

THE EFFECTS OF BBMs

Report for Finansinspektionen

J. MUELLBAUER & J. KASZOWSKA-MOJSA

2023

Introduction

The five questions we were asked are:

1. Under which conditions can the existence or introduction of BBMs reduce households' vulnerability to economic shocks?
2. Under which conditions might they have the opposite effect, i.e. increase households' vulnerability to shocks?
3. How and when, if at all, should BBMs be used to stabilize the macroeconomy?
4. What are possible methods to evaluate welfare costs of BBMs?
5. How is the regulatory experience with BBMs from your country/countries that you are familiar with from your research?

The responses to the questions are dependent on the institutional and macro-economic context, and the relevant time horizon, as feedback effects in the system take time to evolve. In section 4, we outline a framework that we believe is necessary to analyse all the issues raised and which needs to incorporate a large set of institutional features that we now summarise. Variation in these characteristics across countries is great and is likely to affect whether evidence from one country or context is relevant for a small open economy such as Sweden. These include the proportions of adjustable and fixed rate mortgages, and the durations of fixes and of mortgage contracts, including pre-payment penalties for refinancings of fixes. Amortisation requirements matter as lengthening loan contracts or switching to interest only loans is one way in which leakage in response to BBMs can occur. The importance of the fixed/floating distinction is particularly obvious just now with the recent inflation and interest rate shock. In general terms, with floating rates, the risks of higher rates are transferred to households, with knock-on effects on aggregate consumer spending and the wider economy, while bank profitability can even increase. With fixed rates, the financial system bears more of the risk, including the risk of runs if deposits are very concentrated or flighty, though in the absence of mark-to-market of the fixed rate loan book, the valuations of lenders tend to be protected.

The nature of housing loans differs across countries (and within large countries such as the US, e.g. whether mortgage are full recourse or not). For example, in France most housing loans are covered by a collective insurance scheme among lenders rather than by recourse to potential foreclosure. This means that debt-service issues there tend to dominate loan-to-value issues. Another key factor is whether home equity withdrawal is permitted and under what regulatory conditions. As explained in Muellbauer (1), this affects the amplification of house price shocks in the economy, with wider stability implications. Though the US and Denmark are exceptional, access to home equity loans tends to be easier in floating rate environments, such as Sweden's.

The structure of taxation, whether and how (e.g. with what limits) mortgage interest is tax-deductible, and the structure of property taxes, including the frequency of valuations, is another important institutional feature. Proportional (or progressive) property taxes with frequent revaluations have important stabilizing effects, including incentives against high leverage, taking pressure off the need to resort to BBMs. Sweden's reduction in the property tax in 2008 and above all, the fixed cap at a low level, would have greatly reduced the stabilizing potential of the tax. The size of transactions taxes matters, as do other transactions costs, such as real estate agents' fees, which can change with technology and competition rules. Low transactions costs increase flexibility in multiple dimensions both for location and tenures switches. This will affect the options faced by first time buyers faced with tighter loan standards or shocks to house prices, interest rates or income. For example, with low transactions costs, a household with a good net equity cushion, but faced with a large payment shock, has the option of downsizing or switching tenure, making it less vulnerable. As OECD research on mobility has found (2), tight planning controls on land supply and inflexible infrastructure investment complementary with housing development, have a significant impact on labour market flexibility. The tenure structure matters: this includes the proportions of households in subsidised social housing and the allocation rules governing access to such housing, the size of the private rented sector and the extent, if any, of rent and tenure controls and, of course, the proportions in home ownership. The supply-demand situation of the housing market both for owner occupied and rental markets has important

implications for household vulnerability: a very tight market restricts options for households facing negative shocks. Moreover, lack of supply in the face of rising demand drives up prices relative to incomes, itself a source of vulnerability¹.

However, how sensitive residential investment is to fluctuations in house prices, interest rates and credit conditions affects another element of the transmission mechanism. The collapse of high rates of such investment in the global financial crisis (GFC) in countries such as Ireland, Spain and the US contributed substantially to the fall in GDP and the rise in unemployment.

Collectively, ‘bad’ combinations of some of these features can result in high percentages of housing values represented by land. In the UK in recent years, for example, over 70% of the average value of homes has been in the land and under 30% in buildings (3). In Sweden, according to OECD balance sheet estimates in Table 9BR, the ratio of land to land plus tangible fixed assets (mainly residential buildings), which is a close approximation to the land share in home values, was around 55% in 2020. As land values are far more volatile than building costs and prone to overshooting, high percentages necessarily increase risks to financial stability and household vulnerability. On this criterion, the UK looks more at risk than Sweden.

The nature of bank regulation and the application of other macroprudential policies such as overall and sectoral capital requirements on lenders and the CCyB setting affect the leverage of lenders to the housing market. In turn, lower levels of bank leverage tend to result in more cautious loan standards for households, reducing vulnerabilities in the face of negative shocks. In Sweden, the 85% ceiling on LTVs imposed since 2010, and the 2016 and 2018 tightening of amortization requirements for loans with higher LTIs and LTVs has surely influenced mortgage loan standards.

Finally, the nature of the shocks that could destabilize the economy and increase household vulnerability, and the macroeconomic and distributional context in which they occur, matter greatly, and their effects interact with the above characteristics. The government’s fiscal capacity is another potentially important issue as it could limit the extent of fiscal measures to help vulnerable households. For a small open economy, an exogenous inflation shock as in 2022 that raises nominal interest rates is clearly very different from an exogenous shock to credit availability and risk appetite as in the 2008-9 GFC and the subsequent European sovereign debt crisis, taking place in a low inflation environment. Clearly, high levels of income inequality in the lower quintiles of the household income distribution and weaknesses in the social safety net predispose to potential increases in household vulnerability. Moreover, the fact that inflation in the last two years has been most pronounced for food and energy, which have large budget shares for poorer households, exacerbates current household vulnerabilities.

1. Under which conditions can the existence or introduction of BBMs reduce households’ vulnerability to economic shocks?

Tightening LTVs in advance of a sharp drop in house prices reduces vulnerability, especially where mortgages are collateralised and lenders can exercise foreclosure, which appears to operate efficiently in Sweden. In Sweden, the 85% ceiling on LTVs imposed by FI since 2010 has come well in advance of the recent fall in house prices. The 2016 and 2018 tightening of amortization requirements for loans with higher LTVs reduced potential leakage from the LTV ceiling through lenders extending the length of the mortgage contract. Tightening LTIs or DSTIs in advance of a payment shock, e.g. rise in interest rates in a floating debt environment, or an income drop/rise in the unemployment rate, reduces vulnerability. Limits on LTIs or on stressed² DSTIs have a stronger automatic stabilisation function than LTV limits, since they tighten loan standards when house prices rise relative to income, and are especially beneficial in advance of rises in interest rates. Regarding the balance between protecting the resilience of the financial system and that of households, one can argue that LTV limits are better at achieving the former, while LTI and stressed DSTI limits are better at addressing the latter, see (12), p. 8. However, payment shocks which increase pay-

¹ CGFS (12) notes the high negative correlation across countries of the rise in house prices relative to income since 2012 with the change in dwellings per capita.

² Stressed DSTIs are calculated at a higher ‘stressed’ mortgage interest rate than currently prevailing. Limits on the standard DSTI suffer from the problem of relaxing credit availability when nominal interest rates are low, as was the case for the early part of the house price and credit boom of the 2000s, and again since 2010.

ment delinquencies sharply, do have knock-on effects on lender balance sheets. Research in recent years that combines granular household data with macroeconomic data, e.g. (36), (50), strongly emphasises the need for pre-emptive timing of measures and finds that increased effectiveness comes from combinations of measures that address LTV and debt-service issues, as both negative equity and cash-flow problems drive payment delinquencies and foreclosures.

Aron and Muellbauer (8; 9) survey the US literature on ‘double-trigger’ models of delinquencies and foreclosures, apply this approach to aggregate UK data and contrast the strikingly different experiences of the US and UK in the early 1990s (dominated by a payment shock) and in the GFC (dominated by a negative equity shock and credit crunch). As institutional features of Sweden are not so far from the UK, this research is highly relevant. These features include efficient foreclosures, high levels of household debt, similar levels of owner-occupancy, volatile house prices with high price to income ratios, relatively liberal lending standards, a high fraction of floating rate mortgages and relatively easy home equity withdrawal (22). The US differs mainly in the dominance of fixed rate mortgages. This explains why the foreclosure crisis in the US was so severe in and after the GFC and the absence of such a crisis now. In contrast, the rise in interest rates in 1989-91 in the UK caused the largest peak in payment delinquencies and foreclosures that the UK has seen, and has relevance for current circumstances, though post-GFC lending practices have been much more cautious, including the application of stressed DSTI rules on bank lending. Aron and Muellbauer estimate the relative contributions of the proportions of households with negative equity and the average debt interest to income ratio to respective outcomes of aggregate delinquencies and foreclosures. In current circumstances, the latter will dominate, and this will also be the case in Sweden, particularly given the 85% LTV ceiling.

Since the proportion of fixed rate mortgage loans has such a bearing on the distribution of risks between the financial system and households, one does wonder whether Sweden’s position at one extreme of loading interest rate risk primarily on households is sensible. By lowering risk weights on fixed rate loans relative to floating rate loans, it is possible to encourage a shift toward an intermediate risk sharing position.

In Sweden, the extra amortization for loans with a high LTI in addition to high LTVs, is the closest regulators have come to limiting LTIs. With hindsight, had the regulator limited high LTI or high stressed DSTI loans in the last few years, fewer households would now be experiencing payment difficulties. There are softer versions of these BBM tools where the regulators allow a given fraction to be exempt, or where regulators limit the proportion or growth rate of mortgages in particular LTV or stressed DSTI groups³. Also, much depends on what voluntary lending criteria lenders were following before the intervention to limit credit risk for their own private risk assessments. If these were already cautious, additional BBMs are likely to have a lower impact. And, of course, one needs to consider system-wide effects on vulnerability including via house prices, as well as the first round effects on the households directly constrained by the measures.

It is important also to distinguish BBMs for investors from those on buyers of homes for owner-occupation. Investors typically have much deeper pockets, at least than first-time buyers, and have a far greater tendency to focus on asset returns, but also tend to extrapolate recent capital gains. Hence, their behaviour is more likely to contribute to over-shooting of house prices, see (15), for discussion of this over-shooting mechanism. Tarne et al. (62) argue that tighter LTV limits on investors reduce debt, inequality and consumption volatility.

2. Under which conditions might they have the opposite effect, i.e. increase households’ vulnerability to shocks?

Tightening after negative shocks arrive is likely to increase household vulnerability, but realistically this is not a big issue: lenders will obviously exercise additional caution after negative shocks so that such a tightening of policy would have little bite. They may also have little appetite for making use of looser BBM limits if their capital ratios are impaired, unless the CCyB is relaxed. The empirical evidence e.g. (6), (10), section 4.C. suggests that loosening BBMs is less effective on outcomes such as growth of credit, output and house prices than is tightening.

³ Limited flexibility gives lenders discretion to provide higher LTV or LTI loans where, for example, credit scores or income prospects are especially robust.

One of the inevitable problems of macroprudential and insurance policies more generally is one of timing and of protecting against risks that do not materialise. One can make an argument that the early imposition of the 85% LTV ceiling in 2010 will have locked out of owner-occupation some first-time buyers (FTBs), without the bank of parents or grandparents behind them, see (I05) for Norwegian evidence on how the latter can compensate for tighter LTV requirements and for the rise in house price to income ratios. These authors also remark that some successful FTBs, forced to put down larger deposits, will have depleted their liquid asset holdings, making them more vulnerable to income shocks⁴. With historic lows for returns on liquid assets, and rising house prices relative to income, young households will also have found it hard to save adequately for a 15% mortgage deposit. The consequence of ultra-low policy rates and a tighter down-payment constraint will have widened wealth inequality between the haves and the have-nots, especially younger ones. Wider consequences on household vulnerability depend on the functioning of the private rental sector, on access to social housing and on the social safety net. Moreover, their evaluation needs a comprehensive general macro-financial framework and good micro data on household income, wealth and debt, see section 4.

3. How and when, if at all, should BBMs be used to stabilize the macroeconomy?

It is important to appreciate that the resilience of households and of the financial sector are strongly correlated with the macroeconomy, with causal connections running in both directions. A recession typically results in disproportionate rises in unemployment rates and income losses for poorer households, increases bankruptcies and damages bank profits. In the other direction, as noted in (I1), a prolonged period of loose lending standards resulting in a credit boom, with overshooting of real estate prices, can lead to a rapid rise in NPLs when negative shocks arrive. Rising NPLs raise funding costs for banks, damaging their efficiency and profitability. As banks apply tougher lending standards for firms and households, a credit crunch follows, with falling GDP or stagnant economic growth. Thus, the interaction of the credit cycle and real estate has important financial and macroeconomic stability implications.

Indeed in the burgeoning growth-at-risk (GaR) literature, empirical studies indicate that external imbalances, excessive credit growth, and house price booms are associated with increasing growth vulnerabilities in the medium term of at least 1.5 years ahead (4; 5; I6). Downside risks can be mitigated to some extent by applying macroprudential or monetary policy instruments (4; I6; I8; I9). Hence the GaR concept can be used to help calibrate the current stance of macroprudential policy to safeguard financial stability (I7; 23).

Two recent reports are helpful in answering the question. The most recent is CGFS (I2) on the use of macroprudential instruments to mitigate housing market risks. As the report points out, the objectives include financial stability and lender and borrower resilience. Borrower resilience, that could have been encouraged by constraints on LTIs or stressed DSTIs, is particularly relevant just now for the Swedish macroeconomy. The cash-flow channel of monetary policy transmission is important where household debt is high and where household borrowing is at adjustable interest rates, (20; 7; 21; I3; I4). The combination of the cash-flow channel and the home equity channel makes the Swedish macroeconomy especially vulnerable just now. The report is based on the post-2012 experience of the use of such instruments in 14 countries and therefore takes into account risks that emerged during and after the pandemic and the Ukraine war. The first conclusion of the report is: “successful mitigation of the boom-bust cycles in housing markets that have destabilised financial systems in the past requires consistency across housing-related policies. Tax, planning and land supply policies all have a decisive influence on demand-supply imbalances in the housing market. Macroprudential policies complement these other policies by helping to strengthen financial resilience and dampen the build-up of financial vulnerabilities”⁵. This matters in countries such as Sweden and the UK, where fundamental distortions outside the remit of the financial regulator or the central bank need to be addressed. There are also wise words on governance arrangements, on income-based tools vs. LTV based tools, tools with an automatic stabilising function, mitigating inaction bias and on being transparent on the costs and benefits of macropru: “Candid communication about costs, benefits, uncertainties regarding their

⁴ However, this is a weak argument as home equity withdrawal is widely available in Norway. Home-owners with positive equity can therefore easily access credit to buffer negative income shocks.

⁵ This chimes closely with the last paragraph in (I1), p.225.

measurement and how they informed policy decisions helps to maintain support even as memories of housing crises fade.” This is precisely what the questions set by FI are aimed at.

The other highly relevant recent report is Biljanovska et al. (10), a comprehensive summary of the state of knowledge on the effectiveness of macroprudential measures, including what we don’t yet know. It provides useful guidance on the three questions asked above.

4. What are possible methods to evaluate welfare costs of BBMs?

The aim of the analysis is to go beyond the traditional assessment of the welfare costs that are associated with the borrower-based measures (BBMs). Modern modelling techniques provide the capacity for more nuanced simulations, thus enabling a comprehensive examination of the impact of BBMs on the various dimensions of inequality. The approach goes beyond the confines of the theoretical concept of social welfare, which is inherently tied to utility theory. By adopting a multifaceted perspective, the diverse effects of BBMs on different socio-economic strata can be captured, thereby ensuring a holistic understanding of their implications for inequality.

4.1. The established methods

The established methods for evaluating the effects of BBMs, including welfare costs and/or the impact of macroprudential tools on inequality, are highlighted in Table 1 with the most prominent examples.

Theoretically, borrower-based measures have the potential to both increase and decrease social welfare in certain situations. However, their primary and often overlooked impact tends to be the emergence of inequalities.

The DSGE literature, other than the HANK approach, mentioned in Table 1 all adopts a two-representative agent framework of saver and borrower households, and most models assume that households are infinitely lived. This limits enormously the study of distributional effects, including crucial inter-generational ones and differences between households with and without accumulated family wealth. In half the examples illustrated, there is no banking sector, intermediating flows between savers and borrowers. Moreover, assuming such arbitrary and extreme differences in preference parameters between savers and borrowers counters the intuition that preference distributions should be roughly bell-shaped. For a critique of the general approach, see p.805 in (15). This is not to say, that this literature cannot offer useful insights. For example, Chen and Columba (34) calibrate their model with realistic features of the Swedish mortgage market and prudential settings, and some of their conclusions chime with those of CGFS (12) and Biljanovska et al. (10). However, as well as assuming infinitely lived households, their model excludes home equity withdrawal, important in Sweden, and assumes instant market clearing of house prices, and the absence of extrapolative expectations of gains, which contradicts all the empirical evidence summarised in (15). This means that risks emanating from endogenous overshooting of house prices, which BBMs could limit, are outside the scope of this study.

As far as the HANK literature goes, Kaplan et al. (47) and Alves et al. (48) focus on monetary policy transmission, rather than macroprudential issues, and neglect housing market issues. This is not to say, that there is no potential from developing this framework: for example, the heterogeneous agent model of Garriga and Hedlund (24) features tenure choice between owning and renting, rich portfolio choice, long-term defaultable mortgages, and endogenously illiquid housing from search frictions. This goes some way towards the rich MACROPRU framework illustrated in Figure 1 below. There is potential for analysing optimising behaviour in a partial equilibrium context to compare with the heuristic decision rules adopted in ABM models. However, the assumption of model consistent expectations in HANK models stretches credibility about the information processing capabilities of individual households facing radically different constraints.

In the empirical literature, the integrated micro-macro approach of Gross and Población (50) and Jurca et al. (36) was an important advance as it integrates the banking sector with micro household and labour market data. The macro-element potentially captures economy-wide effects resulting from shifts in macroprudential settings with their short-term micro-impacts. But findings need to be interpreted with care. For example, there must be some doubt on how directly applicable the findings of Jurca et al. (36) for Slovakia are to

Table 1: The methods that can be employed to examine the welfare effects of BBMs and their impact on inequality.

Methods	Types of models	Examples
Dynamic Stochastic General Equilibrium Models (DSGE)	Representative agent framework or Heterogeneous groups of agents Heterogeneous agents (HANK models)	(39), (40), (26), (27), (30), (28), (29), (34), (35), (37); based on benchmark of (31) and (32) e.g. (33). (41), (42), (43), (44), (45), (46); (38) (47), (48)
Overlapping Generations Models (OLG)	-	(49)
Integrated Micro-Macro Models	Dynamic Household Balance Sheet (IDHBS) Model	(50), (36)
Agent-based models (ABMs) & Multi-agent systems (MAS)	Housing market models & BBMs Macro-financial models & BBMs	Most of the models were inspired by (52), (53) or reference directly to (54): (54), (57), (58), (60), (59), (61), (56). Among the housing market models, the most relevant from the perspective of welfare costs: (62), (63). Especially (66), (67), (65). Much simpler macro models: (71), (72), (73). Other valuable macro models that are used in monetary policy and macroprudential policies, although they have not yet been used to study the effects of BBMs, but could be adapted: (74), (75), (76), (77).
Econometric studies & Microsimulation models	-	(83), (84), (85), (87), (88), (89), (90), (91) and (92), (93), (96), (94), (95), (49).
Cost-benefit analyses	-	(98), (97) .

Sweden. Slovakia has a far higher owner-occupation rate at 92%, most mortgages are at 3 to 5 year fixes, in contrast with far shorter durations in Sweden, and the banking sector is more concentrated. Moreover, the macroeconomic history, which tempers expectations, is quite different. In Gross and Población (50), simulations are carried out for 7 European countries, with very different institutional structures. Whether the econometric method used to model each country's macroeconomy can take adequate account of differences in feedback mechanisms, for example, from house prices to consumption and residential construction is unclear.

