

From part of the problem to part of the solution: evaluating the effectiveness of borrower-based measures in Austria

Marcel Barmeier, Selin Johanna Scheuerer¹

Evaluating macroprudential policies is key to ensuring that measures are implemented effectively. Borrower-based measures were introduced in Austria in August 2022 via the so-called KIM-V regulation that defines sustainable lending standards for residential real estate (RRE) financing. In our evaluation, we provide evidence on how effective these measures have been so far in addressing systemic risks in Austria's RRE sector. Based on data for lending standards, we find that the KIM-V has halved the share of new lending with a debt service-to-income ratio (DSTI) above 40%. In addition, by applying estimations in a difference-in-differences setting, we find that the ratio of nonperforming loans (NPLs) of RRE loans has decreased by up to 0.5 percentage points since mid-2022. Our findings support the literature, which shows that borrower-based measures effectively reduce systemic risks in the housing sector.

JEL classification: G21, G28, R31

Keywords: borrower-based measures, KIM-V, financial stability, residential real estate

From 2016 onward, the Austrian Financial Market Stability Board repeatedly highlighted the importance of adhering to sustainable standards in real estate lending. When these recommendations did not have the intended effects and systemic risks from residential real estate (RRE) financing kept building up, it was decided to implement legally binding borrower-based measures (BBMs) in August 2022, known as the KIM-V regulation (“Kreditinstitute-Immobilienfinanzierungsmaßnahmen-Verordnung”). The KIM-V sets standards for credit institutions’ new lending by limiting (1) the loan-to-collateral ratio (LTC) to 90%, (2) the debt service-to-income ratio (DSTI) to 40% and (3) the maturity to 35 years.² Given that BBMs have been in place for over two years now, the question arises how effective they have been so far in mitigating risks to financial stability. To provide an answer, we draw on national and international bank-level data in a difference-in-differences framework. The study is structured as follows: In section 1, we discuss the link between BBMs and financial stability, section 2 includes a short literature review, section 3 provides an empirical approach to estimating the effectiveness of the KIM-V and section 4 concludes.

1 Borrower-based measures and financial stability

Poor lending standards in RRE financing increase the likelihood and severity of disruptions to financial stability, i.e. systemic banking crises, as underlined e.g. by

¹ Oesterreichische Nationalbank, Financial Stability and Macroprudential Supervision Division, marcel.barmeier@oenb.at, selinjohanna.scheuerer@oenb.at. Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or the Eurosystem. The authors would like to thank Elena Schlögl, Stefan Schellerer, Stefan Schmitz, David Liebeg and Clemens Bonner (all OeNB) for helpful comments and valuable suggestions.

² Bridge loans and small loans (up to 2%) are exempted from the KIM-V. Furthermore, banks can exempt 20% of the new lending volume from the KIM-V. The minimum exemption volume per bank is EUR 1 million.

Aikman et al. (2021) and Muellbauer (2022). The quality of new loans trickles down to the quality of a bank's RRE portfolio, which constitutes a significant share of banks' domestic credit exposure; in Austria approximately 30%.³ Given that mortgages play such an important role for banks, housing market turmoil and banking crises often go hand in hand (Jordà et al., 2016). Two-thirds of 46 systemic banking crises for which house price data are available were preceded by housing boom-bust cycles (Crowe et al., 2013; Roy, 2022). Systemic banking crises imply high social and economic costs: the public sector on average pays 6.7% of GDP to fight such crises, public debt rises by 21% of GDP and output losses are roughly 35% of GDP (Laeven and Valencia, 2018).⁴ To reduce the risks of a real estate-related banking crisis, BBMs became the most commonly used macroprudential policy tool in Europe: 22 out of 30 countries in the European Economic Area deploy BBMs. The most common BBMs are income- and collateral-based measures. Income-based measures, such as limits to the DSTI or the debt-to-income ratio (DTI), aim at increasing household resilience to income and interest rate shocks. In times of crisis, borrowers have more income at their disposal to cover their regular expenses, which lowers the household's probability of default (PD). Collateral-based measures, like the LTC, aim at improving lender resilience during real estate downturns by requiring higher down payments. If a household defaults on its debt, the bank's loss given default (LGD) is reduced (Lo Duca et al., 2023).

2 Literature review

A major challenge in evaluating BBMs is how to define the target variable for measuring effectiveness. Financial stability is difficult to define in an implementable way (BIS, 2023). Thus, policymakers commonly target specific intermediate objectives, which can be broken down into (1) maintaining borrower resilience, (2) maintaining lender resilience, (3) dampening the housing credit cycle and (4) promoting sustainable house price growth (BIS, 2023). Since many authorities mandated with assessing systemic risks, including the Oesterreichische Nationalbank, focus on the first two objectives, the following literature review covers the impact of BBMs on borrower and lender resilience.

To measure borrower resilience, the target variable is often a single credit risk indicator, e.g. the PD, which is regressed on loan and borrower characteristics. Examples include de Haan and Mastrogioacomo (2020), who find that in Denmark limits to the loan-to-value ratio (LTV) and DSTI reduce the probability of non-performance of loans, which encompasses arrears, foreclosures and defaults. If the LTV (DSTI) is 10 percentage points higher, the probability of nonperformance of loans increases by 0.19 (0.75) percentage points. Galán and Lamas (2019) corroborate the main insights for Spain, emphasizing that income-based measures are more robust determinants of mortgage default than LTV limits. Nier et al. (2019) show for Romania that if the DSTI limit of 40% had been implemented earlier, the PD would have been lowered by approximately 23% in comparison to the case without BBMs. Catapeno et al. (2021) rely on an agent-based model to assess the effectiveness of potential BBMs in Italy. They acknowledge that BBMs

³ The share of RRE loans of banks' total assets is approximately 16%. Source: ECB, Balance Sheet Items data, Consolidated Banking Data.

