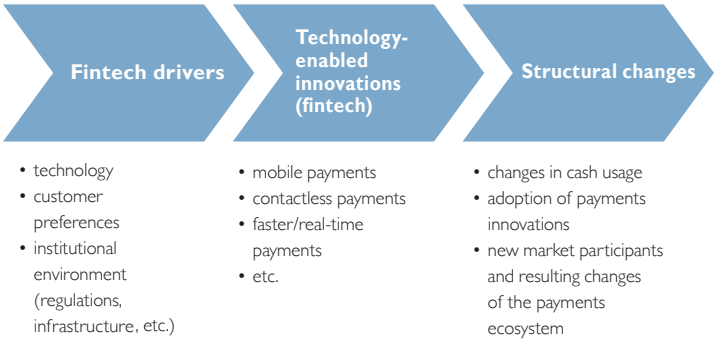
The study is structured as follows: Section 1 discusses the methodology employed. Sections 2 and 3 discuss the drivers of fintech, fintech innovations and the related structural changes. Section 4 relates our findings to the issue of retail payments market integration. Section 5 concludes.

1 Methodology and framework

Over the past few years, a variety of technology-enabled innovations (fintech) have taken hold in retail payments markets in response to customer needs for faster, more secure and more convenient payment methods. These innovations comprise e.g. mobile and contactless payment methods, peer-to-peer money transfers, faster / real-time settlement of transactions, one-click payment / checkout, online payment solutions that do not require providing sensitive payment information to merchants, and cheaper solutions for transferring money abroad. Stern (2017) highlights that the more radical innovations use e-money to circumvent the use of traditional bank accounts for payments. The European Commission (2016) provides a detailed analysis of the contribution of fintech to retail payments market innovation.

Chart 1

Fintech, its drivers and related structural changes



Source: Author's compilation.

Chart 1 illustrates the framework we use to discuss technology-enabled innovations (fintech) in retail payments markets. Useful and comparable indicators for fintech are not readily available for all EU countries, however, which is why we mostly use evidence for the case study countries. The tables often show the best available proxy measures. Moreover, studying fintech and its drivers requires qualitative information on regulations, the structure of the fintech ecosystem, etc. collected from national sources. The tables in section 3 show that especially regarding structural changes, the dimension we are most interested

in, indicators are scarce, mostly based on crude estimations and compiled from national sources. Building a comparable, cross-country database for fintech-relevant variables should therefore be a priority.

Given these data limitations, the paper uses four case study countries as examples for the dynamics discussed: Sweden, Austria[3], Estonia and Bulgaria. The main idea behind the country selection was to cover a broad range of different payment market developments in Europe. This could have been achieved with many different country pairings. We chose four small countries, given that small internal markets imply potentially larger benefits of European market integration and because these countries tend to have less bargaining power in international negotiations, e.g. on financial regulation. The small number of countries was necessary to keep the study manageable.

2 Drivers of fintech

Several factors are contributing to fintech innovations in the markets. Some key drivers of fintech innovations are technology, changing customer behaviors and regulatory and institutional changes.

2.1 Technology

In this paper, we understand the term "technology" to include both genuinely new technologies, such as innovations in blockchain technologies, artificial intelligence or cryptography, but also the spreading of technology throughout society, e.g. the increasing adoption of Internet-enabled mobile phones. Using mobile phones for payment purposes has proven to be an important innovation to increase financial inclusion in some emerging countries.

To approximate the availability of technologies and the appropriate business environment for turning technologies into actual innovations, table 1 shows the Digital Economy and Society Index (DESI), the World Bank Ease of doing business index and the European Innovation Scoreboard (EIS) ranking for the case study countries. Among the case study countries, Sweden emerges as the clear front runner, while Bulgaria shows the lowest rankings by far. Between Austria and Estonia, the latter seems to be somewhat better positioned regarding fintech. Estonia shows better scores in two categories. In particular, the ease of setting up a business can

Table 1

Innovation-friendly business environment

Indicators	Sweden	Austria	Estonia	Bulgaria
Digital Economy and Society Index 2017 (index between 0 and 100)[1]	67.5	56.8	58.0	37.0
Place in DESI EU-28 ranking[1]	3	10	9	27
World Bank Ease of doing business index (place in ranking of 190 countries)	10	22	12	50
European Innovation Scoreboard (place in EU-28 ranking)	1	10	17	27

Source: European Commission, World Bank.

[1] The Digital Economy and Society Index (DESI) 2017 consists of five subcategories including a total of 34 indicators.

Note: Shades of blue and orange indicate whether a country is doing better (darker blue) or worse (darker orange) than the other countries in terms of fintech (intra-row comparison).

[3] *For Austria, new data became available after this study was completed; see Ritzberger-Grünwald and Stix (2018).*

be considered very important in an industry heavily reliant on technology-based start-ups. In addition, Estonia has recently started the e-Residency project, which enables businesses to easily start a company in Estonia digitally.

2.2 Customer behavior

Regarding shifts in customer behavior, the widespread availability of Internet-enabled devices and applications has changed the way individuals interact with their environment. Table 2 shows various aspects of this dimension, namely proxies for consumer attitudes toward technologies, their capabilities to use technologies, and actual usage as measured by the DESI. While, overall, consumers in all four countries seem to have fairly positive opinions on the impact of recent technologies, the gaps regarding capabilities and usage are wider.

On the one side, Sweden stands out, with consumers having the skills and attitude to adopt new technologies fast, which is also reflected in the DESI's usage-related indicators. Estonians have a similarly positive attitude, but lag in terms of skills and adoption. Austrians have a somewhat less positive attitude toward technologies, fewer people feel sufficiently skilled to use new technologies and adoption rates are comparatively low. Bulgaria lags behind the other countries in all categories, with the gap being lowest for the attitude proxy variable.

2.3 Regulation and policies

Regulation and government policies also play a major role in the evolution of the payments landscape. Over the past years, several legal acts have been passed that directly relate to fintech, e.g. the EU's Payment Services Directive 2 (PSD2). The PSD2 broadens the application of the PSD to two new types of (fintech) companies[4], gives customers control over who can access their payments data, obliges incumbents to provide easier and more secure access to these data to other companies and

Table 2

Consumer behavior

Indicators	Sweden	Austria	Estonia	Bulgaria
Attitude: share of respondents who think that the most recent digital technologies have a positive impact on the economy / society / their own lives (average)[1]	77	68	77	67
Skills: share of respondents who think that they are sufficiently skilled in the use of digital technologies for their daily lives[1]	89	70	75	54
Financial inclusion: share of respondents (aged 15+) who hold an account at a financial institution[2]	100	98	98	72
Use: DESI Use of Internet indicator (place in EU-28 ranking)	2	20	6	28
Online banking users (% *of Internet users over the last three months*)	89	63	90	7
Online shopping (% *of Internet users over the last year*)	80	68	64	27

Source: European Commission, World Bank.

[1] *Special Eurobarometer 460: Attitudes towards the impact of digitisation and automation on daily life.*
[2] *World Bank Global Financial Inclusion Database.*

Note: Shades of blue and orange indicate whether a country is doing better (darker blue) or worse (darker orange) than the other countries in terms of fintech (intra-row comparison).

[4] *Account information services providers (AISPs), who provide consolidated information on payments accounts held by a user, and payment initiation services providers (PISPs), who access a user's payment account with the user's consent and authentication to trigger a payment on the user's behalf.*

implements a variety of new technical standards that relate, for instance, to strong and secure customer authentication. It is widely expected that the PSD2 will considerably change the payments landscape, in particular given its far-reaching implications for the control and use of customer data and customer relationships (see e.g. Botta et al., 2018). However, whether these expectations are correct will be clear only after the end of the implementation phase for regulatory technical standards in September 2019.

While the PSD2 constitutes EU-wide legislation, it should be noted that in many countries there are also national regulations on payment services. If there are too many divergent national regulations, these may act as barriers to cross-border business expansion. A fintech innovation in lending illustrates this fact: In the absence of a harmonized EU regulation, eleven EU Member States have adopted national regulations for crowdfunding. This has created higher barriers for the cross-border expansion of crowdfunding platforms (European Commission, 2018). Although national regulators are aware of this difficulty, they must react in a timely fashion to risks arising in national markets and may not be able to wait for a harmonized European solution to be agreed upon and implemented.

This may also apply to other government policies. In a stock-taking exercise, the EBA (2017) concluded that policy approaches to fintech differed across the EU, with 2 countries reporting that they had a sandboxing regime[5] in place, 4 reporting an innovation hub, 7 some other, similar fintech approach and 11 that they had no specific fintech initiative in place (EBA, 2017a). Different treatment can have important implications for the development of new services.

Given that the term "fintech" was only created recently, regulators and authorities are still in the process of developing approaches and stances regarding the topic. Sveriges Riksbank, the Swedish central bank, has repeatedly stated that it actively promotes innovation in this field (Skingsley, 2017). The Swedish supervisory authority, Finansinspektionen, published a report on fintech in December 2017 and launched its Innovation Centre shortly after, which serves as a contact point for financial innovators with the regulator. Eesti Pank, the Estonian central bank, has explicitly included the monitoring of fintech activities as one of its development tasks in its 2018 to 2022 strategy. Moreover, it has established a fintech hub. The Estonian government is also actively pushing for innovative companies to set up establishments in Estonia, e.g. via its e-Residency program. The Austrian Financial Market Authority (FMA) and the Oesterreichische Nationalbank (OeNB), have shown a more cautious approach toward supporting payments market innovation. A more in-depth consideration of the topic began with the establishment of the FMA's FinTech contact point. In early 2018, the Austrian government initiated the FinTech Advisory Board (FinTech Beirat) to discuss relevant fintech policies. In Bulgaria, the Financial Supervision Commission adopted its FinTech Monitoring Strategy in June 2018, which discusses measures such as consulting stakeholders to determine potential policy measures, e.g. the establishment of an innovation hub or sandbox.

[5] *Sandboxes are generally regimes run by national regulators or governments where companies can apply to test a new and innovative service on a small scale, for a limited amount of time and closely monitored by regulators, without having to apply for a full license for that service beforehand.*

2.4 Supportive infrastructures

The availability of certain infrastructures can have both a supportive and hindering effect on companies' ability to implement new and innovative solutions. Fintech services are often marketed or accessed online. In finance, in the light of know-your-customer regulations, remote identification of customers has therefore been an issue from the start. The EU has passed various regulations on e-identification. For businesses it is easiest if there is a widely accepted and easy means for consumers to identify themselves remotely. Of the case study countries, Sweden and Estonia both already have a widely established digital identification solution for public and private services: the Swedish BankID and Estonia's digital ID launched in 2001. Currently, no similarly widely used digital identification solutions exist in Austria or Bulgaria.

Payments infrastructures can also foster innovations. Several Swedish banks built their widely used mobile payments app, Swish, on the Swedish real-time settlement system, which has been in place since 2012. In this context, the implementation of the SEPA Instant Credit Transfer (SCT Inst) scheme and the related infrastructures, EBA Clearing RT1, active since November 2017, and the Eurosystem's TARGET Instant Payment Settlement (TIPS) service, expected to be launched in November 2018, are important initiatives. The Governor of Eesti Pank stated in December 2017 that within one year all banks operating in Estonia should be able to provide instant payments, arguing that this would allow for new business models (Eesti Pank, 2017a). One key aspect and issue of payments infrastructures is interoperability – a lack of interoperability between systems within and across countries can act as a key barrier for market participants in expanding their services.

3 Technology-enabled innovations and structural changes

All these drivers influence the fintech innovations that reach the market. In terms of structural developments, this study focuses on the use of selected payments innovations and their relation to cash usage as well as on changes in the ecosystem of players in payments markets.

3.1 Noncash payments and innovations

In all case study countries, cards are the most important means of payment for noncash payments in the retail payments segment. However, data on the adoption of retail payments innovations are very limited.

One recent innovation are contactless payments, often via near field communication (NFC)-enabled cards. While this seems a trivial innovation at a first glance, De Nederlandsche Bank (2018) reports that NFC has been a major contributing

Table 3

Mobile payments

Indicators	Sweden	Austria	Estonia	Bulgaria
Utility bills paid via mobile phone, 2017 (% of population paying utility bills)	41	11	15	3
Percentage point change since 2014	+29	+5	+11	+2

Source: World Bank Global Financial Inclusion Database, author's calculations.

Note: Shades of blue and orange indicate whether a country is doing better (darker blue) or worse (darker orange) than the other countries in terms of fintech (intra-row comparison).

factor for the substitution of cash for low value payments in the Netherlands. In 2016, contactless payments at points-of-sale (POS) accounted for roughly 2% of all POS payments in the euro area. In Austria, the comparable share was 3.5%, the third highest in the euro area, while in Estonia it was only 0.5% (Esselink and Hernández, 2017). So Austrians appear to be adopting this new technology rather fast. One explanation for why Estonia has been lagging behind in this respect could be the slower roll-out of the infrastructure necessary to accept contactless payments (Laur, 2016).

Mobile payments are one of the best-known innovations in retail payments, but there are no comparable data on mobile payments usage across countries. Therefore, an indicator from the Global Findex database serves as a proxy. It shows that the number of persons who paid utility bills using a mobile phone was highest (41%) and increasing fastest (+29 percentage points) in Sweden, followed by Estonia and Austria; and it also shows very low usage (3%) and growth numbers (2 percentage points) for Bulgaria. Sweden is so far the only country of the four countries in our sample with a widely used mobile payments app: it is called Swish and was launched by Sweden's largest banks in 2013. In 2018, 60% of respondents in the payments survey carried out by Sveriges Riksbank every two years stated that they had used Swish to make a payment over the past month. In 2014 and 2016, the percentages were 10% and 50%, respectively (Sveriges Riksbank, 2018). Swish is therefore a good example of how fast fintech innovations can spread. In the other countries observed, there is usually more than one peer-to-peer or other mobile payment app in place (e.g. ZOIN, BlueCode, Pocopay, Paysera), but mobile payments have not reached a scale like that of Swish so far. Most of the apps in questions were also launched later than Swish.

3.2 Changes in cash usage

Noncash payments innovations that make payments easier, faster and more convenient increase the incentives to use these payments methods. In the case of mobile or contactless payments in Sweden and the Netherlands, for instance, this trend has been at the expense of cash (De Nederlandsche Bank, 2018; Ingves, 2018). However, cash usage has not been declining in every country. In the South(eastern) European countries, but also in Germany and Austria, cash is still very dominant and cash usage is fairly stable (Van der Knaap et al., 2016; Rusu and Stix, 2017;

Table 4

Cash usage

Indicators	Sweden	Austria	Estonia	Bulgaria
Estimated share of cash transactions in number of retail transactions[1] (%)	15	82	48	95
Estimated share five years earlier (%)	40	86	×	×
Number of ATM cash withdrawals per inhabitant, 2017[2]	13	35	29	17
Percentage change since 2014	–39	+2	–6	+18
Value of ATM cash withdrawals per inhabitant, 2017[2] (EUR)	1527	6167	3213	1548
Percentage change since 2014	–35	+9	+8	+28

Source: Author's compilation.

[1] *Austria: Rusu and Stix (2017); Estonia: Esselink and Hernández (2017); Sweden: Sveriges Riksbank (2017b); Bulgaria (including corporate data from 2012): Van der Knaap (2016).*

[2] *Data retrieved from ECB Statistical Data Warehouse and Eurostat; data for Bulgaria for 2016.*

Note: Shades of blue and orange indicate whether a country is doing better (darker blue) or worse (darker orange) than the other countries in terms of fintech (intra-row comparison).

Bagnall et al., 2014). Overall, available evidence suggests that cash is still the dominant retail payment method in most European countries, followed by cards as the dominant noncash payment method. Esselink and Hernández (2017) report for the euro area that cash accounted for 79.5% of all POS transactions (56% of the total value of transactions). 18.5% of all POS transactions were made using cards (37% of total value) and only 2% of total POS transactions (7% of total value) were made by any other payment form.

Table 4 shows some estimations of cash usage for the case study countries. Given that consumers first withdraw most of the cash they spend from ATMs, the number and value of ATM withdrawals per inhabitant is shown as an additional proxy for cash usage.

In the case study countries, the use of cash compared to noncash payment methods has differed historically, but the example of Sweden shows that new technologies can accelerate the adoption of noncash payment methods rapidly. Cash usage in Sweden has declined very quickly, with the proportion of cash payments in the retail sector falling from close to 40% in 2010 to about 15% in 2016 (Ingves, 2018; Sveriges Riksbank, 2017b). Sveriges Riksbank (2018) carries out a payment behavior survey of a random sample of 2,000 citizens every two years. When asked about their attitude regarding the steady decline of cash, 26% of respondents indicated a negative and 47% a positive attitude toward this change. The fast-paced innovation in the Swedish payments landscape is also leading to new questions regarding monetary policy and financial stability. Managing the transition toward a payments system less reliant on cash is a key topic for Sveriges Riksbank. It is one of the first central banks worldwide that has started investigating the possibility of issuing a central bank digital currency (Skingsley, 2017).

For Estonia, Esselink and Hernandez (2017) estimated that cash only accounts for 48% of all POS transactions in terms of numbers and for 31% in terms of volume of all retail transactions in Estonia. These are some of the lowest corresponding figures recorded in the euro area. However, according to Eesti Pank's 2017 payments behavior survey, this has not changed much over the past five years. According to the survey, 79% of Estonians oppose the idea of a completely cashless society – in contrast to consumers in Sweden (Eesti Pank, 2017b).

At this point, the Austrian payments market does not show much evidence for rapid structural change. Based on the OeNB's regular surveys on the use of cash in the economy, cash usage is fairly high and stable, consistent with the high cash preferences found in studies such as Bagnall et al. (2014) and Rusu and Stix (2017). The share of cash transactions in the total number of consumers' payment transactions stood at 82% in 2016, only marginally lower than the 86% recorded in 2011. In terms of transaction volumes, the share of cash payments came to 65%, down from 73.2% in 2011.

For Bulgaria, there are no reliable estimations for cash usage. Estimations from the European Cash Report (Van der Knaap et al., 2016) based on 2012 data suggest that roughly 95% of all payment transactions in Bulgaria (including those by corporates) were cash transactions. It is likely that the share of cash payments in Bulgaria has decreased since 2012 as financial inclusion has progressed, but it remains one of the highest in Europe. In the 2017 edition of the World Bank Global Financial Inclusion Database, 84% of Bulgarian respondents stated that they had paid utility bills exclusively in cash. This corresponds to a decline by 8 percentage points since the 2014 edition.

Table 5

Fintech ecosystem

Indicators	Sweden	Austria	Estonia	Bulgaria
Estimated number of fintechs headquartered in country x[1]	120 to 190	15 to 30	15 to 30	5 to 15
Fintech associations (number of members)[2]	SweFintech (founded in 2017) 50	Fintech Austria (founded in 2017) 33	x	Fintech Bulgaria (founded in 2018) 9
Bigtech (number of banks supporting Apple Pay)[3]	3	0	0	0
Can businesses located in country x receive payments via Amazon Pay?[3]	yes	yes	no	no
Is Google Pay available for online payments / via apps?[3]	yes	yes	yes	yes

Source: Author's compilation.

[1] Estimations based on various sources: Crunchbase; Gromek (2018), Wirtschaftsagentur Wien (2017), startupestonia.ee; websites of fintech associations.
[2] Sweden also has a fintech hub, which was founded in 2016 and has over 100 members; to our knowledge, there is no dedicated, private fintech association in Estonia, but there are related government initiatives, e.g. Startup Estonia.
[3] Data retrieved from the official websites of Apple Inc., Google LLC and Amazon.com, Inc.; last accessed on September 26, 2018.

3.3 New players in the payments ecosystem

Many companies have joined the payments industry and financial services value chains. This includes many technology-based start-ups, often referred to as "fintechs" – some of which have already passed the start-up stage and matured over the past years. The EBA (2017) reported that there are currently more than 1,500 fintechs active in Europe; given the EBA's methodology, this is likely to be a lower bound. Estimating the number of fintechs is complicated as the boundaries of the industry remain unclear, the availability of data is low and many new fintech start-ups do not survive long and exit the market via bankruptcy or buyout by an incumbent bank or a larger fintech.

It is therefore difficult to accurately establish how many fintech companies exist in the case study countries. However, no matter which source is used, the country ranking in terms of fintech numbers is the same, with Sweden showing by far the highest number, followed by Estonia and Austria with roughly similar numbers[6] and finally Bulgaria, which records the lowest numbers. We include only companies that are headquartered in the respective country and include all companies that directly provide financial services or facilitate the provisioning of financial services.

Overall, Sweden has without doubt the most vibrant fintech scene. The Stockholm School of Economics (2018) estimated that the number of fintechs in the greater Stockholm area was between 120 and 188, depending on a broader or narrower definition of fintechs. In a study on the top global fintech ecosystems based on 72 indicators, the Institute for Financial Services Zug (IFZ) (2018) ranked Stockholm seventh out of 30 cities across the globe. To give some examples: Europe's largest licensed fintech, payment services provider Klarna, was founded in Sweden in 2005. According to its website, Klarna serves 60,000,000 end users and 70,000 merchants in 18 markets. Swedish POS infrastructure provider iZettle[7] and payment initiation service provider Trustly were both listed by the Financial Times among the 500 fastest-growing companies in Europe in 2017.

[6] *To put this into perspective: Estonia's population is roughly one-seventh of that of Austria.*

[7] *Recently acquired by PayPal.*

In Estonia, according to the government initiative Startup Estonia, at the end of 2017 there were roughly 400 start-ups, of which roughly 20 to 25 can be classified as fintechs.[8] The fintech scene seems to be of small to medium size, with some mature, innovative companies expanding on an international level (Scott-Briggs, 2017). Fortumo, for instance, founded in 2007, is a mobile payments start-up that allows direct carrier billing with over 350 mobile operators in over 90 countries.

Turning to Austria, in 2018 Vienna was included for the first time in the IFZ's ranking of fintech hubs. Out of 30 cities, it ranked 15th (IFZ, 2018). At the time of writing there were only a handful of licensed payments fintechs in Austria. Judging from a recent report by Wirtschaftsagentur Wien (2017) and memberships in Austria's fintech association, there are probably 20 to 25 fintechs in Austria today. Dimoco is one of the largest; it was founded in 2000 and specializes in carrier billing, providing payment services to merchants and mobile messaging.

According to the available sources, Bulgaria has a rather small number of fintech start-ups. The Bulgarian fintech association, which was founded in 2018, currently has six fintech members. Deloitte (2016) concluded that Bulgaria was lagging behind bigger CESEE countries in terms of financial technology, although it is a test market for IT and technology services and products. One of Bulgaria's fintechs is Cashwave, which has built its business model on the large market of remittances in CESEE and is active in eight markets.

The market presence of large technology companies such as Google, Amazon, Facebook and Apple, which are often referred to as bigtechs, also differs across Europe, but is expanding fast. Between November 22, 2017, and June 22, 2018, Apple Pay and Google Pay, for example, increased their presence in European countries from 8 to 15 and 6 to 8 countries, respectively (according to information on their websites). The activities of large technology companies could be a game changer over the next few years, as these companies mostly have loyal, highly engaged user bases, vast resources and are more technologically advanced and versatile than incumbent banks (McKinsey, 2015). Also, telecommunications companies have entered the payments market, as mobile phones increasingly serve as tools of payment, and payment methods such as carrier billing[9] are becoming increasingly widespread (e.g. Dimoco). Telenor, one of Bulgaria's largest telecommunications companies, offers G-Wallet, which allows customers to use their phone for payments. It cooperates with a selected number of Bulgarian banks.

Incumbent banks have also innovated and engaged in fintech activities. According to Deloitte (2016), incumbent banks are the most innovative players in Austria. In Sweden, the largest banks cooperated to create a real-time settlement infrastructure and, on this basis, launched the mobile app Swish. Also, in the other countries under observation, established institutions continue to play a critical role, given their large customer bases and resources.

4 Retail payments market integration and policy challenges

This section discusses the conclusions from our case studies from the perspective of further retail payments market integration.

[8] *See http://www.startupestonia.ee/about; the list also includes some larger, already mature companies*

[9] *Carrier billing means that a payment is charged to a customer's telephone bill. This is particularly popular for small, recurring payments such as purchases of music, gaming content or apps.*

4.1 Retail payments market integration

Creating a single market for payments has been an important subtopic of the European Single Market project, given that market integration is in many cases associated with overall welfare gains. Moreover, harmonization enhances the smooth functioning of payment and settlement systems, which is a core task of the European System of Central Banks (ESCB). A European payments market that is fragmented in terms of regulations and policies is a key barrier to cross-border activities for all market participants. Many projects, initiatives and committees on European retail payments market integration have been started (and completed), e.g. the Single Euro Payments Area (SEPA) or PSD2, as mentioned above. SEPA has significantly reduced structural barriers for payments market integration, harmonizing standards and lowering costs for cross-border payments made in euro from bank account to bank account. However, SEPA or PSD2 regulate only part of the rapidly changing payments landscape, which is continuously giving rise to further regulatory and policy challenges.

Some other important recent initiatives in retail payments market harmonization include the European Commission's Consumer Financial Services Action Plan[10], published in March 2017, its FinTech Action Plan[11] and the EBA's FinTech Roadmap[12], both published in March 2018. Moreover, the European Retail Payments Board (ERPB) was established in 2014 as a high-level strategic group bringing together various retail payments stakeholders.

Nonetheless, financial integration in European payments markets is considered to be generally low, mostly due to significant barriers for cross-border sales and activities. According to the European Commission (2016), key barriers that remain in the payments area are related e.g. to the custodianship of customer relationships, customer inertia, access to an EU-wide settlement infrastructure, payment acceptance by merchants and consumers and lack of harmonization in the regulatory environment.

4.2 Resulting challenges for policymakers

On the one hand, fintech and digitalization offer chances to foster a European single market for retail payment services by lowering barriers, e.g. providing the possibility to sell and market financial products online and to conduct know-your-customer processes remotely and reducing the necessity for businesses' extensive and costly physical presence in each country of operation (European Commission, 2016). However, there are also risks that fintech and digitalization could raise barriers in some areas. In the following, we use examples from the case studies to discuss some of the most crucial fintech-related questions for policymakers. These questions concern the assessment of trends across Europe and potential implications for monetary and regulatory policy. However, drawing final conclusions would require further analysis and much better data than currently available for a cross-section of European countries.

[10] *European Commission. 2017. COM/2017/0139 final. Consumer Financial Services Action Plan: Better Products, More Choice.*

[11] *European Commission. 2018. Communication COM(2018) 109 final.*

[12] *www.eba.europa.eu/-/eba-publishes-its-roadmap-on-fintech.*

Are there common or diverging trends in payments markets across countries?

The case studies show that despite the historical differences between the four countries, some similar payments market developments can be observed: fintech is a topic in all four countries, evidenced by the existence of fintech associations and hubs, regulatory approaches and government projects. Moreover, payment innovations such as NFC-enabled cards and mobile payment apps are in place in all countries, even though the number of available solutions and the rate of adoption differ. In addition, incumbent banks and payment service providers remain the dominant players, even though some challenger companies have started to gain market share in certain niches.

Nonetheless, the speed of structural changes differs across countries, with Sweden standing out as it sees declining cash usage, a high take-up of mobile payments and a vibrant fintech ecosystem. In Estonia, fintech developments are not yet of the same scale, but the country already features low cash usage by European standards and a supportive environment for fintech, with high digitalization scores and a start up-friendly environment and policy approach. While Austria is an innovative and digitally advanced economy, it seems that consumers and authorities have been more conservative regarding fintech, which is reflected in the rather stable structure of the Austrian payments market and limited fintech activity. For Bulgaria, very few data are available; available sources suggest, however, that the country lags behind the other countries, most likely also because it has yet to catch up regarding overall financial inclusion and digitalization.