Many empirical micro-studies are good at capturing short-run effects on households immediately affected by shifts in BBMs, but miss some of the behavioural responses and wider transmission that operate through

the market links illustrated in Figure 1. Multi-country panel studies have become more sophisticated in their treatment of structural differences between countries, which fixed-effects cannot pick up. However, testing of the assumption that slope coefficients are homogeneous across countries with, for example, fixed vs floating rates, with or without home equity withdrawal, and different rates of owner-occupancy, is often inadequate. Their findings therefore need to be interpreted with a degree of caution. This is one reason why the more qualitative evidence from the 14-country study of post-2012 experience from CGFS (12) is especially useful. Comparisons between Sweden and countries that have many structural similarities such as the UK are especially valuable.

The effects of BBMs are not solely tied to market conditions but also to the personal attributes of households. Most of the methods outlined here aim to illustrate that households may perceive their consumption set as being restricted by regulations, but these constraints could also contribute to smoothing consumption over the business cycle, thus resulting in moderate downturns and reduced volatility. Nonetheless, the critical awareness lies in understanding the varied effects these measures will have on groups of households with specific characteristics and in specific situations e.g., in the labour market in a given phase of the economic and financial cycle. Essentially, only the Agent-Based Modelling (ABM) simulation method with fully heterogeneous agents⁶ (based on empirical data) currently allows analyses at such a finely disaggregated level.

4.2. Research frontier

In our assessment, the cutting-edge approach to studying the effects of borrower-based measures involves employing large-scale, Data-Driven Economic Agent-Based Models (DDEABM). These models have significant flexibility that enables the construction of intricate scenarios and the evaluation of the counterfactual outcomes that are associated with various BBMs. Since these types of models can replicate the economy, the financial system and society up to a 1:1 scale, they require relatively substantial computational power. Below, it is explained that although simulations of the impact of BBMs (as well as other macroprudential policies and even their various combinations and calibrations) can be performed on local hardware, a more feasible solution is to implement them in the cloud using high-performance computing technology, see (78), (68); (69), (70).

This approach has its roots in complex adaptive systems but is flexible enough to potentially analyse simpler scenarios in which groups of similar entities optimise their decisions similar to mainstream economics. The distinctive strength of the DDEABM approach lies in the complete heterogeneity of the agents. All households differ in terms of, among other things, net worth (or other measures of wealth), income, indebtedness and consumption and savings patterns, while individuals can be of a different age, gender, education and occupation, which are derived from empirical micro data. Similarly, companies and banks are diversified in the model based on empirical data. Behavioural rules not only vary across entities but can also adapt to evolving market situations, sectoral and macroeconomic conditions.

Figure 1 illustrates the interactions between agents in the data-driven agent-based MACROPRU model that was developed at the University of Oxford. The analysis of flow charts that are available in Appendix B, highlights how the effects of regulatory changes, e.g., changes in borrower-based measures can propagate within a system and how they impact the stability of the financial system, the conditions of the economy and the society.

In the context of the research interest, the advantage of the DDEABM approach is its flexibility, which enables the study of the implications of BBMs, including but not limited to:

- Cash-income inequality
- Inequality of income that includes imputed rent for owner-occupiers

⁶ Traditional economic models such as the Dynamic Stochastic General Equilibrium (DSGE) framework, which are commonly used for evaluating macroprudential policies, have limitations due to the representative agent assumption. This assumption oversimplifies individual behaviour. Efforts to address this, such as the DSGE 3D model are in the early stages and rely on stylised solutions. In contrast, Agent-Based Modelling (ABM) provides a more realistic approach that incorporates diverse economic agents such as households, businesses and financial institutions. Because it is data-driven, ABM enables researchers to simulate complex dynamics and interactions within financial systems and the broader economy. It also facilitates counterfactual simulations, thereby offering an explanation of the potential consequences of the use of a given macroprudential tool.

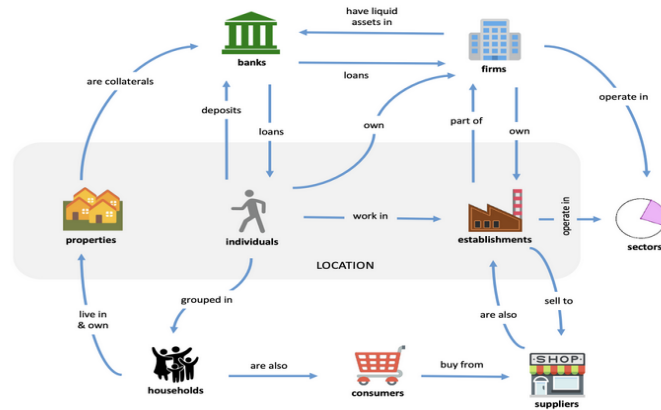


Fig. 1. The interactions between the agents in the MACROPRU model.
Source: (66).

- Inequality between renters and owners at the housing market
- Inequality of wealth (including financial wealth, real wealth)
- Inequality between different age groups
- Inequality between different family types
- Gender inequalities
- Inequality between regions (spatial inequality)
- Multidimensional inequality, e.g., income – wealth – indebtedness – education levels – occupations – health status.

Table 2: A comparison of the large scale data-driven agent-based models.

	Eurace-2	MACROPRU	Bank of Canada	INET
Countries	EU-27	1	1	Global
Sectors	2	many	many	many
Heterogeneous firms	no	yes	no	yes
Heterogeneous households	no	yes	no	yes
Heterogeneous banks	yes	yes	no	yes
Realistic prudential policies	yes	yes	no	yes
Realistic monetary policies	no	yes	yes	yes
Realistic fiscal policies	yes	yes	yes	yes
Time Series Calibration	no	no/yes*	no	yes
Code	C++	Java	Matlab	Python
Inequality considerations	no	yes	no	yes

*When time series data were available.

Additionally, within the MACROPRU model, various interactions of macroprudential policies (borrower-based measures, capital requirements, liquidity requirements, sectorial requirements, large exposures, leverage requirements) and other public policies can be simulated within a specified institutional framework. It is also possible to assess the effects of different instrument calibrations, for example, the effects of different LTV/LTI caps or various maturities and fixed or floating interest rates.

Examples of such models that are used in the context of macroprudential policy (including BBMs) include EURACE-2 (the result of a collaboration between scientists as well as ECB and IMF experts (65)) and the MACROPRU project(51)), which is financed by the European Commission and was undertaken at the

University of Oxford. Both models draw on the tradition of the EURACE (79) and CRISIS models (80) developed after the global financial crisis. Additionally, two other models are worth mentioning: the agent-based model that is used by the Bank of Canada (76; 74; 75; 77) and the global agent-based model that is being developed at the Institute for New Economic Thinking (INET) at the University of Oxford under the guidance of J. Doyne Farmer. The first model is currently focused on monetary policy but could potentially be applied in macroprudential policy as well (though, due to the absence of a realistic real estate market in this model, assessing the impact of BBMs on inequality would be limited. However, it could potentially be helpful in assessing the effects of other macroprudential policies). The INET model should enable the effects of fiscal, monetary, macroprudential and foreign policies as well as the consequences of interactions between countries to be assessed, but this model is still in the stage of the calibration and validation of the results. However, it should be noted that this model is currently being calibrated in a state-of-the-art manner (81) and is designed to enable out-of-sample predictions. In this context, in our view, it is more promising than the Eurace-2 framework.

4.3. Data requirements

It is essential to operate with disaggregated microdata to generate data-driven agent-based simulations. This enables the construction of synthetic populations⁷ that encompass households, firms across diverse sectors (NACE sections) and banks. The databases that were used in developing the MACROPRU project are summarised in Table 3. Building a model for another country, for example, the Swedish economy, would require access to similar sets of micro and macro data.

Table 3: Data requirements

Agents	Types of data	Examples
Individuals	Survey data	<i>Household Finance and Consumption Survey</i> (ECB HFCS), Population dynamics (CSO), Education of population (CSO)
Households-Consumers	Survey data	<i>Household Finance and Consumption Survey</i> (ECB HFCS)
Properties	Survey/census data	ECB HFCS, register on the characteristics of properties in the country and their spatial location, e.g. region
Property_owners	Survey/census data	ECB HFCS + statistics on the real estate sector to ensure matching that is based on probabilities; or proprietary data on the owners of the properties in the country
Industries	Statistics on the NACE sections & Input-output tables (IOT)	<i>Income statements, including revenues, costs, financial results and fixed asset investments</i> (F01) or in a simpler version: aggregates on the sectors (NACE sections) from the Central Statistical Office; IOT
Firms_owners	Proprietary data on the owners of firms or alternatively random matching can be applied	<i>Income statements, including revenues, costs, financial results and fixed asset investments</i> (F01) or similar data on firms & the establishments and the industries in which they operate (NACE sections)
Firms	Financial statements of firms or tax registry	<i>Income statements, including revenues, costs, financial results and fixed asset investments</i> (F01) or similar data on firms & the establishments and industries in which they operate (NACE sections)
Establishments	Financial statements of firms or tax registry	<i>Income statements, including revenues, costs, financial results and fixed asset investments</i> (F01) or similar data on firms & the establishments and industries in which they operate (NACE sections)
Banks	Financial statements (the more details the better)	Balance sheets & profit and loss accounts & cash flows (ideally the proprietary data that is reported to the central bank/financial supervisory authority) & statistics on interest rates by banks or the credit registry
-	Additional data	Macro data, data on the BBMs that are applied and other prudential regulations, regulations regarding taxations and inheritance, statistics on inheritance, institutional framework

⁷ The existing approaches to synthetic population generation are synthetic reconstructions (such as hierarchical iterative proportional fitting, iterative proportional update, generalised ranking, entropy maximisation), combinatorial optimisation (such as genetic algorithms, greedy heuristics, hill-climbing, simulated annealing), statistical learning (such as hierarchical Markov Chain Monte Carlo, hierarchical mixture, deep generative modelling, Bayesian networks). The household population can also be directly derived from survey data using the statistical and econometric methods that are used in the microsimulation approach.

4.4. Technical requirements

Data-driven Agent-Based Models can be effectively developed in Python, Java, C++ and even in MATLAB, thus emphasising an approach that is tailored to working with microdata. The key trade-off involves balancing the precision of a model against the computational power requirements. Optimal scaling in agent-based models was investigated by Hosszu et al. (64) and Axtell (82).

In the MACROPRU project, collaboration with the AWS Global Impact Compute team led to an architecture that leveraged the Amazon Relational Database Service (RDS), Elastic Container Services (ECS), AWS Batch and Simple Storage Service (S3), which were crucial for calibrating and validating the model. This cloud-based infrastructure enhanced the analytical capabilities, thereby aligning with modern research practices. AWS services were harnessed to streamline processes, optimise efficiency and facilitate seamless calibration and Monte Carlo analysis. Running the simulation on AWS proved to be both cost effective and efficient, thus leveraging scalability and ensuring secure data storage. The results underscore the benefits of cloud computing in research endeavours.

The same IT architecture could be used to run simulations of the impact of BBMs for other developed countries whose micro data is available for its initialisation and calibration (including Sweden). In this approach, each container corresponds to a different country-specific model. The modelling in the MACROPRU project has not yet been expanded to encompass the global economy; instead, it has concentrated on small open economies, thus treating the rest of the world as a given (with considerations for exports and imports within the model). The attempt to model the global economy has been undertaken by the team led by J. D. Farmer at the University of Oxford, with a particular emphasis on the research conducted by S. Wiese.

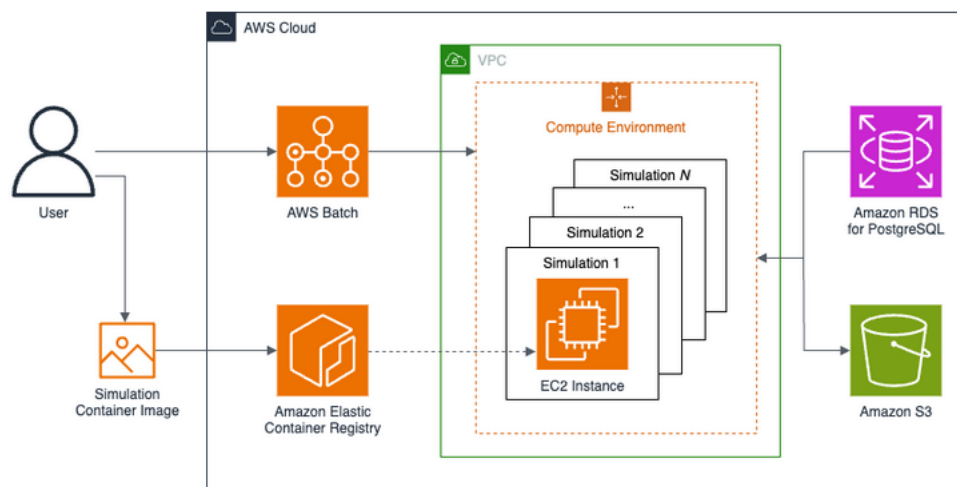


Fig. 2. The implementation of the DDEABM MACROPRU in the AWS cloud.

Source: (68) and (69).

4.5. Further refinements to the model

In the context of the formulated question, the following model refinements should be considered:

I. Advancements in formulating the **expectations in the model** (progress in this context was made by Hommes et al. (76; 77) in the model of the Bank of Canada, which is intended for use in monetary policy).

II. Incorporating the **exchange rate**.

III. At present, the **government is not exogenous** in the model (various taxes are collected from individual entities; the government incurs public expenditures; equations for the budget and debt are considered). In practice, treating government decisions as exogenous can sometimes be useful. Such an approach is also feasible.

IV. The approach exhibits great flexibility, yet it is crucial to meticulously consider **the institutional setting**. This setting will not only influence the effects that are generated by the borrower-based measures but will also determine **the dynamics of the system**. For example, the following should be considered:

-
- the provision of social housing,
 - the tax system, especially the property tax and tax relief that borrowers for owner-occupied and landlords face, transactions taxes,
 - rent regulation,
 - the land use planning system,
 - property rights of landowners;
 - the pension system as that can affect the choice between investing in housing or in financial pension assets.

V. The model is a short-to-medium-term model but also takes into account population dynamics (especially births and deaths, family formation, assortative mating) and their impact on inequality and welfare, for example, through inheritance as an integral part of the system. This tool is designed to explain the potential effects of the calibration and combinations of macroprudential policies in a counterfactual scenario (it is therefore a way of stress testing and determining the effects on the economy, financial stability and society). However, **the out-of-sample predictions and empirical validation of the simulation models** are still the subject of debate.

VI. **Methods for creating a synthetic population and calibration** are subjects of further research and discussion.

The better the representation of society (household and firms attributes), the more effectively the welfare costs and more realistically the impact of BBMs on inequality can be assessed.

5. How is the regulatory experience with BBMs from your country/countries that you are familiar with from your research?

Different borrower-based measures have been implemented in countries under the oversight of their national authorities (and the European Systemic Risk Board (ESRB)) with the aim of curbing excessive credit growth and leverage, preventing maturity mismatch and addressing market illiquidity. These measures also seek to fortify the resilience of the financial infrastructures (99; 100). Notably, these regulations do not explicitly address potential distributional (welfare) effects. The [Appendix C](#) includes a table outlining the BBM regulations across different countries, which are based on notifications to the ESRB. Ongoing research is dedicated to assessing the impact of these regulations on economic growth using the growth at risk (GaR) concept as well as on society by employing the methodologies outlined in section 4, including data-driven economic agent-based modelling (DDEABM). It is important to note that the repercussions of these borrower-based measures on the economy and society remain the subject of continuous investigation, which underscores that this is an open and evolving research area.

5.1. Comments on the experience of France

Consistent with warnings from the IMF FSAP 2018-19 and the ESRB about real estate risks, in autumn 2019 the High Council for Financial Stability (HCFS) noted the recent deterioration in lending standards: extension of maturities, increases in average DSTI and in the shares of loans with a DSTI greater than 35% or LTV greater than 95%, see (25). The HCFS also noted the rise in household debt relative to income and the increased share of income devoted to loan repayment, increasing vulnerability to shocks.

The HCFS recommended a 33% DSTI limit and 25 year maturity ceiling, but permitted some flexibility - up to 15% of loans outside these limits – to protect FTBs and borrowers with complex incomes. In 2020, these recommendations were adjusted to harmonise the measurement of DSTI (including insurance costs) to a 35% ceiling, with up to 20% loans outside these limits, and 27 year maturity ceiling for special cases (e.g. new builds, renovations). This was formally announced in January 2021, with all banks conforming by September 2021, although legally enforced only from January 2022.

The appendix on France in CGFS (12) gives further details, including on the resulting reductions in the shares of new loans with an DSTI over 35%, in new loans with an LTV over 100% and in the share of loans not conforming to the amortisation limit. Interestingly, there were no signs of ‘front-running’, where lenders perversely increase loan riskiness in advance of new regulations becoming effective, despite long periods of consultation before regulations became law. This was probably helped by a good relationship

between the banks and the regulator who emphasised tweaking existing practices of credit allocation rather than introducing radical changes. The appendix on France argues that few distortions to the allocation of credit resulted, with the share of loans to FTBs remaining stable.

In the context of a market share of almost 98% fixed rate housing loans, large interest rate shocks affect mainly potential new entrants to the housing market, while existing borrowers are protected. This is radically different from the situation in Sweden, suggesting more limited relevance of the French experience, except to illustrate what a future with a far higher share of fixed rate loans might look like in Sweden.

5.2. Comments on the experience of the UK

The UK appendix of CGFS (I2) gives an admirably lucid account of the five main risk factors the UK housing and mortgage markets pose to financial stability and lender and borrower resilience. These include the greater vulnerability of highly indebted households, their tendency to cut spending in down-turns, increasing risks for lenders and not only on mortgages, and potentially increasing NPLs, impairing further their resilience. The report notes the pro-cyclicality of credit expansions with house prices and the perception that current risks are low in upswings. These risk factors are all highly relevant for Sweden, even with Sweden's better social safety net, lower level of poverty and better fiscal situation.

In 2014, the UK FPC introduced a policy package consisting of two recommendations. The first was a flow limit restricting the number of mortgages extended at LTI ratios of 4.5 or higher to 15% of a lender's new mortgage lending. The second was a debt service-to-income (DSTI) affordability test. It assesses whether borrowers could still afford their payments if mortgage rates were 3 percentage points higher than the contractual rate for mortgages with less than a 5-year fix. After a period of consultation, the latter was withdrawn in August 2022, see section 4.2 of the report. Fortunately, this occurred after Russia's attack on Ukraine when interest rates were already on the rise, protecting those who had been granted mortgages earlier.

Simulations suggest that the flow limit was more effective than the affordability test in reducing the right tail of the LTI distribution. The argument is that, in the wider regulatory framework, e.g. given capital requirements, the combination of LTV rules adopted by the lenders themselves, extremely high house price to income ratios, and limited saving opportunities for first-time buyers, the great majority would have been priced out of access to a mortgage anyway⁸. In other words, the additional affordability test had only a limited effect. Whether this would hold for Sweden in comparable circumstances would need to be investigated with similarly granular data, which in the UK is continuously available to the Bank of England. There is some evidence that, even though a flow limit is a lot softer than an absolute LTI ceiling, there was a reduction in mortgage extension to low income households after the flow limit was introduced.

One flaw of the report is the lack of attention to the buy-to-let sector and spill-overs to the rental market. Given the extreme supply-demand imbalance in UK housing markets and the withdrawal of rental accommodation, partly due to less generous tax treatment of landlords, the rise in interest rates has led to rapid rent rises, most extreme in London, as heavily geared landlords tried to recoup higher interest costs. The resulting increase in household vulnerability might have been mitigated by earlier targeted measures to reduce gearing levels of landlords, many prone to speculative fever. But the largest reduction in household vulnerability would have come from holistic, long-term housing policies addressing one of the most dysfunctional housing markets in the world (II).

5.3. Further comments

As part of the MACROPRU project outlined in Section 4, the primary focus was on studying the EU countries with a particular emphasis on Poland as a small open economy. The MACROPRU project, which was funded by the European Commission and conducted at the University of Oxford, originated from prior research that had been conducted in Poland. Detailed regulations and recommendations from national authorities, which were subsequently provided to the ESRB, have been incorporated in Appendix C. (with indications of their current status – active or revoked). The column of links provides examples of selected studies that analyse the effects of borrower-based measures in the specific country under examination with

⁸ However, there are limitations to identifying separate effects in such simulations when the two measures are simultaneous.

a predominant emphasis on the research related to the LTV impact on the real estate market and the repercussions of the regulations on household indebtedness.

