

# Effects of interest rate and inflation shocks on household vulnerability in Austria: a microsimulation using HFCS data

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*Motivated by the recent rise in interest rates and high inflation in the euro area, we test households' resilience against these shocks by performing microsimulations to investigate the impact of these shocks on household vulnerability and on debt at risk. We identify financially vulnerable households in Austria using several vulnerability measures common in the literature and household-level data from the latest wave of the Household Finance and Consumption Survey (HFCS). We find that the inflation shock has a stronger impact on the share of vulnerable households than the interest rate shock. However, the interest rate shock has a stronger impact on debt at risk than the inflation shock: the debt of households becoming vulnerable after the former (typically mortgage debt) tends to be larger than the debt held by households becoming vulnerable after the inflation shock (typically nonmortgage debt). Compared to the euro area, the departing levels of household vulnerability and debt at risk are much lower in Austria. The impact of a combined scenario is similar in both regions.*

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Recent economic developments have been posing great challenges to households in the euro area. Rising gas and energy as well as food prices are putting households under pressure to make ends meet. To tackle the high inflation rates across the euro area the ECB has raised the monetary policy rate three times – by 50 basis points on July 21, 2022, by another 75 basis points on September 8, 2022, and by another 75 basis points on October 27, 2022 (ECB, 2022). This has given rise to the concern that households may face difficulties in servicing their debt. Given these recent inflation and interest rate shocks, it has become increasingly important for macroeconomic and borrower-based macroprudential policymaking to take into account the effects of macroeconomic shocks on household financial vulnerability and the share of debt held by financially vulnerable households (debt at risk).

We employ several commonly applied measures to identify potentially financially vulnerable households (see e.g. Albacete and Fessler, 2010; Albacete and Lindner, 2013; Albacete et al., 2014; Ampudia et al., 2016; or Bankowska et al., 2017) using the 2017 wave of the Household Finance and Consumption Survey (HFCS) coordinated by the ECB.<sup>2</sup> For estimating net income we use information from the microsimulation tool EUROMOD (Boone et al., 2019; or Kuypers et al., 2020).

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<sup>2</sup> See Albacete et al. (2018) for a methodological overview.

We simulate macroeconomic shocks, differentiating between an interest rate shock and an inflation shock to uncover their potential consequences for Austria and the euro area. Firstly, we assume the interest rate shock works through an adjustment of households' debt service similar to Albacete et al. (2014). Secondly, we assume the inflation shock works through an increase in households' consumption expenditure. To reflect current developments and uncertainty about inflation and the ECB's interest rate decisions, we use both a milder and a more pronounced scenario. A further refinement of the analysis allows for some discussion on short- and long-run scenarios of the impact of the interest rate and inflation shock (described in detail in section 2.1). We find that increases in inflation have a larger impact on the share of financially vulnerable households both in Austria and the euro area than interest rate shocks. However, debt at risk is more affected by interest rate increases than by inflation shocks.

## 1 Financial vulnerability measures

To identify households that may face difficulties in covering their expenses, we calculate different measures for the financial situation of a household (see tables A2 and A3 for the definitions of the variables used in this study). We include the three standard financial burden indicators: debt service to income (DStI), debt to asset (DtA) and debt to income (DtI).<sup>3</sup> In contrast to related literature (see Albacete et al., 2014; Albacete et al., 2020), we are able to use annual net income derived from EUROMOD instead of gross income to compute the DStI and DtI ratios. We approximate net income from the 2017 wave by employing the relation of net to gross income in each of the 50 income quantiles in every country from the 2014 wave.<sup>4</sup> Like the recent literature, our microsimulation mainly relies on the measure of financial margin (FM), which is defined as the difference between a household's income and expenditure (net income minus annual consumption and debt service).<sup>5</sup> A household is financially vulnerable if the FM is negative. The definition of consumption expenditure includes spending on food and utilities as well as on rent, trips and holidays. These items capture all information available in the HFCS. We consider changes in the price level of food and utilities to have an immediate impact while the effects of changes in prices for rent and holidays may take some time to materialize. Lastly, like Ampudia et al. (2016), we include a measure for subjective distress (SD) based on a question from the HFCS.<sup>6</sup>

Chart 1 shows the share of financially vulnerable households as a percentage of indebted households according to the different measures for Austria and the euro

<sup>3</sup> We define a household as financially vulnerable if  $DStI \geq 0.4$ ,  $DtA \geq 0.75$  and  $DtI \geq 4$ . These thresholds are in line with the abovementioned literature. The first two threshold bear close resemblance to the recently introduced borrower-based macroprudential policy limits in Austria.