In all countries observed, there are fintech solutions and fintechs that operate nationally, e.g. peer-to-peer apps like Swish, ZOIN and others that have expanded rapidly across borders, e.g. Klarna and Dimoco. In the mobile payments area, most of the solutions provided by fintechs and incumbents are national, and even within national borders there are often various providers. This increases the number of payment methods that consumers and stores must handle, which makes the payments system more complex. In fact, one common fintech business model provides integrated payment solutions for merchants, given the difficulties for merchants associated with handling payments through various channels. Whether one or several dominant mobile payment solutions will emerge on the European market or whether this market segment will remain highly fragmented is currently unclear.

What does declining cash usage imply for monetary authorities?

Even though historically, Sweden has already posted a comparatively low share of cash transactions in overall payment transactions, over the past years cash usage has declined rapidly. Fintech, e.g. the mobile payments app Swish, has most likely contributed to this trend, as it increased the incentives for customers to switch from cash to noncash payments (e.g. Ingves, 2018; De Nederlandsche Bank, 2018). The speed at which cash can be replaced can serve as a warning example for regulators and for incumbent banks not to underestimate the speed at which fintech innovations expand.

The decline of cash usage has raised a few questions in Sweden and will raise similar questions across all countries that experience similar trends: How can the monetary authorities ensure a smooth transition to a society that is less dominated by cash? How to ensure that nobody is excluded from the payments system? How

to ensure the smooth provision of cash in a cost-effective manner if only a small share of the population uses cash? Is it desirable for central banks to issue their own digital currency in such cases? All these questions are important, and how central banks across Europe will react to them will have an impact on the overall functioning of the European financial system. The questions become more intricate for euro area countries, which share a common currency and monetary policy but have different evolutions of cash usage. Given that declining cash usage has already become a reality for some European countries, it is important to tackle these questions at a European level in a timely fashion.

Can international policymaking keep up with the pace of innovation?

Digitalization could also create new barriers if national regulators feel the need to pass national regulations to tackle arising issues. This has already happened regarding some fintech developments, e.g. crowdfunding, for which there are eleven different national regimes, which make international expansion difficult for crowdfunding platforms (European Commission, 2018). PSD2 was a positive example in payments in this regard, given that it provides a harmonized European framework for dealing with some of the new business models and issues arising through fintech. Nonetheless, the risk of unilateral regulations remains and increases with the heterogeneity of European countries. Heterogeneity in terms of the structure and evolution of national retail payments markets implies that individual countries may have different interests and priorities in this area, which may slow down the international regulatory process. Continuous monitoring of trends and close cooperation between regulators and policymakers across Europe are needed to avoid increases in regulatory fragmentation.

Similar considerations apply to the support of innovation and fintechs, e.g. the establishment of sandboxes and innovation hubs and the modernization of payment infrastructures. While infrastructure modernizations are desirable, their design and interoperability with existing systems are key. For instance, once TIPS is launched, there will be two major pan-European instant payments infrastructures in the euro area: the EBA's Clearing RT1 and the Eurosystem's TIPS, with the latter offering real-time settlement to banks in central bank money. TIPS and RT1 and other automated clearing house (ACH) solutions are not interoperable. However, the EBA and ACHs can act as TIPS' instructing parties for banks, and thus TIPS can foster the reachability between ACH participants.

5 Conclusions

We provide a simple framework for discussing the drivers, innovations and structural changes in retail payments markets and apply the framework to four European case study countries: Sweden, Estonia, Austria and Bulgaria. Evidence from these four countries shows that their national retail payments markets differ strongly in their characteristics and structural developments. Regarding structural developments, the study focuses on the use of selected payments innovations and their relation to cash usage as well as on changes in the ecosystem of players in payments markets. The Swedish example shows that fintech can contribute to a decline in cash usage, given more consumer-friendly noncash alternatives and increased possibilities to use them online and in stores. Moreover, payments ecosystems are being altered by new payment methods, business models and players, including start-ups and bigtechs.

The case studies show that despite the differences observed across countries, there are some similarities as well. However, they also point to several questions regarding the further integration of national retail payments markets in Europe.

The main conclusions that can be drawn from this study are the following: First, we need better data on structural changes in retail payments markets since current statistics often do not capture recent trends sufficiently well. We also need a proper definition of the fintech industry. Second, monetary authorities and regulators should continuously monitor trends within and across national retail payments markets, given the potential speed at which fintech innovations may spread within and across markets. Finally, all European stakeholders in the field of fintech need to cooperate, both nationally and internationally, to ensure that best practice is implemented and structural barriers in retail payments markets do not increase.

Ultimately, whether fintech will contribute to higher market integration or to higher fragmentation will most likely depend on the appropriate policy responses and on continued efforts to establish a single market for retail payments.

References

Bank for International Settlements (BIS). 2018. Sound Practices: Implications of Fintech Developments for Banks and Bank Supervisors. www.bis.org/bcbs/publ/d415.htm

Bagnall, J., D. Bounie, K. P. Huynh, A. Kosse, T. Schmidt, S. Schuh and H. Stix. 2014. Consumer cash usage: a cross-country comparison with payment diary survey data. In: Deutsche Bundesbank Discussion Paper 2014 (13).

Botta, A., N. Digiacomo, R. Höll and L. Oakes. 2018. PSD2: taking advantage of open-banking disruption. www.mckinsey.com/industries/financial-services/our-insights/psd2-taking-advantage-of-open-banking-disruption

CEPS-ECRI Task Force. 2017. The Future of Retail Financial Services. www.ceps.eu/publications/future-retail-financial-services-what-policy-mix-balanced-digital-transformation

Deloitte. 2016. Fintech in CEE – Charting the Course for Innovation in Financial Services Technology. United Kingdom Department for International Trade.

De Nederlandsche Bank. 2018. From cash to cards – how debit card payments overtook cash in the Netherlands. In: DNB Occasional Studies 16 (1).

Eesti Pank. 2017a. All banks should start providing instant payments within a year says Madis Müller. Eesti Pank press release. www.eestipank.ee/en/press/all-banks-should-start-providing-instant-payments-within-year-says-madis-muller-04122017

Eesti Pank. 2017b. People are used to paying with bankcards, but still would not like to see a cashless society. Eesti Pank press release. www.eestipank.ee/en/press/people-are-used-paying-bankcards-still-would-not-see-cashless-society-11122017

Esselink, H. and L. Hernández. 2017. The Use of Cash by Households in the Euro Area. European Central Bank. Occasional Paper Series No 201.

European Banking Authority (EBA). 2017a. Discussion Paper on the EBA's approach to financial technology (FinTech). EBA Discussion Paper 2017 (2).

European Banking Authority (EBA). 2017b. Risk assessment of the European banking system – November 2017. Luxembourg: Publications Office of the European Union.

European Commission. 2016. Study on the role of digitalisation and innovation in creating a true single market for retail financial services and insurance. https://ec.europa.eu/info/system/files/study-digitalisation-01072016_en.pdf.

European Commission. 2018. FinTech Action plan: For a more competitive and innovative European financial sector. https://ec.europa.eu/info/publications/180308-action-plan-fintech_en

Gromek, M. 2018. Stockholm FinTech Report 2018. Stockholm School of Economics. www.hhs.se/en/outreach/sse-initiatives/documents/stockholm-fintech-report-2018/

Ingves, S. 2018. Speech: Money and payments – where are we heading. Sveriges Riksbank. www.riksbank.se/globalassets/media/tal/engelska/ingves/2018/tal_ingves_180604_eng.pdf

Institute for Financial Services Zug (IFZ). 2018. IFZ FinTech Study 2018 – Overview of Swiss FinTech. www.researchgate.net/publication/323831793_IFZ_FinTech_Study_2018.

Laur, J. 2016. Payment solutions in innovative Estonia. www.europeanpaymentscouncil.eu/news-insights/insight/payment-solutions-innovative-estonia

McKinsey. 2015. Global Payments 2015: A Healthy Industry Confronts Disruption. www.mckinsey.com/industries/financial-services/our-insights/global-payments-2015-a-healthy-industry-confronts-disruption

Ritzberger-Grünwald, D. and H. Stix. 2018. How Austrians bank and pay in an increasingly digitalized world – results from an OeNB Survey. In: Monetary Policy and the Economy Q3/18. Vienna: OeNB. 52–87.

Rusu, C. and H. Stix. 2017. Von Bar- und Kartenzahlern – Aktuelle Ergebnisse zur Zahlungsmittelnutzung in Österreich. In: Monetary Policy and the Economy Q1/17. Vienna: OeNB. 54–85.

Scott-Briggs, A. 2017. 10 Popular fintech Companies in Estonia. www.techbullion.com/10-popular-fintech-companies-estonia/

Skingsley, C. 2017. How the Riksbank encourages innovation in the retail payments market. www.bis.org/review/r170120b.pdf

Stern, C. 2017. FinTechs and their emergence in banking services in CESEE. In: Focus on European Economic Integration Q3/17. Vienna: OeNB. 58–74.

Stockholm School of Economics. 2018. Stockholm Fintech Report 2018. www.hhs.se/en/outreach/sse-initiatives/documents/stockholm-fintech-report-2018/.

Sveriges Riksbank. 2018. Payment patterns in Sweden 2018. www.riksbank.se/globalassets/media/statistik/betalningsstatistik/2018/payments-patterns-in-sweden-2018.pdf

Sveriges Riksbank. 2017a. Fintech – increasingly rapid interaction between financial operations and technological innovation. In: Financial Stability Report 2017 (1). Stockholm: Sveriges Riksbank. 45–48.

Sveriges Riksbank. 2017b. The Riksbank's e-krona project: Report 1. www.riksbank.se/en-gb/financial-stability/payments/e-krona/the-e-krona-projects-first-interim-report/

Van der Knaap, P., T. de Vries and K. Tielenius Kruythoff. 2016. Cash Report 2016: Europe. www.g4scashreport.com

Wirtschaftsagentur Wien. 2017. FinTech – Technology Report. www.fintechmatters.org/wp-content/uploads/2018/07/EN_Fintech-Report_Vienna_Business_Agency.pdf

Nonperforming exposures of Austrian banks – decomposing aggregate measures

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We analyze bank-level loan data to better understand the development of aggregate nonperforming exposure measures of large Austrian banks. We employ quarterly data from Q3 2014 to Q4 2017 for all 18 commercial banks in Austria that apply the International Financial Reporting Standards as well as for all their foreign subsidiaries (this leads to slightly different results than provided in other publications). We focus on the distribution of nonperforming exposure measures across time and banks as well as across economic sectors and borrower types. We find large heterogeneity across banks, economic sectors and borrower types. If we take a closer look at what lies behind the aggregate NPL ratio of about 3.6%, we find that the 10th percentile of the NPL ratio is close to zero whereas the 90th percentile is still at about 8% in the fourth quarter of 2017. Higher NPL ratios across relevant economic sectors do not seem to be concentrated in larger sectors. With regard to borrower type, we find NPL ratios of 5.3% for nonfinancial corporations, 3.8% for households and 2.2% for other financial institutions. Subsidiaries record substantially higher NPL ratios than parent institutions, e.g. over 7% for exposures to nonfinancial corporations (under 5% at parent institutions) and about 5% for households (3% at parent institutions). This points toward higher financial vulnerability among nonfinancial corporations as well as indebted households in CESEE, the region mainly responsible for nonperforming loans in the portfolios of Austrian banks' subsidiaries.

JEL classification: E44, G21
Keywords: nonperforming loans, financial stability, banks, exposure

The financial crisis has left many banks with rather high levels of nonperforming loans (NPLs). At their peak, NPLs accumulated to over a trillion euro in the European Union. Banks displaying high levels of NPLs are hampered regarding their profitability and growth, because NPLs tie up more of those banks' financial resources (mostly capital), which are thus not available for new loan origination. This can further slow down recovery from a financial crisis or even produce a credit crunch on an aggregate level.

However, in recent years NPL ratios have fallen significantly in Europe. At the same time, significant differences between different banks as well as structural differences between European countries can be observed. NPLs in the consolidated portfolios of Austrian banks have fallen below the European average and display an above-average provisioning coverage, with NPLs concentrated in Austrian banks' subsidiaries in Central, Eastern and Southeastern Europe (CESEE). This holds true both for the samples observed by the European Banking Authority (EBA) as well as for those observed by the European Central Bank (ECB): in numerical terms, as of Q4 2017 the ECB – focusing on 111 significant institutions (SIs) in the euro area – reports an NPL ratio of 3.75% for Austrian SIs (this is below the euro area average of 4.92%)[2]. At the same time, the EBA – focusing on 190 significant as well as less significant institutions in the European Union – finds an NPL ratio of 3.7% for Austrian banks with a provisioning coverage (based on nonperforming

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[2] *ECB Supervisory Banking Statistics. Fourth quarter 2017 (ECB, 2018a, p. 85). 111 SIs included in the sample.*

loans and advances) of 52.7%. European averages are 4.0% for NPL ratios and 44.5% for provisioning coverage[3].

While it is well known that the nonperforming exposures (NPE) ratio and the extent to which it is being reduced differ substantially across countries and banks, there is little evidence that shows what the decrease in NPLs looks like on more granular levels. In order to identify some risky pockets for Austrian banks, we argue that it is necessary to systematically decompose aggregate exposure statistics and analyze potential heterogeneity that may be obscured by them. To do so, we employ FINREP reporting data for Austrian banks to deconstruct different aggregate NPL measures and analyze their components on a more granular level. In addition to analyzing heterogeneity across banks, we also investigate NPE measures by borrower type (e.g. households, businesses, etc.) as well as by industrial sector (e.g. construction, trade, health, etc.). Furthermore, we analyze the role of subsidiaries in the aggregate NPL statistics of Austrian banks. This allows us to understand the transmission channels between macroeconomic risk drivers in the real economy and Austrian financial institutions. Identifying possible sources of credit risk, such as economic sectors, is moreover a valuable supplementary tool for ongoing supervisory work.

This article is structured as follows: Section 1 introduces the data and provides definitions of the measures we analyze. Section 2 deals with the heterogeneity across banks that may be obscured by aggregate NPL figures. Section 3 provides information on NPLs across borrower types and economic sectors. In section 4, we contrast the Austrian parent banks with their subsidiaries mostly located in CESEE countries. Section 5 addresses European initiatives to tackle NPLs, while section 6 delivers a short summary and policy conclusions.

1 Data and definitions

In this section, we describe the data we use, the definitions of nonperformance as well as aggregate measures and measures of dispersion around NPLs.

1.1 Financial reporting data

We use data from the financial reporting framework FINREP, which is a standardized reporting scheme originally introduced by the European Banking Authority (EBA) or, more accurately, its predecessor, the Committee of European Banking Supervisors (CEBS). The sample we use comprises 18 Austrian banks[4] that deliver quarterly reporting data on the highest level of consolidation based on International Financial Reporting Standards (IFRS). The sample covers data from the third quarter of 2014 to the fourth quarter of 2017 and roughly 80% of all loans and advances issued by Austrian banks.

[3] *EBA Risk Dashboard – data as of Q4 2017 (EBA, 2018a, p. 30).*

[4] *The sample includes the following banks: Erste Group Bank AG, Raiffeisen Bank International AG, UniCredit Bank Austria AG, BAWAG P.S.K. Bank für Arbeit und Wirtschaft und Österreichische Postsparkasse Aktiengesellschaft, Raiffeisenlandesbank Oberösterreich Aktiengesellschaft, Österreichische Volksbanken-Aktiengesellschaft, RAIFFEISEN-HOLDING NIEDERÖSTERREICH-WIEN registrierte Genossenschaft mit beschränkter Haftung, Oberbank AG, Sberbank Europe AG, HYPO NOE Gruppe Bank AG, Hypo Vorarlberg Bank AG, Raiffeisen-Landesbank Steiermark AG, Bank für Tirol und Vorarlberg Aktiengesellschaft, Oberösterreichische Landesbank Aktiengesellschaft, BKS Bank AG, Hypo Tirol Bank AG, Addiko Bank AG, and HYPO-BANK BURGENLAND Aktiengesellschaft.*

1.2 Definitions of aggregate measures

The most common measure used for nonperforming credits is the notion of nonperforming loans. Although in practice (as well as in this article) the term "NPLs" is often used as a synonym for nonperforming exposures (NPEs), the two concepts differ. In line with the EBA's definition, NPLs include nonperforming loans and advances, while NPEs include debt securities in addition to loans and advances. The term "nonperforming assets" is frequently used to also include foreclosed assets. Moreover, off-balance-sheet items are not included in either the NPL ratio or the NPE ratio. Box 1 lists the exact criteria for qualifying outstanding amounts as nonperforming (independent of the types of credit included), defines all of the nonperforming credit measures we use, and explains their meaning.

Box 1

Qualification criteria for nonperformance

Nonperforming: loans, advances, debt securities or other off-balance-sheet debt are called "nonperforming" if either (1) the exposures are more than 90 days past due (DPD) or (2) the debtor is assessed as unlikely to pay (UTP) the credit obligations in full without realizing collateral, regardless of the existence of any past-due amount or the number of days past due.[1]

Measures relating to nonperformance

- ***NPL ratio:*** *The NPL ratio is defined as the sum of nonperforming loans and advances divided by total gross loans and advances.*[2]
- ***NPE ratio:*** *The NPE ratio is defined as the sum of outstanding nonperforming loans, advances and debt securities divided by all gross carrying amounts of loans, advances and debt securities.*
- ***Coverage ratio (provisions as a percentage of NPEs):*** *The coverage ratio is defined as the accumulated impairment and accumulated changes in fair value due to credit risk and provisions on nonperforming exposures divided by the sum of outstanding nonperforming loans, advances and debt securities.*[3]
- ***Collateralization ratio:*** *The collateralization ratio indicates collateral and financial guarantees received on nonperforming loans or exposures.*

[1] *See EBA Implementing Technical Standards on supervisory reporting on forbearance and nonperforming exposures (EBA, 2013). Note that (2) is assessed by banks on the basis of the EBA's Guidelines on the application of the definition of default (EBA, 2017) and leaves some room for discretion. Note also that in practice there are also secondary elements which have an impact on the volume of nonperforming loans such as the rule that once 20% of the exposure of a bank to a certain borrower is over 90 days past due all the exposure to this borrower has to be treated as nonperforming ("pulling effect"), as provided by the EBA (2013).*

[2] *Based on the FINREP template valid as of December 31, 2017, the following data points are used to compute the NPL ratio: Template F18.00, {row 70; column 60 + row 250, column 60} divided by Template F18.00, {row 70; column 10 + row 250, column 10}.*

[3] *Based on the FINREP template valid as of December 31, 2017, the following data points are used to compute the NPE ratio: Template F18.00, {row 330, column 60} divided by Template F18.00, {row 330, column 10}. The definitions can also be found in the statistical annex of the EBA Risk Dashboard (https://www.eba.europa.eu/documents/10180/2175405/EBA+Dashboard+-+Q4+2017.pdf/d429ed31-65ba-498b-9115-d0e4639112ac).*

As we have already introduced our data and defined the term "nonperforming loan," we will now take a look at what is typically presented as aggregate NPL statistics. Table 1 shows nonperforming exposures and nonperforming loans and advances and places these data in context with the total outstanding volume and the aggregate NPL ratio for our sample. Table 1 clearly shows the decrease in NPE and NPL ratios at the aggregate level. At the end of our sample period, both ratios

are less than half their amount at the beginning. One can also clearly see a downward shift in outstanding exposure in 2016. The disproportionate decrease in outstanding exposure and NPL ratios in 2016 is due to UniCredit Bank Austria's carve-out of Central and Eastern European subsidiaries into the Italian parent entity. As of year-end 2016, UniCredit Bank Austria subgroup's balance sheet (according to FINREP/IFRS) excluded the CESEE business for the first time.

The FINREP templates valid during the observation period do not permit a detailed analysis of the reasons why the NPL ratio rose or fell. New releases of the reporting templates will allow a more precise breakdown of inflows and outflows.

Table 1

Aggregate measures of nonperforming exposure

	Exposure			Loans and advances		
	Outstanding	Nonperforming	NPE ratio	Outstanding	Nonperforming	NPL ratio
	EUR billion		*%*	*EUR billion*		*%*
Q3 2014	723.9	47.4	6.6	596.5	47.1	7.9
Q4 2014	725.2	46.6	6.4	592.5	46.1	7.8
Q1 2015	742.1	47.5	6.4	608.2	47.0	7.7
Q2 2015	728.8	45.2	6.2	596.9	44.8	7.5
Q3 2015	719.9	43.4	6.0	591.5	42.9	7.3
Q4 2015	720.3	40.3	5.6	592.9	39.9	6.7
Q1 2016	730.9	38.9	5.3	603.0	38.6	6.4
Q2 2016	605.7	29.3	4.8	491.2	28.9	5.9
Q3 2016	596.6	27.7	4.6	484.6	27.4	5.7
Q4 2016	614.2	24.9	4.0	500.2	24.7	4.9
Q1 2017	654.2	24.3	3.7	541.0	24.1	4.5
Q2 2017	655.4	22.8	3.5	544.6	22.7	4.2
Q3 2017	659.6	21.4	3.2	551.7	21.3	3.9
Q4 2017	660.2	20.1	3.0	551.6	20.0	3.6

Source: OeNB (supervisory data of 18 IFRS banks).

1.3 Beyond the aggregate – dispersion measures

Note that the (aggregate) NPL ratio can be viewed from two perspectives. It is not only the simple mean but also the weighted mean of bank-level NPL ratios, where the weights represent bank-level exposure as a share of aggregate exposure. The aggregate ratio and the weighted mean describe the same statistical object (measured in different ways). However, there are many other interesting statistical objects we can describe using the bank-level exposure information provided by FINREP. We use the measures defined and explained in box 2.

2 Heterogeneity across banks

Chart 1 shows the distribution of NPL ratios across time and banks. The weighted mean corresponds to the aggregate statistics usually analyzed in standard reports on NPLs like the data presented in table 1. The simple mean as well as the median are rather close to this weighted mean. This points to the facts that (1) banks with larger exposures do not seem to be different from those with smaller exposures and (2) the distribution of NPL ratios around the mean is rather symmetric. The

Box 2

Statistical objects beyond the aggregate and weighted mean

Most of the statistics used in this field are simple ratios, where the sum of a subset is divided by the sum of the full set. Depending on the different definitions (see box 1), different items are included in these sets. Based on this general description we can define:

- ***Aggregate / weighted mean:*** $NPE_{ratio} := \frac{\sum_i npe_i}{\sum_i e_i} = \sum_i \frac{npe_i}{e_i} \cdot w_i$, *where* $w_i = \frac{e_i}{\sum_i e_i}$. *The aggregate and weighted mean ratios reflect the overall nonperforming exposures of the sector. However, potentially large nonperforming exposures of banks with a small share in total exposures have an accordingly small share in the measure. In this way it delivers an exposure volume perspective.*
- ***Mean:*** $MNPE_{ratio} := \frac{1}{I}\sum_i \frac{npe_i}{e_i}$, *where I is the number of banks. The simple (as opposed to weighted) mean of bank-level ratios treats every bank with equal weight. In this way it delivers a bank-level perspective.*
- ***Median:*** *The median of bank-level ratios defines the point in the distribution where an equal number of banks have lower and higher ratios.*
- ***P10 and P90:*** *Analogously to the median, which refers to the 50th percentile of a distribution, one can calculate the 10th and 90th percentiles as points where 90% of observations – in our case ratios – lie above (P10) or below (P90).*

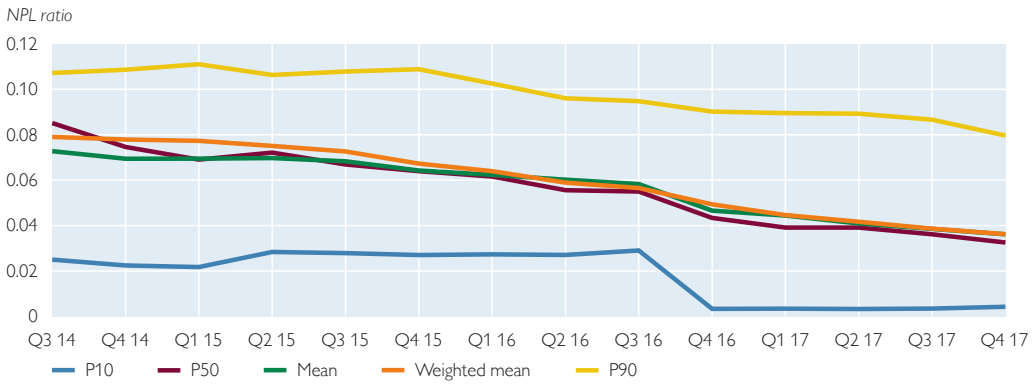
In our case, only 1 or 2 banks (depending on the quarter) lie below the 10th or above the 90th percentile. Thus the above statistics taken together provide us with an intuitive way to describe the heterogeneity of banks' NPL ratios, which may be obscured by the aggregate statistics. The above statistics also inform us about differences between larger banks with more exposure and smaller banks with less exposure (weighted versus simple mean) and the skewness of the underlying distribution (mean versus median).

10th and 90th percentiles of NPL ratios show a substantial spread of NPL ratios across the relevant Austrian banks.

Chart 2 shows an analogous graph for NPE ratios. In this case the weighted mean lies clearly below the simple mean. This may point toward pockets of risk. Banks with smaller outstanding exposures show higher shares of NPEs than larger ones. While the weighted mean is almost exactly the same as the simple mean in the case of NPL ratios, the simple mean is almost one percentage point higher than the weighted mean in the case of NPE ratios.

Chart 1

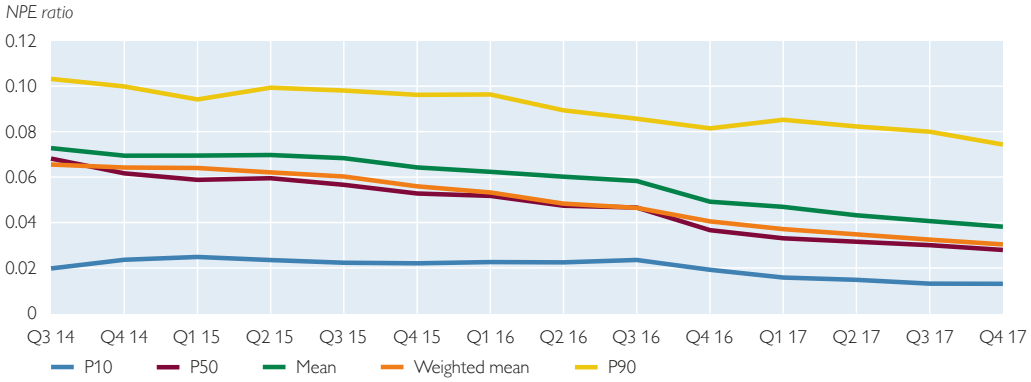
Distribution of NPL ratios across banks



Source: OeNB (supervisory data of 18 IFRS banks).

Chart 2

Distribution of NPE ratios across banks



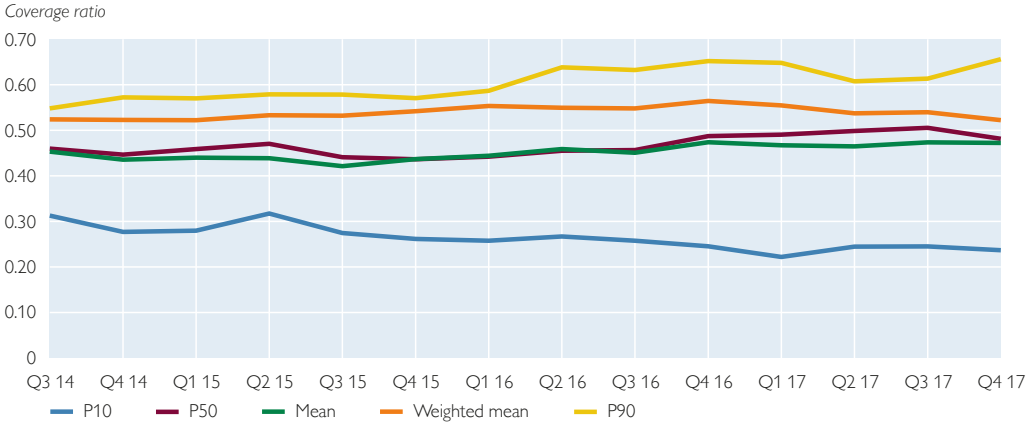
Source: OeNB (supervisory data of 18 IFRS banks).