The experiences of Poland underscore the adverse effects of loans that are denominated in a foreign currency. These experiences also highlight the risks that are associated with a majority of the loans that are granted at variable interest rates, particularly during periods of rising inflationary pressure such as the current situation due to the pandemic and the war in Ukraine. The simulations that were conducted as part of the MACROPRU⁹ project revealed the potential risks that could arise from sub-optimally calibrated and insufficiently coordinated macroprudential policies. This extends beyond the coordination of individual macroprudential instruments to encompass coordination with the fiscal, monetary, social and sectoral policies across different phases of the business cycle.

Prior to 2014, recommendations from the Polish Financial Supervisory Authority (PFSA) on LTV and DSTI ratios were issued as guidelines and were not legally binding. However, they were widely adopted by financial institutions. Research during this period positively evaluated the influence of BBMs on household indebtedness and the financial stability of the banking system. It was demonstrated that the separation of the implementation of monetary and macroprudential policies could enhance social welfare (37). Nevertheless, the main risk was associated with exchange rate risk, which this study did not take into account (101).

In 2014, Brzoza-Brzezina et al. (102) investigated the impact of a significant proportion of mortgage loans that were denominated in foreign currency on the economic policy and social welfare. The study, which used a small open economy DSGE model that had been calibrated for Poland, revealed that foreign currency loans negatively influenced the transmission of monetary policy and had a relatively weaker but positive impact on the effectiveness of macroprudential policy. The study highlighted that such loans improve welfare during domestic interest rate shocks but reduce it during risk premium (exchange rate) shocks. In a realistic stochastic environment, foreign currency loans were found to be welfare-reducing. Regulatory policies aimed at correcting the share of foreign currency loans were also shown to induce a slowdown.

The unpegging of the Swiss franc in 2015 triggered a serious disruption in the Polish banking system, which led to bank restructurings and the collapse of a key bank, which placed a significant percentage of households in a precarious position. Similar situations occurred in many Central and Eastern European countries (101), and resulted in increased insolvencies and persistent social inequalities (106). While favourable labour market conditions during the economic upswing in Poland in the period 2014–2019 partially offset these negative effects, the challenges intensified with the onset of the pandemic and the outbreak of war in Ukraine.

Currently, increased creditworthiness requirements have severely limited young people's access to their first home. The transition to a higher fraction of fixed rate contracts, while improving risk-sharing in the system, has also led to a change in the strategies of banks, which are making loans more expensive for young individuals and those from the lower income percentiles. Unfortunately, this contributes to a further increase in inequality in Poland¹⁰. The introduction of a policy facilitating loans for young people ("Your home at 2%") for first-time buyers unintentionally led to a rise in real estate prices (107).

Following the adoption of the EU CRR/CRD IV Directive (109) in 2014, intensified research in Poland focused on the impact of macroprudential policy on economic growth, financial stability and societal inequalities. Serwa and Wdowiński (110) quantified the effects of macroeconomic aggregate shocks and interest rate shocks on banking variables using a sVAR methodology. Pipień, Wdowiński and Kaszowska's (111) work presented an analysis of the impact of the (CET1) solvency ratio on economic growth and credit for the non-financial sector (the analysis was also conducted using the sVAR model), including research on the financial cycle and its synchronisation with the business cycle (through a spectral analysis).

In response to the use of the DSGE with the three layers of default ("3D") model in EU countries (31; 32), a similar model for Poland was developed (108), which considered the capital requirements and LTV. While

⁹ It is worth adding that the results of this project can be used to complement the conclusions that have been extracted from the ECB system-wide stress-testing exercises by providing data on the rise of inequality in EU countries due to the adoption of new financial regulations or its calibration in a specific counterfactual scenario. It can also supplement the macroeconomic impact assessment for the Basel III reforms (cost-benefit "Growth-at-Risk" approach).

¹⁰ See the latest results of unpublished studies of P. Bukowski, P. Chrostek, F. Novokmet and M. Kobus.

the primary focus was not on social welfare, these studies provided evidence on the welfare costs and benefits of the capital and LTV regulations. Simultaneously, the development of an agent-based model that assessed the impact of macroprudential policy on the economy, the financial system and society was initiated at the National Bank of Poland, see (112).

The results of these studies demonstrated how different calibrations of LTV, DSTI, DTI and maturities, while maintaining a realistic calibration of other macroprudential instruments, can lead to changes in income and wealth distributions, thereby influencing inequalities. Research using restricted data revealed the suboptimality of the calibration of macroprudential instruments in Poland, especially considering the different phases of the economic cycle. This study corroborated the findings presented in Sections 1 and 2 of the current report regarding the effects of BBMs.

The results of the MACROPRU project support the conclusions of this report, and provide quantitative data on the specific impact of macroprudential and public policy on a system and the various types of inequalities. Additionally, it enables the exploration of less obvious effects such as the ones that are discussed in (103), (104) and the previously mentioned (105). For example, because the MACROPRU model incorporates spatial considerations, it can be used to study the effects found in Tzur-Ilan (103). The author demonstrated that LTV limits, which are designed to reduce borrower risk, can lead to the selection of more affordable housing in areas farther from city centres and in lower socioeconomic neighbourhoods. LTV limits had broader implications on the location choices, commuting costs and relocation to less advantaged areas. The study raised questions about the welfare implications of such relocations, particularly for borrowers who were moving further from city centres due to credit constraints.

The MACROPRU model can also be used to test the findings that were highlighted in Kabas and Roszbach (104). According to this study, borrower-based measures can lead to higher wages by reducing household leverage, allowing workers to cope better with subsequent unemployment shocks, e.g. by increasing the scope for job search and finding higher wages as a result. The improvement in wages is primarily observed among workers below the median age, those with a shorter job tenure or those with higher education. The positive impact on wage stability is evident with no association between the improvement in wages and a greater discontinuation risk. The study also suggests that macroprudential policies that constrain household leverage might yield positive effects on the labour market outcomes and the real economy.

Appendix A. Appendix on assessing house price over-valuation

Lars Svensson (115) argues that the house price to income ratio is a highly misleading indicator of house price overvaluation, particularly in Sweden. He proposes instead a user cost to income ratio. On this basis, he argues that Swedish house prices became increasingly undervalued, reaching a peak of under valuation of 30% in 2019. Even with recent falls in Swedish house prices and higher interest rates, he argues that house prices in 2023Q2 were still undervalued by around 20%.

We agree with two of his points. The first is that one should not use the house price to income ratio as a sufficient statistic to judge over-valuation. Indeed, macroprudential authorities such as the ESRB use a dashboard of indicators to judge risks. Our own view is that quantitative models of the behaviour of households and the financial sector, which include mechanisms through which overvaluation can arise, provide more useful risk assessments. His second point concerns a detail in the measurement of user costs, which has not received sufficient attention in the empirical literature. We elaborate on this below.

However, we fundamentally disagree that his proposed user cost to income ratio is a useful way of assessing potential over or undervaluation of house prices. User cost is the product of a real interest rate plus a risk premium plus the proportionate cost of insurance, maintenance and depreciation, times the value of a home. The key point of disagreement concerns two related issues around the measurement of the real interest rate. The first is that, in our view, user cost concepts should have behavioural relevance, which his does not. There is an almost universal consensus among researchers on house price dynamics, Duca et al. (15), that there is an element of extrapolation of recent gains in expectations of capital gains. For behavioural relevance, the real interest component of user cost should reflect such expectations. It then follows that low levels of this real cost of borrowing are better treated as part of a warning signal of near-term *over-valuation* rather than as a signal of under-valuation. Indeed, the evidence from our research on US house prices, Duca et al. (114), is that the extrapolation of gains was a major factor in the overshooting of US house prices in 2004-6. The low level then of this measure of real interest rates should have been a warning.

Svensson proposes the conventional real interest rate defined as the nominal mortgage rate minus the annual inflation rate for consumer prices as the relevant real interest rate for measuring the user cost of housing. As inflation remains high, this real interest rate is low, even after the policy rate increases. In contrast, the behaviourally relevant real interest rate has shot up with the higher nominal mortgage rate and falling house prices, putting further downward pressure on house prices. This is part of the correction from the previous over-valuation. Without serious empirical work on the Swedish housing and mortgage markets, taking into account supply as well as demand factors that include income, interest rates and varying loan standards, it is not possible to quantify the current level of downside house price risk. Simulations of alternative scenarios would have provided a useful guide to the earlier build-up of risks.

Svensson does make a good point regarding a detail in the measurement of user cost. This is to point out that the conventional assumption that insurance, maintenance and depreciation are a constant proportion of home values is not correct. Buildings are subject to these costs but not the land on which they stand. As in Sweden in 2020, around 55% of home values were in the land, and rebuilding costs have risen far less than land and overall house prices, this component of the user cost would have fallen relative to other elements, so making pre-2022 user costs lower than they would be under the conventional proportionality assumption. But this does not help his overall case as an even lower user cost (that includes extrapolative expectations) pre-2022 would just help explain the over-valuation of the time. Since then, building costs have risen more strongly while house prices have fallen, resulting in an even sharper reversal of the user cost, and contributing to the fall in house prices.

The assumption that the risk premium component of user cost is proportional to the home value is another over-simplification often adopted in empirical models. In Chauvin and Muellbauer (113), we allow the risk premium to vary with recent house price volatility. Though one can think of other ways of modelling the risk premium, it seems likely that recent experiences of falling prices would have raised the risk premium, potentially another factor feeding back on further falls.

Appendix B. Flow charts (updating of states) in the agent-based model MACROPRU

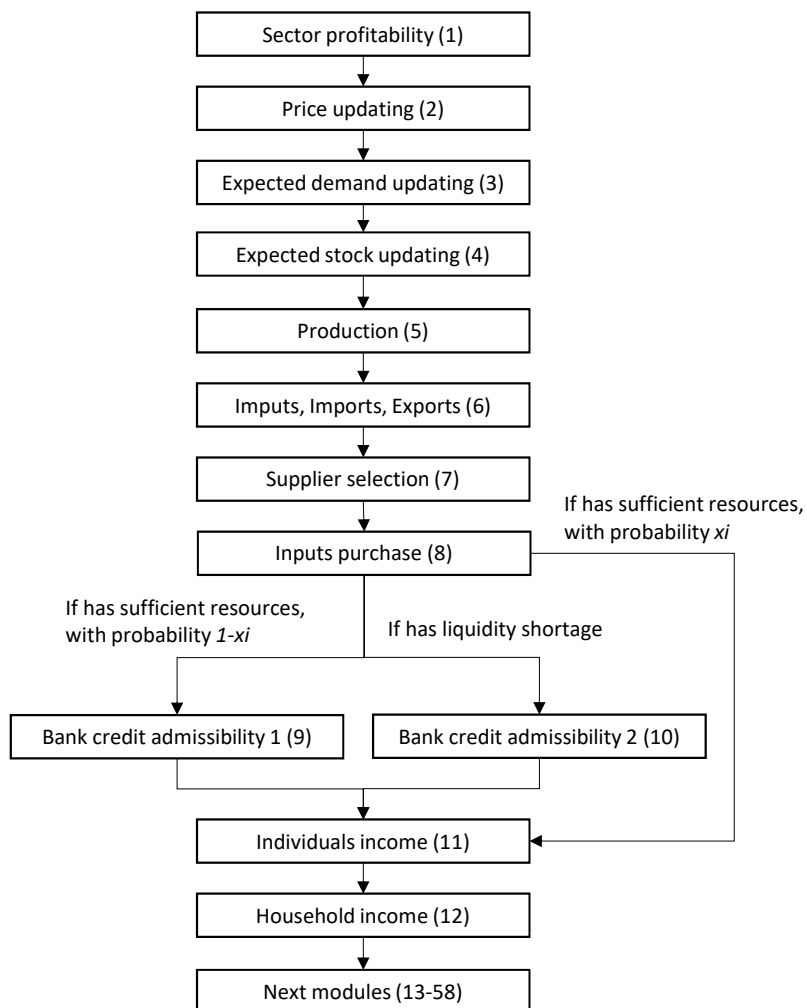


Fig. 1: Sequential updating of states in the model (modules 1–12).

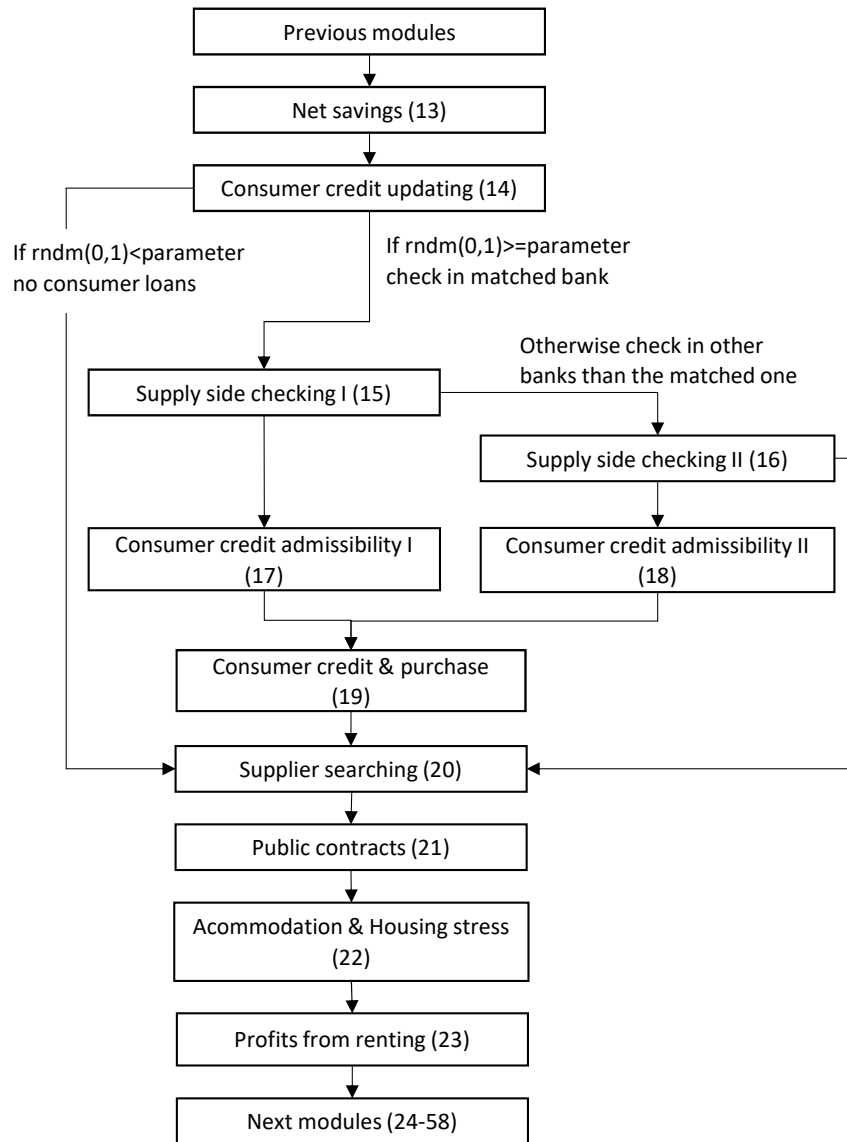


Fig. 2: Sequential updating of states in the model (modules 13–23).

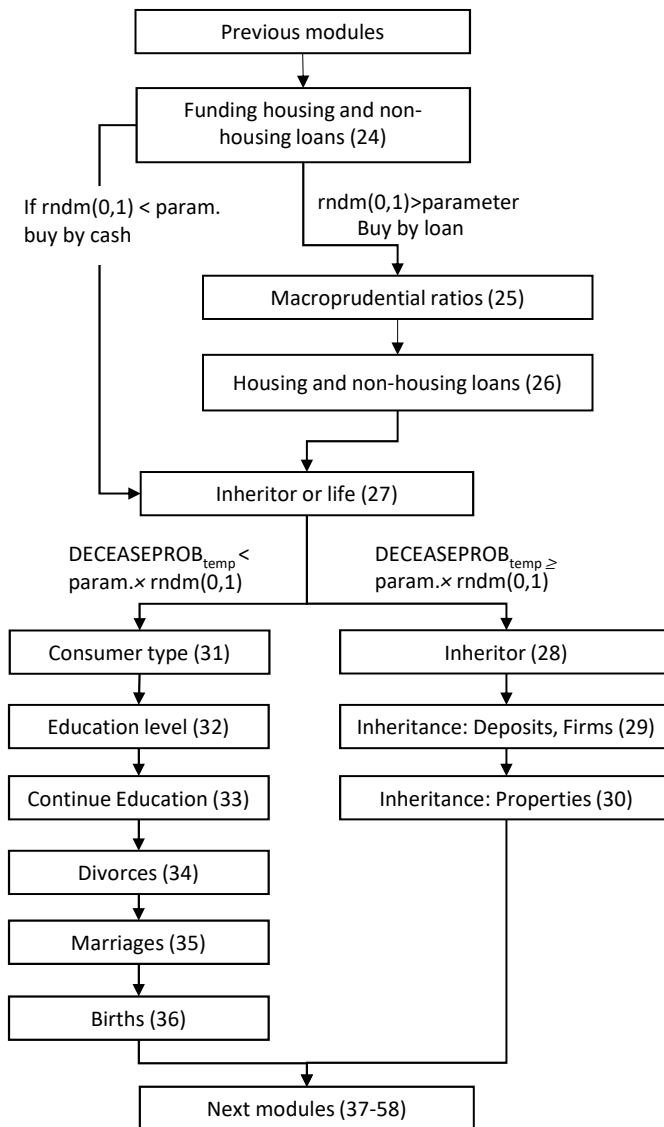


Fig. 3: Sequential updating of states in the model (modules 24–36).

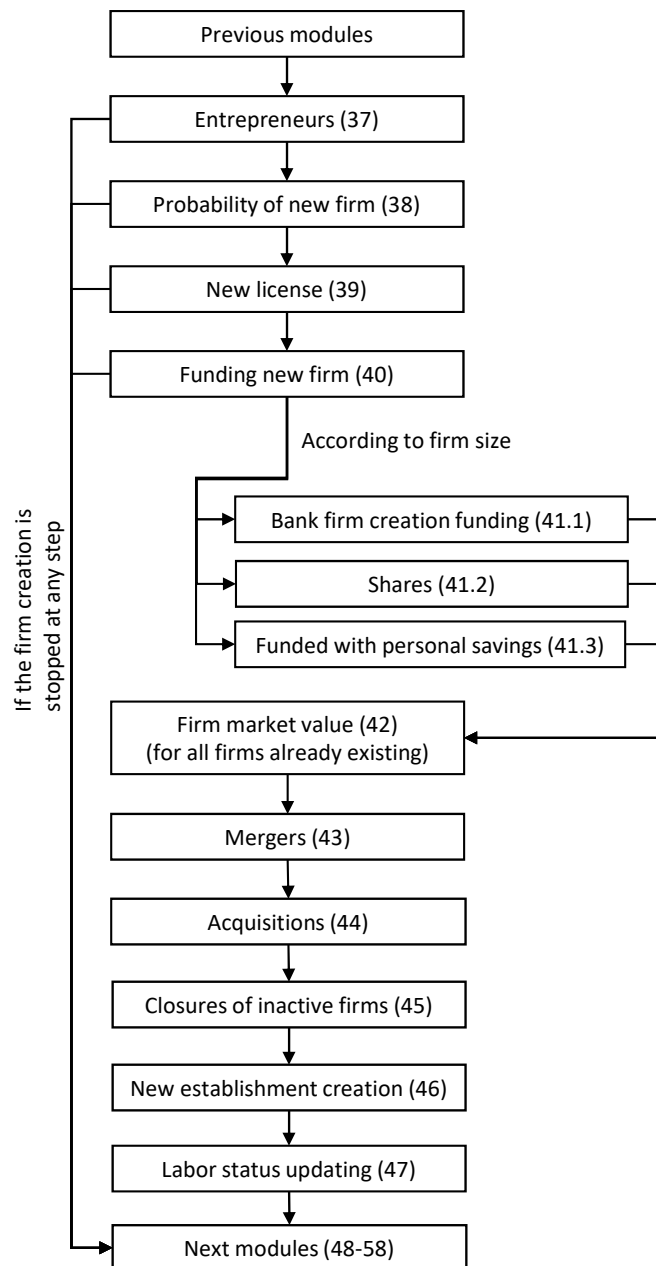


Fig. 4: Sequential updating of states in the model (modules 37–47).