⁴ Data for high-income countries.

reduce the probability of mortgage default but find negligible effects for the Italian market. The TUI⁵-model developed by Górnicka and Valderrama (2020) is another method to estimate effects on credit risk indicators. It was for instance applied to Switzerland (Maslova et al., 2022) and Austria (Górnicka and Valderrama, 2020) to measure the effectiveness of various theoretical DSTI, DTI and LTV limits. For Austria, the PD decreased from 3.9% to 2.2% in an adverse macroeconomic scenario thanks to a DSTI limit of 40% combined with an LTV limit of 80%.

With respect to lender resilience, the literature directs attention to risk measures on the level of individual institutions. Gross and Población (2017) developed a structural micro-macro model which combines household information of the Household Finance and Consumption Survey with macroeconomic and bank-level data. Household resilience is indicated by PD, LGD as well as the expected loss. Any change in these variables subsequently affects banks' capital position via the mortgage portfolios. The model has been applied in a cross-country context, e.g. by Giannoulakis et al. (2023) or Ampudia et al. (2021), but also for individual countries, e.g. Slovakia (Jurča et al., 2020). Giannoulakis et al. (2023) find that the median capital ratio across countries implementing BBMs increases by up to 1 percentage point compared to no policy intervention. Some researchers construct their own bank-level risk measures to evaluate the impact of BBMs. The target variables are typically based on data from stock markets as well as banks' financial statements. Meuleman and Vander Vennet (2020) distinguish between individual bank risk and risk from the linkage with the financial system. They find that BBMs are most effective in lowering banks' individual risk. In other words, a unit increase (tightening) of their self-constructed index for BBMs on average reduces risk by 4.2 percentage points. They do not find a statistically significant effect on the linkage component. Belkhir et al. (2023) add that DSTI and LTV limits are effective in reducing banks' expected capital shortage in a crisis – but only in combination with an inflation-targeting regime. Altunbas et al. (2018) find that asset class measures, which encompass DSTI, LTV and credit growth limits and limits on the exposure to the housing sector, reduce (increase) the expected default frequency⁶ for the average bank by 0.15 (0.66) percentage points when tightened (eased).

To summarize, the literature finds support for the effectiveness of BBMs in addressing systemic risks, measured by indicators evaluating borrower and lender resilience. This gives authorities well-founded arguments to apply BBMs. However, as national specificities play an important role for the effectiveness of BBMs, national characteristics should be considered.

3 Effectiveness of BBMs in Austria

To add to the understanding of BBMs in Austria, we evaluate their effectiveness in a two-step approach. First, we present descriptive statistics for the development of lending standards and the NPL ratio for RRE financing. Second, we use these data in a difference-in-differences setting to estimate the effect of the introduction of the KIM-V on the NPL ratio. Regarding the target variable, we contribute to the

⁵ *Tool for Unobserved-event Investigation.*

⁶ *A forward-looking risk measure computed by Moody's considering Moody's default database, stock market information and banks' financial statements.*

literature on the effectiveness of BBMs with respect to borrower resilience.⁷ De Haan and Mastrogiamomo (2020) as well as Galán and Lamas (2019) are the papers which bear the most resemblance to ours.

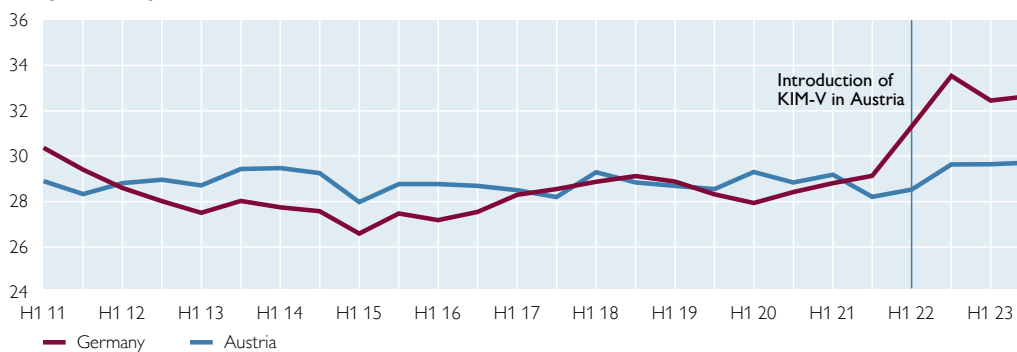
3.1 Data

To conduct our analysis, we compare Austrian and German bank-level data on lending standards and the quality of the RRE loan portfolio, i.e. the NPL ratio.

Chart 1

Average debt service-to-income (DSTI) ratio in Austria and Germany, new lending

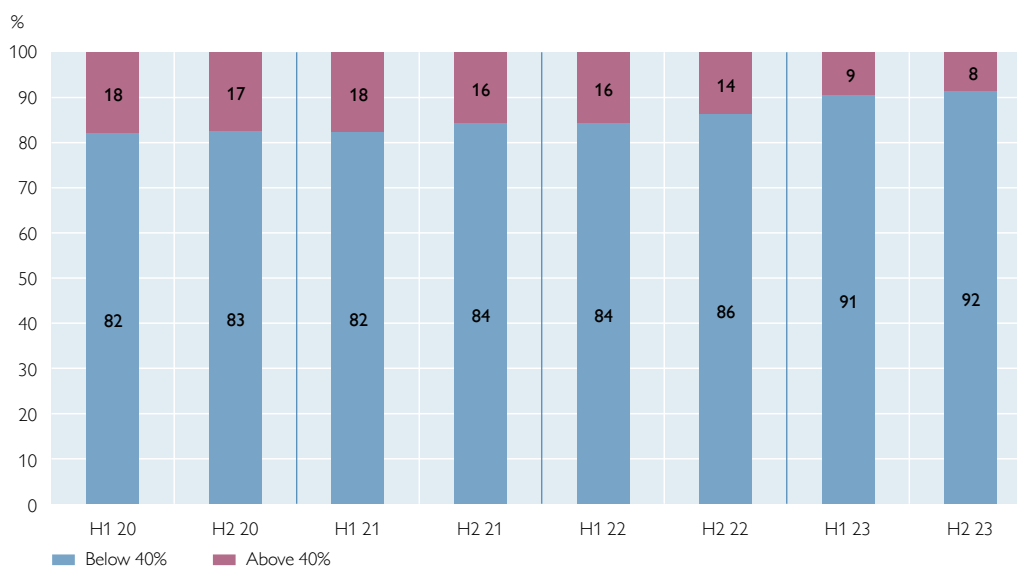
Average volume-weighted DSTI, %



Source: OeNB, Deutsche Bundesbank.