Chart 3 shows the distribution of coverage ratios across banks, calculated on the basis of NPEs. Most banks show coverage ratios between about 25% and 65% (see P10 and P90 in Q4 2017). The weighted mean lies above 50% and both median and simple mean are close to 50%. The distribution of coverage ratios is therefore less symmetric than the distribution of NPL and NPE ratios. Some banks have comparably low coverage ratios while most banks and especially those with larger exposures (as the weighted mean is above the simple mean) show relatively large coverage ratios.

Chart 4 shows the total value of NPLs in EUR billion as well as the remaining value once provisioning coverage and collateral coverage are fully deducted (assuming that the provisions are attributed to the noncollateralized part of the exposure). This measure can be interpreted as a momentary lower bound of future losses under the assumption that the provisions booked refer to the uncollateralized part of the NPL and the collateral can be sold at its current value. Note that deductions were made at the individual bank level and were bounded at zero before aggregating the measure.

Chart 3

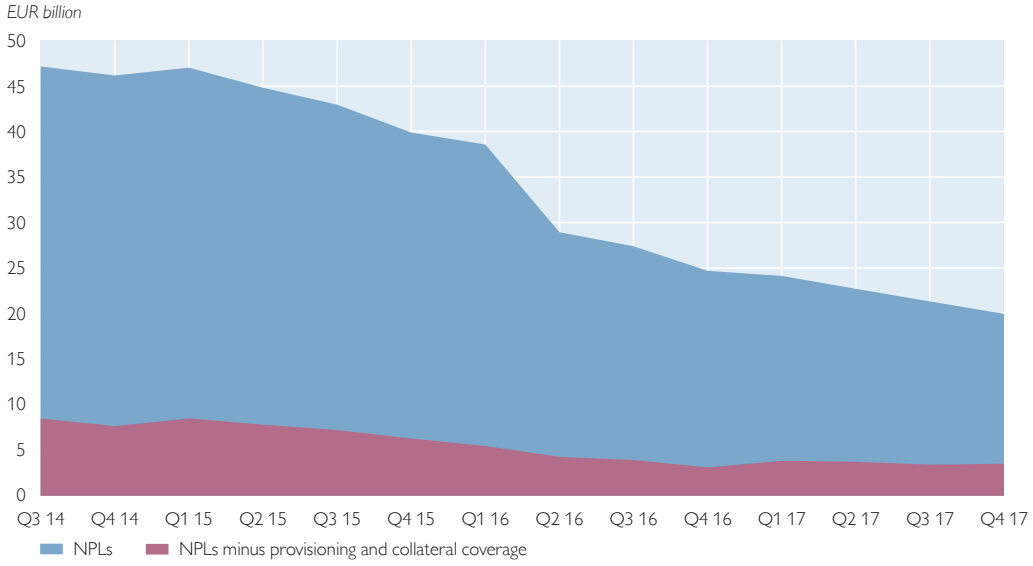
Distribution of coverage ratios across banks



Source: OeNB (supervisory data of 18 IFRS banks).

Chart 4

Nonperforming loans, provisioning and collateral coverage



Source: OeNB (supervisory data of 18 IFRS banks).

3 Borrower types, loan types and economic sectors

In this section we investigate the data at the level of economic sector and borrower type. This helps to better understand what is actually driving aggregate statistics. In subsection 3.1 we ask about borrower types. Which type of borrower is struggling the most to repay debt: households, other financial companies (besides banks) or nonfinancial corporations? Does this change over time? Do collateralized or consumer loans show higher NPL ratios? Are small companies the main contributor to high NPL ratios? At an even more disaggregated level, section 3.2 looks at nonfinancial corporations in specific economic sectors. Here we aim to identify whether companies in certain economic sectors bear particular responsibility for increasing or decreasing NPE measures (with nonperforming exposure exceeding their share of overall exposure).

3.1 Borrower types

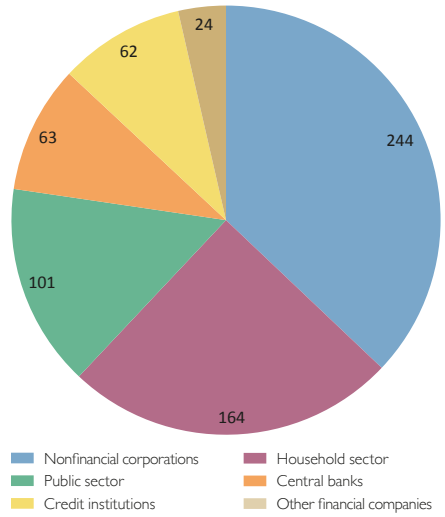
Chart 5 shows all outstanding exposures by borrower type for the fourth quarter of 2017. With about EUR 244 billion, nonfinancial corporations are by far the borrower type that accounts for the largest outstanding exposure. They are followed by households with EUR 164 billion and the public sector (which also includes local governments as well as certain funds and international organizations) with about EUR 101 billion. Central banks and credit institutes have liabilities of about EUR 63 billion and EUR 62 billion each, while other financial institutions such as insurance companies borrowed about EUR 24 billion.

As can be seen in chart 6, nonfinancial corporations also show the largest NPE ratios. About 5.3% of their debt is considered to be nonperforming. The NPE ratio is about 3.8% for households and 2.2% for other financial companies. Credit institutions and the public sector account for hardly any NPEs, and for central banks, the NPE ratio is naturally at zero.

Chart 5

Outstanding exposures broken down by borrower type, Q4 17

EUR billion

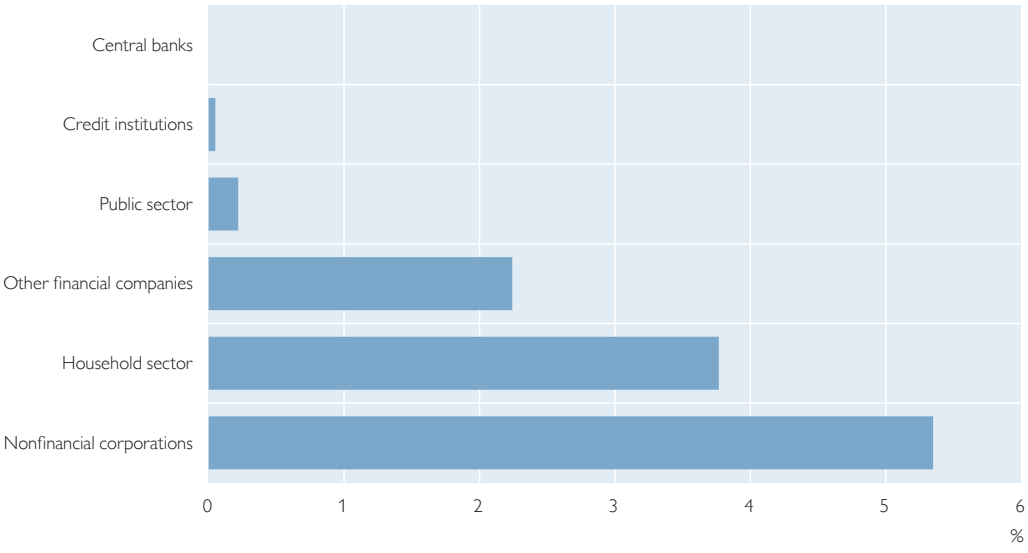


Source: OeNB (supervisory data of 18 IFRS banks).

Chart 7 presents similar more disaggregated information for nonfinancial corporations. Note that both categories, collateralized debt (formerly called commercial real estate)[5] as well as debt owed by small and medium-sized enterprises (SMEs), are subsets of overall debt owed by nonfinancial corporations.[6] Besides the unusual shift in exposure levels evident in the 2016 data, which is again attributable to the carve-out mentioned above, one can see that overall debt has been rising slightly since Q3 2016, while the share of nonperforming debt has declined sharply. The strongest decrease can be observed for collateralized debt, which started off at almost 16% in 2014 and came down to about 6% in Q4 2017. In line with European data, the NPL ratios for collateralized debt and SME debt are higher than the NPL ratios for the overall sector over the entire time period. This points toward rather low nonperforming exposure shares among larger companies using uncollateralized debt.

Chart 6

NPE ratios broken down by borrower type, Q4 17



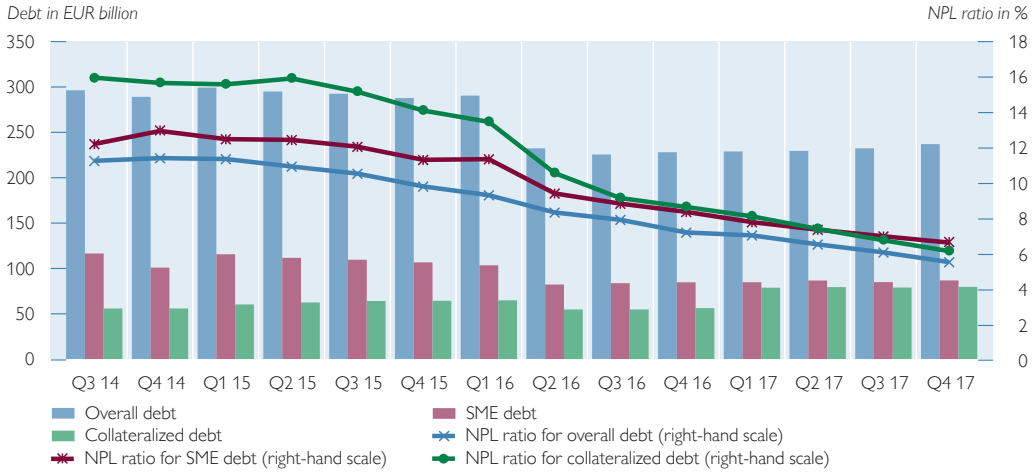
Source: OeNB (supervisory data of 18 IFRS banks).

[5] *Loans collateralized by residential immovable property.*

[6] *They do not add up to the sector's total outstanding debt but may overlap.*

Chart 7

Outstanding debt owed by nonfinancial corporations and NPL ratios broken down by debt type

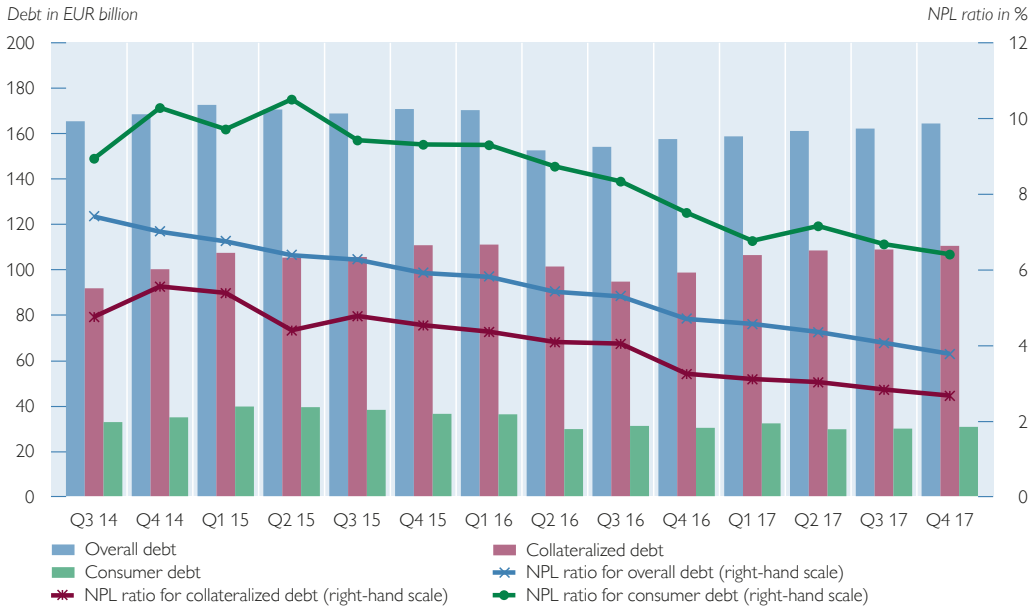


Source: OeNB (supervisory data of 18 IFRS banks).

Chart 8 takes a closer look at the household sector. It shows the total level of outstanding household debt as well as levels of collateralized and consumer debt[7]. From Q3 2014 to Q4 2017, lending to households was rather stable. Note that the shift in exposure level recorded between Q1 2016 and Q2 2016 is again due to a

Chart 8

Outstanding debt owed by the household sector and NPL ratios broken down by debt type



Source: OeNB (supervisory data of 18 IFRS banks).

[7] *Note, however, that while they are both subsets of overall debt, collateralized and consumer debt do not add up to the total debt owed by the household sector but may overlap.*

change in ownership, as explained above. The rise since 2016 is mainly due to collateralized debt, while consumer debt has not been rising. While the NPL ratios are generally higher for consumer debt, they likewise fell from more than 10% in 2015 to slightly above 6% at the end of 2017. NPE ratios for collateralized debt also decreased from over 5% in 2014 to below 3% in 2017.

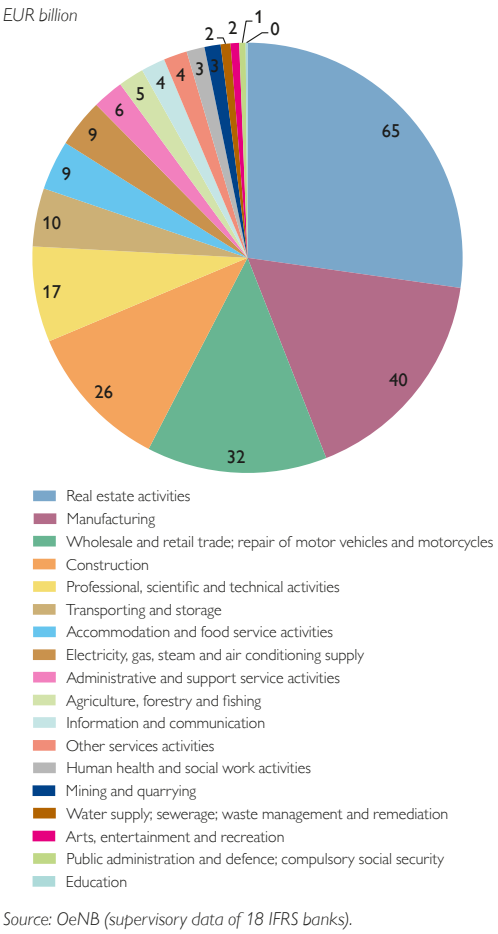
3.2 Economic sectors

Given the available data, we are able to decompose outstanding loans and advances by economic sector. Chart 9 shows Austrian banks' loans and advances toward 18 NACE sectors, i.e. A to S, excluding sector K (financial and insurance activities). Out of the total of about EUR 239 billon, the highest outstanding amounts are found for real estate activities (sector L) with EUR 65 billion, manufacturing (sector C) with EUR 40 billion, wholesale and retail trade (sector G) with EUR 32 billion, construction (sector F) with EUR 26 billion and professional, scientific and technical activities (sector M) with EUR 17 billion.

As can be seen in chart 10, out of the sectors that account for the largest loans and advances, only the wholesale and retail trade sector (sector G) is among those with a rather large share of NPLs. Over 8% of this sector's debt qualifies as nonperforming, and only two other sectors, i.e. accommodation and food service activities (sector I) and other services activities (sector S), show higher shares of nonperforming debt. The sector "other services activities," which shows the highest NPL ratio, accounts for an exposure of only EUR 4 billion. This economic sector includes activities of (political/religious) membership organizations, repair of computers and household goods as well as other personal service activities (washing, hairdressing, funerals).

Chart 9

Outstanding loans and advances broken down by economic sector, Q4 17



Source: OeNB (supervisory data of 18 IFRS banks).

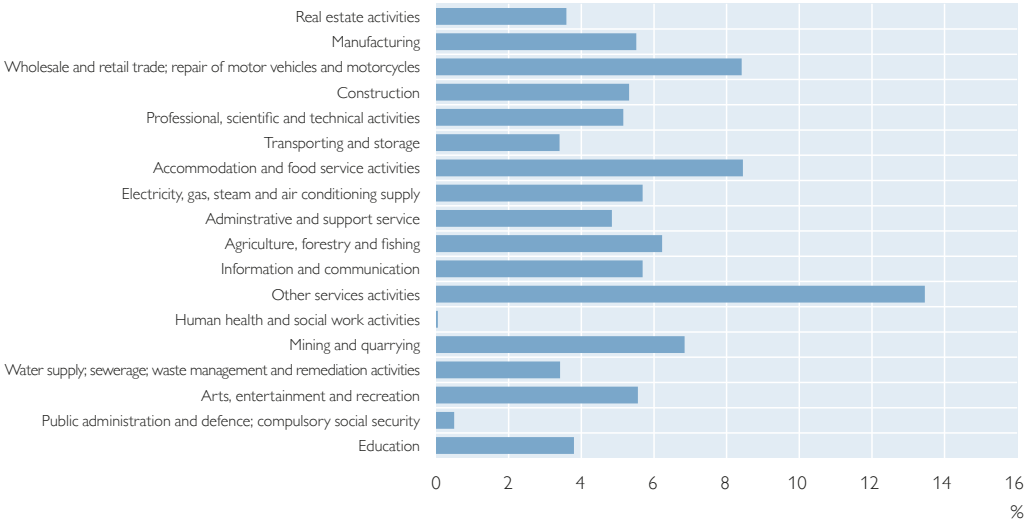
3.3 "Days past due" versus "unlikely to pay"

In this subsection, we look at the criteria based on which banks qualify exposures as nonperforming. As described in box 1, there are two options. Either debt is 90 days past due (DPD, a quantitative criterion) or the bank qualifies it as unlikely to be repaid (UTP, a qualitative criterion) even though it does not show any amounts over 90 days past due. Table 2 shows which share of exposures is classified as nonperforming based on the UTP criterion; the remaining NPL shares result from classi-

Chart 10

NPL ratios broken down by economic sector, Q4 17

(sorted in descending order according to debt owed by the respective sectors)



Source: OeNB (supervisory data of 18 IFRS banks).

fication as DPD. As the weighted mean shows, about half of the outstanding exposure (48.6%) is nonperforming because it is qualified as unlikely to be paid back. In general, the extent to which banks use UTP as a nonperformance criterion varies strongly. As the UTP criterion relies more on qualitative criteria, it is triggered sooner when implemented in a stricter manner. While there are banks where less than one-third of NPE is classified as UTP, there are other banks where UTP debt makes up over 90% of NPE. While UTP as a nonperformance criterion is broadly implemented in the corporate and SME segments, household exposures are usually less often classified as nonperforming based on UTP. Our data confirm this observation. UTP debt accounts for about 52% of total nonperforming debt owed by nonfinancial corporations. The fact that the simple mean lies at 58.2% points to a higher rate of UTP debt for nonfinancial corporations with lower outstanding debt, which might likely be smaller firms. In the case of households, UTP debt still amounts to 38% of all nonperforming debt, with even greater heterogeneity across banks. The household category also covers bullet loans which require repayments and interest payments only at the end of the loan term and where UTP is the only criterion that can trigger default. Cross-European comparisons show an above-average share of UTP nonperforming debt in Austria, which might indicate a more conservative approach in classifying debt as nonperforming compared with other countries.

4 Parents and subsidiaries

In this section, we use unconsolidated bank-level FINREP data from the subsidiaries of Austrian banks to tease out the respective contributions of Austrian parent banks and their subsidiaries to NPL measures. This is especially helpful in understanding differences in the vulnerabilities of loans granted by Austrian banks versus loans granted by foreign (mostly CESEE) banks. It is important to note that in this

Table 2

Exposures classified as nonperforming based on the "unlikely to pay" criterion

	Overall	Households	Nonfinancial corporations
	Share in %		
P10	32.1	15.1	31.7
P50	49.8	39.5	54.9
Mean	53.6	41.0	58.2
Weighted mean	48.6	37.8	52.0
P90	91.0	96.5	90.2

Source: OeNB (supervisory data of 18 IFRS banks).

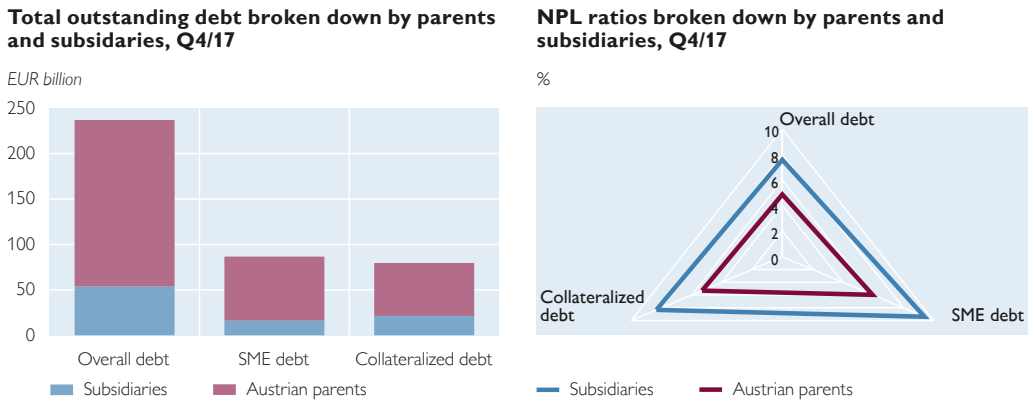
section, "country" refers to the country of origination of the loan and not to the location of the borrower. Thus, it is possible that potentially significant direct cross-border lending has been ignored.

Chart 11 depicts outstanding debt (left-hand panel) and corresponding NPL ratios (right-hand panel) for Austrian parent banks and their foreign subsidiaries. The chart shows that a large share of loans granted to nonfinancial corporations are issued by Austrian parent banks, which holds true both for loans to SMEs and for collateralized loans (as mentioned above, these two categories can overlap and do not sum up to the total exposure to nonfinancial corporations). At the same time, NPL ratios are markedly higher for foreign subsidiaries, regardless of the subcategory observed.

Chart 12 shows that outstanding household loans in general and collateralized household loans in particular were granted predominantly by Austrian parent banks (mostly to Austrian households), while the larger share of consumer loans was granted by foreign subsidiaries. The right panel shows that, in the categories of collateralized household debt and overall household debt, NPL ratios are markedly higher for subsidiaries than for the Austrian parent banks; this drives up the consolidated NPL ratios of Austrian banks shown in the previous sections. It should be noted that collateralized household debt overlaps to a large extent with

Chart 11

Subsidiary vs. parent bank exposures: nonfinancial corporations

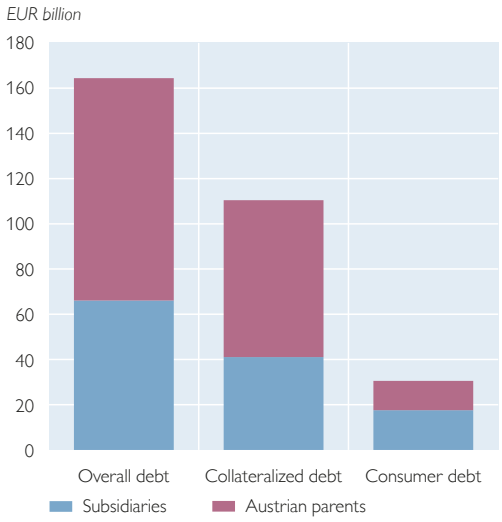


Source: OeNB (supervisory data of IFRS banks).

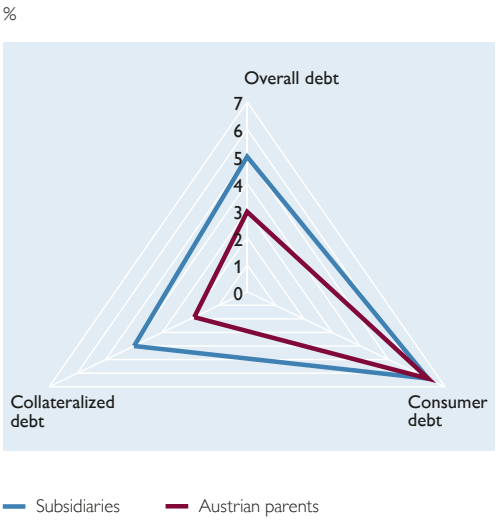
Chart 12

Subsidiary vs. parent bank exposures: household sector

Total outstanding debt broken down by parents and subsidaries, Q4/17



NPL ratios broken down by parents and subsidiaries, Q4/17



Source: OeNB (supervisory data of IFRS banks).

the residential real estate segment, although the classifications are not identical. NPL ratios for consumer loans are similarly high at over 6%.

The reporting data were also used to perform a breakdown of outstanding debt and NPL ratios according to the home country of subsidiaries. However, this breakdown is not depicted here because it would allow inferences to be drawn for individual banks. Summarizing qualitatively, the countries that account for the largest exposures are the Czech Republic, Slovakia and Romania, where NPL ratios are rather low to moderate. Exposures in Croatia, Hungary and Poland are also non-negligible and show somewhat higher NPL ratios.

5 European initiatives to tackle NPLs

Especially since NPLs peaked in 2014, considerable effort has been made to reduce NPL stocks and to prevent a new buildup of NPLs. While banking supervision and banking regulation can make a significant contribution in this regard, other players at both the national and European level have key legal competencies that can aid efforts to reduce NPLs, e.g. through legislation on insolvency proceedings. To this end, various European initiatives have been launched to reduce the volume of NPLs on bank balance sheets.

Important milestones include the following: In 2014, the European Banking Authority (EBA) established a definition of NPLs and NPEs for reporting purposes. This was followed by a comprehensive assessment (including an asset quality review) by the Single Supervisory Mechanism (SSM), which took up operations in late 2014. In September 2016, the SSM (ECB, 2016) published a "Stocktake of national supervisory practices and legal frameworks related to NPLs," followed by the "Guidance to banks on non-performing loans" in March 2017 (ECB, 2017a), which addresses the qualitative management of NPLs in SIs. The guidance was supplemented by the "Addendum to the ECB Guidance to banks on nonperforming

loans: supervisory expectations for prudential provisioning of nonperforming exposures" in March 2018 (ECB, 2018b), which relates to exposures that turn nonperforming from April 1, 2018. In parallel, the European Commission in March 2018 published an analogous proposal regarding the provisioning of loans issued after March 14, 2018 (European Commission, 2018). The proposed regulation also intends to place the definition of nonperforming loans in a level 1 text.

In order to put all of these European initiatives into a unified context, in July 2017, the European Council (2017) published conclusions on the "Action plan to tackle nonperforming loans in Europe." Several of the tasks mandated by the Council are currently being carried out, such as the finalization of the EBA's draft "Guidelines on management of non-performing and forborne exposures" and the development of EBA guidelines on banks' loan origination, monitoring and internal governance. Complementing these mainly regulatory initiatives with supervisory activities, the SSM engages with banks in the context of regular supervisory interaction and places a particular focus on bank strategies to manage and reduce NPL stocks. Such strategies cover a broad range of NPL reduction measures such as sales, securitizations and cures, provisioning, write-offs, etc. Finally, banks' actual performance in reducing their NPL stocks is measured against initial targets on an on-going basis.

6 Concluding remarks

The share of nonperforming exposures in banks' total exposures can be affected by many factors. It is important to identify these factors and to understand what drives changes in the aggregate shares of nonperforming exposures. Disaggregating the totals makes it possible to more clearly identify potential risk factors and to differentiate between systemic and idiosyncratic risk drivers. Moreover, it helps us to understand the riskiness of certain business models and to identify more lenient lending practices among banks.

This paper shows that since Q3 2014 the volume as well as the ratio of nonperforming loans and exposures has declined by more than half to a volume of around EUR 20 billion. Consequently, Austrian banks' NPL ratios have fallen below the European average. At the same time, coverage ratios have remained stable at a comparably high level and are above the European average. Out of this EUR 20 billion, loans totaling at least EUR 5 billion are neither collateralized nor provisioned.