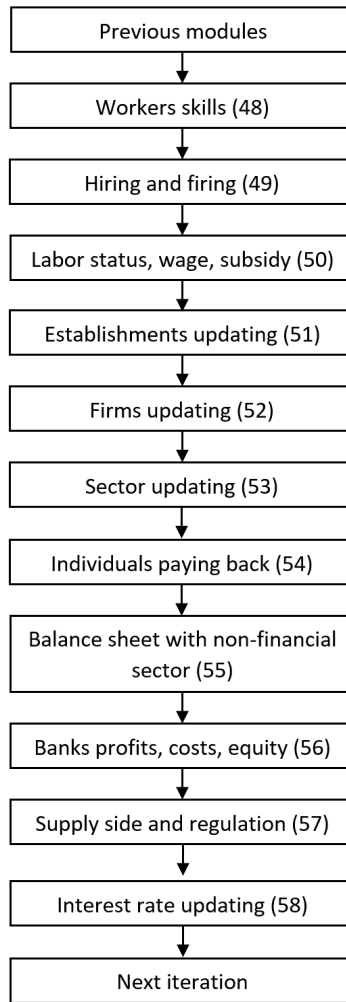


Fig. 5: Sequential updating of states in the model (48–58).

Appendix C. The BBMs in selected European countries

Table 4: The BBMs regulations in European countries based on (99; 100) and own research.

Country	Active on	Measure	Links
Austria	01.08.2022	DSTI: Austrian Financial Market Authority (FMA) has set an upper limit of 40% for debt service-to-income ratios with an exemption bucket of 10% of the assessment basis or EUR 500,000, whichever is higher. The assessment basis for the exemption bucket is the maximum from new lending in the current or previous six months period. Interim loans with a maturity of up to 2 years that are amortized by the sale of a dwelling or granting of public subsidies are exempt from the measure. The sum total of all newly extended loans falling into any one of the exemption buckets should account for no more than 20% of the assessment basis or EUR 1 million, whichever is higher.	(116)
	01.08.2022	LTV: FMA has set an upper limit of 90% for loan-to-value ratios (LTV) with an exemption bucket of 20% of the assessment basis or EUR 1 million, whichever is higher. The assessment basis for the exemption bucket is the maximum from new lending in the current or previous six months period. Interim loans with a maturity of up to 2 years that are amortized by the sale of a dwelling or granting of public subsidies are exempt from the measure. The sum total of all newly extended loans falling into any one of the exemption buckets should account for no more than 20% of the assessment basis or EUR 1 million, whichever is higher.	
	01.08.2022	Loan maturity: FMA has set an upper limit of 35 years for the maturity of loans, with an exemption bucket of 5% of the assessment basis or EUR 250,000, whichever is higher. The assessment basis for the exemption bucket is the maximum from new lending in the current or previous six months period. Interim loans with a maturity of up to 2 years that are amortized by the sale of a dwelling or granting of public subsidies are exempt from the measure. The sum total of all newly extended loans falling into any one of the exemption buckets should account for no more than 20% of the assessment basis or EUR 1 million, whichever is higher.	
	21.09.2018	DSTI: Lenders should be conservative in calculating borrowers' household income and expenditure when making lending decisions to ensure that debt servicing remains within reasonable limits (benchmark of no more than 30% to 40% of household net income). Only verified, regular and sustainable income should be included in this calculation.	
	21.09.2018 21.09.2018	LTV: A down payment lower than a benchmark of 20% of total financing needs is considered to be a cause of concern. Loan maturity: Loan terms should not be excessively long and should take into account the income situation over the course of the borrower's life. Loans with maturities of more than 35 years should be granted only in exceptional cases.	
Belgium	01.01.2020	LTV: LTV for buy-to-let purposes: 80%, tolerance of 10% (with 0% over 90%). LTV for owner-occupied purposes: 90%, tolerance for first time buyers of 35% (with 5% over 100%) and tolerance for others of 20% (with 0% over 100%). Overall LTV & DSTI or DTI limit (new production of loans): max 5% over LTV of 90% and DSTI over 50% or DTI over 9. Applicable to all banks and insurers; "comply or explain" close monitoring for all institutions with an outstanding amount of mortgage loans in excess of 1 billion euro, which are currently 14 Belgian banks and 4 Belgian insurance companies.	
Bulgaria	01.01.2002	Stress testing: The Bulgaria National Bank (BNB) has been conducting regular internal stress test exercises since 2002 to assess the resilience of the banking system to various risk parameters. In 2016 some simulations were conducted together with the asset quality review of the banks in Bulgaria as a part of the comprehensive assessment exercise.	
Cyprus	19.03.2021	LTV: LTV ratio (as amended in 2021) shall not exceed: (a) 80% in case the credit facility is granted for financing the primary permanent residence of the borrower. (b) 50% in case the credit facility is granted to real estate developing companies for financing the acquisition or the construction of luxurious properties (c) 70% for all other property financing cases.	
	18.03.2016	DSTI: Amendment of previous DSTI measure. The debt servicing amount shall be limited to 80% of the borrower's "net disposable income". As for CRE the cap is 80% for loans for all properties that are not the primary residence of the borrower. In case of loan in foreign currency, the total debt servicing amount should be limited to 65% of the "net disposable income".	
	04.12.2013	LTV: First version: 24 November 2003 LTV ratio (as amended in 2013) shall not exceed: (a) 80% in case the credit facility is granted for financing the primary permanent residence of the borrower. (b) 70% for all other property financing cases. (on 18 March 2016, the provisions on the LTV ratio were transferred from the CBC directive on loan origination to a CBC circular to banks, without any changes) (Revoked)	
	04.12.2013	DSTI: The debt servicing amount shall be limited to either: (a) 35% of the borrower's "total monthly income" or, (b) the difference between the "total monthly income" and the "total monthly expenditure", whichever is lower. For high income borrowers, the debt servicing amount may exceed the above limit of 35%. This limit shall in any case not exceed the lower of either: (a) 60% of the borrowers' total monthly income, or (b) the difference between the "total monthly income" and the "total monthly expenditure". (Revoked)	
	04.12.2013	Stress test: Credit institutions should carry out scenario analysis in order to assess the impact on debt servicing in case of increases in the loan instalment due to increases in the interest rate or any other cause. Scenarios shall also be applied to future reduction in the cash flow generating capacity of the borrower. As a minimum scenario, credit institutions shall assume that interest rates move towards their long term average level and that the cash generating capacity of the borrower is reduced by 20%.	
Czechia	01.07.2023	DSTI: The Czech National Bank has decided to abolish the upper limit on the DSTI ratio. The upper limits on the LTV and DTI ratios remain unchanged.	
	01.04.2022	DSTI: The Czech National Bank has set a DSTI ratio of 50% for consumer credit secured by residential property for financing the purchase of owner-occupied residential property of an applicant who is under the age of 36 at the time the loan is granted, or applicants living in a marriage or registered partnership, at least one of whom is not yet 36 at the time the loan is granted, and a DSTI ratio of 45% for consumer credit secured by residential property of the other applicants than referred above.	
	01.04.2022	LTV: The Czech National bank has set a LTV of 90% for consumer credit secured by residential property for financing the purchase of owner-occupied residential property of an applicant who is under the age of 36 at the time the loan is granted, or applicants living in a marriage or registered partnership, at least one of whom is not yet 36 at the time the loan is granted, and a LTV of 80% for consumer credit secured by residential property of the other applicants than referred above.	

Country	Active on	Measure	Links
Czechia	01.04.2022	DTI: The Czech National Bank has set a DTI of 9.5 for consumer credit secured by residential property for financing the purchase of owner-occupied residential property of an applicant who is under the age of 36 at the time the loan is granted, or applicants living in a marriage or registered partnership, at least one of whom is not yet 36 at the time the loan is granted, and a DTI of 8.5 for consumer credit secured by residential property of the other applicants than referred above.	
	03.04.2020	DSTI: The limit on the DSTI ratio (total debt service relative to net monthly income) has been increased to 50% (from 45%). A 5% exemption to mortgages with higher DSTI applies. (Cancelled on 01.07.2020)	
	01.04.2020	LTV: The limit on the LTV ratio (the size of the loan relative to the value of the pledged property) has been increased to 90% (from 80%). A 5% exemption to mortgages with higher LTVs applies. The previous option to provide a maximum of 15% of the total volume of mortgages with an LTV between 80% and 90% has been abolished. Starting from July 8 2020, the LTV limit for buy-to-let mortgages was relaxed to 90% from 60%.	
	01.10.2018	DTI: The upper limit for the DTI ratio of 9 (of the applicant's net annual income). This may be exceeded for 5% of the total amount of retail loans secured by residential property, in justifiable cases i.e. a high probability of a loan repayment is identified. Since April 1 2020, the DTI limit has been cancelled. (Revoked)	
	01.10.2018	DSTI: The upper limit for the DSTI ratio of 45% (of the applicant's net annual income). This may be exceeded for 5% of the total amount of retail loans secured by residential property, in justifiable cases i.e. a high probability of a loan repayment is identified.	
	14.06.2016	LTV: The upper LTV limit of 100% (2015 recommendation) will be reduced to 95% on 1 October 2016 and to 90% on 1 April 2017. The limit of 10% for new loans in a particular quarter with an LTV of 90%–100% (2015 recommendation) will change to a limit of 10% of new loans with an LTV of 85%–95% on 1 October 2016. The limit will be set at 15% of new loans in a particular quarter with an LTV of 80%–90% from 1 April 2017 onwards. An LTV of 60% applies to financing of buy-to-let residential property. (Revoked)	
	16.06.2015	Loan maturity: "The Czech National Bank Recommendation on the management of risks associated with the provision of retail loans secured by residential property" is updated yearly and comprises a series of measures (LTV, DSTI, DTI, Maturity, Amortisation and Stress Test). The term of a retail loan secured by residential property should not exceed 30 years. The term of unsecured consumer credit provided to clients that have a retail loan secured by residential property should not exceed 8 years.	
	16.06.2015	Loan amortisation: "The Czech National Bank Recommendation on the management of risks associated with the provision of retail loans secured by residential property" is updated yearly and comprises a series of measures (LTV, DSTI, DTI, Maturity, Amortisation and Stress Test). Providers should not provide retail loans secured by residential property with a non-standard repayment schedule leading to a shift of the client's credit commitments to a later period.	
	15.06.2015	LTV: Residential mortgage loans with an LTV > 90% for not more than 10% of the total amount of such loans in any given quarter. No residential mortgage loans with LTV > 100%. (Revoked)	
	15.06.2015	Stress test: "The Czech National Bank Recommendation on the management of risks associated with the provision of retail loans secured by residential property" is updated yearly and comprises a series of measures (LTV, DSTI, DTI, Maturity, Amortisation and Stress Test). Assessment of clients' ability to service loans under adverse conditions (i.e. stress-testing of clients' ability to service the loan), especially in the event of a sizeable fall in income, a rise in lending rates or a change in the conditions of clients who apply together for a retail loan secured by residential property (e.g. a divorce between spouses or a loss of income of one of the spouses or partners).	
Denmark	01.02.2016	LTI: Guidelines for banks and mortgage credit institutions to ensure caution in new lending for residential real estate in geographical areas with high price levels and high price increases compared to the rest of the country. The guideline includes 7 best practices including an LTI-rule (loan to gross income) that states: a) If LTI is between 4 and 5 households should have sufficient wealth (including properties but excluding pension schemes) so that net wealth is still positive in case of a decline in the value of the property by 10 percent b) If LTI is above 5 households should have sufficient wealth (including properties but excluding pension schemes) so that net wealth is still positive in case of a decline in the value of the property by 25 percent.	(57)
	01.11.2015	LTV: Home buyers are generally required to make at least a 5 percent down payment (own financing) when purchasing a home.	
Estonia	01.03.2015	LTV: All credit institutions operating in Estonia are subject to a LTV limit of 85% (90% if guaranteed by KredEx) for new housing loans. Up to 15% of the amount of new housing loans issued in a quarter are allowed to breach the limit(s).	
	01.03.2015	DSTI: All credit institutions operating in Estonia are subject to a DSTI limit of not more than 50% of borrower's net income for new housing loans. The DSTI ratio is calculated using either the interest rate in the loan contract (base rate plus margin) plus 2 percentage points, or an annual rate of 6%, whichever is higher. Up to 15% of the amount of new housing loans issued in a quarter are allowed to breach the limit(s).	
	01.03.2015	Maturity: All credit institutions in Estonia are subject to a maturity limit of 30 years for new housing loans. Up to 15% of the amount of new housing loans issued in a quarter are allowed to breach the limit(s).	
Finland	01.07.2023	Maturity: The Finnish Financial Supervisory Authority (FIN-FSA) introduced a 30 year maturity limit for housing loans into the Act on Credit Institutions. Credit providers being allowed to deviate from the limit by up to 10% of their quarterly lending volume.	
	01.01.2023	DSTI: The FIN-FSA recommended that the stressed debt-service-to-income (DSTI) ratio should not exceed 60%. New loans with a stressed DSTI ratio above 60% should account for no more than 15% of the euro volume of new housing loans granted by the lender in a calendar year. The stressed servicing costs should be calculated with a maturity of no more than 25 years and an interest rate of at least 6% (except for loans with long-term interest rate hedges and fixed-rate loans).	
	01.10.2021	LTV: The Board of the FIN-FSA will lower the loan cap for residential mortgage loans other than first-home loans by five percentage points, to the pre-pandemic level of 85%.	
	29.06.2020	LTV: Maximum loan-to-collateral (LTC) ratio, as referred to in chapter 15, section 11 of the Credit Institutions Act. The statutory standard level of the LTC ratio is 90% for residential mortgage loans other than first-home loans. The level may be lowered by 10% based on a decision by the FIN-FSA Board. With the decision of 19 March 2018, the Board lowered the maximum LTC ratio for residential mortgage loans other than first-home loans by 5 percentage points. On 29 June 2020, The FIN-FSA Board decided that the LTC ratio will be adjusted and brought back to the statutory standard level of 90%.	

Country	Active on	Measure	Links
Finland	01.07.2018	LTV: The lowering of the binding maximum loan-to-value ratio, as referred to in chapter 15, section 11 of the Credit Institutions Act, by 5 percentage points to 85% for residential mortgage loans other than those taken for first home purchases.	
	01.07.2016	LTV: LTV of 90% (95% for first-time house buyers) by law. Cap can be tightened by 10 percentage points by Finanssivalvonta.	
	01.03.2010	Stress tests: Recommendation: stress test borrower to test his/her ability to service the debt if the mortgage rate would be 6% and have a maturity of 25 years; also takes into account housing company loans	
France	01.07.2023	Maturity: The Haut Conseil de Stabilité Financière adjusted the allocation within the total flexibility margin of 20% (70% reserved for owner-occupied and 30% for FTB) of its loan maturity measure. The maturity limit of 25 years, and a limit for the total maturity of the loan (the sum of the amortization and grace periods) of 27 years, remain unchanged.	(25)
	01.07.2023	DSTI: The Haut Conseil de Stabilité Financière adjusted the total flexibility margin of 20% (70% reserved for owner-occupied and 30% for FTB) of its DSTI measure. The DSTI limit of 35% remains unchanged.	
	01.01.2022	DSTI: Haut Conseil de stabilité financière (HCSF) decided to convert its 35% DSTI limit from recommendation to legally binding measure with effects from 1 January 2022.	
	01.01.2022	Maturity: Haut Conseil de stabilité financière (HCSF) decided to convert its maturity limit of 25 years from recommendation to legally binding.	
	28.01.2021	Maturity: Credit institutions and financing companies are recommended to ensure that, for new RRE loans (excluding renegotiations, refinancing of outstanding housing loans and credit consolidation) i) DSTI does not exceed 35% and ii) loan maturity does not exceed 25 years. While the maximum amortization period is fixed at 25 years, a grace period of up to 2 additional years can be added to these 25-years maturity in cases when there is a lag between the disbursement of the loan and the date when it is possible to move in (the lag being related to construction or heavy renovation works).Exemption (flexibility margin) for up to 20% of the volume of total new loans (80% reserved for owner-occupied and 30% for FTB).	
	28.01.2021	DSTI: Credit institutions and financing companies are recommended to ensure that, for new RRE loans (excluding renegotiations, refinancing of outstanding housing loans and credit consolidation) i) DSTI does not exceed 35% and ii) loan maturity does not exceed 25 years. While the maximum amortization period is fixed at 25 years, a grace period of up to 2 additional years can be added to these 25-years maturity in cases when there is a lag between the disbursement of the loan and the date when it is possible to move in (the lag being related to construction or heavy renovation works). Exemption (flexibility margin) for up to 20% of the volume of total new loans (80% reserved for owner-occupied and 30% for FTB).	
	01.01.2020	Recommendation for Maturity: limit of 25 years for all banks. To be applied together with recommendation on DSTI. With a (common) 15% exemption for new loans (3/4 for owner-occupied including FTB) as long as DTI<7 for all banks	
	01.01.2020	DSTI: Recommendation on DSTI: limit of 33%. To be applied together with recommendation on maturity. With a (common) 15% exemption for new loans (3/4 for owner-occupied including FTB) as long as DTI<7 for all banks	
Hungary	01.07.2023	DSTI: The nominal income threshold, above which higher indebtedness is allowed, is increased from HUF 500 000 to HUF 600 000 (approx. from EUR 1 350 to EUR 1 620). The regulation will not be applicable for the first loan of borrowers below HUF 450 000 (approx. from EUR 800 to EUR 1 200), compared to past HUF 300 000. Furthermore, once in three years, the credit line could be increased by the amount of 20 percent of the credit line or of HUF 300 00, whichever is the lowest. The nominal threshold for credit line increase will be raised to HUF 450 000.	(63)
	01.07.2019	LTV: Amendment to the Debt Cap Regulation clarifying how the new so-called child support loan applicable from 1 of July should be taken into account during the application of the LTV ratio. It states that 25 percent of the child support loans that are used for the purchase of the same house at most 90 days before taking a housing loan shall be taken into account as loan exposure while calculating the loan-to-value ratio for the housing loan, while 75 percent of the child support loan can be considered as down payment.	
	1.10.2018	DSTI: Payment-to-Income (PTI) ratio limits are amended, and now range from 25% to 60% during the phase-in period (1 Oct. 2018 - 30 June 2019). From 1 July 2019, the limits will range from 25% to 60%, although the income threshold will now be higher (500,000 HUF) as opposed to the phase-in period (400,000 HUF). The PTI ratio limits also depends on the length of the fixation of interest rates, i.e. floating/fixed for < 5 years; at least 5 years but < 10 years; and, at least 10 years or fixed for the entire term of the loan. The PTI limits increase over with income and the length of fixation of interest rates. Additionally, the limits will depend on the the currency. For EUR, the range is 15% to 30%. For other FX, the range is 5% to 15%. Both ranges depend on the interest rate fixation period and the income of the borrower.	
	1.05.2016	DSTI: Amendment of the requirements related to payment-to-income (PTI). Raising the de minimis line on no debt-cap small loans from HUF 200,000 to HUF 300,000. Allow lenders to apply one credit line increase per year without checking PTI ratios, subject to limits on the size of the increase. Differential treatment of mortgages with interest fixation periods of at least five years: monthly debt service of such loans has a lower weight when calculating the PTI ratios for borrowers. Lastly, various technical amendments.	
	01.01.2016	LTV: Amendment of the requirements related to loan to value (LTV).Raising the de minimis line on no debt-cap small loans from HUF 200,000 to HUF 300,000.	
	01.01.2015	DSTI: PTI (Payment-to-income) limits, going from 10% to 60% covering all types of credit and loan operations. The limits are differentiated according to the currency of the loan (HUF, EUR, other currencies) and the net income of the borrower (<=, > HUF 400,000). De minimis exception for very small loans.	
	01.01.2015	LTV: LTV limits for new mortgage loans, going from 35% to 80%. LTV limits for new vehicle loans, going from 30% to 75%. Limites are differentiated according to currency of loan (HUF, EUR, other currencies).	