Chart 2

Austria: debt service-to-income (DSTI) ratio, new lending



Source: OeNB.

Note: Loans that are not clearly assignable are classified as sustainable.

⁷ In addition to the effect of the KIM-V on borrower resilience, the limit on LTC may also have a positive effect on lender resilience. However, this is not quantified in our approach.

In Austria, data on lending standards, i.e. on DSTI, DTI, LTV, LTC and maturity, are available from 2011 onward. From 2011 until 2020, banks reported their lending standards as part of the “Hypothekarkreditumfrage” (HKU)⁸. Starting from 2020, reporting standards were amended and reporting via “VERA H – Private Wohnimmobilienfinanzierung” (VERA-H)⁹ related to RRE lending became legally binding. For Germany, we rely on data that are provided by a loan brokerage platform to the Deutsche Bundesbank (Ausschuss für Finanzstabilität, 2024). As the DSTI is the most relevant indicator for debtors’ ability to repay their loans, we discuss its development in more detail.¹⁰

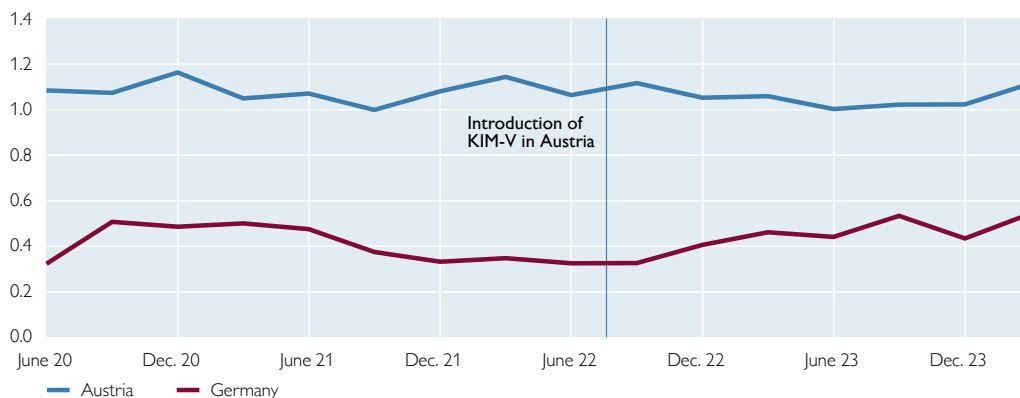
Chart 1 shows the average volume-weighted DSTI for new lending in Germany and Austria. Although interest rates increased gradually from July 2022, the average DSTI for new lending in Austria remained below 30%, whereas in Germany the DSTI peaked at 33.5% in the first half of 2022. While the average DSTI in Austria also increased slightly between the first half of 2022 and the second half of 2023, the reduction in the share of loans with a DSTI above 40% dampened the overall increase in the DSTI (chart 2). In the first half of 2022, 16% of the new lending volume was issued with a DSTI above 40%; in the second half of 2023, this percentage dropped to 8%. The improvement of the DSTI and other lending standards (see the annex) is a first indication of the effectiveness of the KIM-V.

To gauge the loan quality of banks’ RRE portfolio, we consider the NPL ratio for RRE loans. The NPL ratio is corrected for loans that are past due more than one year.¹¹ Chart 3 shows the development of the median corrected NPL ratio on an unconsolidated level for significant institutions from Germany and Austria

Chart 3

NPL ratio of RRE loans in Austria and Germany

Median NPL ratio, %



Source: ECB, OeNB.

Note: Only nonperforming loans with past due ≤ 1 year are considered.

⁸ Up to 11 banks took part in HKU mortgage reporting. The banks’ lending volume added up to at least one-third of the total new lending volume.

⁹ Neue Erhebung Vera H – Private Wohnimmobilienfinanzierung unkonsolidiert ab BT 30.6.2020 - Oesterreichische Nationalbank (OeNB).

¹⁰ See chart A1 in the annex for the evolution of LTV ratios in Austria and Germany.

¹¹ The correction of the NPL ratio is conducted to exclude the effect of loans that were nonperforming already before the KIM-V was introduced.

since June 2020.¹² While in Austria and Germany the NPL ratio remained relatively constant up to the introduction of the KIM-V, the NPL ratio increased in Germany from mid-2022 onward, namely from 0.3% to 0.5% in March 2024. In Austria, the NPL ratio stood at 1.1% in June 2022 and March 2024.

When evaluating the effect of the KIM-V on the NPL ratio, we need to consider that improved lending standards do not immediately reduce defaults in the stock.¹³ Thus, the direct increase in the NPL ratio recorded by German vs. Austrian banks should be considered as part of general fluctuations. Only the persistent increase in the NPL ratio in Germany relative to Austria might be attributable to the KIM-V. Since other confounding factors might have played a role, we continue our analysis with an econometric approach to estimate the causal relationship between the introduction of the KIM-V in Austria and the evolution of non-performing loans.