As of Q4 2017 the largest exposures by borrower type are toward nonfinancial corporations (EUR 244 billion) and households (EUR 164 billion).

Since Q3 2017 exposures to both nonfinancial corporations as well as households have decreased, while the associated NPL ratios have fallen by roughly half to 5.3% and 3.8%, respectively. If we take a closer look at debt owed by nonfinancial corporations, the NPL ratios for collateralized debt (formerly called commercial real estate) and SME debt are higher than the NPL ratios for the overall debt over the entire period. In the area of household debt, NPL ratios for consumer loans consistently declined but remained higher than the NPL ratios for collateralized household loans.

Austrian parent banks account for the major part of the outstanding amounts (except in the case of consumer loans), while NPL ratios are driven mainly by their subsidiaries' exposures.

Disaggregation by economic sector shows that the only sector with both elevated NPL ratios and exposure levels is "wholesale and retail trade." The nonperformance criterion "unlikely to pay" is cited more frequently for nonfinancial corporations, while the main criterion for classifying household debt as nonperforming is "days past due" (90+ days).

In this paper, we illustrated that it is worthwhile to go beyond the aggregate figures usually used to analyze nonperforming exposures and instead explore more disaggregated perspectives and distributions across banks. We find that there is no evidence for extraordinary risk concentrations or immediate threats to financial stability originating from the loan breakdowns that we observed.

References

Bärnthaler, P., A. Punk and E. von Pföstl. 2016. Der Non Performing Exposures Begriff – EU und Basel. In: Österreichisches Bankarchiv 9/16. 659–662.

Barisitz, S. 2013. Nonperforming Loans in CESEE – An Even Deeper Definitional Comparison. In: Focus on European Economic Integration Q3/13. Vienna: OeNB. 67–84.

EBA. 2013. EBA Implementing Technical Standards on supervisory reporting on forbearance and non-performing exposures under article 99(4) of Regulation (EU) No 575/2013.

EBA. 2017. Guidelines on the application of the definition of default under Article 178 of Regulation (EU) No 575/2013.

EBA. 2018a. Risk Dashboard – data as of Q4 2017. https://www.eba.europa.eu/risk-analysis-and-data/risk-dashboard

EBA. 2018b. Consultation Paper on Draft Guidelines on management of non-performing and forborne exposures. https://www.eba.europa.eu/regulation-and-policy/credit-risk/guidelines-on-management-of-non-performing-and-forborne-exposures

ECB. 2016. Stocktake of national supervisory practices and legal frameworks related to NPLs. https://www.bankingsupervision.europa.eu/legalframework/publiccons/pdf/npl/stock_taking.en.pdf

ECB. 2017a. Guidance to banks on non-performing loans. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/guidance_on_npl.en.pdf

ECB. 2017b. Stocktake of national supervisory practices and legal frameworks related to NPLs. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.stock_taking2017.en.pdf

ECB. 2018a. Supervisory Banking Statistics. Fourth quarter 2017. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.supervisorybankingstatistics_fourth_quarter_2017_201804.en.pdf

ECB. 2018b. Addendum to the ECB Guidance to banks on non-performing loans: supervisory expectations for prudential provisioning of non-performing exposures. https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.npl_addendum_201803.en.pdf

European Commission. 2018. Proposal for a Regulation of the European Parliament and of the Council on amending Regulation (EU) No 575/2013 as regards minimum loss coverage for non-performing exposures. https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5467253_en

European Council. 2017. Council conclusions on Action plan to tackle non-performing loans in Europe. http://www.consilium.europa.eu/en/press/press-releases/2017/07/11/conclusions-non-performing-loans/

Funding growth and innovation in Austria – financing conditions for SMEs and start-ups

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In Austria, like in most European countries, small and medium-sized enterprises (SMEs) rely on bank funding as their primary source of external finance. Using ECB survey data, we analyze the availability of bank credit for SMEs in Austria in comparison to SMEs in the euro area. Overall, we find that bank lending has been rather stable over the past few years, and the lending conditions did not discourage many potential borrowers. Creditors and investors treat small, young firms that engage in innovation differently due to their elevated risk profile and the high share of intangible capital in their assets. We discuss the financial life cycle of these start-ups and the appropriate funding in each stage, including policy actions that have been taken to encourage a favorable ecosystem for start-ups in Austria. Whereas public support for these firms is well established, the private market for venture capital is rather small in Austria, especially in comparison with European innovation leaders.

JEL classification: G24, O3, H81
Keywords: corporate funding, small and medium-sized enterprises, start-ups, innovations

Small and medium-sized enterprises (SMEs) make up the overwhelming majority of enterprises in Austria, like in all EU Member States; therefore, their ability to finance investments is highly relevant for economic growth. The financial crisis and its consequences for the banking system have raised questions about credit constraints for SMEs and about their access to funding from other sources. The access to funding for young, innovative SMEs has been much debated because, on the one hand, these firms are seen as important contributors to technological progress and structural change; on the other hand, their risk profile and their capital structure require different financing approaches compared to funding for traditional SMEs. In Austria, several policy measures have been implemented in the recent past to improve the ecosystem for these start-ups. This paper gives an overview of the current situation and is structured as follows: Section 1 presents the main features of SMEs in Austria and compares them to data from European peers. In section 2, we discuss the funding choices of SMEs and start-ups and contrast these considerations with empirical findings. Section 3 focuses on bank lending to SMEs, and section 4 discusses the funding needs of start-ups over their life cycle and briefly presents relevant policy initiatives; finally, section 5 concludes.

1 Some stylized facts on SMEs in Austria

The European Commission defines SMEs as "enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million".[2] SMEs account for most of the economic activity in Austria; in fact, the overwhelming majority of Austrian enterprises are SMEs. This is by no means a peculiarity of the Austrian economy: in all EU Member States, more than 99% of enterprises are small or medium-sized; in the U.S.A., too, SMEs make up more than 99% of all

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[2] *Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. For further details, see http://ec.europa.eu/DocsRoom/documents/15582/attachments/1/translations.*

enterprises. The fact that almost everywhere almost all enterprises actually are categorized as SMEs might contest the analytical rigor of the category itself.

According to the European Commission (2017), there were 325,428 SMEs in the nonfinancial business economy in Austria in 2017, and they employed 1.9 million people. Austrian SMEs employed 68.7% of the workforce in the private sector, which was roughly the same level as the EU average (66.6%). While productivity is generally lower in SMEs than in large firms, the productivity of Austrian SMEs is higher than the average EU SME productivity: the percentage of value added by SMEs was 62% in Austria compared to an EU average of 56.8%. Lower productivity is also reflected in lower wages. Labor costs in SMEs are only 56% of the total labor costs in the nonfinancial business sector. Within the EU, the share of SMEs in total value added varied from 51.8% in the U.K. to 82% in Malta.

Austrian SMEs tend to employ more people than European SMEs on average: only 0.9% of all EU firms are medium-sized, i.e. they employ between 50 and 249 persons, whereas 1.6% of Austrian firms belong to this size class. In comparison, 87.3% of Austrian firms have 9 or fewer employees and thus are labeled micro firms, while EU-wide, on average, 93% of enterprises are micro firms.

SMEs contribute significantly to economic growth and employment in Austria. From 2011 to 2016, value added in the nonfinancial business sector increased by 15.2% in Austria; but while the growth rate for large firms with 250 employees or more was 10.3%, it was 18.2% for SMEs. Over the same period, employment in SMEs expanded by 7.6% compared to 3.3% in large firms.

Growth rates among SMEs vary quite significantly: while many remain rather constant in size over time, others see strong increases in turnover and employment. The growth path very much depends on the chosen business model and technology. Local service providers like bakers or barber shops are rarely in a position to exploit economies of scale that would support strong growth. Eurostat defines firms with more than 10 employees and an annual growth rate of more than 10% as high-growth firms (HGFs). EU-wide these HGFs accounted for about 9.9% of all firms in 2016, whereas in Austria, their share was 6.8%; only Greece and Romania had relatively fewer HGFs. Additionally, HGFs in Austria were significantly smaller, with an average of 59 employees compared to an average of 85 employees in the EU in aggregate.

Due to Austria's lackluster performance in the field of HGFs, there is recurring doubt whether SMEs' growth is constrained by obstacles in their financing of new investments. Deleveraging in the aftermath of the financial crisis or new bank regulations have been named as potential causes of such financial constraints. The existence of the SME-supporting factor in the Capital Requirements Regulation[3] is testament to the very importance that policymakers in all EU countries, not only Austria, attribute to SMEs' access to finance.

A special case in the group of fast-growing SMEs are so called start-ups. Start-ups are defined as firms that are less than 10 years old, aim at significant growth in revenue and/or employment (often by exploiting economies of scale) and introduce a technological innovation or operate on an innovative business model. The Austrian Institute for SME Research (KMU Forschung Austria) estimates that between 500

[3] *This factor was introduced in January 2014 and it allows for lower capital requirements on bank loans to SMEs; for more details, see European Banking Authority (2016).*

and 1,000 start-ups are founded in Austria each year. Despite the fact that job creation and technology diffusion by newly founded firms have been a focus of innovation policy and economic research for decades (see, for example, Schibany et al., 2013), start-up entrepreneurs and their social networks have managed to create a certain hype around their activities. Although there is strong public interest in start-ups, reliable data on their activities are not available so far.

2 The funding structure of SMEs

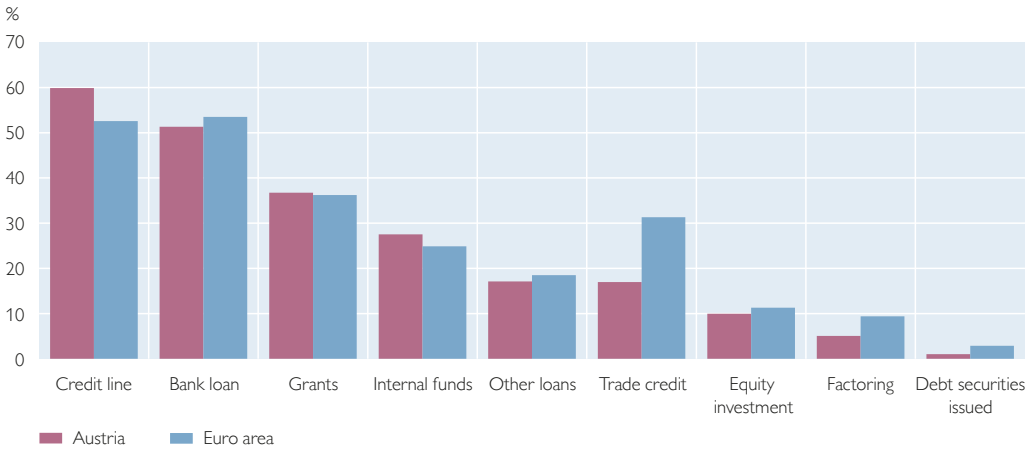
Austrian SMEs finance their assets mostly by debt; their equity ratio was 30.4% on average in 2016[4]. The equity ratio is positively correlated with size: micro firms, small firms and medium-sized firms have average equity ratios of 23%, 28% and 33%, respectively. Differences according to economic sectors are less pronounced, with the one exception of tourism: whereas SMEs in most sectors report equity ratios of 30% or more, SMEs in the tourism industry have a mean equity ratio of only 20%. Among the credit components of the balance sheet, bank financing (overdrafts and loans) are the most prominent ones, with bank loans representing 28.6% of all liabilities.

The demand for credit and equity by firms has been modeled by Myers and Majluf (1984) in a "pecking order" generated by asymmetric information. Firms prefer funding their operations by retained earnings to funding by credit, and they prefer funding by credit to funding by equity. Managers of firms[5] have better information about the returns on investment of their operations than outside investors. Therefore, outside investors demand a risk premium which is higher for equity because the risk of equity funding is higher, whereas internal funding by retained earnings has no risk premium attached.

A company's ability to rely on retained earnings clearly depends on its recent cash flows, which were negatively affected by the financial and economic crisis

Chart 1

Funding sources used by SMEs



Source: ECB SAFE.

[4] *Data on the balance sheets of SMEs were taken from a recent report by Wirtschaftskammer Österreich (2018).*

[5] *Myers and Majluf (1984) also examine possible conflicts of interest between managers, old shareholders and new shareholders; for many Austrian SMEs, it is fair to assume that managers and old shareholders are identical.*

after 2008, but have improved over the last years. Therefore, even if firms preferred to use internal funds for their funding, they would have to use external sources to a higher degree. Chart 1 presents the latest results from the Survey on the Access to Finance of Enterprises (SAFE), which is conducted semiannually by the ECB and the European Commission among European firms. The data for chart 1 stem from the survey round that was conducted in March and April 2018. More than 50% of responding SMEs in Austria and the euro area said that credit lines and bank loans were relevant to their enterprises,[6] whereas only about 3% of euro area SMEs and 1% of Austrian SMEs considered debt securities as relevant.

The problem of asymmetric information is more severe for SMEs than for larger enterprises because they are usually less obliged to report firm-specific information depending on their legal form of incorporation. The lack of reliable timely information about the state of an SME affects not only investment decisions, it also raises the monitoring costs for potential investors after they have provided funding to an SME.

One way to overcome the problem of asymmetric information for SMEs is to establish a lasting relationship with their main bank. Over time, the bank will be in a better position to assess a firm's characteristics that are decisive in lending but usually unobservable, like, for instance, management quality. While this kind of relationship lending can increase the flow of bank credit toward SMEs, too much proximity between bank managers and their business debtors might also erode credit standards, as Haselmann et al. (2018) have shown for southern Germany.

Beside the information and monitoring issues, the higher risk premia of SMEs compared to larger firms can also be explained by higher default risk. Equity ratios in firms rise with the size of their balance sheets, and SMEs by definition have smaller balance sheets than large firms. Therefore, negative economic shocks pose a more severe risk to SMEs and their investors. Bärnthaler et al. (2018) show that banks' ratios of nonperforming loans (NPLs) to total loans to SMEs are higher than the NPL ratio for loans to large firms. Credit guarantees by the public sector can increase banks' willingness to provide loans to SMEs as they transfer the associated risk.

Debt funding directly via the capital market by issuing bonds or commercial paper is not accessible to most SMEs, again due to economies of scale because tapping the bond market involves significant transaction costs. Before a bond can be issued, the issuer has to meet regulatory requirements, publish a prospectus and pay legal fees and other expenses. Moreover, once the bond has been issued, the issuing firm has to engage in investor relations, which also consumes resources. Equity funding via the stock market is subject to similar concerns.

The size of their financing needs also makes SMEs unattractive to institutional investors like pension funds or insurance companies, which dominate capital markets. These investors often manage assets up to billions of euro and tend to look for single investment opportunities where they would place at least EUR 5 million to EUR 10 million; and this would exceed the funding needs of most SMEs by far.

[6] *The question asked in the SAFE is: "Are the following sources of financing relevant to your enterprise, that is, have you used them in the past or considered using them in the future?" It should be noted that the category "credit line" in chart 1 combines funding from credit lines, bank overdrafts or credit card overdrafts.*

SMEs often refrain from equity funding in general, not only via the stock market, because they are concerned about loss of control. Equity investors acquire a stake in the firm and this usually also gives them a form of participation in decision-making. In many cases, SMEs are run by their owners, who want to keep making their own decisions without interference from external investors.

For innovative SMEs or start-ups, the funding choices are different. They are less interested in bank loans (which they are also less likely to receive, as we will see later) because, in general, loans come with prespecified repayment schedules, maturities and interest rates regardless of whether an enterprise is successful or not. The business models of these firms are risky, therefore they tend to look for risk capital or venture capital (VC) in the form of equity stakes. VC investors are willing to bear the risk and, in return, they participate in the potential gains to come. Furthermore, their role exceeds the mere financing function of regular investors, as we will see in section 4.

To get a picture of the economic situation of SMEs, the SAFE survey asks firms what their most pressing problems are. Participants in the survey can choose their answer from the following list: finding customers, competition, access to finance, cost of production and labor, availability of skilled staff or experienced managers, regulation, or other. Interestingly, access to finance seems to be a lesser concern to Austrian SMEs, with only 6.2% of domestic respondents naming this as their most pressing problem; each one of the other possible answers was chosen by more SMEs in the survey.[7] For most SMEs in Austria, the availability of skilled staff or experienced managers is the most pressing problem in their current operations, followed by difficulties to find customers.

The European Investment Bank (EIB) also examined access to finance in its annual Investment Survey (EIBIS); the results from the most recent wave of this survey are presented in EIB (2017). The EIBIS asks firms to rank obstacles in their investment decisions. Additionally, the EIBIS classifies firms into different categories according to their innovation profile: basic firms (i.e. firms that do not engage in any innovation activities), adopting firms, developers, incremental innovators and leading innovators. Again, for Austrian firms surveyed in the EIBIS, availability of staff with the right skills is the most prominent obstacle, with more than 90% of leading innovators and developers naming this as the most important investment obstacle. In contrast, availability of finance is one of the least important obstacles to investment for all Austrian firms in the survey, regardless of their innovation profile; only the availability of adequate transport infrastructure is even less of a problem to them.

3 The availability of bank credit to SMEs

In the aftermath of the financial crisis, bank lending to SMEs[8] in the euro area has dropped significantly. Wehinger (2014) offers an overview over the impairment of bank lending to SMEs during the financial crisis and policy responses to facilitate SME access to financing. Total bank loans to SMEs in the euro area declined from

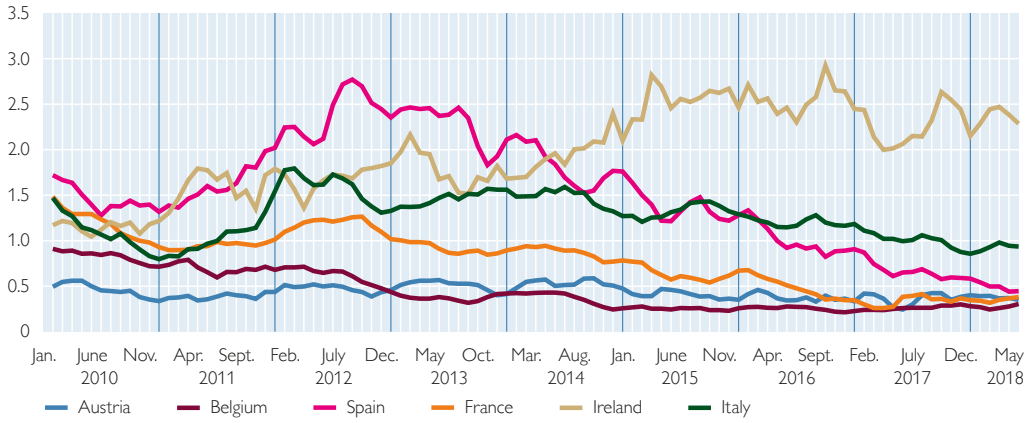
[7] *This compares fairly well to Greece, where 20.5% of surveyed SMEs named access to finance as their most pressing problem.*

[8] *SME credit is proxied by loans to nonfinancial corporations up to and including EUR 1 million from the ECB's MFI statistics.*

Chart 2

Interest rate spreads between bank loans to SMEs and bank loans to large firms

Three-month moving average in percentage points



Source: ECB.

an average pre-crisis level of EUR 85 billion per month in 2008 by 36% to EUR 54 billion in 2013 and has not recovered yet; in the first half of 2018, the monthly average had reached EUR 65 billion.

3.1 SME lending patterns of Austrian banks

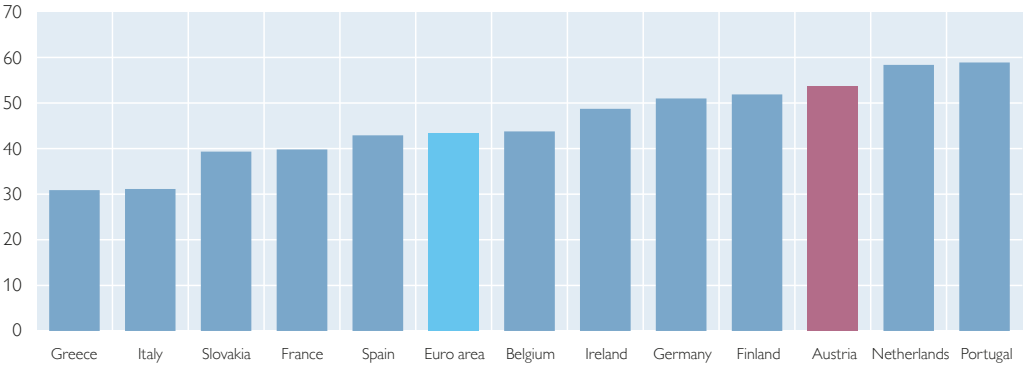
In Austria, bank lending to SMEs has been much more resilient. It did not decline during the crisis and dipped only briefly in 2013 just to recover by 2016, when it had already reached pre-crisis levels again. In June 2018, the amount of loans other than revolving loans and overdrafts as well as convenience and extended credit card debt from the Austrian banking sector to SMEs totaled EUR 1.16 billion, which was exactly the monthly average in 2008.

Banks' interest rates for SME loans have been declining since the end of 2011 in Austria and amounted to 1.77% in June 2018. The spread between SME loans and loans to large firms has been rather stable over the last years and averaged

Chart 3a

SMEs that did not apply for bank loans because of sufficient internal funds

% of surveyed SMEs

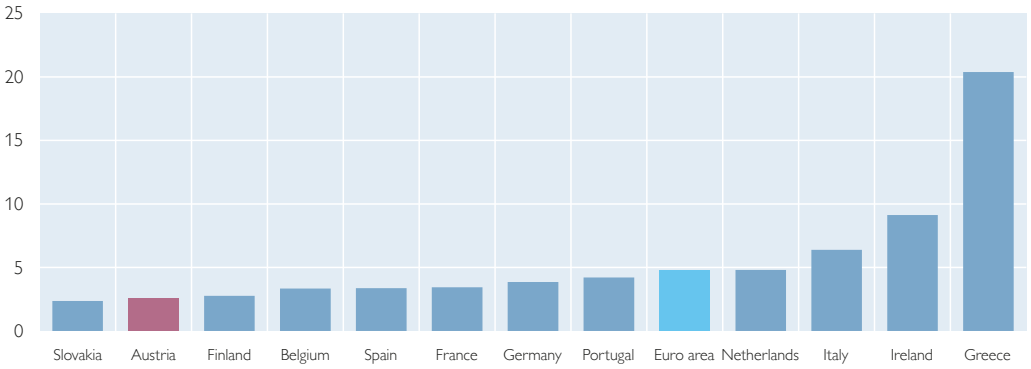


Source: ECB SAFE.

Chart 3b

SMEs that did not apply for bank loans because of possible rejection

% of surveyed SMEs

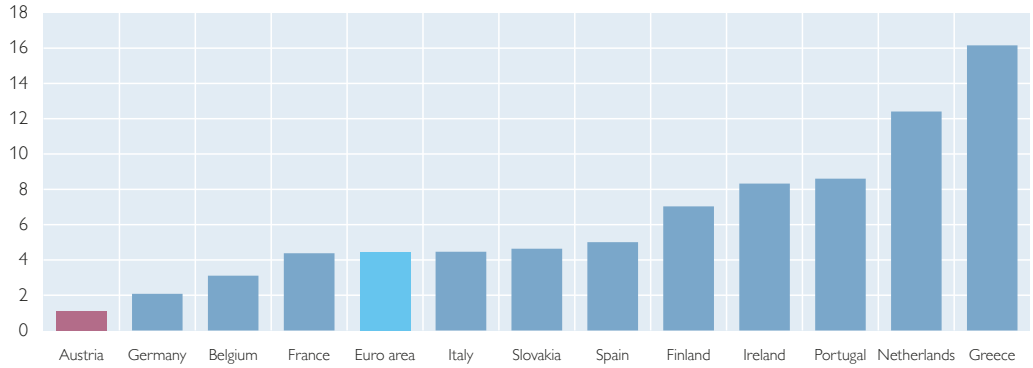


Source: ECB SAFE.

Chart 3c

SMEs that applied for bank loans but whose applications were rejected

% of surveyed SMEs

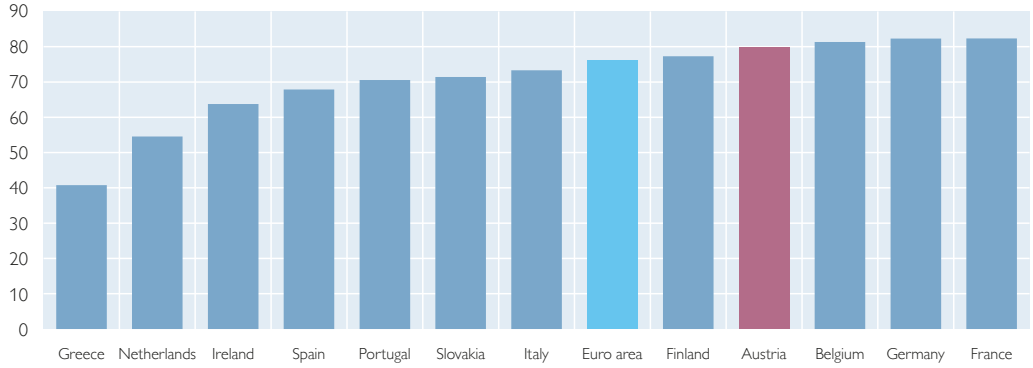


Source: ECB SAFE.

Chart 3d

SMEs that applied for bank loans and got the total amount they applied for

% of surveyed SMEs



Source: ECB SAFE.

38 basis points during the first half of 2018. There are only a few euro area countries where SMEs would find more favorable credit conditions for the time being. In some countries, the spread for SME loans has increased significantly (as can be seen in chart 2), thereby impeding the transmission of expansive monetary policy impulses in the aftermath of the financial crisis for a large part of the business sector.

According to the latest SAFE wave (which refers to the second half of 2017), 53% of Austrian SMEs had not applied for bank loans because they had sufficient internal funds at their disposal, and only 2.6% of SMEs had not applied for a bank loan because they feared their application would be rejected. Of those SMEs that had applied for bank loans, only 1% was rejected by the banks, whereas 79.8% received the full amount they had applied for. These numbers compare quite favorably to other euro area countries, as can be seen in charts 3a to 3d. Like in most countries, the rejection rate peaked in 2009 and rose again in 2014, but declined swiftly thereafter.

As we have seen in chart 1, credit lines, bank overdrafts or credit card overdrafts represent an important part of SME funding in Austria. The SAFE data allow us to trace back the path of interest rates charged on these funding instruments. The average interest rate on credit lines or bank overdrafts was 1.95% in Austria in the second half of 2017, which was the second lowest rate in the euro area next to rates in Finland. Interest rates have come down by 140 basis points since 2014 in Austria and 250 basis points in the euro area on average. The decline in euro area rates was mostly driven by lower rates in Portugal, Spain and Italy, where the interest rate had exceeded 6% in 2014 (compared to 3.3% in Austria).

In its annual report "Financing SMEs and Entrepreneurs," the OECD also analyzes the credit conditions for SMEs. In a comparison of SME loans to total new business loans up to 2016, they find that the share of SME loans has increased in Austria, mostly due to a decline in the loans to larger firms. This is interpreted as the result of large firms' strategy to resort to forms of funding other than bank loans. As we have shown in section 2, alternative forms of funding, like e.g. funding via capital markets, are not easily available to many SMEs. The OECD report also analyzes data on loan maturities and finds that in Austria, the share of short-term loans (defined as loans with a maturity of less than one year) in all SME loans declined from 60% to 40% between 2009 and 2016. Short-term funding is usually sought by firms to finance working capital, whereas long-term borrowing funds investments. Therefore, the relative reduction in the share of short-term loans to Austrian SMEs coincides well with the current upswing of the investment cycle in Austria (see Fenz et al., 2018). Survey data on bank lending in Austria as presented by Hubmann (2018) also show that SMEs have continuously increased their credit demand since the end of 2016, and credit standards of banks have remained neutral over this period.