Country	Active on	Measure	Links
Iceland	16.06.2022	DSTI: The maximum Debt-Service-to-Income limit of 35% applies to all new mortgage lending to consumers. In case of first-time buyers, the maximum limit is 40%. For the interest rate, the higher of contractual interest rates or a reference interest rate of 3% for indexed mortgages and 5.5% for non-indexed mortgages should be used. For the maturity, the maximum maturity is 25 years for indexed mortgage loans and 40 years for non-indexed mortgage loans. The lender is authorised to use an annuity mortgage amortisation schedule for both indexed and non-indexed mortgage loans. The DSTI rules provide for a flexibility quota of 5% of the volume of new mortgages each quarter that are exempt from the rules. Refinancing of mortgage loans due to payment difficulties of the consumer is exempt from the DSTI rules.	
	16.06.2022	DSTI: Rules on maximum LTV: Maximum LTV for first-time buyers decreased from 90% to 85%. Maximum LTV for other buyers maintained at 80%.	
	01.12.2021	DSTI: Maximum Debt-Service-to-Income limit of 35% applies to all new mortgage lending to consumers. In case of First-time buyers the maximum limit is 40%. The debt service includes all payments of principal and interest of all mortgage loans of the consumer. Income of the consumer is defined as long term sustainable income net of taxes, pension contributions and other deductions. When calculating the debt-service a maximum maturity of 40 years is allowed for non-indexed mortgages and 30 years for indexed mortgages, irrespective of the actual maturity of the mortgage. The rules provide for a flexibility quota of 5% of the volume of new mortgages each quarter that are exempt from the rules. Refinancing of mortgage loans due to payment difficulties of the consumer is exempt from the rules. The measure applies to all mortgage lenders in Iceland, including banks, pension funds, the Housing and Construction Authority and other registered lenders.	
	30.07.2021	LTV: The maximum loan-to-value ratio for consumer mortgages has been lowered from 85% to 80%. The LTV limit for first time buyer is unchanged at 90%.	
	17.07.2017	LTV: Regulation on requirements for new residential mortgage loans. The regulation contains a LTV cap on new residential mortgage loans to consumers with a 85% LTV limit (90% for first time buyers).	
Ireland	01.01.2023	LTI: Change to existing LTI measures: LTI limit for FTBs increased from 3.5 to 4 times income (LTI limit for second and subsequent buyers unchanged at 3.5 times income). Proportionate allowances: o The proportion of lending allowed above the limits will now apply at the level of the borrower type (e.g. FTB) rather than the individual limit (e.g. FTB LTI). 15 per cent of FTB lending can take place above the limits. 15 per cent of SSB lending can take place above the limits. 10 per cent of BTL lending can take place above the limits.	(62)
	01.01.2023	LTV: Change to existing LTV measures: LTV limit for SSBs is being increased from 80 per cent to 90 per cent (LTV limit for FTB and BTL mortgages remains unchanged at 90 per cent and 70 per cent respectively). Proportionate allowances: The proportion of lending allowed above the limits will now apply at the level of the borrower type (e.g. FTB) rather than the individual limit (e.g. FTB LTI). 15 per cent of FTB lending can take place above the limits. 15 per cent of SSB lending can take place above the limits. 10 per cent of BTL lending can take place above the limits.	
	01.01.2018	LTI: Revision of existing loan-to-income (LTI) measures. Permitting a proportion of mortgage lending above the LTI limit to be considered separately for first-time-buyers (FTBs) and second and subsequent buyers (SSBs). The revision allows for 20 per cent of the value of new mortgage lending to FTBs to be above the LTI cap (of 3.5 gross income) and 10 per cent of the value of new mortgage lending to SSBs to be above the 3.5 LTI cap. Up to end-2017, the LTI allowance had been set at 20 per cent of the combined value of FTB and SSB lending. On the 20/06/2019 a minor revision to the Regulations was approved, exempting lifetime mortgages from the LTI ratio with effect from 20/06/2019.	
	01.01.2018	LTV: Clarification is provided on the collateral valuation for construction-related mortgage lending (e.g. financing of renovations). At the time of entering a loan agreement, when calculating the value of the collateral, lenders will be required to take the lower of; the estimated market value of the property after completion of all works, or; the sum of the site cost plus the cost of work, as estimated at the time of entering into the loan agreement.	
	01.01.2017	LTV: Following an extensive review of the mortgage measures in Ireland in 2016, a number of refinements to improve the sustainability and effectiveness of the current framework were identified and implemented. The ceiling on the LTV ratio for all first-time buyers is now set at 90% therefore the sliding limit based on the property value was removed.	
	9.02.2015	LTI: Proportionate LTI limit: new housing loans with LTI greater than 3.5 should not be more than 20% of aggregate value new housing loans.	
	09.02.2015	LTV: Proportionate LTV limits of: 80% for non-first time buyers (FTBs); 90% for FTBs of properties up to €220,000; a sliding LTV limit based on property value for FTBs over €220,000. To be exceed by no more than 15% of the value of new lending for primary home. For so-called "buy to let" (BTL) property, i.e. property that is purchased for investment purposes by renting it out, banks are required to limit new loans with LTV of greater than 70% to 10% of the aggregate value of all new BTL loans issued over a six monthly period.	
	01.01.2012	Stress tests: Lenders must assess whether borrowers can still afford their mortgage loans on the basis of a minimum 2% interest rate increase above the offered rate.	
	Latvia	01.01.2022	LTV: Amendment of previous measure (active since 01.06.2020) to include in the scope also credit institutions that offer financial services in Latvia via branch (Freedom of Establishment) and direct cross-border (Freedom to Provide Services).
01.06.2020		LTV: Institutions shall develop the policy and set out respective procedures for the issuance of loans for the purchase of a property for a purpose of renting it out (buy-to-let, BTL) or otherwise deriving income from real estate transactions by the borrower. The loan amount in such cases may not exceed 70 percent of the market value of the loan collateral (real estate), and in the creditworthiness assessment income from the real estate shall not account for more than 70 percent of the total income. Also institutions shall assess the extent to which the risk of the borrower depends on the declared income generated by the real estate (e.g. rental or other comparable income arising from the real estate transactions by the borrower), and on the ability of the borrower to repay debt from other sources. If the declared income in the creditworthiness assessment from the borrowers' actions relating to real estate exceeds 20 percent of the total income and the amount of the loan for which the borrower has applied for exceeds 70 percent of the market value of the loan collateral (real estate), the creditworthiness is to be assessed as insufficient.	

Country	Active on	Measure	Links
Latvia	01.01.2022	DTI: The highest allowed DTI ratio is set at 6 for both RRE and Consumer Loans Debt (D) is all debt obligations of the borrower (to financial institutions and as far as feasible to obtain such data also to non-financial institutions – i.e. unpaid utility bills, prospective alimony debt payments, etc.), including the loan to which the borrower has applied to, and also granted but not yet used excess loans, but excluding debt obligations that would be paid off as a result of the planned granting of credit. Income (I) is the average monthly income calculated according to the requirements for DSTI multiplied by 12. If the DSTI exceeds 40 percent and the DTI exceeds ratio of 6 then the creditworthiness of the borrower shall be assessed as insufficient, and the loan shall not be issued. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. The institution must be able to explain the reasoning behind their decision. Amendment of previous measure (LV.DETI.785) to include in the scope also credit institutions that offer financial services in Latvia via branch (Freedom of Establishment) and direct cross-border (Freedom to Provide Services).	
	01.01.2022	Maturity: The institution shall also set a maximum allowed maturity for different types of loans (excl. overdrafts). The maximum repayment term of a mortgage loan to a natural person must not exceed 30 years, while that of a consumer loan (including financial leasing transactions) - 7 years. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. Amendment of previous measure (LV.LMAT.786) to include in the scope also credit institutions that offer financial services in Latvia via branch (Freedom of Establishment) and direct cross-border (Freedom to Provide Services).	
	01.01.2022	DSTI: The highest allowed DSTI ratio for housing and consumer loans is set at 40%. Debt-service (DS) is the total monthly aggregate of credit payments to financial institutions which includes amortisation of all borrowers debt obligations, including overdraft credits granted and not yet used (e.g. revolving loans, credit lines and payment card credits, or similar products whose issuance and repayment (i) are not covered by specific pre-agreed schedule, and (ii) is possible within a limited period of contract), but except debt obligations that would be covered (paid off) as a result of the planned granting of credit. Income (I) is the documented and verifiable average monthly income of the borrower after tax and other compulsory national and social payments that the institution recognizes as recurrent based on available last six-month income data of the borrower. If the income of last six months does not reflect the borrower’s regular income, with appropriate justification a longer period of time shall be used. If the DSTI exceeds 40 percent and the DTI exceeds ratio of 6 then the creditworthiness of the borrower shall be assessed as insufficient, and the loan shall not be issued. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. The institution must be able to explain the reasoning behind their decision. Amendment of previous measure (LV.DSTI.784) to include in the scope also credit institutions that offer financial services in Latvia via branch (Freedom of Establishment) and direct cross-border (Freedom to Provide Services).	
	01.06.2020	DSTI: The highest allowed DSTI ratio for housing and consumer loans is set at 40%. Debt-service (DS) is the total monthly aggregate of credit payments to financial institutions which includes amortisation of all borrowers debt obligations, including overdraft credits granted and not yet used (e.g. revolving loans, credit lines and payment card credits, or similar products whose issuance and repayment (i) are not covered by specific pre-agreed schedule, and (ii) is possible within a limited period of contract), but except debt obligations that would be covered (paid off) as a result of the planned granting of credit. Income (I) is the documented and verifiable average monthly income of the borrower after tax and other compulsory national and social payments that the institution recognizes as recurrent based on available last six-month income data of the borrower. If the income of last six months does not reflect the borrower’s regular income, with appropriate justification a longer period of time shall be used. If the DSTI exceeds 40 percent and the DTI exceeds ratio of 6 then the creditworthiness of the borrower shall be assessed as insufficient, and the loan shall not be issued. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. The institution must be able to explain the reasoning behind their decision.	
	01.06.2020	Maturity: The institution shall also set a maximum allowed maturity for different types of loans (excl. overdrafts). The maximum repayment term of a mortgage loan to a natural person must not exceed 30 years, while that of a consumer loan (including financial leasing transactions) - 7 years. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis.	
	01.06.2020	DTI: The highest allowed DTI ratio is set at 6 for both RRE and Consumer Loans Debt (D) is all debt obligations of the borrower (to financial institutions and as far as feasible to obtain such data also to non-financial institutions – i.e. unpaid utility bills, prospective alimony debt payments, etc.), including the loan to which the borrower has applied to, and also granted but not yet used excess loans, but excluding debt obligations that would be paid off as a result of the planned granting of credit. Income (I) is the average monthly income calculated according to the requirements for DSTI multiplied by 12. If the DSTI exceeds 40 percent and the DTI exceeds ratio of 6 then the creditworthiness of the borrower shall be assessed as insufficient, and the loan shall not be issued. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. The institution must be able to explain the reasoning behind their decision.	
	01.06.2020	DTI: The highest allowed DTI ratio is set at 6 for both RRE and Consumer Loans Debt (D) is all debt obligations of the borrower (to financial institutions and as far as feasible to obtain such data also to non-financial institutions – i.e. unpaid utility bills, prospective alimony debt payments, etc.), including the loan to which the borrower has applied to, and also granted but not yet used excess loans, but excluding debt obligations that would be paid off as a result of the planned granting of credit. Income (I) is the average monthly income calculated according to the requirements for DSTI multiplied by 12. If the DSTI exceeds 40 percent and the DTI exceeds ratio of 6 then the creditworthiness of the borrower shall be assessed as insufficient, and the loan shall not be issued. Institutions can employ exemption in cases where the creditworthiness of the borrower is assessed to be sufficient despite the DSTI or DTI being above the limits prescribed. In a similar manner, institutions can also apply an exemption to the maximum maturity limits. Such exemptions may not exceed 10 percent of the institution’s total outstanding amount of newly issued loans to households on a quarterly basis. The institution must be able to explain the reasoning behind their decision.	

Country	Active on	Measure	Links
Latvia	01.07.2014	LTV: LTV cap of 90% for residential mortgage lending. The LTV requirement is set in the Law on Consumers Rights' Protection, but Latvijas Banka can issue a recommendation on the appropriate LTV level. Amendment of previous measure (LV-LTVR-2007(126)) to include additional LTV cap of 95% for loans supported by a state guarantee under the Law on Assistance in Resolution of Dwelling Issues.	
	01.07.2007	LTV: LTV cap of 90% for residential mortgage lending. The LTV requirement is set in the Law on Consumers Rights' Protection, but Latvijas Banka can issue a recommendation on the appropriate LTV level.	
Lichtenstein	01.07.2024	Loan amortisation: The FMA has decided to implement an amortisation requirement based on affordability with affordability being defined as a loan-service-to-income ratio below 33% for new residential real estate loans (RRE) and 37% for existing RRE loans. Loans not meeting these criteria should apply a minimum annual amortisation of 1% until the loan classifies as affordable.	
	01.11.2023	Loan amortisation: The FMA has decided to implement an adjustment of the amortisation period for mortgages with high LTV ratios. The amortisation is lowered from 20 years to 15 years for the amount of the loan exceeding an LTV ratio of 66% with a minimum annual amortisation of 1% of the loan amount.	
	01.02.2015	Loan amortisation: According to the regulation on requirements for mortgage loans applicable to home loans and loans on income property, the mortgage has to be amortized so that the loan-to-value (LTV) ratio falls below two thirds within 20 years.	
	01.02.2015	LTV: At mortgage origination or if a mortgage is expanded, the loan-to-value ratio (LTV) must not exceed 80%. A higher LTV ratio is possible in exceptional cases, but such a loan has to be qualified as "exception to policy".	
Lithuania	02.01.2022	LTV: Introduction of LTV limit for second and subsequent mortgage loans for natural persons: - 70%; - less than 85% (i.e. unchanged) if the outstanding amount of each previous mortgage loan is lower than 50% of the value of housing purchased using that loan.	(117)
	01.07.2017	DSTI: Amendments to existing regulations: wider application of the borrower-based measures, which currently apply not only to mortgages issued by credit institutions, but also loans for house purchase or loans with RE collateral granted by other credit providers. Lending standards (including the requirement to calculate LTV and DSTI are also applied to natural persons who are carrying out construction or lease activities for business purposes. Also, lending standards applied for all types of household loans preventing excessive provision of unsecured loans to households.	
	01.07.2017	LTV: Amendments to existing regulations: wider application of the borrower-based measures, which currently apply not only to mortgages issued by credit institutions, but also loans for house purchase or loans with RE collateral granted by other credit providers. Lending standards (including the requirement to calculate LTV and DSTI are also applied to natural persons who are carrying out construction or lease activities for business purposes. Also, lending standards applied for all types of household loans preventing excessive provision of unsecured loans to households.	
	01.11.2015	DSTI: Amendments to previously introduced measure (DSTI of not more than 40% of borrower's net income): 1) introduction of stress DSTI limit of 50% (alongside the usual 40% limit) with the 5% interest rate used in the stress testing. 2) A credit provider can apply a DSTI of more than 40% of the borrower's income, but overall capped at 60%, for the amount of housing loans that is not higher than 5% of the total value of new housing loans granted by that credit provider during the calendar year.	
	01.11.2015	Maturity: Maturity of new housing loans should not be more than 30 years.	
	01.11.2011	Maturity: Maturity of new housing loans should not be more than 40 years. (Revoked)	
	01.11.2011	LTV: LTV of new housing loans cannot be more than 85%.	
	01.11.2011	DSTI: DSTI of not more than 40% of borrower's net income. On 28 May 2015 the Bank of Lithuania adopted the amendment to the Responsible Lending Regulations confirming the DSTI measure, effective from 1 November 2015.	
Luxembourg	01.01.2021	LTV: The measure comprises the activation of legally binding LTV limits for new mortgage loans on residential immovable property located in Luxembourg. The measure applies to all lenders in residential real estate. Following the Recommendation of the Systemic Risk Committee (CRS/2020/005), the CSSF activated LTV limits that are differentiated across different categories of borrowers. Three categories are considered, with the following calibration: - LTV limit of 100% for first-time buyers acquiring their primary residence; - LTV limit of 90% for other buyers (i.e. not first-time buyers) acquiring their primary residence. This limit is implemented in a proportional way via a portfolio allowance. Specifically, lenders may issue 15% of the annual portfolio of new mortgages granted to these borrowers with an LTV above 90% but below the maximum LTV of 100%. - LTV limit of 80% for other mortgage loans (including the buy-to-let segment). The LTV limits also apply in cases the RRE loan was contracted by a legal structure such as a "société civile immobilière" (SCI - real-estate company constituted under civil law).	
Malta	01.07.2019	Maturity: Maturity caps applied for all new RRE loans differentiating between two categories of borrowers. For Category I Borrowers, 40 years maturity cap or the official retirement age – whichever occurs first. For Category II borrowers, 25 years maturity cap or the official retirement age – whichever occurs first. Update 29/11/2021: Without prejudice to the Lenders' internal policies, and notwithstanding the maturity limits set out, a Loan may exceptionally mature beyond a Borrower's retirement age, when: a. The Borrower submits evidence to the Lender of stable income from employment or other own sources of income; b. The Lender conducts an assessment on whether the aforementioned income is to subsist throughout the duration of the loan; and c. All the other conditions of this Directive are met.	
	01.07.2019	LTV: Loan-to-value-at-origination (LTV-O) applied differentiating between two categories of borrowers. For Category I Borrowers: (i) if the collateral market value is below EUR175,000 (excluding haircuts) loans are exempted from the LTV-O limits ; (ii) if the collateral market value is exceeding EUR175,000, a cap of 90% LTV-O with a 'speed limit' of 10% on the volume of loans shall apply. For Category II borrowers, the LTV-O ratio shall not exceed 75% LTV-O cap with a 'speed limit' of 20% on the volume of loans.	