3.2 Empirical strategy

Estimating the causal effect of the introduction of BBMs in Austria is challenging. Ideally, we would randomly allocate banks to a group that has to fulfill the requirements for new lending according to the KIM-V (treatment group) and a group that does not have to fulfill the requirements (control group). However, as the KIM-V targets all banks in Austria, we need to find other methods for estimating the impact. Thus, we rely on a difference-in-differences approach, where we compare

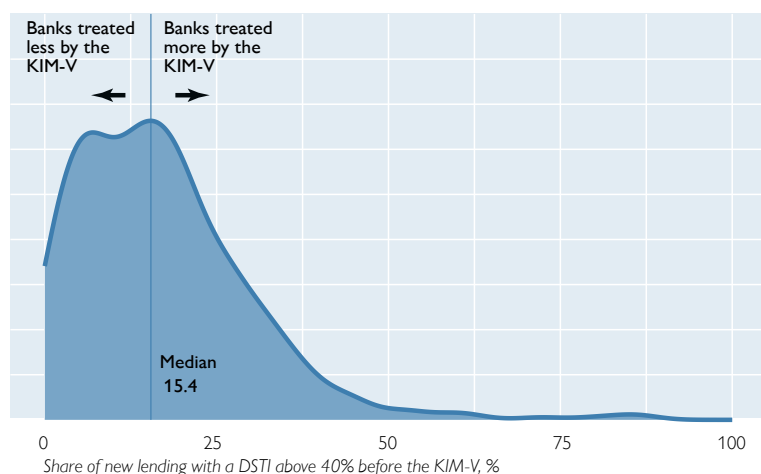
the NPL ratio of banks that are treated by the KIM-V and banks that are not treated by it.

Since the assignment of banks into a treatment or control group is crucial, we rely on two alternative approaches. First, as the KIM-V was introduced only in Austria, we draw on bank-level data from Germany to build a control group (baseline specification).¹⁴ As the banking sectors in Austria and Germany are alike (e.g. high degree of bank competition, large number of banks), German banks are most suitable to serve as a control group when we estimate the effects of the implementation of the KIM-V in Austria.

Second, we classify Austrian banks into a treatment and a control group based on their standards for new lending

Chart 4

Distribution of banks: new lending with a DSTI above 40% before the KIM-V



Source: OeNB (VERA-H reports).

¹² As of the first quarter of 2024, data are available for 84 significant institutions, of which 59 banks are from Austria and 25 banks from Germany, representing a significant share of each market.

¹³ Improved lending standards resulting from the KIM-V lead to lower probabilities of default. Thus, the NPL ratio is reduced. However, given the timespan that needs to be considered in this transmission mechanism, the effect of the KIM-V materializes only with a time lag.

¹⁴ As data for banks from Germany are only available for significant institutions, we only compare the NPL ratio of significant institutions in Austria and Germany.

prior to the introduction of the KIM-V (robustness specification).¹⁵ Chart 4 shows the distribution of Austrian banks with respect to their share of new lending with a DSTI above 40% in 2020 and 2021, i.e. before the KIM-V was introduced. The control group comprises banks that had a below-median share of new lending with a DSTI above 40%, while banks with an above-median share of new lending with a DSTI above 40% make up the treatment group.¹⁶ Given the numerous exemptions to the KIM-V, banks with a low share of new lending with a DSTI above 40% did not need to change their lending standards significantly once BBMs were introduced.¹⁷

The econometric validity of the difference-in-differences approach rests on critical assumptions. Most importantly, the method assumes that the NPL ratios of treated and non-treated banks have parallel trends in the absence of the KIM-V (“parallel trends assumption”). While this is generally not testable, the pre-KIM-V trends provide an indication. Chart 3 shows for the baseline specification that the evolution of the median NPL ratios were fairly parallel for banks from Austria and Germany before the treatment. In June 2020 and June 2022, the median NPL ratios corresponded for banks in both countries, with the German NPL ratio standing at 0.3% and the Austrian one at 1.1%. As a further assumption for the difference-in-differences approach, the composition of the control and the treatment group should not change over time (“time-invariant composition assumption”). This assumption would be violated in the baseline specification if banks endogenously changed their headquarters between Austria and Germany in response to the introduction of the KIM-V. However, this has not been observed in the Austrian and German banking markets.

To estimate the effects of BBMs on the credit quality in Austria, the following two-way fixed effects model in its baseline specification will be estimated:¹⁸

$$NPL\ ratio_{i,j,t} = \beta_1 BBM_i \times Time_t + \gamma X_{i,t-1} + \delta_t + \eta_j + \varepsilon_{i,j,t} \quad (1)$$

where $NPL\ ratio_{i,j,t}$ is the corrected NPL ratio for RRE loans¹⁹ of bank i in country j at time t , BBM_i is a dummy variable that is 1 if the bank is in the treatment group and 0 otherwise, $Time_t$ is a dummy variable that is 0 before the introduction of the KIM-V and 1 afterward and $X_{i,t-1}$ refers to lagged control variables on the bank level. As suggested by Manz (2019), we include the common equity tier 1 (CET1) ratio, the return on assets (ROA) ratio and the overall NPL ratio in the estimation.²⁰ Bank variables are lagged by one quarter to control for potential endogeneity between control variables and the NPL ratio. δ_t and η_j are time- and country-fixed

¹⁵ For this approach, we use data from significant and less significant institutions in Austria.

¹⁶ In 2020 and 2021, the median share of new lending with a DSTI above 40% stood at 15.4%. Thus, half of the Austrian banks had a share of new lending with a DSTI above 40% above 15.4%, while the other half had a share below 15.4%.

¹⁷ As a further check, we exclude banks in the first and fourth quartile of the distribution of new lending with a DSTI above 40% prior to the KIM-V. This is to control for bank heterogeneity at the extremes of the distribution and to ensure that the treatment and the control group are more comparable. The estimation results do not change significantly compared to the robustness specification.

¹⁸ For the robustness specification, the estimation equation remains the same, except that we do not have country-fixed effects but group-fixed effects.

¹⁹ The corrected NPL ratio is defined in section 3.1. To focus on new nonperforming loans, NPLs with past due > 1 year are excluded.