3.2 Bank lending to innovative SMEs and start-ups

Access to bank loans is more difficult for innovative, technology-intensive SMEs or start-ups for a number of reasons. First, innovative firms hold a substantial part of their capital in the form of intangible assets. Intangible assets are defined by the OECD (2018) as "identifiable non-monetary assets without physical substance" that in most cases represent intellectual property such as patents, brands, copyrights or software. This asset class is challenging to use as collateral for several reasons. The valuation of intangible assets often suffers from the lack of standardized approaches, especially when it comes to innovative intellectual property rights for which no market has been established yet. A bank that should lend money against this collateral and the creators of the intellectual property may differ quite significantly in their assessment of a fair price for intangible assets and the future cash flows to be expected from innovations.

Another problem with intangible assets like innovative intellectual property rights is their restricted range for redeployment outside the original business environment in which they have been created. Physical capital like machines or vessels can be deployed in many different production processes, and often there is a liquid secondary market for used capital goods. Innovations are by definition new to the market; hence, if the borrower defaults on their loan, the bank might repossess the intangible asset but will find it difficult to resell it. Due to this kind of transaction risk, a bank would offer a loan against innovative intangible collateral only after applying a severe haircut (if at all).

The repossession of intangible assets poses a risk in itself because property rights in technologies or innovative processes are more difficult to uphold than the ownership of tangible assets. Even if innovative processes are protected by patents or copyrights, the original innovators might deploy them in new applications and it might become rather difficult for the new owners to prove misappropriation or infringement. Again, these considerations induce banks to abstain from accepting intangible assets as collateral.

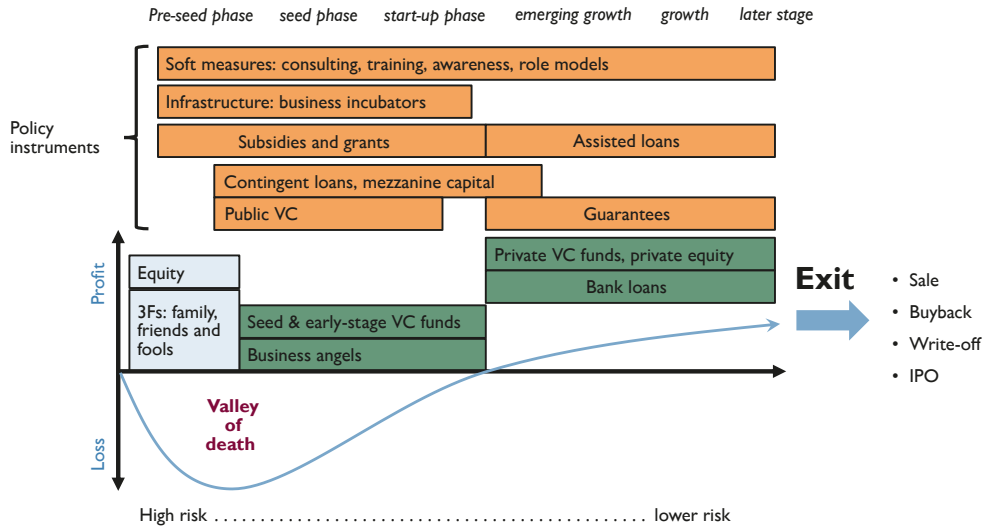
Young firms in general have more restricted access to funding because they had less time to accumulate retained revenues and therefore have lower equity ratios. The lower equity ratio makes marginal investment in these firms relatively riskier for external investors. Another reason for the lower propensity of creditors to provide loans to young firms is their missing track record. With young firms, investors cannot judge whether management is capable of running the business or whether the business model itself is sustainable. Older firms that have already mastered this test of the markets are more likely to receive loans or equity investments. In its recent Investment Report, the EIB writes: "Young SMEs with radical innovative projects are the most credit-constrained category of firms" (EIB, 2017, p. 339).

4 The funding of start-ups

As we have seen so far, start-ups do not really have sufficient access to bank credits or traditional capital markets, so they usually rely on alternative forms of funding. In this context, the start-up's current stage in its life cycle plays a significant role: for each different stage, different financing conditions and instruments apply.

Chart 4

Start-up life cycle stages and financing



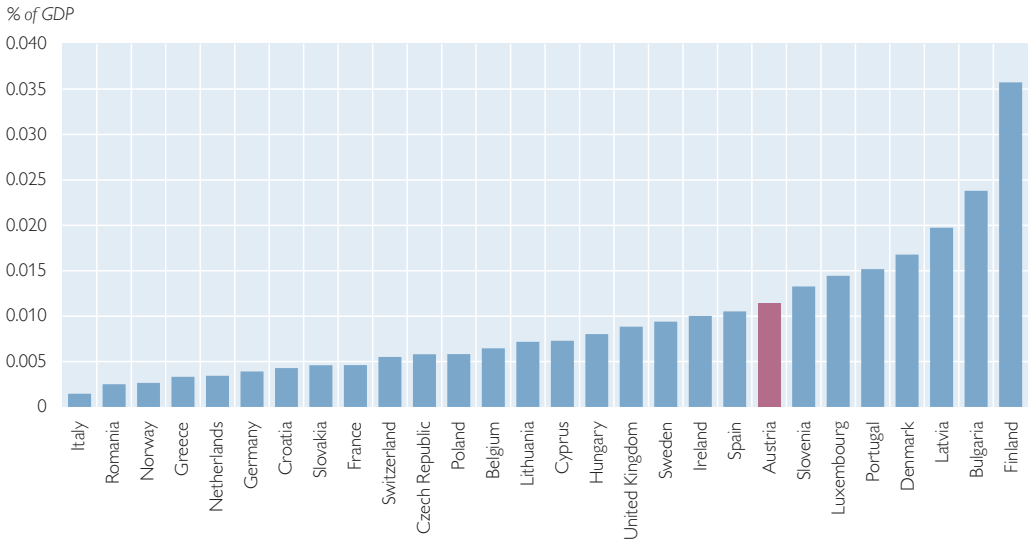
Source: Authors' compilation based on Darcy et al. (2009).

This holds true especially for innovative start-ups which may still need long (and potentially costly) R&D processes before they can deliver their first products and, eventually, scale up production. Chart 4 highlights this relationship.

In the very first stage ("seed") in the start-up life cycle, the costs of setting up the firm, the costs of R&D necessary to develop or refine the business idea (e.g. proof of concept, prototype development, product refinement, etc.) lead to rather high operating costs. These costs are not yet matched by corresponding market revenues; revenues are likely to be negligible. At this stage, start-ups face a great risk of running out of funds ("burning cash"), hence the notion of the "valley of death," which indicates that many innovative start-ups eventually fail right there. Early financing often relies on the founder's own funds, the so called "3Fs" (families, friends and fools) and maybe on a business angel who specializes in the very early stages of business creation and might bring to the start-up not only funding but also much needed business and market know-how. Additionally, funding via "crowdinvesting" is rising in importance as well. External financing in the form of bank loans is basically excluded at this stage, for reasons we have mentioned before. The public sector might support start-ups during this phase with a variety of different instruments, ranging from "soft measures" like the provision of specialized know-how, training, infrastructure (e.g. incubator centers) to direct monetary support by grants or the provision of public capital (e.g. via public VC funds). According to Leitner et al. (2018), the most important funding sources are founders' own capital resources (with about 81% of all start-ups reportedly using this source) followed by public subsidies and allowances (reported by 55% of all start-ups). Interestingly, business angels take third place, with about 33% of start-ups reporting to have some sort of financial backup by business angels. Only 21.8% of the surveyed start-ups had received bank loans, compared to 51.3% of SMEs according to the SAFE data.

Chart 5

Business angel investments in 2016 and 2017



Source: EBAN, Eurostat.

However, reliable statistical data on funding by business angels are rather scarce, there is no official reporting and many business angels prefer not to disclose their activities. We used data from the European Business Angels Network (EBAN) that are published annually to compare the role of business angels in Austria with that in other European countries. Chart 5 shows the disclosed amounts invested by business angels in 2016 and 2017,[9] measured as a percentage of GDP. In total, business angels invested EUR 20 million in Austrian firms in 2017. The largest business angel market in the EU is the U.K. with 8,000 active business angels and a total investment sum of EUR 107 million in 2017. Interestingly, the average investment sum of EUR 500,000 per business angel is quite high in Austria,[10] indicating that this form of investment is conducted mostly by rather wealthy individuals.

Crowdinvesting is a relatively new form of alternative financing based on online platforms that directly match creditors and debtors. It is the most immediate form of financial intermediation without any risk transformation or maturity transformation provided by the intermediary. In Austria, it gained traction in 2015, when a new regulatory framework was enacted; for more details, see Pointner and Rauning (2018). In 2017, crowdinvesting accounted for investment flows of about EUR 25 million according to CrowdCircus market statistics. By mid-2018, crowdinvesting had already surpassed more than 2/3 of the previous year's volume. Despite the rapid growth of this new market, it should be noted that most of these investments are channelled into real estate and not into start-ups. According to

[9] *We dropped Estonia from the chart, as its share was more than double that of Finland. Non-EU countries Switzerland and Norway are included because their general degree of capital deepening is comparable to Austria's.*

[10] *The average sum is only surpassed by Portugal (EUR 590,000) and amounts to EUR 400,000 in Germany and approximately EUR 250,000 in Sweden, Finland and Spain, respectively; other countries' averages are lower.*

Leitner et al. (2018), about 10% of start-ups have received funding via crowd-investing.

After the seed phase, start-ups enter the early growth phase, when they slowly build up a track record and – as a result of previous funding by different investors – accumulate assets (physical and intangible), which could partially serve as collateral for bank loans. At the same time, the companies are now also attractive to more "traditional" VC funds. As an additional economic policy instrument, loan guarantees and interest-based loans (assisted loans) can now also be used.

During the growth phase, when the estimated company value increases, the exit question comes into play. Early-stage VC funds usually have a time horizon of approximately five years; this is the period for which shares of a portfolio company are typically held. Typical forms of exits are sales to large companies in the same sector ("trade sale"), sales to other VC funds ("secondary investments"), a buyback of shares by the start-up founders as well as the sale of company shares on the stock exchange in the form of an initial public offering (IPO). It should be noted that the latter exit channel in Austria is extremely rare among start-up companies due to the shallowness of the Austrian capital market.

4.1 Policy initiatives to support start-ups

The public sector is also active in funding innovative SMEs and start-ups in Austria. At the federal level, the main agencies responsible for stimulating the establishment of new businesses in general and innovative start-ups in particular are aws (austria wirtschaftsservice GmbH) and FFG (Austrian Research Promotion Agency). FFG's funding portfolio ranges from support programs for applied research in very early stages of the innovative process to grants for the development of marketable products. Besides direct support at the individual firm level, FFG also funds so-called structural programs that aim at improving the framework for innovation by supporting cooperation between science and industry. FFG runs a start-up funding program which covers up to 70% of all costs in technically risky and economically interesting projects of young innovative SMEs; the funding consists of a mix of nonrepayable subsidies and low-interest loans. Markt.Start is another FFG program for small companies. Its objective is to provide financial assistance during the start-up phase or the emerging-growth phase (see chart 4), when innovative SMEs introduce new products or processes to the market.

The agency aws acts as a public bank (with its own bank license), supporting start-ups with a wide variety of instruments. Indeed, aws covers a start-up's complete life cycle as shown in chart 4 with specific instruments which are specifically geared to the different stages or phases of the life cycle. The most important measures are:

- Grants: pre-seed and seed financing (specific grants for setting up and developing an innovative high-tech start-up company); specific grants for the creative industries sector; grants for innovative services (in practice mainly IT).
- Direct and indirect provision of public risk capital: aws Gründerfonds (public VC fund which invests directly in innovative start-ups), aws Mittelstandsfonds (public fund which invests directly in growth-oriented SMEs), aws Venture Capital Initiative (indirect stimulus via public investment in private VC funds), aws business angel fund (syndicating investments of certified business angels in conjunction with the European business angel fund).

- Guarantees: aws guarantees for loans for young firms or SMEs that were founded no more than six years ago; double equity (guarantees for loans for young firms or SMEs which have also equity capital).
- Infrastructure: AplusB Scale-up (support for specific incubator centers specifically geared toward mentoring, assisting and supporting innovative start-ups).
- Soft measures: aws business angel exchange (matchmaking between business angels and start-ups); various awareness, consulting and training measures.

Box 1

Policy in action: the start-up package

In 2016, the Austrian government agreed upon a so-called start-up package to strengthen the domestic start-up economy and help to create a supportive ecosystem for start-ups in Austria. The whole bundle of measures and initiatives was worth EUR 185 million and aimed at the creation of an additional 50,000 enterprises by 2020. The package consisted of the following main policy actions:

***Reduction of non-wage labor costs:** The public purse subsidizes the employer's contribution to social security for the first three employees and for a period of three years.*

***Risk capital premium:** 20% of annual investments in a start-up are reimbursed (up to EUR 250,000) with public funds.*

***Public funds for start-up support:** The financial endowment of the aws business angels funds and aws seed funding was increased.*

***New private investment funds:** a new legal form of investment funds ("Mittelstandsfinanzierungsgesellschaft") that focuses entirely on risk capital for SMEs and carries tax advantages was created.*

***Digital one-stop-shop for business founders:** All the necessary information and documents for starting an enterprise are made available online.*

In its SBA Fact Sheet Austria, the European Commission called the start-up package a "remarkably broad set of innovative measures" and expressed its interest in the implementation of the package. More generally, the public funding of start-ups does not seem to be the problem in Austria; the European Startup Monitor (2017) ranks Austria as the country leading in governmental funding of start-ups.[1]

[1] In the 2017 European Startup Monitor (ESM) survey, 55.4% of Austrian start-ups stated that they had received government subsidies, compared to 35.5% of German start-ups (in 2nd place) and 25% of Spanish start-ups (in 3rd place); the survey does not quantify the amount of these subsidies.

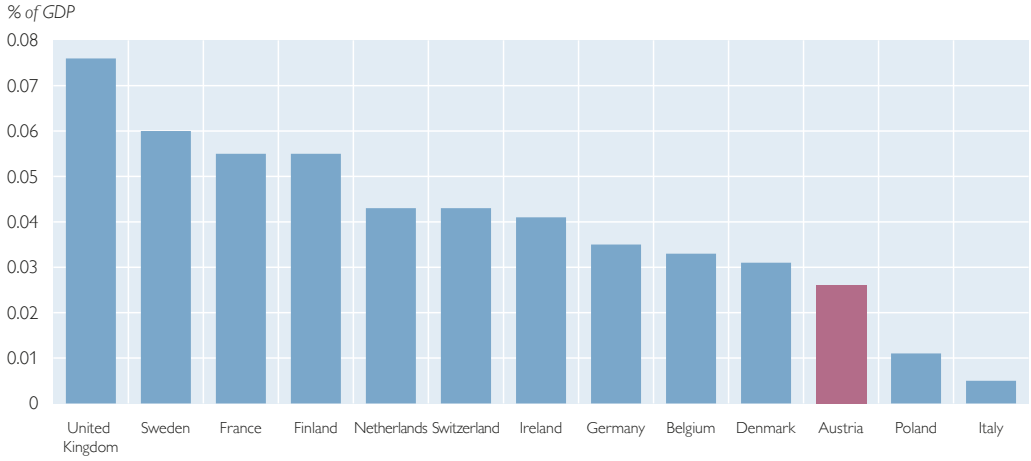
4.2 Recent trends in the Austrian venture capital market

The development of the VC market in Austria has always been considered to be a particular weakness of the Austrian innovation system; for an extensive analysis, see Jud et al. (2013). Despite various policy approaches to stimulate the capital market, it is still in an "infant stage," especially compared with the much more developed markets of some Nordic countries (e.g. Finland, Sweden), the Netherlands, Switzerland, France or the U.K. (see chart 6). Nevertheless, Austria has gained some ground on Germany, which has a comparable economic structure and institutional set-up (i.e. a traditional focus on financing via bank loans).

Even during past hypes (e.g. the boom of the so-called "new economy" of the 1990s) and times of strong economic growth like the years before the global financial crisis, the risk capital market in Austria was less dynamic than in other countries. It was nearly drying up after the financial and economic crisis in 2008 and the following years. Important institutional actors such as banks, insurers and pension funds even left the market altogether, as documented by Gassler and Sellner (2015).

Chart 6

Investment in risk capital in 2017



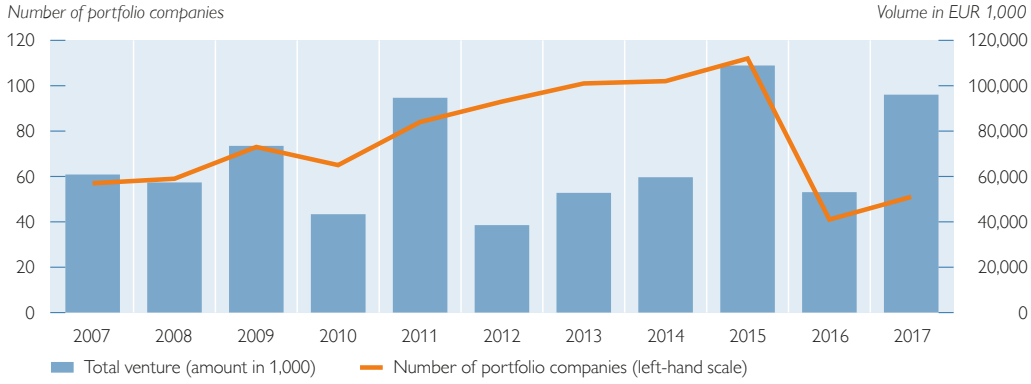
Source: Invest Europe, Eurostat.

Recent anecdotal evidence (based on interviews with various fund managers) and media reports suggest an increased activity of VC firms in Austria. Some fund managers even raised the question of whether there might be "enough" interesting start-up projects around that are able to absorb the "flood" of new VC coming to Austria. Indeed, the history of some genuine VC firms shows that they had no problem at all to raise new VC money for their second round (after their first fund has already been successful). Of course, a series of extremely successful exits (at least under the conditions of the Austrian VC market) resulted in a much higher propensity to supply relevant risk capital available from potential investors. Besides, the still low interest rate environment is an important push factor as well. However, official data from the relevant organisation ("Invest Europe") show ups and downs and no clear trend toward an ever increasing market size (see chart 7).

Apart from considering the amount of available VC funds, it is also worth looking at the number of start-ups which were able to attract VC investments, i.e. which became portfolio companies of VC funds. If we compare these numbers and

Chart 7

Venture capital investment and number of portfolio companies in Austria

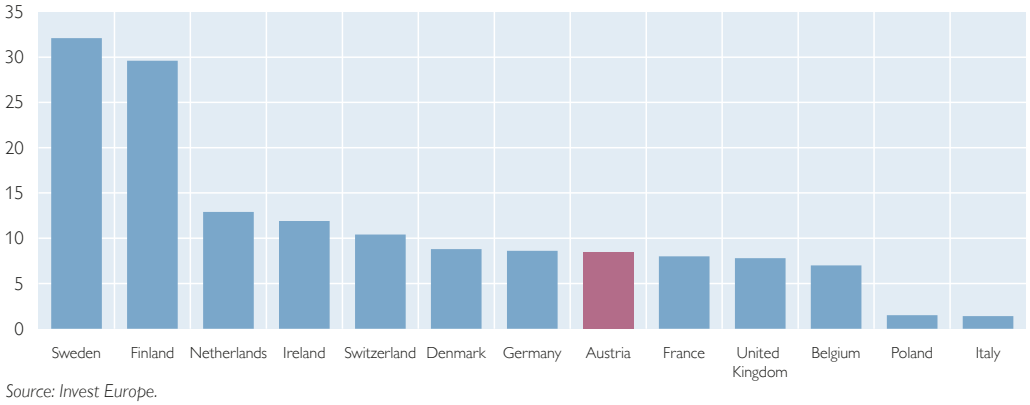


Source: Invest Europe.

Chart 8

Start-up density in selected countries

Number of portfolio companies per million inhabitants



Source: Invest Europe.

control for the size of the country (measured by population as a proxy for the potential of business founders), we get a metric for the "density" of start-ups in a given economy. The resulting pattern for selected European countries is shown in chart 8. Again, two Nordic countries (Sweden and Finland) are at the top, well ahead of countries like the Netherlands, Ireland and Switzerland and, eventually, Austria. Interestingly, the differences between these countries are relatively small.

There are some notable differences regarding the ranking (in comparison to the ranking of VC per GDP). In the start-up density ranking, Austria is close to Germany and even ahead of France and the U.K. Even though the latter two do have a higher VC-to-GDP ratio, their start-up density is lower than in Austria. Hence, their average VC investment per start-up (portfolio company) must be remarkably higher. This might be a hint that Austrian start-ups start from a rather modest level given the small size of their initial market whereas French and U.K. start-ups can start with an initial (national) market almost ten times the size of the Austrian one. Additionally, the technological specialization of start-ups might play a role here as well, since e.g. start-ups in the life sciences do need much more VC than start-ups in the IT/telecom sector.

Indeed, in interviews VC fund managers have stated that the available funds for the relatively small initial investments in new start-ups do not constitute a bottleneck anymore. Together with public subsidies for the very early stage, the available VC funds cover these stages in an appropriate way. This coincides with Wilson (2015), who finds that "as public funding has increased, there is a growing concern regarding the shortage of innovative entrepreneurs, a lack of entrepreneurial skills and capabilities and low quality of investment projects."

However, additional investment rounds in follow-up stages seem to be the bottleneck today. Investments per start-up of EUR 0.5 million or more still present a problem for the typically small-scaled VC funds active in Austria. Financing the scaling up of initially successful start-ups is much more capital intensive, and this is the area where Austria's VC market is still lagging behind. Thus, there is in fact a danger that Austria might lose some of its successful start-ups (e.g. by relocating to other markets) in the very phase in which success might be just around the corner.

5 Concluding remarks

More than 99% of Austrian firms are SMEs; therefore, their funding conditions are an important concern to policymakers and the public. We have seen that the dominance of SMEs is not a particular feature of Austria's economic structure but owes more to the definition of SMEs as specified by the European Commission. Austrian SMEs on average fund 30% of their assets with equity. With respect to debt funding, Austrian banks have been more resilient in the crisis than banks in other countries regarding the provision of loans to SMEs. Credit conditions in terms of interest rates or rejected loan application are also rather favorable in Austria. Hence, we do not find any indication of the Austrian banking sector restricting credit for SMEs.

Start-ups are new SMEs that operate with innovative technologies and business models that aim at rapid growth. Their operations, especially in the early stages of their life cycle, are rather risky, and therefore start-ups prefer venture capital and other alternative forms of funding from investors that are willing and able to bear some risk. Banks are understandably reluctant to grant loans to firms with no proven track record and a balance sheet that mainly consists of intangible assets. Whereas Austrian SMEs in general have good access to bank loans, start-ups are credit constrained in this respect.

While we find that in the early stages of their life cycle, Austrian start-ups seem to have sufficient access to finance, or at least they are not lagging behind their European peers in this respect, in later stages – when the volume of desired investments has increased significantly – they seem to experience some funding constraints. Economic policymakers have addressed these problems by launching several initiatives and providing public assistance, which has been positively acknowledged at the international level. It is important to keep in mind that it takes time until these initiatives become fully operational and effective. Therefore, policymakers should maintain their support for some years and refrain from erratic changes. Furthermore, given that the public funds reserved for this policy area are quite substantial, an evaluation of measures is warranted.

References

Bärnthaler, P., H. Elsinger, P. Fessler and E. Woschnagg. 2018. Nonperforming exposures of Austrian banks – decomposing aggregate measures. In: Financial Stability Report 36. Vienna: OeNB. 40–55.

European Banking Authority. 2016. Report on SMEs and SME Supporting Factor. London.

European Commission. 2017. SBA Fact Sheet Austria.

EIB. 2017. Investment Report 2017/2018.

Darcy, J., H. Krämer-Eis, D. Guellec and O. Debande. 2009. Financing technology transfer. EIB Papers 14/2. 54–72.

Fenz, G., C. Ragacs, M. Schneider and K. Vondra. 2018. Robust growth in Austria: economic boom continues in 2018. Economic outlook for Austria from 2018 to 2020. In: Monetary Policy & the Economy Q2/18. Vienna: OeNB. 154–179.

Gassler, H. and R. Sellner. 2015. Risikokapital in Österreich. Ein Flaschenhals im österreichischen Innovationssystem? IHS-Policy Brief. Vienna.

Haselmann, R., D. Schoenherr and V. Vig. 2018. Rent Seeking in Elite Networks. Journal of Political Economy 126. No. 4. 1638–1690.

Hubmann, G. 2018. Starke Nachfrage nach Unternehmenskrediten trifft auf günstige Konditionen. In: Statistiken – Daten & Analysen Q3/18. Vienna: OeNB. 48–56.

Jud, T., J. Marchart, K. Friesenbichler, M. Peneder and S. Haslinger. 2013. Risikokapital in Österreich. Studie im Auftrag von bmwfj und aws. WIFO. Vienna.

Kollmann, T., C. Stöckmann, S. Hensellek and J. Kensbock. 2016. European Start-up Monitor. Duisburg.

Leitner, K.-H., G. Zahradnik, R. Dömötör, M. Raunig, M. Pardy and E. Mattheiss. 2018. Austrian Start-up Monitor 2018. Austrian Institute of Technology. Vienna.

Myers, S. and N. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. In: Journal of Financial Economics 13. 187–221.

OECD. 2018. Financing SMEs and Entrepreneurs 2018. An OECD Scoreboard. Paris.

Pointner, W. and B. Rauning. 2018. A primer on peer-to-peer lending: immediate financial intermediation in practice. In: Monetary Policy & the Economy Q3/18. Vienna: OeNB. 36–51.

Schibany, A., H. Gassler and R. Sellner. 2013. Gründungen und Unternehmensdynamik. Eine empirische und vergleichende Analyse. IHS Studie im Auftrag des ERP-Fonds. Vienna.

Wehinger, G. 2014. SMEs and the credit crunch: Current financing difficulties, policy measures and a review of literature. In: OECD Journal: Financial Market Trends. Paris.

Wilson, K. E. 2015. Policy Lessons from Financing Innovative Firms. OECD Science, Technology and Industry Policy Paper No. 24. Paris.

Wirtschaftskammer Österreich. 2018. Wirtschaftskraft KMU. Österreichs KMU im Überblick. Vienna.

Improved own funds levels: effects on banks' "problem probability"

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Christoph Leitner[1]

This study investigates the empirical relationship between banks' own funds levels and their probability of entering financial difficulties or "problem probability." Because many micro- and macroprudential tools used in modern banking supervision focus on own funds requirements, knowledge about this relationship is essential for effectively assessing own funds requirements in the context of supervision and financial stability. A key contribution of our study is the use of a broad definition of "problem." While standard literature takes the perspective of debt investors, harm to financial stability can emerge earlier, i.e. without losses to such investors. Our definition of a "problem" therefore also encompasses instances such as government support or aid by the banking sector and is thus more suitable from a socio-political perspective. As a case in point, dealing with the issue of "too big to fail" might require a good understanding of how additional own funds reduce the problem. We find the relationship to be economically and statistically significant. Our results suggest that a bank that increases its own funds ratio from 10% to 11% reduces its one-year problem probability by more than 50 basis points. The effect is stronger for banks with a higher risk profile or with a lower initial level of own funds.

JEL classification: G21, G32, G33, G34
Keywords: problem probability, own funds, bank rating model, too big to fail

Aside from liquidity requirements, own funds requirements are the main anchor for modern banking regulation. The causal link is clear: better capitalized banks maintain a larger cushion of capital that can absorb loss before they fail, thus reducing the rate of bank failure. In turn, a lower rate of bank failure increases financial stability. We introduce the term "problem probability" to designate the probability of a given bank failing.