Country	Active on	Measure	Links
Malta	01.07.2019	DSTI: The stressed Debt-Service-to-Income ratio at origination (sDSTI-O) is set at 40% for both categories of borrowers, following a shock to interest rates of 150 bps. Category I Borrowers with a collateral market value below EUR 175,000 are exempted from the sDSTI-O limit. Update 29/11/2021: Category I Borrowers comprises first-time buyers (FTBs) and non-FTBs purchasing, constructing, restoring, improving and/or finishing their primary residence not having outstanding residential real-estate (RRE) loans upon the signing of the deed. It includes borrowers who already own or have owned a primary residence and at the origination of the mortgage loan the pre-existing primary residence has either been sold or a promise of sale agreement (“konvenju”) has been entered into; or there are pending proceedings before the Civil Court which hinder the sale of the primary residence. Provided that, any other additional RRE loans on the same Primary Residence with an outstanding RRE loan, solely for the purpose of constructing, restoring, improving and/or finishing the Primary Residence and save for additional Independent Units, would also fall under the definition of Category I Borrowers of this Directive, on condition that there are no outstanding loans which fall under the definition of Category II Borrowers; Provided further that the conditions stipulated under this paragraph shall also apply to a Remortgage Loan. Category II borrowers includes any other loans for the purchase, construction, restoration, improvement and/or finishing of an RRE excluding Category I Borrowers. The measure applies to all lenders granting domestic RRE loans. It is targeted to both resident and non-resident borrowers entering into new RRE loans for property within the Maltese territory secured by RRE. The stressed DSTI-O shall be calculated as follows: $DSTI-O \text{ stressed} = \frac{\text{Annual Repayment} \Delta \text{r stressed}}{\text{Gross Income with } \Delta \text{r stressed}} = +150 \text{ bp}$.	
Netherlands	01.01.2013 01.01.2012	Maturity: New mortgage loans are only tax deductible when they are amortised within 30 years. LTV: LTV limit for new mortgage loans decreases stepwise 1 percentage point per annum from 106% in 2012 to 100% in 2018.	
Norway	01.01.2023 01.01.2023 01.01.2021 01.01.2021 01.01.2021 01.01.2021 01.01.2021 01.01.2021 01.04.2020 01.07.2018 01.07.2018 01.07.2018 01.07.2018 01.01.2017 01.01.2017 01.01.2017 01.07.2015 01.07.2015 01.12.2011 01.12.2011 03.03.2010	LTV: LTV is capped at 85%, additional collateral is accepted. Stress tests: When assessing a customer’s debt-service ability lenders must ensure that the customer have sufficient funds to cover regular expenses after an interest rate increase of 3 percentage points. At a minimum the customer must be able to be to cover regular expenses if the interest rate was 7 percent. Lenders may deviate from the debt-to-income requirement and stress test when issuing a residential mortgage loan where the purpose of the loan is to restructure existing debt held by borrowers that are not able to service the debt. Loan amortisation: residential mortgage loans with an LTV above 60% need to be amortised at a rate of 2.5% per annum or the equivalent to an annuity loan with a 30 year repayment period. The maximum term of consumer loans is 5 years and monthly principal repayments is required. Flexibility quota: 10% of the new mortgage loans volume per quarter outside Oslo is allowed not to meet the regulatory requirements; in Oslo, the limit is 8%; for consumer loans the limit is 5%. (Revoked) LTV: LTV is capped at 60% for secondary homes in Oslo, otherwise at 85%, additional collateral is accepted.(Revoked) DTI: Total debt may not exceed five times gross annual income. Lenders may deviate from the debt-to-income requirement and stress test when issuing a residential mortgage loan where the purpose of the loan is to restructure existing debt held by borrowers that are not able to service the debt. Stress tests: When assessing a borrower’s debt-servicing ability, the lender needs to make allowance for an interest rate increase of 5 percentage points on total debt and include required amortization. The credit line limit of credit cards shall be applied when calculating amortization. Lenders may deviate from the debt-to-income requirement and stress test when issuing a residential mortgage loan where the purpose of the loan is to restructure existing debt held by borrowers that are not able to service the debt. (Revoked) Flexibility quota: The mortgage volume allowed to deviate from the regulatory requirements was temporarily increased from 8% and 10% to 20%. (Revoked) Loan amortisation: Residential mortgage loans with an LTV greater than 60% need to be amortised at a rate of 2,5% per annum or equivalent to an annuity loan with a 30 year repayment period. (Revoked) LTV: The LTV-ratio for residential mortgage loans is capped at 85%. The cap is 60% for secondary homes in Oslo. Additional collateral is accepted. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. (Revoked) DTI: Total debt may not exceed five times gross annual income. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. Stress tests: When assessing a borrower’s debt-servicing ability, the lender needs to make allowance for an interest rate increase of 5 percentage points. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. DTI: Total debt may not exceed five times gross annual income. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. (Revoked) Stress tests: When assessing a borrower’s debt-servicing ability, the lender needs to make allowance for an interest rate increase of 5 percentage points. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. (Revoked) LTV: The LTV-ratio for residential mortgage loans is capped at 85% (60% for home equity lines of credit). The cap is 60% for secondary homes in Oslo. Additional collateral is accepted. 10% of the mortgage volume per quarter is allowed not to meet the regulatory requirements, the limit is 8% for mortgages in Oslo. (Revoked) Loan amortisation: Residential mortgage loans with an LTV greater than 70% need to be amortised at a rate of 2,5% per annum or equivalent to an annuity loan with a 30 year repayment period. 10% of the volume of a lender’s approved loans per quarter are allowed not to meet the regulatory requirements. (Revoked) Stress tests: When assessing a borrower’s debt-servicing ability, the lender needs to make allowance for an interest rate increase of 5 percentage points. 10% of the volume of a lender’s approved loans per quarter are allowed not to meet the regulatory requirements.(Revoked) Loan amortisation Residential mortgage loans with an LTV greater than 70% need to be amortised. (Revoked) Stress tests: When assessing a borrower’s debt-servicing ability, the lender needs to make allowance for an interest rate increase of 5 percentage points. (Revoked) LTV: Supervisory guidelines for prudent residential mortgage lending practices specify that the LTV-ratio for residential mortgage loans is capped at 90% (75%*). In 2011 the LTV-cap was lowered to 85% (70%*). (*) applies to home equity lines of credit. (Revoked)	(105) , (104)

Country	Active on	Measure	Links
Poland	01.07.2014	Maturity: Banks should recommend to their clients loans of maturity not longer than 25 years, and if clients ask for loans of longer maturity banks are recommended to grant loans of maturity of maximum 35 years and assess the creditworthiness assuming maturity of 25 years.	(102) , (112)
	01.01.2014	LTV: LTV limits: Residential real estate: 2014 - 95%, 2015 - 90%, 2016 - 85% or 90% if the part above 85% is insured or collateralized with funds on bank account, government or NBP securities, >=2017 (target levels) - 80% or 90% if the part above 80% is insured or collateralized with funds on bank account, government, NBP securities or IKE / IKZE (funds accumulated in the third Pillar of retirement program). Commercial real estate: since July 2014 - 75% or 80% if the part above 75% is insured or collateralized with funds on bank account, government, NBP securities or IKE / IKZE (funds accumulated in the third Pillar of retirement program).	
	01.01.2014	DSTI: Removal of strict DSTI levels, for creditworthiness assessment bank should take into consideration broad set of indicators and set their internal DSTI limits. The PFSA can challenge these limits. Banks should pay particular attention to loans for which DSTI ratios exceed 40% (for borrowers with incomes below the average salary in the region) and 50% (for other borrowers). In such cases the client should be informed about heightened risk of such a transaction. Applies to newly originated housing loans.	
	01.07.2013	DSTI: Removal of strict DSTI levels, for creditworthiness assessment bank should take into consideration broad set of indicators and set their internal DSTI limits . Applies to all loans to households.	
Portugal	01.02.2022	Maturity: The maturity limit on new housing loans shall be 40 years for borrowers aged 30 or under; 37 years for borrowers aged over 30 and up to and including 35; and 35 years for borrowers aged over 35.	(119) , (120)
	01.04.2020	DSTI: The exceptions on DSTI above 50% were amended as follows: - up to 10% of the total amount of credit granted under this measure by each institution may be granted to borrowers with a DSTI of up to 60% - up to 5% of the total amount of credit granted under this measure by each institution may exceed the limits laid down regarding the DSTI. In response to the COVID-19 pandemic, Banco de Portugal has decided that personal credit with maturities of up to two years and duly identified as intended to mitigate households' temporary liquidity shortage situations will no longer have to comply with a DSTI ratio limit and is also exempted from observing the recommendation of regular principal and interest payments. This measure will be in force from 1 April 2020 to 30 September 2020 subject to further reassessments.	
	01.04.2020	Maturity: The maturity limit on new personal loans is tightened from 10 years to 7 years with the exception of credit granted to education, health and renewable energies whose maturity limit is kept in 10 years provided that these purposes are duly evidenced. Therefore the original maturity limits on new consumer loans become the following: - 7 years for personal loans - 10 years for personal loans granted for education, healthcare or renewable energy, provided that these purposes are duly evidenced - 10 years for car loans	
	01.07.2018	LTV: LTV limits established: of 90% for credit for own and permanent residence; of 80% for credit for purposes other than own and permanent residence; of 100% for credit for purchasing immovable property held by the credit institutions and for property financial leasing agreements. The denominator of this ratio corresponds to the minimum between the purchase price and the appraisal value of the immovable property pledged as collateral.	
	01.07.2018	DSTI: DSTI limit 50%, with the following exceptions: up to 20% of the total amount of credit granted under this measure by each institution in each year may be granted to borrowers with a DSTI of up to 60%; up to 5% of the total amount of credit granted under this measure by each institution in each year may exceed the limits laid down regarding the DSTI. The calculation of the DSTI numerator considers the instalments of all credit agreements already concluded, including instalments of credit agreements out of the scope of the Recommendation of Banco de Portugal within the legal framework of new credit agreements for consumers, provided that there is a defined repayment schedule, and the instalments of the new credit agreement. For the purposes of this calculation, the instalments of the new credit agreement are assumed to be constant, and the impact of an interest rate rise shall be considered for this agreement, in accordance with the provisions of an Instruction 3/2018 of Banco de Portugal. For the calculation of the DSTI denominator, it is recommended that the annual income of a borrower be divided into 12 months. In the case of a borrower aged 70 and over at the planned expiry of the agreement, a reduction of income of at least 20% of current annual income shall be considered, weighted by the ratio of the number of years of the agreement in which a borrower is aged 70 and over to the total maturity of the agreement. This reduction in income shall not be considered if at the time of the creditworthiness assessment the borrower is already retired.	
	01.07.2018	Maturity: Regarding the original maturity of the loans, limits: of 40 years for new agreements for credit relating to residential immovable property or credit secured by a mortgage or equivalent guarantee; average maturity of new credit agreements should gradually converge to 30 years until the end of 2022; of 10 years for new consumer credit agreements	
Romania	01.04.2022	LTV: The NBR has decided to lower LTV limits by 10 percentage points for loans granted to individuals for the purchase of a property other than that intended to be used as housing for their own use. The measure applies to both credit institutions and non-bank financial intermediaries in order to ensure a level playing field and to reduce the risk of regulatory arbitrage.	(118)
	01.01.2019	DSTI: Implementation of a limit of 40% on debt service to income (DSTI), as measured by the ratio between total monthly payment obligations arising from credits and borrower's net income. For FX exposures for which the borrower is not naturally hedged, the DSTI cannot exceed 20% of net income. Monthly debt service related to revolving exposures such as overdrafts and credit cards must be taken as a minimum of 3 percent of the exposure at origination. Loans granted for the solely for purpose of refinancing which do not imply additional amounts will be exempted from the regulation. For first time home buyers, the specified limits are increased by 5 percentage points. A maximum of 15% of new loans will be exempted from the regulation. The measure applies to credit institutions, non-bank financial lenders, payments institutions and institutions issuing electronic money.	
	18.12.2012	DSTI: Credit institutions must ensure stricter criteria for debt servicing capacity in case of FX loans granted to unhedged non-financial firms even in cases of a severe depreciation of the local currency or increases in interest rates. In establishing the debt servicing capacity they should take into account the foreign currency and interest rate shocks defined for consumer loans: (a) for foreign currency risk, the depreciation scenarios of the local currency to be incorporated are: 35.5% for EUR denominated loans, 52.6% for CHF denominated loans and 40.9% for USD denominated loans and (b) for interest rate risk: 0.6 percentage points increase in interest rate. The measure is applied to both banks and non-bank financial institutions.	
	31.10.2011	Maturity: Consumer loans with a maturity of more than 5 years are not allowed. The measure is applied to both banks and non-bank financial institutions.	

Country	Active on	Measure	Links
Romania	31.10.2011	LTV: In case of housing loans, limits on the LTV ratio were imposed: 85% for local currency denominated loans, 80% to FX loans granted to hedged borrowers, 75% for EUR denominated loans granted to unhedged borrowers, and 60% for other FX loans granted to unhedged borrowers. In case of consumer loans, maximum LTV is 75%. LTV limits for loans granted through the governmental program "Prima Casă" are 95% irrespective the currency. The measure is applied to both banks and non-bank financial institutions.	
	21.10.2011	DSTI: In the case of consumer loans, when establishing the maximum level of DSTI, the credit institutions have to take into account the foreign currency risk, interest rate risk and income risk. The values for these risk factors are explicitly specified in the regulation: (a) for foreign currency risk, the depreciation scenarios of the local currency to be incorporated are: 35.5% for EUR denominated loans, 52.6% for CHF denominated loans and 40.9% for USD denominated loans, (b) for interest rate risk: 0.6 percentage points increase in interest rate and (c) for income risk: 6% reduction in income. The measure is applied to both banks and non-bank financial institutions.	
Slovakia	01.01.2023	DTI: The DTI limit is gradually tightened for borrowers above 40 years old if the loan maturity exceed the retirement age. The limit is tightened by 0.25% for every year above 40 and starting at 8% (age 41; 7.75, age 42: 7.5 etc...). The floor is set at 3% at the age of 60. 5% of new loans can be granted with a DTI above the limit, irrespective of the age of the borrower.	(36) , (98)
	01.10.2022	DSTI: The current maximum instalment implied by the DSTI limit is 60%. In the case of a "green consumer loan", the maximum instalment may be increased by 50€.	
	01.10.2022	Maturity: The maximum maturity of the "green consumer loans" is extended from 8 to 10 years.	
	01.01.2020	DSTI: Tightening the limit on debt service to income ratio (DSTI) for both housing loans and consumer loans. The DSTI limit is tightened from 80% to 60%. Exemptions: - 5% of new loans can be granted with DSTI up to 70% (applicable to any new loans) - 5% of new consumer loans with maturity not exceeding 5 years can be granted with DSTI up to 70% (applicable only to new consumer loans with maturity not exceeding 5 years)	
	01.07.2018	LTV: Tightening of LTV limits for housing loans, whereby two measures apply in unison: (i) the LTV cannot exceed 90% and, (ii) the maximum share of new loans with LTV > 80% cannot exceed 20% (previously 40%). This is subject to a phase-in period. 1 July 2018 - 31 Sept. 2018: 35% 1 Oct. 2018 - 31 Dec. 2018: 30% 1 Jan. 2019 - 30 June 2019: 25% From 1 July 2019 onwards: 20%	
	01.01.2018	DSTI: Limit on debt service to income ratio for consumer loans (tightening of the measure transferred from existing recommendation) Loan instalments (for both new and existing loans, subject to assumed interest rate increase by 2 p.p., if interest rate is not fixed) cannot exceed 80% of borrower's disposable income. Disposable income is defined as net income less the minimum subsistence amount (including the minimum subsistence amount for children and spouse, if applicable). Exception: For clients with debt-to-income (including the new loan) not exceeding 1 (or 1.5 in case of leasing), the above-mentioned limit is 100%. (Revoked)	
	01.07.2018	DTI: Total borrower's indebtedness (including both new and existing loans) cannot exceed 8-times his/her yearly net disposable income. The measure will be phased-in following activation on 1 July 2018, which permits the following share of new loans to exceed the DTI limit of 8. 1 July 2018 - 31 Sept. 2018: 20% 1 Oct. 2018 - 31 Dec. 2018: 15% 1 Jan. 2019 - 30 June 2019: 10% From 1 July 2019, the share of new loans with a DTI > 8 can exceed 5% (up to 10%) only for loans granted to young clients (up to 35 years of age, income < 1.3 x Average), with DTI < 9.	
	01.01.2018	Maturity: Maturity limits for consumer loans a) consumer loans granted by financial institutions other than building societies: 8 years a) loans granted by building societies: 30 years (measure transferred from existing recommendation)	
	01.03.2017	DSTI: Tightening of the limit on debt-service-to-income ratio for housing loans. Loan instalments (for both new and existing loans, subject to assumed interest rate increase by 2 p.p., if interest rate is not fixed) cannot exceed 80% of borrower's disposable income. Disposable income is defined as net income less the minimum subsistence amount (including the minimum subsistence amount for children and spouse, if applicable).	
	01.01.2017	Maturity: Maturity limits for housing loans: a) loans secured by RRE: 30 years with possible exemption of 10% of new loans (measure transferred from existing recommendation) b) loans not secured by RRE granted by building societies: i) maximum maturity: 30 years ii) max share of new loans over 25 years: 10% iii) max share of new loans over 20 years: 20% (new measure) c) other loans not secured by RRE: 8 years (measure transferred from existing recommendation)	
	01.01.2017	LTV: LTV limits for housing loans (all three apply in parallel): a) LTV cannot exceed 100% (measure transferred from existing recommendation) b) Share of new loans with LTV > 90% cannot exceed 10% (measure transferred from existing recommendation) c) Share of new loans with LTV > 80% cannot exceed 40% (new measure)	
	31.12.2015	Stress tests: Banks should perform portfolio stress testing for an increase in interest rates and unemployment. (Revoked)	
	1.03.2015	Loan amortisation: Loans with (partial) deferred payment of interest or principal should not be granted. Specified exceptions are allowed. All loans must be amortised at least by annuity repayments.	
	1.03.2015	DSTI: Bank's internal systems should include an indicator containing household income, standard household living costs, and total debt servicing requirements.	
	01.03.2015	Stress tests: Set and adhere to an internal limit for the indicator of customer repayment ability. The limit should be met also in the case of an interest rate increase. Banks should verify their customers' income.	
	01.03.2015	Maturity: Maximum maturity for new housing loans should be 30 years with no more than 10% of new loans exceeding this limit. Maximum maturity for other new loans is 9 (ultimately 8) years. Date of application: Housing loans: 1 March 2015. Other loans: 9 years from 1 March 2015 to 31 December 2015; 8 years from 1 January 2016 onwards. (Revoked)	
01.11.2014	LTV: LTV of new loans should not be more than 100%. The share of loans with an LTV ratio of between 90% and 100% should not exceed: a) 25%, until 30 June 2015; b) 20%, from 1 July 2015 to 31 March 2016; c) 15%, from 1 April 2016 to 31 December 2016; d) 10%, from 1 January 2017. (Revoked)		

Country	Active on	Measure	Links
Slovenia	01.07.2023	DSTI: Reduce allowed deviation from DSTI caps 10% to 3%, with other DSTI restrictions not applying to loans that fall under the exception.	
	01.07.2023	DSTI: Lower the creditworthiness threshold from 76% of gross income, to a level determined by the minimum living expenses and if necessary adjusted for inflation, reviewed every year. The new threshold will be €745, meaning that €745 is the minimum amount that a consumer must be left with, after paying off all credit obligations.	
	01.07.2023	DSTI: Reduce the maximum allowed DSTI to 50% from 67%, irrespective of the borrower's level of income.	
	01.07.2022	LTV: The Bank of Slovenia has lowered the recommended LTV: The recommended LTV value has been decreased from 80% to 70% for borrowers not buying primary property. For the property to be classified as primary (and eligible for higher LTV up to 80%) it must fulfil three criteria: (1) It must be pledged as collateral (2) The loan must be used to purchase, renovate or build this property. (3) The borrower must move his/her permanent address to the property Housing loans with complete government guarantee have been excluded from the macroprudential restrictions.	
	01.07.2022	DSTI: The Bank of Slovenia has changed conditions for allowed deviation from DSTI cap: The threshold for credit worthiness has been abolished for allowed deviation from the DSTI cap. The change affects both housing and consumer loans. Housing loans with complete government guarantee have been excluded from the macroprudential restrictions.	
	01.11.2019	Maturity: The regulation sets out the maximum maturity of consumer loans that are not secured by residential real estate. This may not exceed 84 months (seven years). Up to 15% of consumer loans (relative to the amount of loans that comply with the limit on maturity and the cap on DSTI) approved by a bank each quarter may have a maturity of more than seven years. The maturity of such loans may not exceed 120 months (10 years), and must also comply with the cap on DSTI.	
	01.11.2019	DSTI: The DSTI cap for consumer loans depends on the borrower's annual net income and is: (a) 50% for net income of no more than twice the minimum gross wage, and (b) 67% for the portion of the net income that exceeds twice the minimum gross wage. (c) Notwithstanding the income level, an amount of at least 76% of the minimum gross wage must remain for the consumer each month after the payment of all instalments under credit agreements. If the consumer is supporting a family member or another person that he/she is required to support by law, the amount of income stipulated for the person that he/she is supporting according to the criteria for allocating cash social assistance set out by the law governing social security benefits must also remain for the consumer. Up to 10% of consumer loans and 10% of housing loans (relative to the amount of loans that comply with the limit on maturity and the cap on DSTI) approved by a bank each quarter may have a DSTI that exceeds the prescribed cap on DSTI. DSTI may not exceed 67%, and the loans must also comply with the limits on maturity. Furthermore, the exemptions do not apply to loans that do not comply with point (c). Amendment from May 2020: Due to COVID-19 some individuals might have experienced temporary declines in their income, which do not necessarily reflect a change in their long-term credit worthiness. Therefore, the macroprudential restrictions on household lending were amended to provide some temporary flexibility when calculating income. If the borrower's income was temporarily affected by COVID-19 and has since normalized (i.e. the bank has information for at least one month of normalized income), the banks can exclude the months with decreased earning. In this case, the income is annualized using the information for remaining months. Update from July 2022: Loans secured by financial instruments are exempt from the DSTI cap. However, their maturity is limited to three years and the ratio between the loan and the value of collateral composed of financial instruments at the time of loan approval (LTC) is not allowed to exceed 70%. Housing loans with complete government guarantee have been excluded from the macroprudential restrictions. Further, the calculation of allowed deviations quota was amended: The quota for allowed deviations is now calculated with respect to loans which are compliant with all the binding macroprudential instruments and were granted in the previous quarter. Housing loans with complete government guarantee have been excluded from the macroprudential restrictions. (Revoked)	
	05.11.2018	DSTI: Extension of the 2016 DSTI recommendation also to consumer loans and introduction of a recommendation on maturity limits for consumer loans. The highest recommended LTV ratio for housing loans is 80%. The highest recommended DSTI ratio for housing and consumer loans is: (a) for borrowers with monthly income less than or equal to EUR 1,700: 50%; and (b) for borrowers with monthly income exceeding EUR 1,700: 50% for that portion of income up to EUR 1,700 inclusive, and 67% for that portion of income exceeding EUR 1,700. (Revoked) In the event of several borrowers, this provision applies to each borrower separately.	
	05.11.2018	Maturity: The highest recommended maturity for consumer loans is 120 months. Update from July 2022: The calculation of allowed deviations quota was amended: The quota for allowed deviations is now calculated with respect to loans which are compliant with all the binding macroprudential instruments and were granted in the previous quarter. Housing loans with complete government guarantee have been excluded from the macroprudential restrictions. (Revoked)	
	06.09.2016	LTV: The recommended maximum level of the LTV ratio is 80%.	
	06.09.2016	DSTI: The recommended maximum level of the DSTI ratio is: (a) for borrowers with monthly income less than or equal to EUR 1,700: 50%; and (b) for borrowers with monthly income exceeding EUR 1,700: 50% for that portion of income up to EUR 1,700 inclusive, and 67% for that portion of income exceeding EUR 1,700. In the event of several borrowers, this provision applies to each borrower separately. (Revoked)	
	UK	21.06.2017	
01.10.2014		LTI: Proportionate LTI limit: new residential mortgage loans with LTI greater than 4.5 should not be more than 15% of aggregate volume new residential mortgage loans. De minimis exception for lenders with mortgage lending up to GBP 100 million per annum or extending fewer than 300 mortgages. Implemented as a Pillar II measure.	
01.06.2014		Stress tests: Mortgage lenders need to assess whether borrowers can still afford their mortgage loans if the Bank of England's rate were 3 percentage points higher over a 5 year period than at origination of the loan. (Revoked)	