²⁰ Information on the CET1, ROA and overall NPL ratios is sourced from regulatory reporting (COREP, FINREP).

effects, respectively. Ideally, we would also control for heterogeneity on the bank level by applying bank-fixed effects. In addition, we would control for bank-specific reactions to changes in macroeconomic variables (e.g. interest rate) via bank-time fixed effects. However, given the small sample size, either is infeasible.²¹ The estimated coefficient of interest is $\hat{\beta}_1$. $\hat{\beta}_1 < 0$ would indicate that the introduction of the KIM-V in Austria reduced the NPL ratio compared to the case where no BBMs were in place.

3.3 Results

Estimation results for evaluating the effectiveness of BBMs with respect to their impact on NPLs are shown in table 1. As discussed in section 3.2, two alternative empirical strategies are executed with respect to assigning banks to a treatment and a control group.

Columns (1) and (2) show that the introduction of BBMs in Austria is associated with a 0.5-percentage-point decrease in the NPL ratio of Austrian banks compared to German banks. With respect to the robustness specification, we find that the KIM-V reduced the NPL ratio of Austrian banks that were relatively more exposed to the regulation by 0.1 percentage points compared to Austrian banks that were relatively less exposed (columns (3) and (4)). The results are confirmed when we consider bank control variables.

The results need to be interpreted with caution. While we are confident that the KIM-V reduced the NPL ratio for RRE loans, the magnitude is of greater uncertainty. This is shown by the relatively large difference between the estimated coefficients in the baseline and robustness specifications, which indicates the importance of choosing an appropriate control group. Furthermore, a reduction of the NPL ratio in the range of 0.1 to 0.5 percentage points may appear small. However, given that the KIM-V has only addressed a portion of the RRE loan volume currently outstanding²², this would translate into a significantly lower NPL ratio

Table 1

Estimation results for the effectiveness of the KIM-V

Dependent variable	Baseline specification		Robustness specification	
	NPL ratio		NPL ratio	
	(1)	(2)	(3)	(4)
BBM x Time	-0.0046** (0.00002)	-0.0045** (0.00006)	-0.0008** (0.00001)	-0.0013* (0.00010)
Bank controls	No	Yes	No	Yes
Time-fixed effects	Yes	Yes	Yes	Yes
Country-/group-fixed effects	Yes	Yes	Yes	Yes
Observations	1,472	1,371	1,222	1,083
R2	0.05263	0.17945	0.04423	0.31703

Source: OeNB.

Note: Clustered standard errors are in parentheses. Significance codes: *** = 0.01, ** = 0.05, * = 0.1.

²¹ Data consist of quarterly data between June 2020 and March 2024. In the baseline specification, the sample consists of 84 significant institutions, of which 59 banks from Austria and 25 banks from Germany.

²² In June 2024, approximately 17% of the outstanding RRE loan volume had been granted since the introduction of the KIM-V.

for loans granted since August 2022. When we factor in the unfavorable macroeconomic developments since then (e.g. rising interest rates), it could seem unrealistic for RRE loans granted since mid-2022 to have a very low NPL ratio.

4 Concluding remarks

Borrower-based measures in Austria have been effective. Combining evidence from descriptive statistics on the development of lending standards with an empirical approach to estimate the effect on borrower resilience, we find that the BBMs have reduced systemic risks in the residential real estate market. Standards for new RRE loans have improved significantly since the KIM-V was introduced in mid-2022, while NPL ratios for RRE lending have remained relatively stable. Deploying a difference-in-differences approach to empirically evaluate the effectiveness of BBMs, we find that the introduction of the KIM-V reduced the NPL ratio of Austrian banks by up to 0.5 percentage points compared to a control group.

Given that BBMs such as the KIM-V address only the new lending volume, it can take many years for their full effect to unfold with respect to borrower and lender resilience. Many member countries in the Single Supervisory Mechanism therefore regard BBMs as a structural measure in the nature of a backstop (Lang et al., 2022).

References

- Aikman, D., R. Kelly, F. McCann and F. Yao. 2021.** The macroeconomic channels of macroprudential mortgage policies. Central Bank of Ireland. Financial Stability Notes 2021(11).
- Altunbas, Y., M. Binici and L. Gambacorta. 2018.** Macroprudential policy and bank risk. In: *Journal of International Money and Finance* 81. 203–220.
- Ampudia, M., M. Lo Duca, M. Farkas, G. Pérez-Quirós, M. Pirovano, G. Rünstler and E. Tereanu. 2021.** On the effectiveness of macroprudential policy. ECB Working Paper Series 2559/2021.
- Ausschuss für Finanzstabilität. 2024.** Elfter Bericht an den Deutschen Bundestag zur Finanzstabilität in Deutschland.
- Belkhir, M., S. Ben Naceur, B. Candelon, W. Gyu Choi and F. Mugrabi. 2023.** Macroprudential policy and bank systemic risk: does inflation targeting matter? IMF Working Paper Series 23/119.
- BIS. 2023.** Macroprudential policies to mitigate housing market risks. CGFS Papers No 69. December.
- Catapeno, G., F. Franceschi, M. Loberto and V. Michelangeli. 2021.** Macroprudential Policy Analysis via an Agent Based Model of the Real Estate Sector. Bank of Italy. *Termini di Discussione (Working Papers)* 1338.
- Crowe, C., G. Dell’Ariccia, D. Igan and P. Rabanal. 2013.** How to Deal with Real Estate Booms: Lessons from Country Experiences. In: *Journal of Financial Stability* 9(3). 300–319.
- De Haan, L. and M. Mastrogiacomo. 2020.** Loan to Value Caps and Government-Backed Mortgage Insurance: Loan-Level Evidence from Dutch Residential Mortgages. In: *De Economist* 168(4). 453–473.
- Franta, M. and L. Gambacorta. 2020.** Beyond the LTV ratio: New Macroprudential Lessons from Spain. Banco de España Working Paper Series 1931.
- Galán, J. E. and M. Lamas. 2019.** On the effects of macroprudential policies on Growth-at-Risk. In: *Economics Letters* 196. 109501.