For several questions in applied banking supervision, the relationship between problem probability and own funds levels is of central importance. As an example, macroprudential impact analysis quantifies the costs of a given increase in minimum own funds levels, e.g. foregone credit growth (and thus foregone short-term GDP growth), and nets these costs against the benefits from the measure, e.g. improved financial stability (longer-term growth).

A second case in point are the capital surcharges on systemically important banks. Large banks give rise to high social costs upon failure ("social loss given default," SLGD). For systemically important banks, SLGD might be so high as to severely limit the government's options, a phenomenon that has been described as "too big to fail." These banks, it is argued (see e.g. FRS, 2015), should compensate for this by an appropriately lower problem probability (PP). The idea of assigning each bank in a financial system a maximum Equal Expected Impact (PP · SLGD) was used by the Federal Reserve System (FRS, 2015) to calibrate the capital buffers for global systemically important banks (GSIBs) in 2015. Such calibration requires a sound understanding of how additional own funds reduce the problem probability. A third example corroborating the importance of knowing the relationship between

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own funds and problem probability is the recent attempt to calibrate optimal own funds requirements in a financial system (see e.g. Brooke et al., 2015).

The OeNB has developed, and maintains, bank rating methods that can quantify the problem probability of any individual bank. The Austrian Banking Business Analysis (ABBA) model – the core model – uses a selected set of bank-specific risk indicators to assess the riskiness of banks. Microprudential supervisors use the output of these models to prioritize their resources and to identify problem candidates at an early stage. As a byproduct, this model also showcases the dependence of problem probabilities on own funds levels. This sensitivity reveals by how much the problem probability of a given bank decreases when own funds levels increase by 1 percentage point. In turn, the magnitude of this effect depends on (1) the bank's initial own funds position, i.e. an increase in own funds from 8% to 9% results in a larger decline in problem probability than an increase from 24% to 25%, and (2) the level of other risk parameters, i.e. whether, given an initial level of own funds, the bank is considered "risky" or "safe." This study aims at quantifying the sensitivity of problem probability to own funds level changes and the dependence of this effect on other risk parameters.

The use of the OeNB's ABBA model has several advantages:

- The ABBA model is grounded in long-term banking supervision experience and has been developed based on the regulatory reporting system, which supplies a large set of highly standardized input data. The model is carefully maintained and updated, and it is tested frequently by its continuous application in ongoing banking supervision.
- Even more importantly than the point above, the OeNB's ABBA model uses a suitable definition of "problem." Frequently, the literature on bank rating models uses the regulatory default definition[2]. This definition, relating to days past due and unlikeliness to pay is relevant from the perspective of external creditors. From a socio-political perspective and taking financial stability into account, costs associated with a bank's failure emerge at a much earlier stage. A bank in trouble gives rise to external social costs, e.g. by lowering the general trust in the banking system and as a result occasioning an increase in financial intermediation costs and a decrease of the value of bank liabilities. Even more evidently, government rescue programs are external social costs that are both sizeable (even from a socio-political perspective) and do not (on their own) trigger a default according to the regulatory default definition. Exactly on this point, the data definitions in the ABBA model are appropriate with respect to the questions arising from the macroprudential side. Compared to the commonly used definition of default, the ABBA problem definition includes a much broader set of "failures" and therefore considers cases where external creditors are not necessarily affected, but financial stability is. Basing our analysis on an appropriate problem definition, i.e. the one applied in the ABBA model, is the main contribution of this study. For instance, Altunbas et al. (2010) use Moody's Expected Default Frequency, which is based on a loss to external creditors,

[2] *See Article 178 of Regulation (EU) No 575/2013 (Capital Requirements Regulation – CRR), in short: "A default shall be considered to have occurred […] when either or both of the following have taken place: (a) the institution considers that the obligor is unlikely to pay its credit obligations […] in full […]; (b) the obligor is past due more than 90 days on a material credit obligation […]."*

while Berger and Bouwman (2013) track the survivability of the name of the bank[3]. The ABBA problem definition is much broader and includes, besides failing to service an obligation, e.g. support from the banking sector, rescue mergers, own funds rescue injections and state aid. The precise criteria are:

- Insolvency: This includes court-ordered initiation of bankruptcy proceedings as well as receivership proceedings ("Geschäftsaufsichtsverfahren") pursuant to Article 82 of the Austrian Banking Act (Bankwesengesetz – BWG).
- Closure (moratorium pursuant to Article 78 Austrian Banking Act): By regulation, the federal government can deny single entities the participation in the payment system and transactions with customers.
- Closure upon default – revocation or relinquishment of the banking license: The bank relinquishes the banking license, or the banking supervisors revoke it to protect customers.
- Sector aid: This is defined as aid in the form of non-symmetrical contracts in order for a bank to be rescued by other banks which share the same brand, are in an institutional protection scheme or are otherwise affiliated. Sector aid typically comes in the form of capital injections, troubled asset purchases, rescue mergers, guarantees, etc. Without that support, own funds requirements would not be met, business continuity would be questioned, and refinancing would be impossible.
- State aid: The federal government, one of its institutions or a state-owned enterprise (e.g. ABBAG) grants financial aid. The state, for instance, becomes (co)owner, provides participation capital or grants guarantees. Without that support, own funds requirements would not be met, business continuity would be questioned, and refinancing would be impossible.

For the sake of completeness, it is important to note that this study quantifies only the first of two main channels by means of which increased own funds contribute to financial stability. The first channel – and the one examined here – relies on the lower problem probability of an institution and the higher stability of that institution given increased own funds. The second effect, not studied here, is that increased own funds may help prevent the buildup of excessive credit growth and asset price bubbles. Behn et al. (2016) conclude that, depending on the parameterization of their model, up to half of the positive effects of increased own funds comes from this second indirect feedback effect.

1 Data and model

For the investigation of the relationship between a bank's own funds levels and its probability of entering financial difficulties, i.e. "problem probability," the calibration dataset of the latest ABBA calibration (ABBA 3.1) has been augmented with current quarterly data, so that the period extends from Q3 2010 to Q4 2015. The dataset ends in 2015 but includes data about the problem bank indicator from 2016, because the latter must be monitored for over a year (e.g. estimating the problem bank indicator for 2016 with data until the end of 2015). The dataset

[3] *For an overview of the literature on empirical models forecasting bank failure, see Demyanyk and Hasan (2010). The first generation early warning models were called CAMEL ratings.*

includes data from 663 credit institutions[4], which are distributed across the different banking sectors in Austria: the Raiffeisen credit cooperatives sector, the savings banks (Sparkassen) sector, the joint stock banks (Aktienbanken) sector, the state mortgage banks (Landes-Hypothekenbanken) sector, the building and loan associations (Bausparkassen) sector, and the remaining credit cooperatives (Volksbanken) sector (see table 1).

Table 1

Distribution of the calibration data (Q3 10–Q4 15) across the different banking sectors

Sector	Number of observations
Raiffeisen credit cooperatives	10,885
Savings banks	1,034
Joint stock banks	804
State mortgage banks	124
Building and loan associations	66
Remaining (Volksbank) credit cooperatives	39

Source: Authors' compilation.

Note: Each observation represents a credit institution at a quarterly reference date.

The logit model underlying the ABBA model estimates the problem probability of a bank as a function of observable ratios

$$\hat{p} = \frac{1}{1 + e^{\hat{\beta}^T x}},$$

where $\hat{\rho}$ represents the estimated problem probability, x the ratios and $\hat{\beta}$ the estimated coefficients that represent the relationship of the ratios with the problem probability. Section 1.1 deals with the data basis of the key ratios x, while section 1.2 deals with the problem indicator $\hat{\rho}$.

1.1 Risk factors, exogenous variables

The calibration data contain the four most relevant key ratios from the ABBA Model 3.1 for each credit institution and quarterly reporting date. Together, these cover over 83% of the explanatory power[5] of the ABBA model and thus the key risk categories (see table 2). The other three ratios of the ABBA model 3.1 only play a subordinate role for the explanatory power.

Table 2

The four key ratios

Ratio	Description	Hypothesis	Risk type
RoA	Profit of common business operation (expected) / total assets (average)	Decrease	Profitability
VaR credit risk	Relative 95% VaR credit risk / own funds	Increase	Credit risk
Own funds ratio	Own funds / (own funds requirements · 12.5)	Decrease	Own funds
Own funds requirements for operational risk	Own funds requirements for operational risk / own funds requirements (total)	Increase	Operational risk

Source: Authors' compilation.

Note: RoA = return on assets; VaR = value at risk.

[4] *These include major banks, regional banks and decentralized banks. Only special purpose banks are removed from the sample.*

[5] *Measured by "beta weights," i.e. transformation of the estimated coefficients $\hat{\beta}$ into weights.*

In turn, to estimate the ABBA model 3.1, a statistical variable selection was conducted from all 51 ratios available for the calibration dataset under the following objective function: Find a model that

- has a high accuracy ratio,
- does not contain too many input variables,
- is as robust as possible against the data sample,
- covers all seven Risk Assessment System (RAS) risk modules with at least one ratio, and
- produces output that is as similar as possible compared to that of the previous ABBA model.

1.2 Problem indicator, endogenous variables

The problem bank indicator completes the calibration dataset. It indicates whether a credit institution meets at least one problem criterion according to the definition above (see section 1) in the four quarters following a quarterly reference date (problem bank indicator = 1). Table 3 shows the absolute frequency of both expressions per quarter (0 = non-problem bank, 1 = problem bank). Where one of these institutions meets the problem criteria at least once, the remaining data (with problem bank indicator = 0) are also excluded from the calibration dataset (outlier adjustment). For example, in the fourth quarter of 2010, 591 banks do not have any problems, while 20 fulfill at least one criterion according to the definition above (see section 1).

Table 3

Problem indicator

Reference date	Problem indicator = 0	Problem indicator = 1
	Number of observations	
Q3/2010	592	24
Q4/2010	591	20
Q1/2011	590	18
Q2/2011	586	18
Q3/2011	584	19
Q4/2011	582	18
Q1/2012	582	18
Q2/2012	582	18
Q3/2012	576	14
Q4/2012	575	11
Q1/2013	574	14
Q2/2013	571	13
Q3/2013	566	12
Q4/2013	563	16
Q1/2014	563	20
Q2/2014	561	29
Q3/2014	557	31
Q4/2014	552	31
Q1/2015	551	24
Q2/2015	552	16
Q3/2015	544	16
Q4/2015	543	15
Total	12,537	415

Source: Authors' compilation.

Note: Each observation represents a credit institution at a quarterly reference date, where a problem bank indicator of 1 indicates that a credit institution meets at least one problem criterion in the four quarters following a quarterly reference date.

Table 4 shows descriptive statistics of the calibration dataset[6]. For example, the average (unweighted) own funds ratio is 18.75% and the average operational risk percentage of the total own funds requirements is 9.78%.

2 Empirical analysis and results

In the ABBA model framework, a logit model is used to estimate a bank's problem probability. For the model presented here, the calibration dataset of the current ABBA model (3.1) is expanded, the explanatory variables are reduced to the four most relevant key ratios and the

[6] *Note that the ratio values of the four model ratios are winsorized both at the lower and at the upper end. During winsorization, extreme measure values are set to a statistically determined lower or upper winsorization limit to prevent bias and data quality issues caused by outliers.*

Table 4

Descriptive statistics of the calibration dataset

	Total assets (EUR thousand)	RoA (%)	VaR credit risk (%)	Own funds ratio (%)	Own funds requirements for operational risk (%)	Problem bank indicator (0/1)
Minimum	4,737	–0.93	0	0	1.92	0
1st quartile	69,640	0.36	16.18	13.87	7.77	0
Median	151,100	0.54	27.32	17.60	8.99	0
Mean	56,980,000	0.54	974.74	18.75	9.78	0.03204
3rd quartile	365,700	0.72	43.26	22.35	10.52	0
Maximum	125,100,000,000	1.47	27,402.49	39.34	30.16	1

Source: Authors' calculations.

Note: RoA = return on assets; VaR = value at risk.

up-sampling[7] usually required for a model like this is omitted. This allows a transformation of the model's estimated logit scores into probabilities[8], which is central to the relationship between capitalization and problem probability.

Table 5 shows the model result of the estimated model with the four key ratios (4-factor model). The estimated logit scores using this model have a very high selectivity (Area Under the Curve (AUC)[9] = 0.84). The correlation between the estimated logit scores from the model used here and the ABBA score for the most recent quarterly reporting date of the calibration dataset (Q4 2015) is, at 0.93, very high. This demonstrates the stability of the current ABBA model and that the four key ratios used here are the most relevant ones from the ABBA model.

The estimated problem probabilities for the entire calibration dataset range from 0.01% (one basis point) to 94.2% (see table 6). The mean value of 3.2% corresponds to the proportion of problem banks in the calibration dataset (415/12,952). The 1-factor logit model with the own funds ratio as the only explanatory variable also shows the desired relationship (see table 7) and exhibits good calibration quality even without the remaining key ratios (AUC = 0.74).

Table 5

Model result of the logit model (4-factor model)

	Estimate	Standard error	p-value	Statistical significance
Intercept	–0.471100	0.195500	0.01595	*
RoA	–3.058000	0.127000	< 2E-16	***
VaR credit risk	0.000026	0.000009	0.002714	**
Own funds ratio	–0.144300	0.011900	< 2E-16	***
Own funds requirements for operational risk	0.468100	0.012730	0.000237	***

Source: Authors' calculations.

*Note: RoA = return on assets; VaR = value at risk. Codes denoting statistical significance: *** p < 0.001, ** p < 0.01, * p < 0.05, . p < 0.1.*

[7] *Up-sampling duplicates the datasets with the rarer value (here: problem bank); otherwise, the datasets with the more frequent value (here: non-problem bank) would have an exaggerated influence on the estimates. In the most extreme form, all problem database records would be duplicated until the ratio of problem banks to non-problem banks is 1:1 (for ABBA 3.1, however, each problem bank was included in the estimation a maximum of ten times).*

[8] $p = \frac{1}{1+e^{-s}}$, *with probability* ρ *and logit score* s.

[9] *Measures the discriminatory power of a model: 1 stands for perfect selectivity and 0.5 corresponds to the expected value of a random method.*

Chart 1 shows a summary of the model result:

- The x axis shows the own funds ratio and the y axis the estimated problem probability. The black dots indicate the actual own funds ratio and the problem probability estimated by the 4-factor model (see table 5) for each record[10] of the calibration dataset.
- The lines represent the estimated relationship between the own funds ratio and the problem probability, assuming constant values of the other inputs (RoA, own funds requirements (total), relative 95% VaR credit risk, own funds requirements for operational risk)[11]:
  - For the blue line, the above inputs are set to their respective averages, representing banks whose risk level would typically be estimated to be average.
  - For the magenta line, the above inputs are set to values usually reported by banks whose risk level is estimated to be rather low.
  - For the orange line, the above inputs are set to values usually reported by banks whose risk level is estimated to be rather high.[12]
- There is a clear negative correlation: Banks with high own funds have substantially lower problem probabilities. The reduction in problem probability is largest for banks with poor capitalization as well as for banks which have a high degree of risk due to other risk factors.

In contrast to chart 1, chart 2 shows the relationship between the own funds ratio and the problem probability as a *change*, i.e. the decrease of the problem probability if the own funds ratio increases by 1 percentage point:

- Again, this depends on the (initial) own funds ratio (x axis) and the other input variables (color scale).
- As shown in chart 1, the lines reflect the relationship assuming constant values for the inputs (RoA, own funds requirements (total), relative 95% VaR credit risk, own funds requirements for operational risk):
  - The magenta line shows the relationship usually reported by banks whose risk level is estimated to be rather low.
  - The orange line shows the relationship usually reported by banks whose risk level is estimated to be rather high.

Table 6

Distribution of the estimated logit scores

Minimum	1st quartile	Median	Mean	3rd quartile	Maximum
0.0001	0.0052	0.0142	0.0320	0.0332	0.9420

Source: Authors' calculations.

Table 7

Model result of the 1-factor logit model

	Estimate	Standard error	p-value	Statistical significance
Intercept	-0.965800	0.178700	0.000000064	***
Own funds ratio	-0.147842	0.011554	< 2E-16	***

Source: Authors' calculations.

*Note: Codes denoting statistical significance: *** p < 0.001, ** p < 0.01, * p < 0.05, . p < 0.1.*

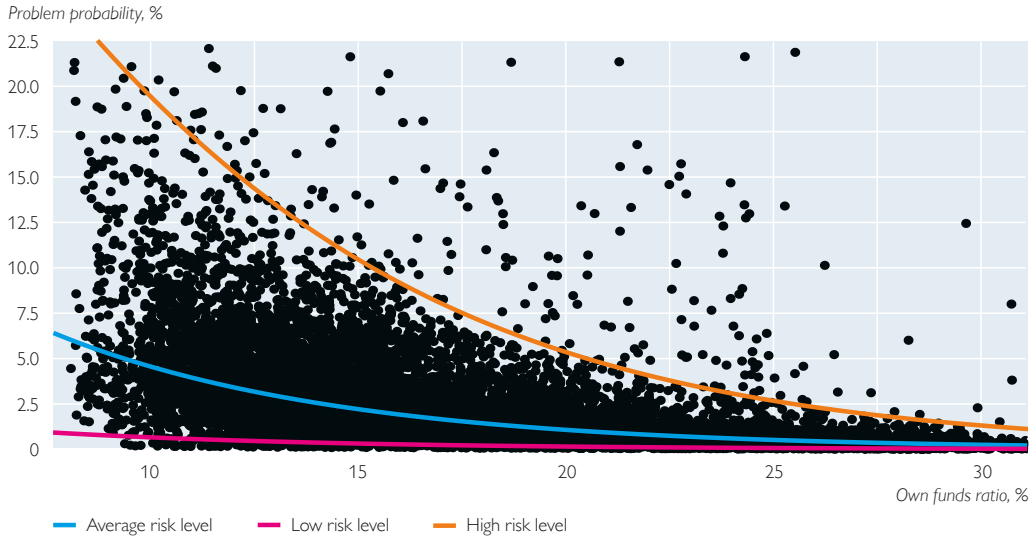
[10] *One credit institution at a quarterly reference date.*

[11] *It follows from this assumption that for the model ratio VaR credit risk, own funds were simulated proportionally to the own funds ratio.*

[12] *In detail, for the orange line, the 5% quantile of the model ratio RoA and the 95% quantiles of the model ratio own funds requirements for operational risk and the model ratio own funds requirements (total) and relative 95% VaR credit risk were used, with the corresponding mirrored quantiles (95% and 5%, respectively) used for the magenta line.*

Chart 1

Relationship between the own funds ratio and the estimated problem probability (4-factor model)



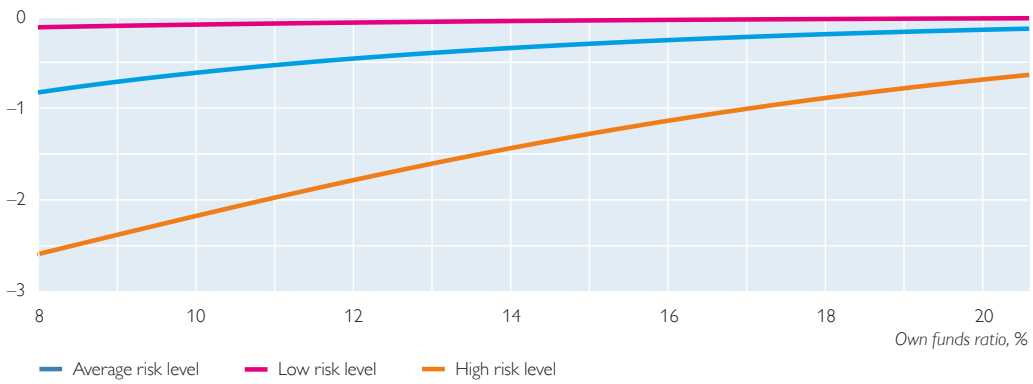
Source: Authors' calculations.

Note: Each black dot represents a credit institution at a quarterly reference date. The three lines show the estimated relationship assuming different levels of risk (low, average, high) of the other inputs.

— The blue line, which shows the relationship usually reported by banks whose risk level is estimated to be average, is of primary interest. It shows that banks with an own funds ratio of 10% can expect an increase to 11% to lead to a decline in problem probability of more than 50 basis points. Thus, the relationship is not only statistically but also economically significant: When one considers loss events where the loss makers are not the bank's direct creditors as a "problem," the reduction of the likelihood of a problem occurring with a higher capitalization is substantial.

Chart 2

Relationship between the own funds ratio and changes in the problem probability



Source: Authors' calculations.

Note: The three lines represent the different levels of risk (low, average, high) of the other inputs.

3 Summary

We quantify the dependence of problem probability on a bank's own funds levels. This relationship serves as a basis for assessing macro- and microprudential supervisory measures.

Our key contribution is the use of the OeNB's ABBA model that employs a much broader definition of "problem" compared with the definition of default commonly used that considers losses from the perspective of debt investors. The definition we use includes, inter alia, rescue mergers and state aid, and is thus much better equipped to answer questions related to financial stability. The magnitude of the effect of a better own funds position depends on the initial own funds level and the level of other risk factors. If a bank with an own funds ratio of 10% and an average level of all other risk indicators increases its own funds by 1 percentage point, its one-year problem probability will decline by 50 basis points according to our estimations. This implies a 300-basis-point reduction of the ten-year problem probability[13], which we deem an economically sizeable effect. At the same time, we emphasize that a lower problem probability of individual banks is only one aspect of the positive effect of improved own funds levels on financial stability that does not consider positive effects coming from indirect feedback, such as a reduction of excessive credit growth and asset price bubbles.

References

Altunbas, Y., L. Gambacorta and D. Marqués-Ibáñez. 2010. Does monetary policy affect bank risk-taking? ECB Working Paper Series no 1166.

Behn, M., M. Grossand and T. Peltonen. 2016. Assessing the costs and benefits of capital-based macroprudential policy. ECB Working Paper Series no 1935.

Berger, A. N. and C. H. S. Bouwman. 2013. How does capital affect bank performance during financial crises? In: Journal of Financial Economics 109(1). 146–176.

Brooke, M., O. Bush, R. Edwards, J. Ellis, B. Francis, R. Harimohan, K. Neiss and C. Siegert. 2015. Measuring the macroprudential costs and benefits of higher UK bank capital requirements. Bank of England Financial Stability Paper no 35. December.

Demyanyk, Y. and I. Hasan. 2010. Financial crises and bank failures: A review of prediction methods. In: Omega 38(5). 315–324.

FRS. 2015. Calibrating the GSIB Surcharge.

Peltonen, T., P. Sarlin, F. Betz and S. Oprică. 2013. Predicting distress in European banks. ECB Working Paper Series no 1597.

[13] *To extrapolate from a one-year probability to a ten-year probability, we assume a constant logit score s (see footnote 8). For instance, this condition holds if the increase of own funds is permanent, there is no change in the other risk indicators and the relationship between risk indicators and problem probability is time invariant.*

Lending to households in CESEE with regard to Austrian banking subsidiaries and macroprudential measures addressing credit-related risks[1]

Tina Wittenberger[2]

The macroeconomic environment improved significantly in 2017. And so did Austrian banks' lending activities in Central, Eastern and Southeastern Europe (CESEE) – the banks' most important foreign market. As Austrian banks' exposure in terms of volume and profit is concentrated in six countries of the CESEE region, namely the Czech Republic, Slovakia, Romania, Croatia, Hungary and Russia, these countries will be the focus of this study. Moreover, the analysis sheds light on lending to households, in particular on mortgage and consumer loans, and it reveals Austrian banking subsidiaries' relative importance for their host markets. All CESEE countries analyzed in this study have implemented several macroprudential measures – either legally binding ones or in the form of recommendations – to cope with credit lending risks. Some countries did so because they are already faced with high growth rates, others did so to prevent risks from accumulating once credit growth picks up again.

JEL classification: E58, G18, G21, G28, P34
Keywords: banking, Austrian banks, financial stability, macroprudential policy, credit growth, household lending, risks, CESEE

Central, Eastern and Southeastern Europe (CESEE)[3] is the most important foreign market for Austrian banks' business activities. In most CESEE countries, the macroeconomic environment improved significantly in 2017, which is also reflected in Austrian banking subsidiaries' lending activities. The study focuses, on the one hand, on the Czech Republic, Slovakia, Romania, Croatia, Hungary and Russia – i.e. on countries that are of importance in terms of size and profitability from an aggregate perspective – and, on the other hand, on the household segment, specifically on mortgage and consumer loans. Section 1 gives an overview of the aggregate loan portfolio and credit development of Austrian banking subsidiaries in CESEE. In sections 2 to 7, I analyze lending activities of Austrian banking subsidiaries in the aforementioned countries by comparing them to the respective market, and provide an overview of macroprudential measures with regard to risks stemming from household lending.

1 In CESEE, Austrian banking subsidiaries' lending is focused on household loans

CESEE is the most important foreign market for Austrian banks' business activities. Slightly more than 60% of Austrian banks' foreign claims[4] were on CESEE in the first quarter of 2018. At end-2017, Austrian banking subsidiaries had total as-

[1] *Cutoff date: September 15, 2018.*

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[3] *In this study, the CESEE region also comprises countries such as Russia and Ukraine.*

[4] *Austrian banks in domestic and foreign ownership.*

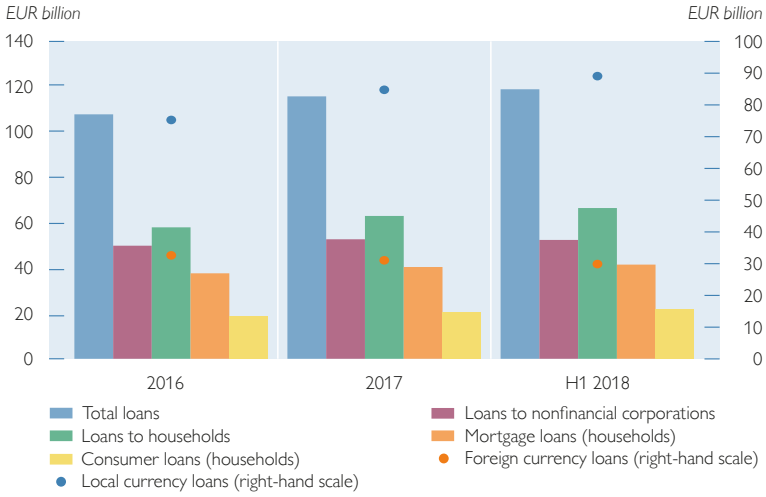
sets of EUR 206 billion and total outstanding loans[5] of EUR 116 billion in CESEE. Their loan-to-deposit ratio was 79%. This reflects their business model of collecting deposits and lending to the real economy, confirming compliance with the Sustainability Package[6], which the Oesterreichische Nationalbank (OeNB) and the Austrian Financial Market Authority (FMA) published in 2012. According to this package, lending shall be linked to a local stable funding base. In the first half of 2018, Austrian banking subsidiaries continued to grow and had total assets of EUR 212 billion, total loans of EUR 119 billion and a loan-to-deposit ratio of 82%.

The macroeconomic environment improved significantly in most CESEE countries in 2017, which is also reflected in the total asset growth of Austrian banking subsidiaries (11% year on year), credit growth (7% year on year), historically low credit risk provisions – which, however, may not be sustainable should the business cycle turn – and a rise in net profit after tax (11.6% year on year). Business activities in CESEE contribute substantially to Austrian banks' overall profitability.

As to Austrian banking subsidiaries' aggregate loan portfolio in CESEE, the share of household loans came to 56% in the first half of 2018, while the share of nonfinancial corporations' loans came to 44%. This segmental composition has prevailed since 2014. This development may thus reflect a shift in Austrian banks' business strategies and cycles. On a more granular basis, i.e. when breaking the household loan segment down into mortgage and consumer loans, mortgage loans prevailed with 62% in the first half of 2018 and were thus twice as high as consumer loans. In 2017, consumer loans grew slightly faster than mortgage loans (by about 1 percentage point). In the first half of 2018, consumer loan growth gained momentum, outpacing mortgage loans by 4 percentage points. Austrian banking subsidiaries' lending in local currency prevails throughout CESEE. In 2017, loans in local currency grew by 12%, whereas loans in foreign currency decreased continuously. The OeNB and the FMA have advised against foreign currency lending in CESEE (Guiding Principles)

Chart 1

Austrian banking subsidiaries' loans in CESEE



Source: OeNB.