Country	Active on	Measure	Links
Sweden	01.03.2018	<p>Loan amortisation: New borrowers with mortgages in excess of 4.5 times their gross income (LTI) must amortise at least 1 per cent of the debt in addition to the existing amortisation requirement.</p> <p>The existing amortization requirements imply that mortgagors with: LTV between 50 and 70 percent must amortise at least 1 percent of the mortgage per year and LTV above 70 percent must amortise at least 2 percent per year. The amendment implies that new mortgagors with an LTI above 4.5 must amortise an additional 1 percent per year.</p> <p>During the COVID-19 pandemic banks were allowed to apply amortisation requirement exemption also for Covid-19 related reasons. The temporary exemption started on April 14, 2020 and ended on August 30, 2021.</p>	
	01.06.2016	<p>Loan amortisation: New mortgages with an LTV above 70% must be amortised by at least 2% of the original loan amount each year. Loans that have an LTV below 70% must be amortised by a minimum of 1% annually until the LTV has reached 50%. For existing mortgages raised before 1 June 2016, additional loans may be paid either in accordance with the basic rule or over a period of ten years.</p> <p>Exemptions from the amortisation requirement will be allowed in certain situations, such as unemployment or sickness. Furthermore, mortgage firms may waive the amortisation requirement for a loan collateralised by a newly produced residential property, although for a maximum of five years.</p>	
	01.10.2010	<p>LTV: LTV of new mortgages should not be more than 85%.</p>	

References

- [1] Muellbauer, J. Real estate booms and busts: implications for monetary and macroprudential policy in Europe, in "2022 ECB Forum on Central Banking: Challenges for monetary policy in a rapidly changing world", proceedings of the 2022 ECB Forum on Central Banking, pp. 142–244. https://www.ecb.europa.eu/pub/conferences/ecbforum/shared/pdf/2022/Muellbauer_paper.pdf
- [2] Causa, O., Pochelmann, J. Should I stay or should I go? Housing and residential mobility across OECD countries?, *Economics Department Working Papers*, No. 1626, 2020, pp. 1–71. [https://one.oecd.org/document/ECO/WKP\(2020\)34/En/pdf](https://one.oecd.org/document/ECO/WKP(2020)34/En/pdf)
- [3] Muellbauer, J. Why we need a green land value tax and how to design it, paper presented at the workshop: “Local housing inequity and its implications for the role of government”, OECD Network on Fiscal Relations, 28 November 2022, Paris. Available on the OECD website, 2023. <https://www.oecd-ilibrary.org/sites/d7681f43-en/index.html?itemId=/content/component/d7681f43-en>
- [4] Aikman, D., Bridges, J., Hacıoglu Hoke, S., O’Neill, C., Raja, A. Credit, Capital and Crises: A GDP-at-Risk Approach, *Bank of England Working Paper*, No. 824, September 2019, pp. 1–64. <https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2019/credit-capital-and-crises-a-gdp-at-risk-approach.pdf>
- [5] Arbatli-Saxegaard, E., Gerdrup, K., Johansen, R. Financial Imbalances and Medium-Term Growth-at-Risk in Norway, *Norges Bank Staff Memo*, No. 5, 2020, pp. 1–56. https://www.norges-bank.no/contentassets/26a09adf56ad4f528ef1e58b526096f0/sm_2020_05.pdf?v=04162020133012
- [6] Araujo, J., Patnam, M., Popescu, A., Valencia, F., Yao, W. Effects of Macroprudential Policy: Evidence from over 6,000 Estimates, *International Monetary Fund Working Paper*, 20/67, 2020, pp. 1–53. <https://www.imf.org/en/Publications/WP/Issues/2020/05/22/Effects-of-Macroprudential-Policy-Evidence-from-Over-6-000-Estimates-49440>
- [7] Aron, J., Duca, J., Muellbauer, J., Murphy, A., Murata, K. Credit, Housing Collateral and Consumption, Evidence from the U.K., Japan and the U.S. *Review of Income and Wealth*, Volume 58, Issue 3, September 2012, pp. 397–423. <https://doi.org/10.1111/j.1475-4991.2011.00466.x>
- [8] Aron, J., Muellbauer, J., Modelling and Forecasting Mortgage Delinquency and Foreclosure in the UK, *Journal of Urban Economics*, Volume 94, July 2016, pp. 32–53. <https://doi.org/10.1016/j.jue.2016.03.005>
- [9] Aron, J., Muellbauer, J. Modelling and Forecasting Mortgage Delinquency and Foreclosure in the UK, CEPR: VoxEU, 1 Aug 2016. <https://cepr.org/voxeu/columns/modelling-and-forecasting-mortgage-delinquency-and-foreclosure-uk>
- [10] Biljanovska, N., Chen, S., Gelos, G., Igan, D., Martinez Peria, M., Nier, E., Valencia, F. Macroprudential Policy Effects: Evidence and Open Questions, *IMF Departmental Paper*, Volume 2023, Issue 002, 2023, pp. 1–42. <https://www.elibrary.imf.org/downloadpdf/journals/087/2023/002/article-A001-en.xml>
- [11] Muellbauer, J., Soskice, D. The Thatcher Legacy: Lessons for the future of the UK economy. Resolution Foundation, *The Navigating Economic Change Essays*, 2022, pp. 1–29. <https://economy2030.resolutionfoundation.org/reports/the-thatcher-legacy/>

- [12] CGFS, 2023. Macroprudential Policies to Mitigate Housing Market Risks, *CGFS Paper*, No. 69, Report prepared by a CGFS Study Group chaired by E. Assouan (Banque de France). <https://www.bis.org/publ/cgfs69.htm>
- [13] Cloyne, J., Ferreira, C., Surico, P. Monetary Policy when Households have Debt: New Evidence on the Transmission Mechanism, *Bank of England Staff Working Paper*, No. 589, April 2016, pp. 1–69. <https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/monetary-policy-when-households-have-debt-new-evidence-on-the-transmission-mechanism.pdf>
- [14] Di Maggio, M., Kermani, A., Keys, B. J., Piskorski, T., Ramcharan, R., Seru, A. Interest Rate Pass through: Mortgage Rates, Household Consumption, and Voluntary Deleveraging, *American Economic Review*, Volume 107, No. 11, November 2017, pp. 3550–88. <https://www.aeaweb.org/articles?id=10.1257/aer.20141313>
- [15] Duca, J., Muellbauer, J., Murphy, A. What Drives House Price Cycles? International Experience and Policy Issues, *Journal of Economic Literature*, American Economic Association, Volume 59, No 3, September 2021, pp. 773–864. <https://www.aeaweb.org/articles?id=10.1257/jel.20201325>
- [16] Duprey, T., Ueberfeldt, A. Managing GDP Tail Risk. *Bank of Canada Staff Working Paper*, No. 20-3, 2020. <https://www.bankofcanada.ca/2020/01/staff-working-paper-2020-3/>
- [17] European Systemic Risk Board, Features of a Macroprudential Stance: Initial Considerations, ESRB Report, April 2019. https://www.esrb.europa.eu/pub/pdf/reports/esrb_report190408_features_macroprudential_stance_initial_considerations~f9cc4c05f4.en.pdf
- [18] Franta, M., Gambacorta, L. On the Effects of Macroprudential Policies on Growth-at-Risk, *Economics Letters*, Volume 196, November 2020, 109501. <https://doi.org/10.1016/j.econlet.2020.109501>
- [19] Galán, J. E. The Benefits Are at the Tail: Uncovering the Impact of Macroprudential Policy on Growth-at-Risk, *Journal of Financial Stability*, November 2020, 100831. <https://doi.org/10.1016/j.jfs.2020.100831>
- [20] Jackman, R., Sutton, J. Imperfect Capital Markets and the Monetarist Black Box: Liquidity Constraints, Inflation and the Asymmetric Effects of Interest Rate Policy, *The Economic Journal*, 92, 1982, pp. 108–28. <https://www.jstor.org/stable/2232259>
- [21] La Cava, G., Hughson, H., Kaplan, G. The Household Cash Flow Channel of Monetary Policy, *Policy Research Discussion Paper*, No. 2016-12, 2016, Reserve Bank of Australia, pp. 1–36 <https://rba.gov.au/publications/rdp/2016/pdf/rdp2016-12.pdf>
- [22] Li, J., van Santen, P., Zhang, X. Home equity extraction activities in Sweden, Staff memo, Riksbank, 2020. <https://www.riksbank.se/globalassets/media/rapporter/staff-memo/svenska/2020/home-equity-extraction-activities-in-sweden.pdf>
- [23] Suarez, J. Growth-at-Risk and Macroprudential Policy Design, *Journal of Financial Stability*, Volume 60, June 2022, 101008. <https://doi.org/10.1016/j.jfs.2022.101008>
- [24] Garriga, C., Hedlund, A. Mortgage Debt, Consumption, and Illiquid Housing Markets in the Great Recession, *American Economic Review*, 110 (6), 2020, pp. 1603–34. <https://www.aeaweb.org/articles?id=10.1257/aer.20170772>

- [25] Idier, J. Borrower-based measures: The french experience, in: An EU Legal Framework for Macroprudential Supervision through Borrower-Based Measures, *Conference Papers Banca d'Italia*, No. 94, 23 September 2022, pp. 19–24. https://www.bancaditalia.it/pubblicazioni/quaderni-giuridici/2023-0094/qrg-94.pdf?language_id=1
- [26] Quint, D., Rabanal, P. Monetary and Macroprudential Policy in an Estimated DSGE Model of the Euro Area. *International Journal of Central Banking*, Issue 35, **2014**, pp. 169–236. (<https://www.ijcb.org/journal/ijcb14q2a8.htm>)
- [27] Rubio, M., Carasco-Gallego, J. Macroprudential and monetary policies: Implications for financial stability and welfare, *Journal of Banking & Finance*, Vol. 49, December **2014**, pp. 326–336. (<https://doi.org/10.1016/j.jbankfin.2014.02.012>) (<https://www.sciencedirect.com/science/article/abs/pii/S0378426614000740>)
- [28] Ozkan, F., Unsal, D.F. On the Use of Monetary and Macroprudential Policies for Small Open Economies. *IMF Working Paper*, **2014**, WP/14/112, pp. 1–34. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/On-the-use-of-Monetary-and-Macroprudential-Policies-for-Small-Open-Economies-41673>
- [29] Rubio, M., Unsal, F. Macroprudential Policy, Incomplete Information and Inequality: The Case of Low-Income and Developing Countries. *IMF Working Paper*, **2017**, WP 17/59, pp. 1–36. (<https://www.imf.org/en/Publications/WP/Issues/2017/03/21/Macroprudential-Policy-Incomplete-Information-and-Inequality-The-case-of-Low-Income-and-44752>)
- [30] Punzi, M., Rabitsch, K. Effectiveness of macroprudential policies under borrower heterogeneity. *Journal of International Money and Finance*, vol. 85, issue C, July 2018, pp. 251–261. [doi:10.1016/j.jimonfin.2017.11.008](https://doi.org/10.1016/j.jimonfin.2017.11.008), <https://www.sciencedirect.com/science/article/abs/pii/S0261560617302310>
- [31] Clerc, L., Derviz, A., Mendicino, C., Moyen, S., Nikolov, K., Stracca, L., Suarez, J., Vardoulakis, A. Capital Regulation in the Model with Three Layers of Default *International Journal of Central Banking*, Issue 40, **2015**, pp. 9–61. <https://www.ijcb.org/journal/ijcb15q3a1.htm>
- [32] Mendicino, C.; Nikolov, K.; Suarez, J.; Supera, D. Optimal Dynamic Capital Requirements *Journal of Money, Credit and Banking*, Vol. 50, Issue 6, **2018**, pp. 1271–1297. <https://doi.org/10.1111/jmcb.12490>.
- [33] Balfoussia, H., Dellas, H., Papageorgiou, D. Loan-to-value ratio limits: an exploration for Greece, *Bank of Greece Working Paper*, No. 248, **2018**, pp. 3–50. <https://dx.doi.org/10.2139/ssrn.4196641>
- [34] Chen, J. Columba, F. Macroprudential and Monetary Policy Interactions in a DSGE Model for Sweden. *International Monetary Fund Working Paper*, WP/16/74, March **2016**, pp. 2–58. <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Macroprudential-and-Monetary-Policy-Interactions-in-a-DSGE-Model-for-Sweden-43825>
- [35] Poutineau, J.-Ch., Vermandel, G. A Welfare Analysis of Macroprudential Policy Rules in the Euro Area, *Revue d'économie politique*, Vol. 127, No. 2, **2017**, pp. 191–226. <https://www.jstor.org/stable/26596154>
- [36] Jurča, P., Klacso, J., Tereanu, E., Forletta, M., Gross, M. The Effectiveness of Borrower-Based Macroprudential Measures: A Quantitative Analysis for Slovakia, *International Monetary Fund Working Paper*, WP/20/134, **2020**, pp. 2–37. <https://doi.org/10.5089/9781513550503.001>

- [37] Żoch, P., Macroprudential and monetary policy rules in a model with collateral constraints, *The Polish Journal of Economics*, 302(2), 2020, pp. 43–69. <https://doi.org/10.33119/GN/120623>
- [38] Hinterschweiger, M., Khairnar, K., Ozden, T., Stratton, T. Macroprudential policy interactions in a sectoral DSGE model with staggered interest rates. *Bank of England Working Papers*, No. 904, January 2021, pp. 1–62. <https://www.bankofengland.co.uk/working-paper/2021/macprudential-policy-interactions-in-a-sectoral-dsge-model-with-staggered-interest-rates>
- [39] Kiyotaki, N., Moore, J. Credit Cycles. *Journal of Political Economy*, Volume 105, Issue 2, April 1997, pp. 211–248. <https://www.journals.uchicago.edu/doi/10.1086/262072>
- [40] Iacoviello, M. House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle *American Economic Review*, Volume 95, No. 3, 2005, pp. 739–764. <https://www.aeaweb.org/articles?id=10.1257/0002828054201477>
- [41] Lambertini, L., Mendicino, C., Punzi, M.T. Leaning against boom-bust cycles in credit and housing prices *Journal of Economic Dynamics and Control*, Volume 37, Issue 8, August 2013, pp. 1500–1522. <https://doi.org/10.1016/j.jedc.2013.03.008>.
- [42] Falagiarda, M., Saia, A. Credit, Endogenous Collateral and Risky Assets: A DSGE Model *International Review of Economics & Finance*, Volume 49, pp. 125–148. <https://doi.org/10.1016/j.iref.2017.01.025>.
- [43] Jensen, H., Ravn, S.H., Santoro, E. Changing credit limits, changing business cycles *European Economic Review*, Volume 102, February 2018, pp. 211–239. <https://doi.org/10.1016/j.eurocorev.2017.12.008>
- [44] Bluwstein, K., Brzoza-Brzezina, M., Gelain, P., Kolasa, M. Multiperiod Loans, Occasionally Binding Constraints, and Monetary Policy: A Quantitative Evaluation *Journal of Money, Credit and Banking*, Volume 52, Issue 7, 2020, pp. 1691–1718. <https://doi.org/10.1111/jmcb.12689>
- [45] Gelain, P., Lansing, K., Mendicino, C. House Prices, Credit Growth, and Excess Volatility: Implications for Monetary and Macroprudential Policy *International Journal of Central Banking*, Volume 9, Issue 2, 2013, pp. 219–276. <https://ideas.repec.org/a/ijc/ijcjou/y2013q2a11.html>
- [46] De Paoli, B., Paustian, M. Coordinating monetary and macroprudential policies *Journal of Money, Credit and Banking*, Volume 49, No. 2/3, 2017, pp. 319–349. <https://www.jstor.org/stable/26449315>
- [47] Kaplan, G., Moll, B., Violante, G.L. Monetary Policy According to HANK *American Economic Review*, Volume 108, No.3, 2018, pp. 697–743. <https://www.aeaweb.org/articles?id=10.1257/aer.20160042>
- [48] Alves, F., Kaplan, G., Moll, B., Violante, G. A Further Look at the Propagation of Monetary Policy Shocks in HANK *Journal of Money, Credit and Banking*, Volume 52, Issue 52, 2020, pp. 521–559. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/jmcb.12761>
- [49] Carpentier, J-F., Olivera, J., Van Kerm, P. Macroprudential policy and household wealth inequality *Journal of International Money and Finance*, Volume 85, July 2018, pp. 262–277. <https://doi.org/10.1016/j.jimonfin.2017.11.009>
- [50] Gross, M., Población, J. (2017). Assessing the efficacy of borrower-based macroprudential policy using an integrated micro-macro model for European households. *Economic Modelling*, Volume 61, 2017, pp. 510–528 <https://doi.org/10.1016/j.econmod.2016.12.029>