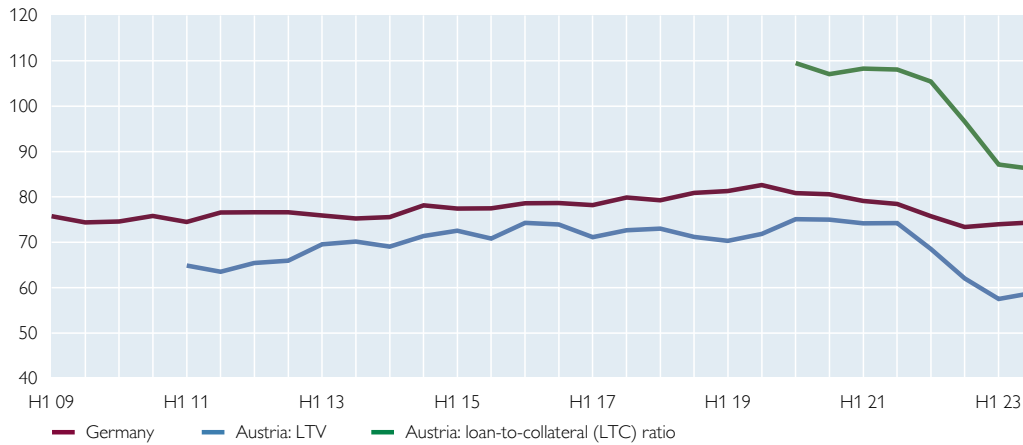
- Giannoulakis, S., M. Forletta, M. Gross and E. Tereanu. 2023.** The effectiveness of borrower-based macroprudential policies: a cross-country analysis using an integrated micro-macro simulation model. ECB Working Paper Series 2795/2023.
- Górnicka, L. and L. Valderrama. 2020.** Stress Testing and Calibration of Macroprudential Policy Tools. IMF Working Paper Series 20/165.
- Gross, M. and J. Población. 2017.** Assessing the efficacy of borrower-based macroprudential policy using an integrated micro-macro model for European households. In: *Economic Modelling* 61. 510–528.
- Jordà, Ò., M. Schularick and A. Taylor. 2016.** The Great Mortgaging: Housing Finance, Crises and Business Cycles. In: *Economic Policy* 31(85). 107–152.
- Jurča, P., J. Klacso, E. Tereanu, M. Forletta and M. Gross. 2020.** The Effectiveness of Borrower-Based Macroprudential Measures: A Quantitative Analysis for Slovakia. IMF Working Paper Series 20/134.
- Laeven, L. and F. Valencia. 2018.** Systemic bank crises revisited. IMF Working Paper Series 18/206.
- Lang, J. H., M. Behn, B. Jarmulska and M. Lo Duca. 2022.** Real estate markets, financial stability and macroprudential policy. ECB Macroprudential Bulletin.
- Lo Duca, M. et al. 2023.** The more the merrier? Macroprudential instrument interactions and effective policy implementation. ECB Occasional Paper Series 310/2023.
- Manz, F. 2019.** Determinants of non-performing loans: What do we know? A systematic review and avenues for future research. In: *Management review quarterly* 69(4). 351–389.
- Maslova, S., L. Valderrama and L. Zeng. 2022.** Switzerland: Selected Issues. IMF Country Report 22/172.
- Meuleman, E. and R. Vander Venet. 2020.** Macroprudential policy and bank systemic risk. In: *Journal of Financial Stability* 47. 100724.
- Muellbauer, J. 2022.** Challenges for monetary policy in a rapidly changing world: Real estate booms and busts: Implications for monetary and macroprudential policy in Europe. ECB Forum on central banking 2022.
- Nakamura, F. 2020.** Household Debt and Borrower-Based Measures in Finland: Insight from a Heterogeneous Agent Model. IMF Working Paper Series 23/262.
- Nier, E., R. Popa, M. Shamloo and L. Voinea. 2019.** Debt Service and Default: Calibrating Macroprudential Policy Using Micro Data. IMF Working Paper Series 19/182.
- Roy, S. 2022.** What drives the systemic banking crises in advanced economies? In: *Global Finance Journal* 54. 100746.

Annex

Chart A1

Average loan-to-value (LTV) ratio in Austria and Germany, new lending

Average volume-weighted LTV, %

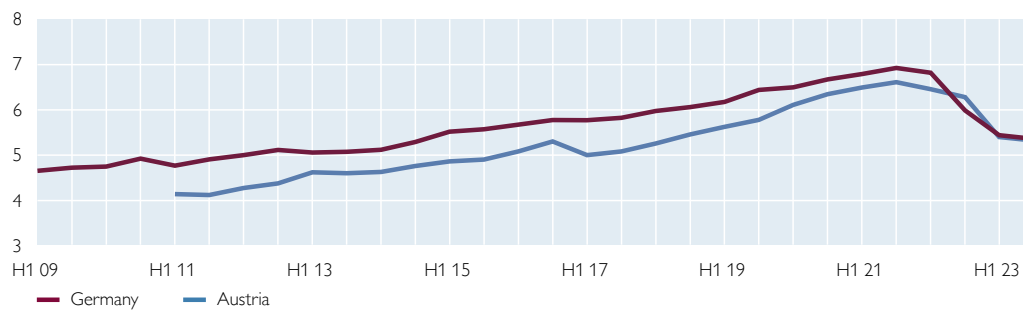


Source: OeNB, Deutsche Bundesbank.