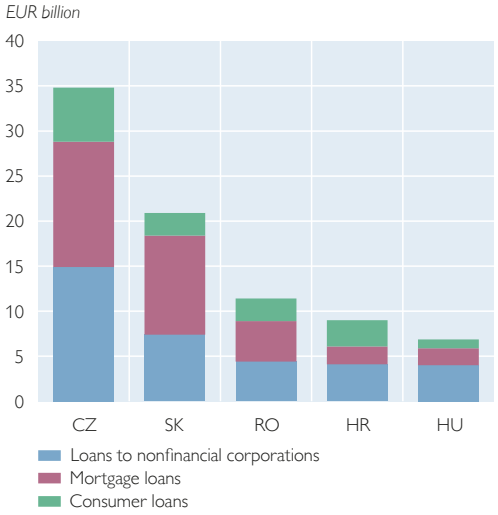
Note: Gross loans; volumes are not exchange rate adjusted.

[5] *Data on loans used for the analysis in this study come from an OeNB survey that is conducted every six months and comprises large Austrian banks. The survey's sample was adjusted for the purpose of this analysis, considering only banks that were still active in the first half of 2018. Loans are gross, i.e. before credit risk provisioning. Loan growth rates are exchange rate adjusted, volumes are not.*

[6] *See https://www.oenb.at/en/financial-market/financial-stability/sustainability-of-large-austrian-banks-business-models.html.*

Chart 2

Austrian banking subsidiaries' loans in CZ, SK, RO, HR and HU



Source: OeNB.

Note: Data as at H1 2018. Data for Russia are confidential and hence not included.

since 2010.[7] Several banking supervisory authorities in CESEE have implemented measures targeting foreign currency loans as well.

The following analysis will focus on six CESEE countries, namely the Czech Republic, Slovakia, Romania, Croatia, Hungary and Russia, in which Austrian banks have, on the one hand, relatively large exposures and in which profit contributions are, on the other hand, relatively high. In the first half of 2018, Austrian banking subsidiaries had about 80% of their outstanding loans in the six countries listed above and approximately 80% of the CESEE net profit after tax came from these countries. Austrian banking subsidiaries' net profit after tax stood at EUR 2.6 billion at end-2017 (Q2/2018: EUR 1.6 billion).

2 In the Czech Republic, Austrian banking subsidiaries are part of a dynamic lending environment

The Czech Republic is the most important CESEE market of Austrian banks in terms of exposure size and profit contribution. Austrian banking subsidiaries reported an outstanding loan volume of about EUR 35 billion in the Czech Republic in the first half of 2018, which corresponds to 30% of Austrian banking subsidiaries' total CESEE loans. About 60% of loans were extended to the household sector. Close to 30% of profits came from the Czech Republic. In the second quarter of 2018, Austrian banking subsidiaries had a total assets market share of about 26%. Credit growth has been quite vivid in the last years. In 2017, loans to households grew by 9%, more specifically mortgage loans by 12% and consumer loans by 6%. Mortgage loans remained the key product in household lending for Austrian banking subsidiaries (as well as for the whole market), with volumes being twice as large as those of consumer loans. Austrian banks' lending development mirrors that of the local banking sector. In 2017, Austrian banking subsidiaries grew by almost 2 percentage points faster in the household sector than on the market as a whole, however. In the first half of 2018, Austrian banking subsidiaries' household loans increased by 6%, with mortgage and consumer loans growing at the same rate.

In general, household lending is very dynamic in the Czech Republic. Additionally, the Czech National Bank (CNB) identified a continuous spiral between property prices and property purchase loans as the most significant domestic risk. To cope with the risks stemming from household lending, the CNB implemented

[7] *In 2010, Austrian banking groups active in CESEE committed themselves to an agreement with the Austrian supervisory authorities (referred to as Guiding Principles). According to these principles, banking groups will no longer offer the riskiest types of foreign currency loans, i.e. mortgage and consumer loans in Swiss franc or Japanese yen, to households and small and medium-sized enterprises without income in the matching currency. In addition, consumer loans in euro are to be granted to borrowers with the highest creditworthiness only.*

a set of macroprudential recommendations in the last two years. At the individual loan level, the CNB recommends a loan-to-value (LTV) ratio limit of 90% and that a maximum of 15% of new loans within one quarter may have LTV ratios between 80% and 90%. One year passed between the announcement of the LTV recommendation and its implementation in the second quarter of 2017. Nevertheless, some credit institutions exceeded both recommended limits according to the CNB. The share of loans with LTV ratios between 70% and 80% has risen significantly since then and banks are rather close to the 90% target. Moreover, the valuation of mortgages in connection with LTV recommendations is an important issue, especially in times when property prices are considered rather high. As mortgage loans in the Czech Republic are issued at fixed rates for several years (e.g. for three to five years) and are floating thereafter, households may be susceptible to interest rate risk (see CNB, 2018a).

In June 2017, the CNB recommended that lenders should monitor the debt-to-income (DTI) ratio as well as the debt service-to-income (DSTI) ratio, set internal limits for, and prudently assess, loan applications based on these ratios. This recommendation was updated in June 2018. The CNB defined levels for the DTI, i.e. 8 (9 with effect from October 1, 2018), and the DSTI, i.e. 40% (45% with effect from October 1, 2018), above which lenders should assess loan applications in a particularly prudent manner (see CNB, 2018c). The CNB aims to establish legally binding prudential limits.

Given the still dynamic mortgage loan growth – even though the CNB recognizes a slight slowdown in growth rates and rising costs of loans with high LTV ratios – as well as historically low credit risk costs, the CNB has implemented a countercyclical capital buffer (CCyB), gradually increasing its rate from 1.0% to 1.5% until July 2019.[8] Challenges to profitability may arise once the business cycle changes pace or even turns (CNB, 2018b).

3 In Slovakia, Austrian banking subsidiaries are among dynamic household lending

Slovakia is the second most important CESEE market for Austrian banks in terms of exposure size. In the first half of 2018, Austrian banking subsidiaries' outstanding loans in Slovakia amounted to around EUR 22 billion, the lion's share of which, i.e. 50%, were mortgage loans, while 11% were consumer loans. When looking at yearly growth rates in 2017, mortgage loans grew by 10% year on year, while consumer loans even rose by 17% year on year, though starting from a rather low level. At year-end 2017, Austrian banking subsidiaries grew by slightly more than 2 percentage points faster than the banking system in the household segment as a whole. Austrian banking subsidiaries had a market share (measured by total assets) of 38% in Slovakia in the second quarter of 2018. In the first half of 2018, Austrian banking subsidiaries' household lending grew in line with the market by about 6%.

Due to low interest rates (as part of the European Central Bank's expansionary monetary policy), a benign economic environment and rising wages in a small open economy, loan growth surged in Slovakia. The National Bank of Slovakia (NBS) is closely monitoring the credit developments and has implemented several legally binding macroprudential debt caps. LTV ratios were tightened from 100%

[8] *CCyB rate valid from July 1, 2018: 1.0%; rate valid from January 1, 2019: 1.25%; rate valid from July 1, 2019: 1.5%.*

to a maximum of 90% (effective from July 1, 2018) and the financial buffer was set to a minimum (20% effective from July 1, 2018). Additionally, limits on the terms of loans were established (e.g. not more than 10% of new housing loans should have maturities of over 30 years and not more than 10% of new consumer loans should have maturities of over 8 years). Finally, as of July 1, 2018, a DTI of 8 came into force (see NBS, 2018b).

According to the NBS, credit standards may ease in particular for consumer loans as the aggregate nonperforming loan (NPL) ratio for consumer loans has already increased since end-2015 despite exceptionally benign economic conditions and vivid credit growth. Even though consumer loans – in contrast to mortgage loans – only made up 14% of total loans in Slovakia at end-2017, they constitute one of the banking sector's principal income streams. This is due to the fact that interest margins on consumer loans in Slovakia are among the highest in Europe – reflecting, inter alia, that they are associated with higher risks given their status as unsecured any-purpose loans – and due to the rapid growth of consumer loans in the stock. According to NBS analyses, returns on consumer loans are equivalent to more than two-thirds of the income from housing loans, constituting almost half of total loans in Slovakia. Consumer loan growth therefore increases not only the significance of these kinds of loans within the financial sector, but also their potential risks to financial stability in Slovakia. Since the market for consumer loans is highly competitive and since consumer loans are susceptible to economic changes, adequate risk pricing is crucial. Should the currently favorable economic situation change in the future, then the default rate for consumer loans may increase even further. As far as mortgage loans are concerned, the NPL ratio is at its lowest levels since 2009. In Slovakia, mortgage loans often have variable interest rates that pose a risk once interest rates start to rise again (see NBS, 2017).

The CCyB rate was increased from 0% to 0.5% (effective from August 1, 2017) and further to 1.25% (effective from August 1, 2018) as a response to growth trends in the household and nonfinancial corporate loans market as well as easing credit standards (despite the measures taken to date) and vivid economic growth, all of which could lead to economic overheating according to the NBS. As of August 1, 2019, the CCyB rate will be increased further, namely to 1.5% (see NBS, 2018b).

4 In Romania, Austrian banking subsidiaries extend consumer loans, while government-subsidized program drives mortgage lending

Austrian banking subsidiaries in Romania had an outstanding loan volume of nearly EUR 12 billion in the first half of 2018, with housing loans accounting for 38% and consumer loans for 21%. Mortgage loan growth was negative (–5% in 2017), while consumer loan growth was vivid (10% in 2017). In the first half of 2018, however, consumer loan growth stagnated, while mortgage loan growth was clearly positive again. In the second quarter of 2018, Austrian banking subsidiaries had a market share of about 23% of total assets in Romania. In the Romanian banking system, loan growth in the household sector was driven by mortgage loan growth, which was quite dynamic in 2017, while consumer loan growth was in single digits. In sum, household lending by Austrian banking subsidiaries grew slower by 2.5 percentage points in 2017.

In the past, the National Bank of Romania (NBR) took regulatory measures early on to mitigate risks stemming mainly from foreign currency mortgage lending, which were in line with the respective European Systemic Risk Board (ESRB) recommendation[9] from 2011. LTV ratios are capped at 85% for loans denominated in Romanian lei and at 80% for loans denominated in foreign currencies provided that the debtor has eligible income denominated in or indexed to the loan currency. For unhedged debtors, the maximum LTV ratio is 75% for loans denominated in euro and 60% for loans denominated in other foreign currencies (see NBR, 2012). In Romania, housing loans were mainly granted in euro. LTV ratios for mortgage loans stood at 80% at end-March 2018.

The government-subsidized "First Home Program" is exempted from the aforementioned regulation, which is why LTV ratios may reach 95%. The General Board of the National Committee for Macroprudential Oversight (NCMO) in Romania has issued a recommendation (R/1/2018) according to which the government should consider recalibrating the "First Home Program" from a social perspective by revising the requirements to access this program while preserving a sustainable level of indebtedness. In its country report on Romania, the International Monetary Fund (see IMF, 2018b) notes that the effectiveness of existing macroprudential tools on mortgages is undermined by this program. New mortgage lending in Romania is primarily driven by the public "First Home Program." From March 2017 to March 2018, about 60% of new housing loans were taken out within the framework of this program. "First Home Program" loans account for approximately 50% of total mortgage exposure in the household segment (see NBR, 2018). According to the NBR (2018), borrowers who took out loans within this program exhibit higher levels of indebtedness than those who took out standard housing loans.

Additionally, there are more detailed regulations with regard to foreign currency loans, including consumer loans, such as a minimum guarantee level of 133% of the loan value and a cap on consumer loan maturity of five years (see NBR, 2012). To sum up, foreign currency loans have decreased significantly in the years following the implementation of the aforementioned limits. In 2017, new loans were granted almost entirely in domestic currency. As of December 2017, 34% of household loans were denominated in foreign currency.

Table 1

Overview of macroprudential measures related to household loans

	CZ	SK	RO	HR	HU	RU
Loan-to-value (LTV) ratios	×	×*	×	–	×	×**
Debt-to-income (DTI) ratios	×*	×**	–	–	–	–
Debt service-to-income (DSTI) ratios/ payment-to-income (PTI) ratios	×*	×*	×	–	×*	×**
Foreign currency loans	–	–	×	–	×	×
Countercyclical capital buffer (CCyB)	1.0%	1.25%	0%	0%	0%	0%
Liquidity ratios	–	–	–	–	×*	–

Source: National central banks.

Note: The list comprises macroprudential recommendations and regulations with a focus on household loans. x… adapted in 2018. x**… newly implemented in 2018.*

[9] *See https://www.esrb.europa.eu/home/html/index.en.html.*

As in other CESEE countries, the share of mortgage loans at variable interest rates is quite high. In fact, 95% of new housing loans have variable interest rates, while 58% of consumer loans have fixed rates (as of September 2017) (see NBR, 2017). In March 2018, most new housing loans and around one-third of new consumer loans were granted at variable rates (see NBR, 2018). The interest rate risk is more pronounced for mortgage loans than for consumer loans given their long maturities (up to 30 years compared to an average of 5 years for consumer loans) and their large volumes.

In its Financial Stability Report of December 2017, the NBR stated that a DSTI ratio of over 55% was found to be risky and that it considered implementing it as a prudential DSTI limit. In September 2017, about 25% of debtors posted an indebtedness level in excess of 55%, indicating that a significant part of households is facing high risks of non-performance. Additionally, the NBR argued that the DSTI cap should be applicable to both, consumer and housing loans.

In 2016, the CCyB was set at 0% and has been maintained at this level since then as there is no excessive credit growth according to NBR analyses. At the sectoral level, however, there are signals indicating a buildup of vulnerabilities related to household lending, and residential property prices continued to increase at a fast pace (see NCMO, 2018). The NBR is closely monitoring these developments and a working group on household overindebtedness was set up.

Credit quality in Romania remains an issue, even though there has been steady progress in reducing large stocks of problem loans that arose due to the crisis in 2008. As a consequence, the systemic risk buffer, effective since June 2018, was implemented to address risks associated with problem loans.

5 In Croatia, Austrian banking subsidiaries focus on consumer lending – overall market growth rates are rather modest

In Croatia, Austrian banking subsidiaries reported EUR 9.5 billion of outstanding loans, with consumer loans accounting for 31% and housing loans for 21% in the first half of 2018. Mortgage loan growth registered by Austrian banking subsidiaries was negative in 2017, while consumer lending was positive, posting growth rates of around 8%. This credit development continued during the first half of 2018.

In 2017, loan growth in the Croatian banking system registered a mild recovery, showing acceleration tendencies in mortgage lending due to a government-subsidized housing loans program. In light of the borrowers' strong interest in this government-supported program, the latter will be continued until 2020. The Croatian National Bank (HNB) therefore expects a boost in demand for housing loans (see HNB, 2018c).

In 2017, Austrian banking subsidiaries grew by around 1%, which is in line with the loan growth rate observed for the Croatian banking system. Austrian banking subsidiaries' market share in total assets amounted to about 28% in the second quarter of 2018.

To date, there are no macroprudential lending caps on e.g. LTV or DTI ratios, also reflecting the currently rather weak lending activity. However, the HNB has implemented numerous measures aimed at consumer protection and awareness since 2013. Cases in point include measures to mitigate interest rate and exchange rate risks and to convert loans denominated in Swiss franc into euro (measure taken in 2015). As a result, the Croatian banking system still has a relatively high

share of foreign currency loans (Q4/2017: 51%). However, there are risk-mitigating factors, such as a high degree of euroization.

Another noteworthy measure is the recommendation[10] issued by the HNB in September 2017 to mitigate interest rate risks related to long-term household loans, according to which credit institutions should extend their range of credit products to fixed-rate loans, while minimizing costs for borrowers. Moreover, the HNB recommends credit institutions to offer clients with already existing contracts to voluntarily change their loan financing conditions to protect themselves against interest rate risks should they have taken out loans at variable interest rates. The relatively uncertain economic recovery, which is mirrored in a still high unemployment rate and low household income levels, could amplify negative effects of a possible increase in annuities for households (see HNB, 2017b). The HNB recommendation was issued against the backdrop of a relatively high share of household loans with variable interest rates. A survey conducted by the HNB in mid-2016 revealed that 67% of household loans and 81% of mortgage loans were at variable rates, making the sector susceptible to interest rate changes. At end-2017, 61% of household loans had variable interest rates (see HNB, 2017a).

The HNB introduced a CCyB rate of 0% that took effect as of January 1, 2016. Although there has been a slight recovery in lending activity, there are still no cyclical pressures in terms of evolution of systemic risks, the HNB argues. According to the data for the first quarter of 2018, as analyzed by the HNB, GDP continued to grow, while the nominal debt of nonfinancial corporations and households continued to decline. Therefore, the HNB announced that it will maintain the CCyB rate of 0% for the third quarter of 2019 (see HNB, 2018d).

6 In Hungary, household lending rebounds after years of deleveraging with Austrian banking subsidiaries taking part in consumer loan growth

In the first half of 2018, Austrian banking subsidiaries in Hungary recorded an outstanding loan volume of EUR 7.2 billion, accounting for a market share of 14.2% (as measured by total assets in the second quarter of 2018). Housing loans had a share of 26% and consumer loans a share of 14% in the Austrian banking subsidiaries' aggregate loan book in Hungary. While growth rates registered by Austrian banking subsidiaries in 2017 were negative in the mortgage loan segment, they were relatively high in the consumer loan segment, coming to 21% in 2017 and continuing to rise in the first half of 2018. Compared to the credit growth rates of Hungary's banking system, Austrian banking subsidiaries grew faster in 2017.

Since 2016, annual growth rates of household loans have been positive in Hungary, mainly driven by mortgage loans and, more recently, also by consumer loans. In addition, mortgage

Table 2

Regulatory limits for PTI and LTV levels in Hungary

		HUF	EUR	Other currency
PTI (payment-to-income) ratio	Net monthly income lower than HUF 400,000	50%	25%	10%
	Net monthly income equal or higher than HUF 400,000	60%	30%	15%
LTV (loan-to-value) ratio	Mortgage loans	80%	50%	35%
	Motor vehicle loans	75%	45%	30%

Source: MNB (2016).

Note: LTV limits that are 5 percentage points higher can be applied to financial leases.

[10] *See https://www.hnb.hr/documents/20182/2042017/ep26092017_preporuka.pdf/63011671-4e66-4f21-bb92-5afd01c3d13a.*

lending is supported by the "Home Purchase Subsidy Scheme for Families." In the second quarter of 2018, 16% of new housing loans were granted within the framework of this program (see MNB, 2018a). Since the National Bank of Hungary (MNB) has not observed excessive lending yet, the CCyB rate is currently set at zero while credit development is being closely monitored.

Hungary implemented macroprudential debt cap rules in January 2015 to prevent excessive credit growth and a renewed buildup of foreign currency loans, as observed in the past (see MNB, 2016). Currently, household debt is at comparatively low levels in Hungary and is almost exclusively denominated in local currency. In parallel with the recovery of the economy, the outflow of household loans is increasing dynamically, and thus the prudential limits will gradually become effective. Measures taken in 2015 included the implementation of threshold levels to LTV ratios and payment-to-income (PTI) ratios to mitigate the impact of various risks (see table 2).

In its 2017 Macroprudential Report, the MNB stated that no trends had been observed suggesting potential circumvention of existing debt cap limits by extending the maturity of loans or sequential unsecured and collateralized borrowing, even though LTV ratios of mortgage loans were close to regulatory limits.

It is noteworthy that the share of variable-rate housing loans is high in Hungary, which was also reported in other CESEE countries. Most household loans have variable or fixed rates of up to one year. For this reason, the MNB has encouraged fixed-rate and longer-term lending and has taken measures to increase borrowers' awareness of interest rate risks. As a case in point, the calculation of the PTI ratio was changed to not discourage fixed-rate borrowing in 2016. With effect from October 1, 2018, the PTI ratio has been reduced for loans with variable or fixed rates of less than five years, respectively, as well as for loans with fixed rates between five and ten years. The PTI ratio for loans with fixed rates of at least ten years or for the whole term has remained unchanged. Further changes to the PTI ratio include an increase in limits of monthly net income levels from currently HUF 400,000 to HUF 500,000. Thus, borrowers with higher income levels will still be allowed to take out loans, albeit with higher monthly instalments given their higher repayment capacity (see MNB, 2018b).

Furthermore, Hungary has implemented prudential liquidity requirements, such as the foreign exchange funding adequacy ratio (FFAR) in 2012 and the mortgage funding adequacy ratio (MFAR) in 2017. The FFAR was tightened to 100% in 2015 to prevent currency mismatches; the MFAR was tightened to 20% in 2018 to address maturity mismatches on banks' balance sheets.

7 In Russia, mortgage lending is expanding, albeit from low levels

Since 2016, only one Austrian banking subsidiary has operated in Russia.[11] This subsidiary has a mixed loan portfolio, with loans to nonfinancial corporations making up the lion's share in the first half of 2018, followed by consumer and mortgage loans. Mortgage lending has expanded significantly since 2015, coming closer to the volume of consumer loans. This subsidiary's contributions to overall profitability of Austrian banks are substantial.

[11] *For reasons of confidentiality, no banking data are published.*

The Russian banking sector is dominated by Russian state-related banks that held 71% of total assets at end-2017, while foreign banks clearly play a subordinated role, holding only 7% of total assets. In the second quarter of 2018, the Austrian banking subsidiary had a market share of about 1%. With 72%, nonfinancial corporate loans accounted for the bulk of the Russian banking system's loan portfolio in 2017, while consumer and mortgage loans made up smaller shares, coming to 16% and 12%, respectively.

In recent years, banks in Russia have sought to increase lending to households to counter relatively weak demand for new loans from nonfinancial corporations. Furthermore, household lending, i.e. mainly mortgage lending, has picked up since 2015 as mortgage lending was subsidized by the government, interest rates have declined and mortgage penetration in Russia – currently at around 6% of GDP – is far below the CESEE average of 20%. Mortgage lending therefore gained the most momentum in loan growth in Russia, posting growth rates of about 19% as of April 1, 2018 (see CBR, 2018). According to Moody's (2018), banks are currently focusing on relatively creditworthy borrowers. The Russian ruble is the prevailing currency in mortgage lending. The Central Bank of Russia (CBR) reacted to the dynamic loan growth and introduced prudential preventive measures, i.e. higher risk weights for housing loans with down-payment ratios of less than 20% for loans originated after January 1, 2018. According to the CBR, the share of issued loans with LTV ratios of more than 80% was 14.0% in the first quarter of 2017 and already as high as 42.4% in the fourth quarter of 2017 (see CBR, 2018).

Lending activity in the retail sector has expanded since mid-2016. In April 2018, growth rates of about 14% were registered in consumer lending. The CBR again tightened risk weights for consumer loans issued after May 1, 2018 and plans to implement a prudential limit on the debt burden ratio (PTI) to mitigate risks associated with renewed accelerating growth in this credit segment. The Ordinance for the PTI should enter into force in the second half of 2018, and calculations of the PTI ratio will be mandatory from January 1, 2019 onward. In 2019, after calibrating the level of risk depending on the PTI ratio, it is planned to shift to the use of this indicator to establish the values of macroprudential buffers for consumer loans (see CBR, 2018). Consumer loans boomed once before, in 2011 and 2012, and urged the CBR to intervene to prevent systemic risks.

To discourage lending in foreign currency, the CBR raised risk weights early on in the past, particularly for borrowers lacking a corresponding foreign income. The share of unhedged foreign currency loans is therefore relatively low in Russia.

The CCyB rate is maintained at 0%. In the event of accelerated loan growth rates, a reduction of underwriting standards, or an excessive increase in the share of dividend payments, the CBR may consider establishing a positive buffer.

8 Summary and conclusions

Austrian banking subsidiaries' lending activities in the household sector broadly matched credit developments in the local banking systems of the Czech Republic, Slovakia, Romania, Croatia, Hungary and Russia in 2017. They grew faster in the household segment in the Czech Republic, Slovakia, Hungary and Russia than the market did in these countries. Due to already relatively high outstanding loan volumes with respect to Austrian banking subsidiaries' aggregate exposure to

CESEE countries, growth rates in the Czech Republic and Slovakia matter more. In Romania, Croatia and Hungary, lending activities of Austrian banking subsidiaries focused on consumer loans rather than on mortgage loans in 2017. This trend continued in the first half of 2018, except for Romania, where consumer lending almost stagnated. Austrian banking subsidiaries' outstanding mortgage loan volume in CESEE is twice as high as their outstanding consumer loan volume. Lending in local currency is prevailing, while foreign currency lending becomes more and more of a legacy issue. Credit growth of Austrian banking subsidiaries is based on a local funding base, which is in line with the corresponding macroprudential recommendations issued by the OeNB and the FMA.

In the six CESEE countries under review, numerous macroprudential recommendations and regulations with regard to household lending have been introduced (and have often been tightened). These measures mainly included debt cap tools, e.g. LTV ratios. In sum, macroprudential measures have contributed to strengthening the banking systems' resilience and to avoiding the buildup of systemic risks. Moreover, institutional settings are crucial for effective macroprudential policymaking. Greater independence of supervisory authorities is usually associated with reduced cyclicality of the riskiness of credit allocation (see IMF, 2018a).

Credit cycles in the Czech Republic and Slovakia are mature and authorities are well aware of the risks related to the ongoing credit boom. By making use of the macroprudential toolkits at their disposal, they have reacted accordingly. Furthermore, the CNB is making an effort to turn recommendations into legally binding rules. While the Czech Republic pursues its own monetary policy, thereby supporting current regulatory measures in a way, Slovakia's fast-growing economy is (procyclically) challenged by the European Central Bank's ultra-low interest rates. Both countries have activated countercyclical capital buffers and will increase them gradually. Hungary implemented its macroprudential measures in 2015 in anticipation of a rather vivid renewal of lending and to avoid a rise in vulnerabilities to unsustainable levels as observed in the past. Romania has successfully coped with the relatively high stock of foreign currency loans, proving that macroprudential measures taken early on are now bearing fruit. Moreover, Romanian authorities brace themselves for potential risks arising in particular in the real estate sector. The Romanian banking system is still struggling with NPLs from the last credit cycle. Therefore, the NBR has adapted the systemic risk buffer accordingly. In contrast to other CESEE markets, Croatia is lagging behind economic growth rates. The HNB has identified the high share of variable-interest mortgage loans amid relatively weak economic conditions as well as potential adverse developments (economic downturn, rise in interest rates) as possible risks and has published a respective recommendation. Hungary has adapted some of its macroprudential measures as well to react to interest rate-related risks. In Russia, the spotlight is currently on mortgage lending, which has exhibited the greatest growth momentum. Consumer lending, however, has also picked up in Russia. To avoid the (renewed, in the case of consumer loans) buildup of systemic risks, the CBR has reacted by imposing higher risk weights and tightening as well as extending their macroprudential toolkit.

References

CBR. 2017. Financial Stability Review No. 2. 2017 Q2–Q3.

CBR. 2018. Financial Stability Review No. 1. Q4 2017–Q1 2018.

CNB. 2018a. Risks to financial stability and their indicators. January.

CNB. 2018b. Financial Stability Report 2017/2018.

CNB. 2018c. Official information of the Czech National Bank. Recommendation on the management of risks associated with the provision of retail loans secured by residential property. June 12.

Fessler, P., E. List and T. Messner. 2017. How financially vulnerable are CESEE households? An Austrian perspective on its neighbors. In: Focus on European Economic Integration Q2/17. Vienna: OeNB. 58–79.

HNB. 2017a. Analytical annex to Recommendation to mitigate interest rate and interest rate-induced credit risk in long-term consumer loans. September.