- [51] MACROPRU: Investigating new policies for financial stability that do not create inequality <https://cordis.europa.eu/project/id/101023445>
- [52] Geanakoplos, J., Axtell, R., Farmer, J.D., Howitt, P., Conlee, B., Goldstein, J., Hendrey, M., Palmer, N., Yang, Ch-Y. Getting at Systemic Risk via an Agent-Based Model of the Housing Market, *American Economic Review*, Volume 102, No. 3, May **2012**, pp. 53–58. <https://www.aeaweb.org/articles?id=10.1257/aer.102.3.53>
- [53] Axtell, R., Farmer, D., Geanakoplos, J., Howitt, P., Carrella, E., Conlee, B., Hendrey, M., Kalikman, P., Masad, D., Palmer, N., Yang, Ch-Y.. An agent-based model of the housing market bubble in metropolitan Washington, DC. **2014**, pp. 1–27. In: Whitepaper for Deutsche Bundesbank’s Spring Conference on "Housing markets and the macroeconomy: Challenges for monetary policy and financial stability". <https://www.bundesbank.de/resource/blob/636130/f457c5401aa4f559c9808c07c29c34fb/mL/2014-06-04-eltville-08-agent-based-model-of-housing-market-bubble-presentation-data.pdf>
- [54] Baptista, R., Farmer J.D., Hinterschweiger, M., Low, K., Tang, D., Uluc, A. Macroprudential policy in an agent-based model of the UK housing market. *Bank of England Staff Working Paper*, No. 619, October **2016**. <https://www.bankofengland.co.uk/working-paper/2016/macprudential-policy-in-an-agent-based-model-of-the-uk-housing-market>
- [55] Carro, A., Taming the housing roller coaster: The impact of macroprudential policy on the house price cycle. *Journal of Economic Dynamics and Control*, Volume 156, November **2023**, 104753. <https://doi.org/10.1016/j.jedc.2023.104753>
- [56] Carro, Adrian, Could Spain be Less Different? Exploring the Effects of Macroprudential Policy on the House Price Cycle. *Banco de España Working Paper*, No. 2230, **2022**, pp. 7–48. <https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSerias/DocumentosTrabajo/22/Files/dt2230e.pdf>
- [57] Cokayne, G. The Effects of Macroprudential Policies on House Price Cycles in an Agent-based Model of the Danish Housing Market, *Danmarks Nationalbank Working Paper*, No. 138, May **2019**, pp. 1–33. <https://www.nationalbanken.dk/media/dafdshbq/working-paper-number-138.pdf>
- [58] Catapano, G., Franceschi, F., Loberto, M., Michelangeli, V., Macroprudential Policy Analysis via an Agent Based Model of the Real Estate Sector, *Bank of Italy Working Paper*, No. 1338, June **2020**. https://www.bancaditalia.it/pubblicazioni/temi-discussione/2021/2021-1338/en_tema_1338.pdf?language_id=1
- [59] Yun, T-B., Moon, I-Ch. Housing Market Agent-Based Simulation with Loan-To-Value and Debt-To-Income. *Journal of Artificial Societies and Social Simulation*, 23 (4) 5, **2020**, pp. NA. <https://www.jasss.org/23/4/5.html>
- [60] Laliotis, D., Buesa, A., Leber, M., Población, J. An agent-based model for the assessment of LTV caps, *Quantitative Finance*, Volume 20, Issue 10, **2020**, pp. 1721–1748. <https://doi.org/10.1080/14697688.2020.1733058>
- [61] Guerrero, O. (2020). Decentralized markets and the emergence of housing wealth inequality, *Computers, Environment and Urban Systems*, Volume 84, p. 101541. <https://doi.org/10.1016/j.compenvurbsys.2020.101541>

- [62] Tarne, R., Bezemer D., Theobald, T. The effect of borrower-specific loan-to-value policies on household debt, wealth inequality and consumption volatility: An agent-based analysis, *Journal of Economics Dynamics and Control*, Volume 144, November **2022**, p. 104526. <https://doi.org/10.1016/j.jedc.2022.104526>
- [63] Mérő, B., Borsos, A., Hosszú, Z., Oláh, Z., Vágó, N., Analysing Construction Cost Shocks with a High-Resolution Housing Market Agent-Based Model, *Journal of Economic Dynamics and Control*, Volume 155, October **2023**, p. 104738. <https://doi.org/10.1016/j.jedc.2023.104738>
- [64] Hosszu, Z., Borsosa, A., Mero, B., Olah, Z., Vago, N. The More the Merrier? – The Optimal Choice of Scaling in Economic Agent-Based Models, Work in progress.
- [65] Gross, M., Hilberg, B., van der Hoog, S., Kohlweyer, D. The Eurace@IMF+ECB Model, forthcoming. [The main characteristics can be found in Gross, M. The Eurace 2.0 Model. Monetary and Capital Markets Department, IMF Presentation]. http://www.cbr.ru/content/document/file/54437/session%20%20-%20imf%20-%20mgross_moscow.pdf
- [66] Kaszowska-Mojša, J., Włodarczyk, P., Santos, J.L., Farmer, D. The effects of macroprudential policies on inequality, *Intitute for New Economic Thinking Working Paper*, University of Oxford, forthcoming.
- [67] Kaszowska-Mojša, J., Pipień, M. Macroprudential Policy in a Heterogeneous Environment—An Application of Agent-Based Approach in Systemic Risk Modelling, *Entropy*, **22**, **2020**, p. 129. <https://doi.org/10.3390/e22020129>
- [68] Kaszowska-Mojša, J., Santos, J.L., Bydlon, S., Gleiser, I., Farmer, D. Cloud-Powered Insights: Unveiling the Effects of Macroprudential Policy in a Small Open Economy, *Entrepreneurial Business Economic Review*, forthcoming.
- [69] Kaszowska-Mojša, J., Bydlon, S., Gleiser, I., Farmer, D. How Agent-Based Models powered by High-Performance Computing is Enabling Large Scale Economic Simulations, Amazon Web Services High Performance Computing Blog entry to be released at the AWS website in 2024.
- [70] Gleiser, I. Rigor and flexibility: the benefits of agent-based computational economics, Amazon Web Services High Performance Computing Blog entry published on 7 January 2023 <https://aws.amazon.com/blogs/hpc/rigor-and-flexibility-the-benefits-of-agent-based-computational-economics/>.
- [71] D’Orazio, P. Income inequality, consumer debt, and prudential regulation: An agent-based approach to study the emergence of crises and financial instability, *Economic Modelling*, Volume 82, **2019**, pp. 308–331. <https://doi.org/10.1016/j.econmod.2019.01.015>
- [72] Popoyan, L., Napoletano, M., Roventini, A. Taming macroeconomic instability: Monetary and macro-prudential policy interactions in an agent-based model, *Journal of Economic Behavior & Organization*, Volume 134, February **2017**, pp. 117–140 <https://doi.org/10.1016/j.jebo.2016.12.017>
- [73] Alexandre da Silva, M., Lima, G. Combining Monetary Policy And Prudential Regulation: An Agent-Based Modeling Approach, *Journal of Economic Interaction and Coordination*, Volume 15, **2020**, pp. 385–411. <https://link.springer.com/article/10.1007/s11403-017-0209-0>
- [74] Poledna, S., Miess, G., Hommes, C. Economic Forecasting with an Agent-Based Model, SSRN, February **2020**, pp. 1–49. <http://dx.doi.org/10.2139/ssrn.3484768>

- [75] Poledna, S., Miess, G., Hommes, C., Rabitsch, K. Economic Forecasting with an Agent-Based Model, *European Economic Review*, Volume 151, January **2023**, p. 104306. <https://doi.org/10.1016/j.euroecorev.2022.104306>
- [76] Hommes, C., He, M., Poledna, S., Siqueira, M., Zhang, Y. CANVAS: A Canadian Behavioral Agent-Based Model, *Bank of Canada Staff Working Paper*, No. 2022-51, **2022**, pp. 1–50. <https://www.bankofcanada.ca/2022/12/staff-working-paper-2022-51/>
- [77] Grazzini, J., Hommes, C., Poledna, S., Zhang, Y. Understanding Post-Pandemic Inflation Dynamics with a Behavioral Macroeconomic Model of the Canadian Economy, SSRN, **2023**, pp. 1–12. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4381235
- [78] Gill, A., Lalith, M., Poledna, S., Hori, M., Fujita, K., Ichimura, T. High-Performance Computing Implementations of Agent-Based Economic Models for Realizing 1:1 Scale Simulations of Large Economies, *IEEE Transactions on Parallel and Distributed Systems*, Volume 32, Issue: 8, August **2021**. <https://ieeexplore.ieee.org/document/9359510>
- [79] Deissenberg, C., Van Der Hoog, S., Dawid, H. Eurace: A massively parallel agent-based model of the European economy, *Applied Mathematics and Computation*, Volume 204, Issue 2, October **2008**, pp. 541–552. <https://doi.org/10.1016/j.amc.2008.05.116>
- [80] Farmer, J., Foley, D. The economy needs agent-based modelling, *Nature*, 460, **2009**, pp. 685–686. <https://doi.org/10.1038/460685a>
- [81] Farmer, D., Dyer, J., Cannon, P., Schmon, S. Calibrating Agent-based Models to Microdata with Graph Neural Networks, *Institute for New Economic Thinking at the Oxford Martin School Working Paper*, University of Oxford, No. 2022-30, bf 2022, pp/ 1-8. <https://ideas.repec.org/p/amz/wpaper/2022-30.html>
- [82] Axtell, R. 120 Million Agents Self-Organize into 6 Million Firms: A Model of the U.S. Private Sector, *AAMAS '16: Proceedings of the 2016 International Conference on Autonomous Agents & Multiagent Systems*, **2016**, pp. 806–816. <https://cmep.r.gmu.edu/wp-content/uploads/2017/09/Axtell-AAMAS-p806.pdf>
- [83] Park, S., Kim, Y-H. The impact of macroprudential policy on inequality and implications for inclusive financial stability *Journal of Banking & Finance*, Volume 146, January **2023**, 106716. <https://doi.org/10.1016/j.jbankfin.2022.106716>
- [84] Frost, J., van Stralen, R. Macroprudential policy and income inequality *Journal of International Money and Finance*, Volume 85, **2018**, pp. 278–290. <https://doi.org/10.1016/j.jimonfin.2017.11.010>
- [85] Georgescu, O-M., Vila Martin, D. Do macroprudential measures increase inequality? Evidence from the euro area household survey. *ECB Working Paper Series*, No. 2567, **2021**, pp. 1–47. <http://dx.doi.org/10.2139/ssrn.3870018>
- [86] Konstantinou, P.; Rizos, A.; Stratopoulou, A. Macroprudential policies and income inequality in former transition economies *Economic Change and Restructuring*, 55, **2022**, pp. 1005–1062. <https://link.springer.com/article/10.1007/s10644-021-09333-9>
- [87] Cussen, M., O'Brien, M., Onorante, L., O'Reilly, G., Assessing the impact of macroprudential measures, *Economic Letters* Volume 2015, No 3, **2015**, pp. 2–10. <https://www.centralbank.ie/docs/default-source/publications/economic-letters/economic-letters---vol-2015-no-3.pdf>

- [88] Kelly, R., O'Malley, T., O'Toole, C. Designing Macro-prudential Policy in Mortgage Lending: Do First Time Buyers Default Less?, *Research Technical Papers*, 02/RT/15, Central Bank of Ireland, **2015**, pp. 2–35. <https://centralbank.ie/docs/default-source/publications/research-technical-papers/research-technical-paper-02rt15.pdf?sfvrsn=8>
- [89] Lyndon, R., McCarthy, Y. What Lies Beneath? Understanding Recent Trends in Irish Mortgage Arrears. *The Economic and Social Review*, Volume 44, No. 1, **2013**, pp. 117–150. <https://www.esr.ie/article/view/66>
- [90] Hallissey, N., Kelly, R., O'Malley, T. Macro-prudential Tools and Credit Risk of Property Lending at Irish banks. *Economic Letter Series*, Volume 2014, No. 10, **2014**, pp. 2–8. <https://www.centralbank.ie/docs/default-source/publications/economic-letters/economic-letter---vol-2014-no-10.pdf>
- [91] Price, G. How has the LVR restriction affected the housing market: a counterfactual analysis?, *Reserve Bank of New Zealand Analytical Note*, AN2014/03, May **2014**, pp. 1–19. https://www.nzae.org.nz/wp-content/uploads/2015/01/an2014_03-_SMALL.pdf
- [92] Bloor, C., McDonald, C. Estimating the Impacts of Restrictions on High LVR Lending, *Reserve Bank of New Zealand Analytical Note*, No. AN2013/05, October **2013**, pp. 1–17. <https://www.rbnz.govt.nz/-/media/project/sites/rbnz/files/publications/analytical-notes/2013/an2013-05.pdf>
- [93] Igan, D., Kang, H. Do Loan-to-Value and Debt-to-Income Limits Work? Evidence from Korea, *International Monetary Fund Working Paper*, No. WP/11/297, **2011**, pp. 3–34. <https://www.imf.org/external/pubs/ft/wp/2011/wp11297.pdf>
- [94] Michelangeli, V., Pietrunti, M., A Microsimulation Model to Evaluate Italian Households' Financial Vulnerability, *International Journal of Microsimulation*, Volume 7, Issue 3; pp. 53–79. <https://www.microsimulation.pub/articles/00107>
- [95] Cerutti, E., Correa, R., Fiorentino, E., Segalla, E., Changes in Prudential Policy Instruments—A New Cross-Country Database. *International Journal of Central Banking*, Vol 13, S1, March **2017**, pp. 477–503. <https://www.ijcb.org/journal/ijcb17q1a17.htm>
- [96] Reichenbachas, T. Assessing the impact of macroprudential measures: The case of the LTV limit in Lithuania, *Lietuvos Bankas Working Papers Series*, No. 80/2020, **2020**, pp. 1–29. <https://www.lb.lt/en/publications/assessing-the-impact-of-macroprudential-measures-the-case-of-the-ltv-limit-in-lithuania>
- [97] Arregui, N., Benes, J., Krznar, I., Mitra, S., Santos, A. Evaluating the Net Benefits of Macroprudential Policy: A Cookbook. *International Monetary Fund Working Papers*, Volume 2013, Issue 167, pp. 1–73. https://www.imf.org/-/media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2013/_wp13167.ashx
- [98] Cesnak, M., Klacso, J., Vasil, R. Analysis of the Impact of Borrower-Based Measures, *National Bank of Slovakia Occasional Papers*, No. 3/2021, **2021**, pp. 4–65. https://www.nbs.sk/_img/documents/publik/op_3_2021_cesnak_klacso_vasil_analysis_of_the_impact_of_borrower-based_measures.pdf
- [99] ESRB, Macroprudential measures, 2023. https://www.esrb.europa.eu/national_policy/shared/pdf/esrb.measures_overview_macroprudential_measures.xlsx

- [100] ESRB, Other measures, 2023. https://www.esrb.europa.eu/national_policy/other/html/index.en.html
- [101] Unfair terms in Swiss franc loans. Overview of European Court of Justice case law. European Parliament 2021. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689361/EPRS_BRI\(2021\)689361_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689361/EPRS_BRI(2021)689361_EN.pdf)
- [102] Brzoza-Brzezina, M., Kolasa, M., Makarski, K. Monetary and macroprudential policy with foreign currency loans, *National Bank of Poland Working Papers*, No. 184, 2014, pp. 1–32. <https://ideas.repec.org/p/nbp/nbpmis/184.html>
- [103] Tzur-Ilan, N. The Real Consequences of LTV Limits on Housing Choices, *Review of Financial Studies*, forthcoming, pp. 1–65. <http://dx.doi.org/10.2139/ssrn.2927783>.
- [104] Kabas, G., Roszbach, K., The Price of Leverage: Learning from the Effect of LTV Constraints on Job Search and Wages, *Norges Bank Working Paper*, 21/14, 2023, pp. 1–62. <https://www.suomenpankki.fi/globalassets/en/financial-stability/events/sra-2023/papers/kasper-roszbach---the-price-of-leverage---learning-from-the-effect-of-ltv-constraints-on-job-search-and-wages.pdf>
- [105] Aastveit, K., Juelsrud, R., Wold, E., Mortgage Regulation and Financial Vulnerability at the Household Level. *Norges Bank Working Paper*, No. 6/20, 2020, pp. 1–48. <http://dx.doi.org/10.2139/ssrn.3640636>
- [106] Chwiedosik, K., Karaszewska Z., Urbańska, K. Nasza walka o sprawiedliwość. Uwolnieni od banków. Centrum Prawa Finansowego i Ekonomii, 2023, pp. 1–350. <https://www.empik.com/nasza-walka-o-sprawiedliwosc-uwolnieni-od-bankow-chwiedosik-kamil-karaszewska-zofia-katarzyna-urbanska,p1353349987,ksiazka-p>
- [107] Szymański, K. Jak bezpieczny kredyt 2% wpłynął na rynek nieruchomości?, 10.10.2023. <https://direct.money.pl/artykuly/porady/jak-bezpieczny-kredyt-wplynal-na-rynek-nieruchomosci>
- [108] Makarski, K., Serwa, D. Macroprudential policy in Poland: modifying the model with three layers of default. SUERF Presentation 2019. https://www.suerf.org/docx/1_8c19f571e251e61cb8dd3612f26d5ecf_19531_suerf.pdf
- [109] CRR/CRD IV. <https://www.europex.org/eulegislation/crd-iv-and-crr/>
- [110] Serwa, D., Wdowiński, P. Macro-financial linkages in the Polish economy: combined impulse-response functions in SVAR models, *NBP Working Papers*, No. 246, 2016, pp. 1–47. https://static.nbp.pl/publikacje/materialy-i-studia/246_en.pdf
- [111] Pipień, M., Wdowiński, P., Kaszowska, J. Identyfikacja cech cyklu finansowego i analiza jego synchronizacji z cyklem koniunkturalnym, *Materiały i Studia*, No. 332, 2016, pp. 1–69. <https://static.nbp.pl/publikacje/materialy-i-studia/ms332.pdf>
- [112] Kaszowska-Mojša, J., Pipień, M. Macroprudential Policy in a Heterogeneous Environment—An Application of Agent-Based Approach in Systemic Risk Modelling, *Entropy*, 22, 2020, 129. <https://doi.org/10.3390/e22020129>
- [113] Chauvin, V., Muellbauer, J. Consumption, household portfolios and the housing market in France, *Economics and Statistics*, vol. 58, 2018, pp. 157–178. https://www.persee.fr/doc/estat_0336-1454_2018_num_500_1_10840

- [114] Duca, J., Muellbauer, J., Murphy, A. How Mortgage Finance Reform Could Affect Housing, *American Economic Review*, Volume 106, No. 5, **2016**, pp. 620–624. <https://www.aeaweb.org/articles?id=10.1257/aer.p20161083>
- [115] Svensson, L. Are Swedish House Prices Too High? Why the Price-To-Income Ratio is a Misleading Indicator, *NBER Working Paper Series*, No. 31862, **2023**, pp. 1–65. <http://www.nber.org/papers/w31862> and latest version in <https://larseosvensson.se/files/papers/are-swedish-house-prices-too-high.pdf>
- [116] Lindner, P., Albacete, N., Simulating impacts of borrower based macroprudential policies on mortgages and the real estate sector in Austria – evidence from the Household Finance and Consumption Survey 2014, Paper prepared for the IFC-National Bank of Belgium Workshop on "Data needs and Statistics compilation for macroprudential analysis", Brussels, Belgium, 18-19 May 2017 <https://www.bis.org/ifc/publ/ifcb46i.pdf>
- [117] Dirma, M., Karmelavičius, J. Micro-Assessment of Macroprudential Borrower-Based Measures in Lithuania, *IMF Working Paper*, WP/23/227, October **2023**. <https://www.imf.org/-/media/Files/Publications/WP/2023/English/wpiea2023227-print-pdf.ashx>
- [118] Popa, R., Ichim, S., Neagu, F. Asymmetric Effects of Borrower-Based Measures on Household Access to Finance and Default, Paper prepared for the Conference on Central Banks, Financial Markets, and Inequality, Bank of Italy, March 29 – April 1, 2023.
- [119] Leal, A., Lima, D. Macroprudential policies in Portugal: Evidence with Borrower-Based Measures, *Revista de Estabilidade Financiera*, No. 35, **2018**. https://www.bde.es/f/webbde/GAP/Secciones/Publicaciones/InformesBoletinesRevistas/RevistaEstabilidadFinanciera/18/NOVIEMBRE/Macroprudential_policy_espanol.pdf
- [120] Félix, S., Abreu, D., Oliveira, V., Silva, F. The impact of a macroprudential borrower based measure on households' leverage and housing choices, *Working Papers*, No. 202116, Banco de Portugal, Economics and Research Department, **2021**, pp. 1–27. <https://ideas.repec.org/p/ptu/wpaper/w202116.html>