Chart A2

Average debt-to-income (DTI) ratio in Austria and Germany, new lending

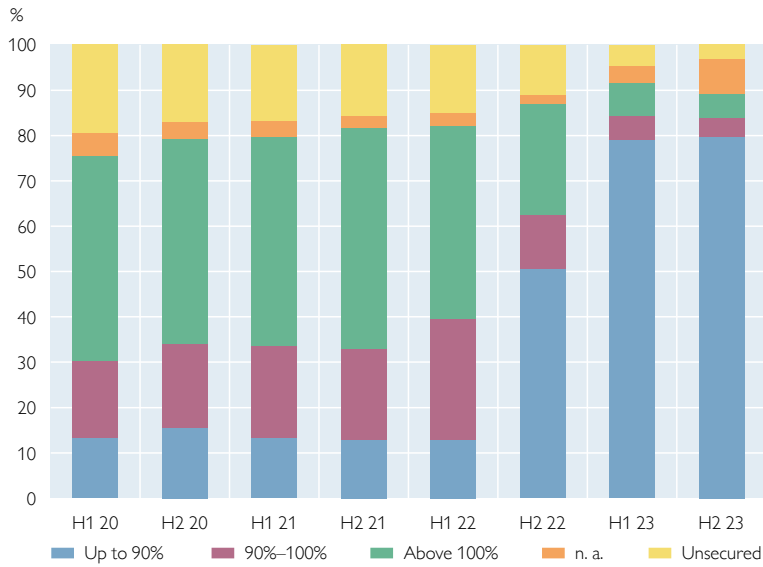
Average volume-weighted DTI, %



Source: OeNB, Deutsche Bundesbank.

Chart A3

Austria: loan-to-collateral (LTC) ratio by bucket, new lending

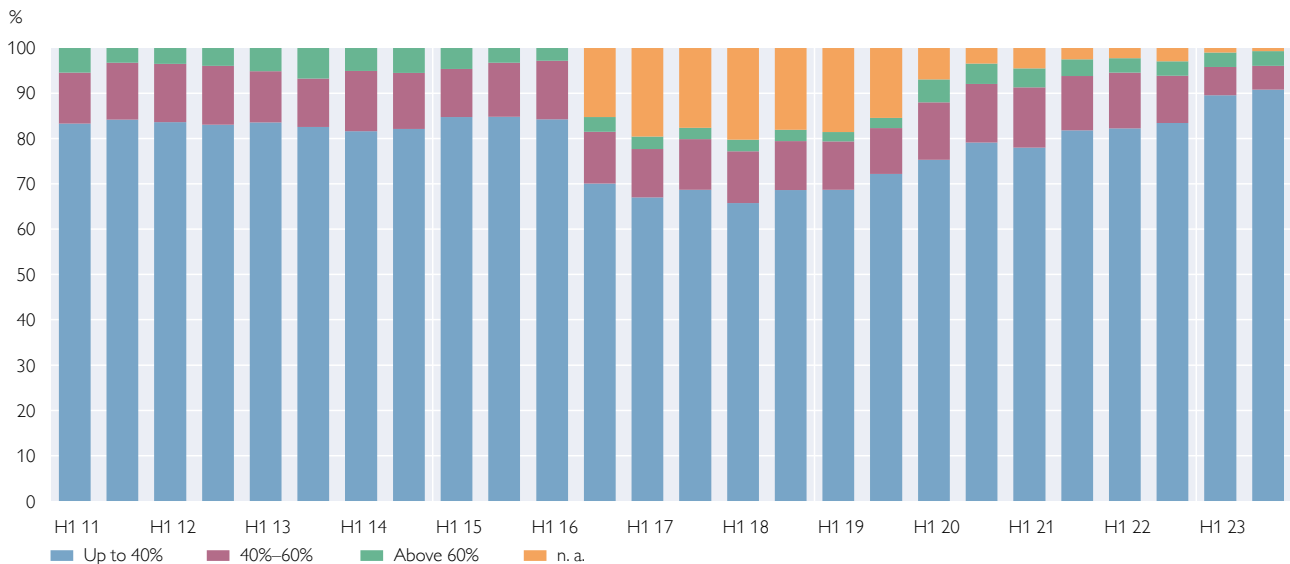


Source: OeNB.

Note: Up to Q4 19: HKU mortgage reporting by up to 11 banks accounting for at least one-third of the new lending volume. From Q2 20: VERA-H reporting by all Austrian banks.

Chart A4

Austria: debt service-to-income (DSTI) ratio by bucket, new lending

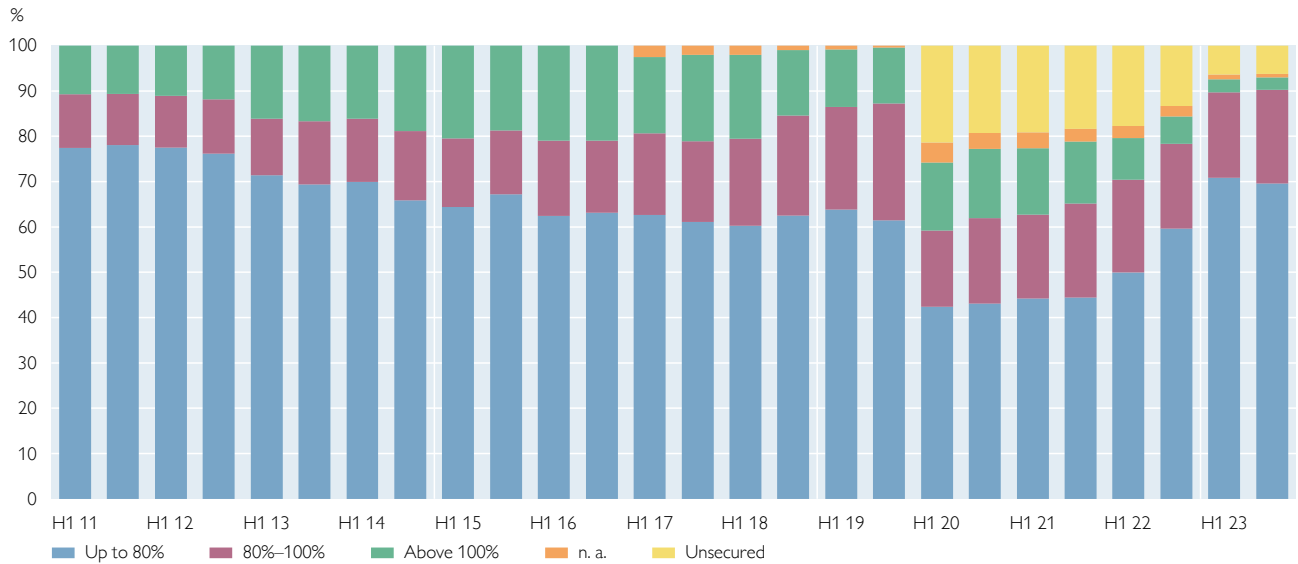


Source: OeNB.