HNB. 2017b. Recommendation to mitigate interest rate and interest rate-induced credit risk in long-term consumer loans. September 26.

HNB. 2018a. Macroprudential Diagnostics. February.

HNB. 2018b. Announcement of the application of the countercyclical buffer rate for the Republic of Croatia for the second quarter of 2019. March 26.

HNB. 2018c. Financial Stability. May.

HNB. 2018d. Macroprudential Diagnostics. July.

IMF. 2018a. Global Financial Stability Report. A Bumpy Road Ahead. April.

IMF. 2018b. Romania: 2018 Article IV Consultation – Press Release; Staff Report and Statement by the Executive Director for Romania. IMF Country Report No. 18/148. June.

IMF. 2018c. Slovak Republic: 2018 Article IV Consultation – Press Release; Staff Report and Statement by the Executive Director for the Slovak Republic. IMF Country Report No. 18/241. July.

IMF. 2018d. Slovak Republic: Selected Issues. IMF Country Report No. 18/242. July.

IMF. 2018e. Hungary: 2018 Article IV Consultation – Press Release and Staff Report. IMF Country Report No. 18/252. August.

IMF. 2018f. Russian Federation: 2018 Article IV Consultation – Press Release; Staff Report. IMF Country Report No. 18/275. September.

MNB. 2016. Macroprudential Report.

MNB. 2017. Macroprudential Report.

MNB. 2018a. Trends in Lending. August.

MNB. 2018b. The Amendment of the Debt Cap Rules has been published. Press release from August 22.

Moody's Investors Service. 2017. Banks – Hungary. Banking System Profile. May.

Moody's Investors Service. 2018. Banks – Russia. Slow economic growth will test banks' business models. March.

NCMO. 2018. Macroprudential Recommendations. http://www.cnsmro.ro/en/politica-macroprudentiala/lista-recomandarilor/.

NBR. 2012. Financial Stability Report.

NBR. 2013. Financial Stability Report.

NBR. 2017. Financial Stability Report. December.

NBR. 2018. Financial Stability Report. June.

NBS. 2017. Financial Stability Report. May.

NBS. 2018a. Financial Stability Report. May.

NBS. 2018b. Quarterly Commentary on Macroprudential Policy. July.

Annex of tables

Annex of tables

Cutoff date for data: October 18, 2018

Conventions used:

x = no data can be indicated for technical reasons.

.. = data not available at the reporting date.

Revisions of data published in earlier volumes are not indicated.

Discrepancies may arise from rounding.

International financial market indicators

Table A1

Short-term interest rates[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	Three-month rates, period average, %							
Euro area	0.57	0.22	0.21	–0.02	–0.26	–0.33	–0.33	–0.33
U.S.A.	0.43	0.27	0.23	0.32	0.74	1.26	1.14	2.13
Japan	0.33	0.24	0.21	0.17	0.08	0.06	0.06	0.07
United Kingdom	0.83	0.51	0.54	0.57	0.50	0.36	0.33	0.62
Switzerland	0.07	0.02	0.01	–0.75	–0.75	–0.73	–0.73	–0.74
Czech Republic	1.00	0.46	0.36	0.31	0.29	0.41	0.29	0.88
Hungary	6.98	4.31	2.41	1.61	0.99	0.14	0.21	0.06
Poland	4.91	3.02	2.52	1.75	1.70	1.73	1.73	1.71

Source: Bloomberg, Eurostat, Macrobond.

[1] *Average rate at which a prime bank is willing to lend funds to another prime bank for three months.*

Table A2

Long-term interest rates[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	Ten-year rates, period average, %							
Euro area	3.05	3.01	2.28	1.27	0.93	1.17	1.29	1.19
U.S.A.	1.81	2.25	2.60	2.13	1.82	2.34	2.35	2.84
Japan	0.86	0.71	0.57	0.36	–0.04	0.05	0.05	0.05
United Kingdom	1.74	2.03	2.14	1.79	1.22	1.18	1.13	1.42
Switzerland	0.67	0.88	0.80	–0.02	–0.36	–0.08	–0.11	0.07
Austria	2.37	2.01	1.49	0.75	0.38	0.58	0.57	0.76
Czech Republic	2.78	2.11	1.58	0.58	0.43	0.98	0.74	1.86
Hungary	7.89	5.92	4.81	3.43	3.14	2.96	3.30	2.66
Poland	5.00	4.03	3.52	2.70	3.04	3.42	3.52	3.25

Source: ECB, Eurostat, Macrobond.

[1] *Yields of long-term government bonds.*

Table A3

Stock indices

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	Annual change in %, period average							
Euro area: EURO STOXX	–6.36	17.53	13.07	11.76	–9.67	17.16	16.48	4.38
U.S.A.: S&P 500	8.81	19.17	17.49	6.71	1.63	16.92	17.25	15.06
Japan: Nikkei 225	–3.43	49.20	13.84	24.21	–11.92	19.53	16.69	15.34
United Kingdom: FTSE100	1.09	12.69	3.23	–1.38	–1.74	13.96	20.17	1.65
Switzerland: SMI	4.88	24.14	9.28	4.23	–10.12	10.91	8.73	2.53
Austria: ATX	–14.79	16.94	–2.36	1.28	–5.42	34.83	31.43	18.96
Czech Republic: PX 50	–14.60	2.50	1.60	0.80	–11.50	14.30	10.52	13.35
Hungary: BUX	–12.00	3.30	–3.90	17.30	28.90	31.50	31.84	13.59
Poland: WIG	–6.70	16.10	8.10	–0.30	–9.80	30.00	27.70	3.88

Source: Macrobond.

Table A4

Corporate bond spreads[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	Percentage points, period average							
	Euro area							
AA	1.67	0.89	0.59	0.72	0.80	0.74	0.84	0.58
BBB	3.75	2.25	1.71	1.89	2.11	1.71	1.88	1.52
	U.S.A.							
AA	1.50	1.12	0.88	1.04	0.93	0.74	0.78	0.72
BBB	2.59	2.17	1.76	2.13	2.21	1.54	1.63	1.46

Source: Macrobond.

[1] *Spreads of seven- to ten-year corporate bonds against ten-year government bonds (euro area: German government bonds).*

Financial indicators of the Austrian corporate and household sectors

Table A5

Financial investment of households[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	EUR billion, four-quarter moving sum							
Currency	0.6	1.2	0.9	0.7	0.6	0.6	0.7	0.5
Deposits	3.8	1.9	3.2	6.5	10.4	8.5	13.1	10.5
Debt securities[2]	0.2	–1.8	–4.2	–3.5	–2.7	–2.7	–2.9	–2.9
Shares and other equity[3]	1.1	–0.1	1.9	–0.3	1.1	–0.4	0.0	–0.2
Mutual fund shares	0.9	2.7	3.5	4.1	3.1	3.8	3.8	3.5
Insurance technical reserves	3.7	3.4	3.3	1.3	1.1	0.2	1.3	–0.1
Other accounts receivable	0.0	0.0	1.7	1.1	–0.9	1.4	0.0	1.6
Total financial investment	10.3	7.3	10.3	9.9	12.7	11.4	16.0	12.9

Source: OeNB (financial accounts).

[1] *Including nonprofit institutions serving households.*
[2] *Including financial derivatives.*
[3] *Other than mutual fund shares.*

Table A6

Household[1] income and savings

	2010	2011	2012	2013	2014	2015	2016	2017
	EUR billion, four-quarter moving sum							
Net disposable income	173.8	178.3	185.4	185.6	190.7	193.2	200.6	205.1
Savings	16.8	14.2	16.6	13.3	14.0	13.1	15.7	14.1
Saving ratio in %[2]	9.6	7.9	8.9	7.1	7.3	6.8	7.8	6.8

Source: Statistics Austria (national accounts broken down by sectors).

[1] *Including nonprofit institutions serving households.*
[2] *Saving ratio = savings / (disposable income + increase in accrued occupational pension benefits).*

Table A7

Financing of nonfinancial corporations

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	EUR billion, four-quarter moving sum							
Debt securities[1]	2.8	1.7	–0.7	0.0	0.7	–1.9	–2.1	0.2
Loans	0.6	7.0	3.3	5.8	14.6	14.6	16.1	13.7
Shares and other equity	2.4	4.4	4.1	2.4	3.6	10.9	3.8	9.2
Other accounts payable	1.0	3.1	2.9	4.7	6.1	3.4	5.2	2.1
Total external financing	6.7	16.2	9.6	12.9	25.0	27.1	23.0	25.2

Source: OeNB (financial accounts).

[1] *Including financial derivatives.*

Table A8

Insolvency indicators

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
Default liabilities (EUR million)	3,206	6,255	2,899	2,430	2,867	1,863	668	908
Defaults (number)	3,505	3,266	3,275	3,115	3,163	3,025	1,531	1,525

Source: Kreditschutzverband von 1870.

Note: Default liabilities for 2013 include one large insolvency.

Table A9

Housing market indicators

	2010	2011	2012	2013	2014	2015	2016	2017
Residential property price index	*2000=100*							
Vienna	143.9	156.1	180.7	196.3	204.6	209.2	217.2	220.4
Austria	127.3	132.7	149.1	156.0	161.4	168.1	180.4	187.2
Austria excluding Vienna	121.1	124.0	137.4	141.1	145.4	152.9	166.7	174.9
Rent prices[1]	*2010=100*							
Rents of apartments excluding utilities, according to CPI	100.0	103.3	107.8	111.2	115.6	120.7	124.4	129.6
OeNB fundamentals indicator for residential property prices[2]								
Vienna	–3.2	2.8	11.3	15.2	16.0	16.2	17.9	19.9
Austria	–9.4	–6.0	–0.7	–1.8	–2.0	–0.4	4.2	8.4

Source: OeNB, Vienna University of Technology (TU Wien).

[1] *Free and regulated rents.*

[2] *Deviation from fundamental price in %.*

Austrian financial intermediaries[1]

Table A10

Structural indicators

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period							
Number of banks in Austria	809	790	764	738	672	628	669	622
Number of bank branches	4,468	4,359	4,255	4,096	3,926	3,775	3,820	3,677
Number of foreign subsidiaries	101	93	85	83	60	58	60	57
Number of branches abroad	146	151	200	207	209	215	212	216
Number of bank employees[1]	79,110	77,712	75,714	75,034	74,543	73,712	74,038	73,590

Source: OeNB.

[1] Number of persons, including part-time employees, employees on leave or military service, excluding blue-collar workers.

Table A11

Total assets

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Total assets on an unconsolidated basis	982,114	927,155	896,424	859,165	832,267	815,275	842,375	836,461
Total assets on a consolidated basis	1.163,595	1.089,713	1.078,155	1.056,705	946,342	948,861	962,044	972,449
Total assets of CESEE subsidiaries[1]	276,352	264,998	285,675	295,557	184,966	205,532	197,725	211,736
Leverage ratio (consolidated, %)[2]	6.1	6.5	6.1	6.3	7.6	7.7	7.8	7.6

Source: OeNB.

[1] The transfer in ownership of UniCredit Bank Austria's CESEE subsidiaries to the Italian UniCredit Group limits the comparability of figures as of end-2016.
[2] Definition up to 2013: tier 1 capital after deductions in % of total assets. Definition as of 2014 according to Basel III.

Table A12

Sectoral distribution of loans to domestic nonbanks

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
	All currencies combined							
Nonbanks	330,385	326,820	328,324	333,970	338,322	341,227	338,058	347,496
of which: nonfinancial corporations	*140,384*	*140,329*	*136,606*	*137,235*	*136,963*	*143,113*	*138,134*	*148,101*
households[1]	*139,056*	*139,052*	*140,946*	*146,432*	*153,501*	*156,376*	*153,451*	*157,805*
general government	*27,972*	*25,970*	*28,102*	*28,076*	*27,630*	*24,292*	*27,592*	*24,663*
other financial intermediaries	*22,806*	*21,244*	*22,578*	*22,127*	*19,987*	*17,316*	*18,689*	*16,927*
	Foreign currency							
Nonbanks	47,652	40,108	36,288	33,950	30,089	22,181	27,338	20,840
of which: nonfinancial corporations	*9,156*	*6,985*	*6,379*	*5,293*	*4,296*	*3,408*	*4,181*	*3,428*
households[1]	*32,905*	*28,385*	*25,374*	*24,423*	*21,224*	*16,486*	*19,185*	*15,429*
general government	*2,827*	*2,478*	*2,777*	*2,858*	*2,623*	*943*	*2,129*	*526*
other financial intermediaries	*2,761*	*2,257*	*1,759*	*1,374*	*1,945*	*1,343*	*1,815*	*1,457*

Source: OeNB.

[1] Including nonprofit institutions serving households.

Note: Figures are based on monetary statistics.

[1] Since 2007, the International Monetary Fund (IMF) has published Financial Soundness Indicators (FSIs) for Austria (see also www.imf.org). In contrast to some FSIs that take only domestically-owned banks into account, the OeNB's Financial Stability Report takes into account all banks operating in Austria. For this reason, some of the figures presented here may deviate from the figures published by the IMF.

Table A13

Loan quality[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, %							
Nonperforming loans in % of total loans (Austria[2])	4.7	4.1	4.4	4.0	3.2	2.5	2.7	2.2
Nonperforming loans in % of total loans (consolidated)	8.7	8.6	7.0	6.5	5.2	3.4	4.1	3.1
Nonperforming loans in % of total loans (Austrian banks' CESEE subsidiaries)	13.9	14	11.8	11.5	8.6	4.5	5.8	3.9
Coverage ratio[3] (Austria[2])	×	×	×	×	×	59	60	61
Coverage ratio[3] (consolidated)	×	×	×	×	×	52	54	51
Coverage ratio[3] (Austrian banks' subsidiaries in CESEE)	48	53	57	59	67	61	61	64

Source: OeNB.

[1] As of 2017, data are based on Financial Reporting (FINREP) including total loans and advances. Data before 2017 only include loans to households and corporations.
[2] Austrian banks' domestic business.
[3] Total loan loss provisions in % of nonperforming loans.

Table A14

Exposure to CESEE

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Total exposure according to BIS[1]	209,818	201,768	184,768	186,397	193,273	210,616	209,900	218,014
Total indirect lending to nonbanks[2, 3]	171,117	161,439	177,389	176,728	108,738	118,268	114,093	119,500
Total direct lending[4]	51,539	52,926	43,144	40,866	32,976	28,507	30,909	28,135
Foreign currency loans of Austrian banks' CESEE subsidiaries[3]	85,382	79,047	76,736	69,317	32,576	31,027	31,749	29,846

Source: OeNB.

[1] As of mid-2017, comparability of data with earlier figures is limited due to several methodological adjustments in data collection.
[2] Lending (net lending after risk provisions) to nonbanks by all fully consolidated bank subsidiaries in CESEE.
[3] The transfer in ownership of UniCredit Bank Austria AG's CESEE subsidiaries to the Italian UniCredit Group limits the comparability of figures as of end-2016.
[4] Cross-border lending to nonbanks and nonfinancial institutions in CESEE according to monetary statistics.

Table A15

Profitability on a consolidated basis[1]

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Operating income	37,673	35,271	28,717	28,064	22,408	22,837	11,668	11,677
of which: net interest income	19,259	18,598	19,345	18,336	14,604	14,526	7,259	7,484
net fee-based income	7,260	7,590	7,741	7,730	6,562	6,886	3,428	3,536
net profit/loss on financial operations	1,137	670	426	–50	110	90	44	–449
other operating income[2]	10,016	8,413	1,205	2,048	1,132	1,335	937	1,106
Operating expenses	25,582	27,318	19,833	17,612	16,685	14,772	7,646	7,729
of which: staff costs	10,391	10,378	9,543	8,959	8,774	8,416	4,167	4,188
other administrative expenses	6,410	6,628	6,569	6,830	5,818	5,583	2,872	2,938
Operating profit/loss	12,090	7,953	8,884	10,452	5,723	8,065	4,012	3,948
Net profit after taxes	2,966	–1,035	685	5,244	4,979	6,558	3,358	3,592
	%							
Return on average assets[3]	0.3	–0.0	0.0	0.6	0.6	0.8	0.8	0.8
Return on average equity (tier 1 capital)[3]	5.1	–0.7	0.7	8.8	8.3	10.6	10.8	10.8
Interest income to gross income	51	53	67	65	65	64	62	64
Cost-to-income ratio	62	73	69	63	75	65	66	66

Source: OeNB.

[1] The transfer in ownership of UniCredit Bank Austria AG's CESEE subsidiaries to the Italian UniCredit Group limits the comparability of figures as of end-2016.
[2] Since end-2014, other operating income and other operating expenses have been netted under other operating income.
[3] End-of-period result for the full year after tax but before minority interests as a percentage of average total assets and average tier 1 capital, respectively.

Table A16

Profitability of Austrian banks' subsidiaries[1, 2] in CESEE

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Operating income	12,685	12,544	12,159	12,261	7,752	7,914	3,922	3,979
of which: net interest income	*8,780*	*8,414*	*9,068*	*8,431*	*5,135*	*5,304*	*2,616*	*2,770*
securities and investment earnings	*66*	*63*	*27*	*49*	*57*	*71*	*64*	*77*
fee and commission income	*2,992*	*3,164*	*3,477*	*3,358*	*2,184*	*2,315*	*1,131*	*1,144*
trading income	*739*	*736*	*–251*	*642*	*681*	*381*	*200*	*76*
other operating income[3]	*–321*	*–374*	*–831*	*–528*	*–344*	*–157*	*–152*	*–88*
Operating expenses[3]	6,363	6,253	6,413	6,264	4,084	4,216	2,078	2,135
of which: staff costs	*2,992*	*2,922*	*2,978*	*2,896*	*1,956*	*2,052*	*1,002*	*1,036*
Operating profit/loss	6,321	6,291	5,746	5,998	3,668	3,698	1,844	1,844
Net profit after taxes	1,999	2,201	672	2,050	2,354	2,627	1,527	1,582
	%							
Return on average assets[4]	0.7	0.8	0.2	0.7	1.3	1.3	1.6	1.5
Return on average equity (tier 1 capital)[4]	8.2	8.4	9.9	9.5	14.3	14.3	17.5	16.6
Interest income to gross income	69	67	75	69	66	67	67	70
Cost-to-income ratio[3]	50	50	53	51	53	53	53	54

Source: OeNB.

[1] *Pro rata data of Yapı ve Kredi Bankası, a joint venture of UniCredit Bank Austria AG in Turkey, are included for the period from the first quarter of 2014 until end-2015.*
[2] *The transfer in ownership of UniCredit Bank Austria AG's CESEE subsidiaries to the Italian UniCredit Group limits the comparability of figures as of end-2016.*
[3] *Since end-2014, other operating income and other operating expenses have been netted under other operating income.*
[4] *End-of-period result expected for the full year after tax as a percentage of average total assets and average total tier 1 capital, respectively.*

Table A17

Solvency

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Own funds	88,204	88,994	87,584	87,793	80,699	84,983	83,001	85,041
Total risk exposure	621,925	578,425	562,790	537,447	442,870	449,451	448,304	462,049
	End of period, eligible capital and tier 1 capital, respectively, as a percentage of risk-weighted assets							
Consolidated total capital adequacy ratio	14.2	15.4	15.6	16.3	18.2	18.9	18.5	18.4
Consolidated tier 1 capital ratio	11.0	11.9	11.8	12.9	14.9	15.9	15.3	15.8
Consolidated core tier 1 capital ratio (common equity tier 1 as from 2014)	10.7	11.6	11.7	12.8	14.8	15.6	15.1	15.1

Source: OeNB.

Note: Since 2014, figures have been calculated according to CRD IV requirements; therefore, comparability with previous figures is limited.

Table A18

Market indicators of selected Austrian financial instruments

	2011	2012	2013	2014	2015	2016	2017	Sept. 2018
Share prices	*% of end-2011 prices, end of period*							
Erste Group Bank	100	177	187	142	214	206	267	265
Raiffeisen Bank International	100	157	128	65	71	91	157	129
EURO STOXX Banks	100	112	141	134	127	117	130	106
Uniqa	100	105	99	83	80	77	94	92
Vienna Insurance Group	100	132	118	121	83	70	84	80
EURO STOXX Insurance	100	134	179	185	215	203	222	225
Relative valuation: share price-to-book value ratio	*%, end of period*							
Erste Group Bank	42	70	93	80	108	95	115	119
Raiffeisen Bank International	40	60	51	48	50	59	100	80
EURO STOXX Banks	49	58	81	77	75	52	83	70
Uniqa	153	105	104	78	74	69	85	89
Vienna Insurance Group	95	107	102	98	79	62	71	70
EURO STOXX Insurance	65	75	107	94	102	89	106	108

Source: Bloomberg.

Table A19

Key indicators of Austrian insurance companies

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
Business and profitability	*End of period, EUR million*							
Premiums	16,341	16,608	17,077	17,342	16,920	16,975	9,227	9,378
Expenses for claims and insurance benefits	12,973	13,150	14,157	15,514	14,751	14,727	7,225	7,012
Underwriting results	455	592	477	475	560	581	327	306
Profit from investments	3,391	3,354	3,211	3,216	3,051	2,815	1,609	1,341
Profit from ordinary activities	1,395	1,524	1,421	1,354	1,414	1,244	934	694
Acquisition and administrative expenses	3,499	3,528	3,573	3,697	3,818	3,728	1,924	1,953
Total assets[1]	108,374	110,391	113,662	114,495	114,707	137,280	140,288	136,609
Investments								
Total investments	103,272	105,496	107,442	107,933	108,897	109,235	109,887	109,673
of which: debt securities	*37,614*	*39,560*	*41,667*	*41,517*	*43,241*	*44,030*	*43,564*	*44,109*
stocks and other equity securities[2]	*12,505*	*12,464*	*12,619*	*12,522*	*12,534*	*11,862*	*12,704*	*12,588*
real estate	*5,371*	*5,689*	*5,858*	*5,912*	*6,022*	*6,149*	*6,038*	*6,240*
Investments for unit-linked and index-linked life insurance	18,330	19,127	20,179	19,776	20,142	20,587	20,241	20,160
Claims on domestic banks	16,872	16,687	15,800	15,492	13,793	10,313	×	10,058
Reinsurance receivables	1,933	824	918	971	1,027	1,036	1,237	1,237
	%							
Risk capacity[1] (median solvency capital requirement)	350	368	380	375	×	276	241	238

Source: FMA, OeNB.

[1] *Contains shares, share certificates (listed and not listed) and all equity instruments held by mutual funds.*
[2] *A new reporting system based on Solvency II was introduced in 2017; therefore, some indicators cannot be compared with historical values.*

Table A20

Assets held by Austrian mutual funds

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Domestic securities	50,963	49,757	52,116	52,970	54,382	54,824	54,467	54,053
of which: debt securities	*17,527*	*16,203*	*15,467*	*13,609*	*13,278*	*11,879*	*12,525*	*11,619*
stocks and other equity securities	*3,637*	*3,610*	*3,345*	*3,530*	*4,283*	*4,678*	*4,377*	*4,371*
Foreign securities	96,854	99,647	110,397	114,833	120,330	128,836	123,615	128,071
of which: debt securities	*63,661*	*62,972*	*69,642*	*70,326*	*69,911*	*70,353*	*70,004*	*69,763*
stocks and other equity securities	*14,208*	*16,278*	*17,910*	*18,521*	*20,145*	*22,924*	*20,742*	*23,195*
Net asset value	147,817	149,404	162,513	167,802	174,712	183,661	178,071	182,124
of which: retail funds	*84,158*	*83,238*	*89,163*	*91,626*	*94,113*	*97,095*	*95,607*	*95,787*
institutional funds	*63,659*	*66,167*	*73,350*	*76,177*	*80,599*	*86,572*	*82,465*	*86,337*
Consolidated net asset value	126,831	128,444	138,642	143,249	148,682	156,173	151,762	155,442

Source: OeNB.

Table A21

Structure and profitability of Austrian fund management companies

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Total assets	644	670	725	745	691	674	644	641
Operating profit	111	131	158	184	157	177	81	82
Net commissions and fees earned	283	310	368	411	402	407	212	202
Administrative expenses[1]	205	219	246	266	284	267	139	134
Number of fund management companies	29	29	29	29	29	30	29	29
Number of reported funds	2,168	2,161	2,118	2,077	2,029	2,020	2,040	2,013

Source: OeNB.

[1] *Administrative expenses are calculated as the sum of staff and material expenses.*

Table A22

Assets held by Austrian pension funds

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Total assets	16,335	17,385	19,011	19,646	20,839	22,323	21,645	22,198
of which: direct investment	*1,139*	*1,640*	*1,065*	*990*	*835*	*848*	*827*	*838*
mutual funds	*15,278*	*15,745*	*17,946*	*18,656*	*20,004*	*21,475*	*20,818*	*21,360*
foreign currency (without derivatives)	*5,714*	*5,964*	*7,578*	*7,279*	*9,169*	*n.a.*	*9,754*	*9,698*
stocks	*4,805*	*5,472*	*6,250*	*6,200*	*6,972*	*7,867*	*7,357*	*7,980*
debt	*8,464*	*7,650*	*9,163*	*9,552*	*9,521*	*9,054*	*9,625*	*9,709*
real estate	*567*	*583*	*576*	*690*	*754*	*1,165*	*774*	*986*
cash and deposits	*1,488*	*2,033*	*1,598*	*1,850*	*1,863*	*2,192*	*1,827*	*1,445*

Source: OeNB, FMA.

Table A23

Assets held by Austrian severance funds

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
	End of period, EUR million							
Total direct investment	1,442	1,528	1,415	1,565	1,682	1,893	1,682	2,074
of which: euro-denominated	*1,415*	*1,507*	*1,299*	*1,502*	*1,647*	*1,847*	*1,647*	*1,998*
foreign currency-denominated	*27*	*21*	*x*	*63*	*35*	*46*	*35*	*75*
accrued income claims from direct investment	*22*	*21*	*15*	*14*	*15*	*13*	*15*	*13*
Total indirect investment	3,834	4,701	5,912	6,741	7,745	8,720	7,745	8,981
of which: total of euro-denominated investment in mutual fund shares	*3,540*	*4,220*	*5,190*	*5,790*	*6,743*	*7,429*	*6,743*	*7,719*
total of foreign currency-denominated investment in mutual fund shares	*294*	*481*	*722*	*951*	*1,002*	*1,291*	*1,002*	*1,262*
Total assets assigned to investment groups	5,254	6,218	7,306	8,294	9,412	10,597	9,412	11,049

Source: OeNB.

Note: Due to special balance sheet operations, total assets assigned to investment groups deviate from the sum of total indirect investments.

Table A24

Transactions and system disturbances in payment and securities settlement systems

	2012	2013	2014	2015	2016	2017	H1 17	H1 18
Large-value payment system (domestic, operated by the OeNB)	*Number of transactions in million, value of transactions in EUR billion*							
Number	1	1	1	1	1	1	1	1
Value	9,974	5,906	7,438	6,381	4,316	3,690	2,050	809[1]
System disturbances	1	3	0	1	4	0	2	2
Securities settlement systems								
Number	2	2	2	2	2	2	1	1
Value	418	369	377	315	335	701[2]	733[3]	790
System disturbances	1	5	2	3	3	0	0	2
Card payment systems								
Number	633	673	856[4]	901	963	1,061	510	565
Value	48	72	91[4]	97	101	108	53	55
System disturbances	4	2	0	2	4	1	0	1
Participation in international payment systems								
Number	41	53	113	144	166	191	91	104
Value	1,820	1,643	2,463	2,420	3,029	3,242	1,565	1,852
System disturbances	0	0	0	0	0	0	0	0

Source: OeNB.

[1] As of 2018, liquidity transfers from participants' domestic accounts to their own TARGET2 accounts are no longer included in domestic transactions.
[2] Free-of-payment (FOP) transactions were first included in the value in 2017.
[3] New reporting mechanism following the migration to TARGET2-Securities (T2S): "intra" transactions are counted twice (i.e. separately for the sending and the receiving leg).
[4] On-us ATM transactions were first included in 2014.