<sup>4</sup> The implicit assumption necessary for this estimation is that the overall tax system in the country did not change drastically in this period. For the euro area results, we approximate in this gross-net transformation Malta and the Netherlands with Cyprus and Belgium, respectively, and Lithuania and Latvia both with Estonia as they are not available in 2014.

<sup>5</sup> The financial margin of household  $i$  is defined as  $FM_i = NetInc - (consumption\ expenditure + debt\ service)$ .

<sup>6</sup> This information is based on a question in the HFCS whether the households deemed itself able to meet their expenses or not.

area.<sup>7</sup> This share varies between 2.3% and 15.8% in Austria. For example, 5.2% of indebted Austrian households have a negative FM; this means that these households' annual consumption plus their annual total debt service exceeds their annual net income.<sup>8</sup> Our results indicate that the share of vulnerable households is significantly lower in Austria than in the euro area.

The share of debt held by financially vulnerable households is also of considerable interest for financial stability considerations. Like Albacete et al. (2014), we calculate the debt at risk, i.e. the share of debt held by potentially vulnerable households (table 1). Depending on the financial burden indicator, this share ranges from 3% to 34% in Austria. The table also shows that debt at risk is significantly lower in Austria than in the euro area (except for the subjective vulnerability measure), which points to a relatively high resilience of households in Austria compared to their euro area peers. Socioeconomic information on vulnerable households can be found in the annex (table A1).

## 2 Microsimulations

In this chapter we first describe the simulation scenarios. We then analyze the increase in financially vulnerable households and in debt at risk following various shocks and compare the results for Austria with the euro area.

### 2.1 Simulated scenarios

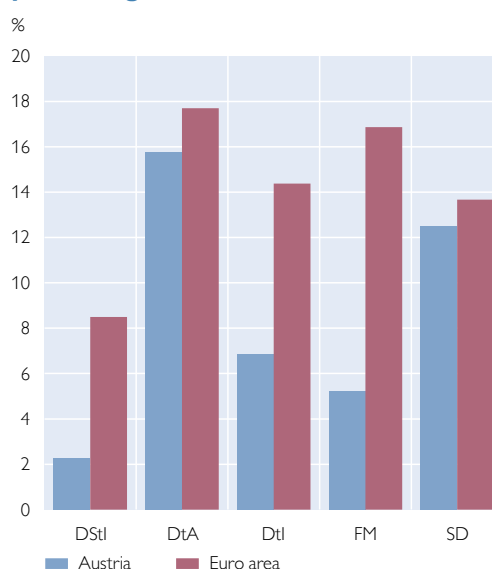
Interest rate shocks affect households' debt service when interest rates increase. We assume a 100% pass-through of the simulated interest rate changes, which is in line with the empirical literature (e.g. Albacete et al., 2014). We opt for two different interest rate increases: a 100 basis point increase representing a milder scenario and a 300 basis point increase for a more pronounced scenario. Further,

<sup>7</sup> In the 2017 wave, the euro area countries in the HFCS include Austria, Belgium, Cyprus, Germany, Estonia, Spain, Finland, France, Greece, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, the Netherlands, Portugal, Slovenia and Slovakia.

<sup>8</sup> If one considers consumption to exclude expenditure on holidays (and rent) this figure is obviously lower (at about 2%).

Chart 1

### Financially vulnerable households as a percentage of indebted households



Source: Eurosystem HFCS 2017, OeNB.

Note: DStI  $\geq 0.4$ , DtA  $\geq 0.75$ , Dtl  $\geq 4$ , FM  $< 0$ , SD = not able to meet expenses.