Note: Up to Q4 19: HKU mortgage reporting by up to 11 banks accounting for at least one-third of the new lending volume. From Q2 20: VERA-H reporting by all Austrian banks.

Chart A5

Austria: loan-to-value (LTV) ratio by bucket, new lending

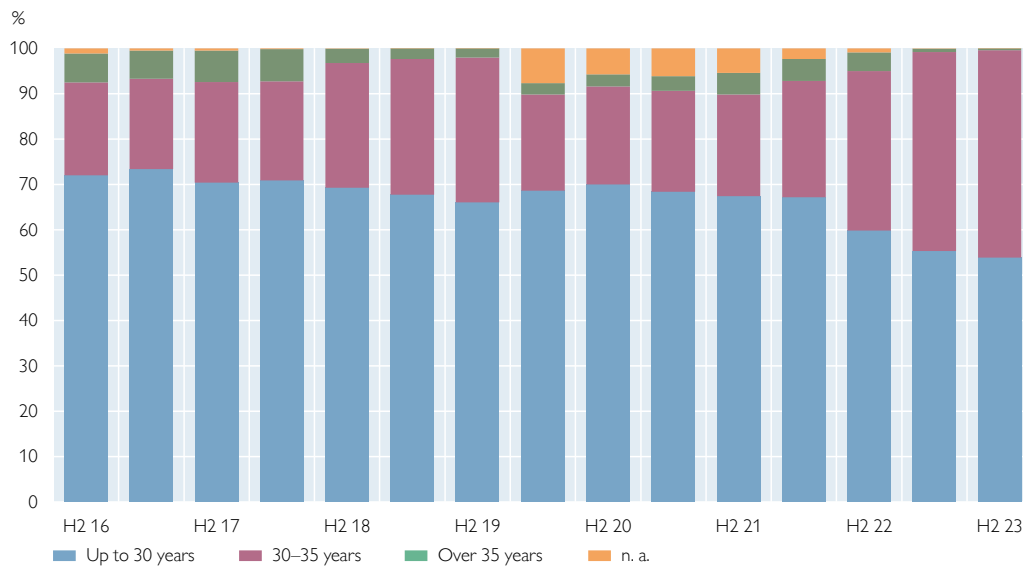


Source: OeNB.

Note: Up to Q4 19: HKU mortgage reporting by up to 11 banks accounting for at least one-third of the new lending volume. From Q2 20: VERA-H reporting by all Austrian banks.

Chart A6

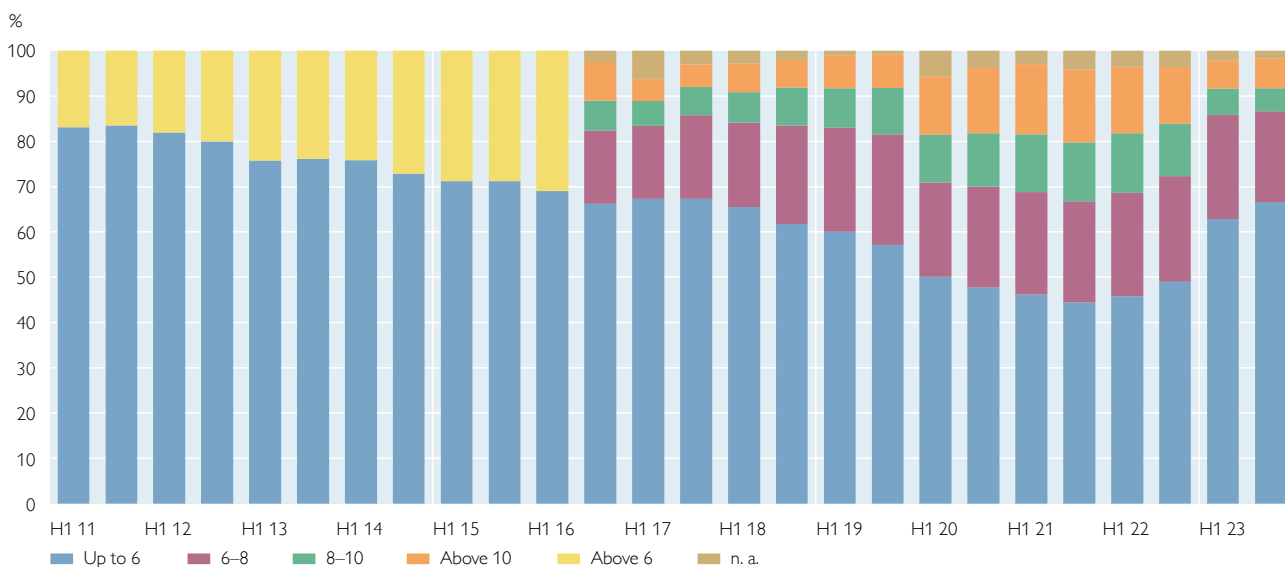
Austria: maturity by bucket, new lending



Source: OeNB.

Note: Up to Q4 19: HKU mortgage reporting by up to 11 banks accounting for at least one-third of the new lending volume. From Q2 20: VERA-H reporting by all Austrian banks.

Austria: debt-to-income (DTI) ratio by bucket, new lending



Source: OeNB.

Note: Up to Q4 19: HKU mortgage reporting by up to 11 banks accounting for at least one-third of the new lending volume. From Q2 20: VERA-H reporting by all Austrian banks.