Table 1

### Debt at risk

	DStI	DtA	Dtl	FM	SD
	% of total household debt				
Austria	9.7	20.3	34.3	3.1	8.2
Euro area	21.5	22.8	45.6	12.0	6.2

Source: Eurosystem HFCS 2017, OeNB.

Note: DStI  $\geq 0.4$ , DtA  $\geq 0.75$ , Dtl  $\geq 4$ , FM  $< 0$ , SD = not able to meet expenses.

Table 2

**Overview of interest rate and inflation shock simulations**

		Baseline	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Interest rate shock	Magnitude	+0 basis points	+100 basis points	+100 basis points	+300 basis points	+300 basis points
	Loans affected	-	Variable rate	Variable and fixed rate	Variable rate	Variable and fixed rate
	For the following measures	DStI, DtA, Dtl, FM, SD	FM	FM	FM	FM
Inflation shock	Magnitude	0%	5%	5%	10%	10%
	Prices affected	-	Food, utilities	Food, utilities, housing rent, trips and holidays	Food, utilities	Food, utilities, housing rent, trips and holidays
	For the following measures	DStI, DtA, Dtl, FM, SD	FM	FM	FM	FM

Source: Authors' calculations.

like Albacete et al. (2014), we distinguish between a shock which is assumed to affect only loans with variable interest rates (denoted as “short-term”) and a shock which affects all loans (denoted as “long-term”). The change in debt service after the interest rate increase affects the FM and hence determines which households are deemed potentially vulnerable. An overview of the baseline and the simulated shock scenarios (1 to 4) is shown in the top panel of table 2.<sup>9</sup>

The inflation shocks trigger an increase of households’ consumption expenditure.<sup>10</sup> To observe the effect of inflation increases in the short term, we simulate a 5% and a 10% increase in prices for food and utilities. Thus, we capture the situation that potential inflation shocks are first transmitted through food and utilities, which is in line with the literature (Gallin and Verbrugge, 2019; Gautier and Le Bihan, 2022; Gautier et al., 2022). Additionally, we simulate a scenario where we also increase housing rents and prices paid for holidays by 5% and 10% (reflecting a longer-term impact). The bottom panel of table 2 gives an overview of the different simulated inflation shock scenarios.

**2.2 Simulation results**

While it is not clear whether the magnitudes of the inflation and interest rate shocks are equivalent within each scenario, the scenarios are comparable in the sense that scenarios 1 and 2 represent a milder assumption on increases in inflation and interest rates, while scenarios 3 and 4 depict more pronounced cases, which imply higher costs for households.

The simulation results reported in chart 2 show some distinct differences in the relative increase in vulnerable households and debt at risk after interest rate shocks and inflation shocks. For Austria, we find that the share of financially vulnerable households after the inflation shock rises from about 5% to above 7%, which is a

<sup>9</sup> The baseline scenario reflects the most recent data available from the third wave of the HFCS in Austria with a reference period of 2017 for households’ balance sheet information. Acknowledging the limitation of the time lag of the HFCS and 2022, we need to assume that the structure of household vulnerability in Austria did not change significantly in the last years.

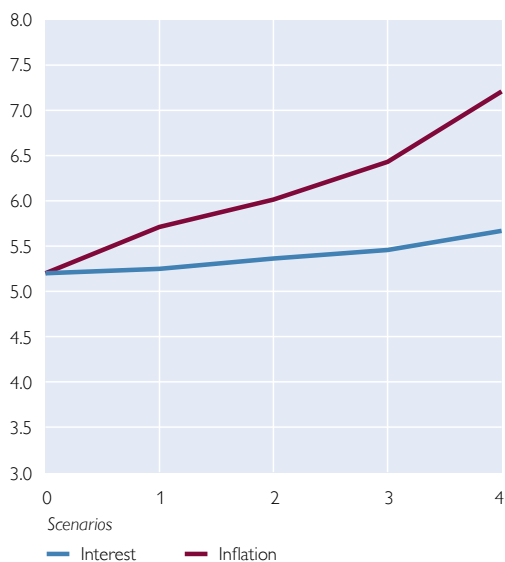
<sup>10</sup> We acknowledge that the HFCS provides only limited information on consumption expenditure and that more information would be desirable.

Chart 2

### Results of interest rate and inflation shock simulations

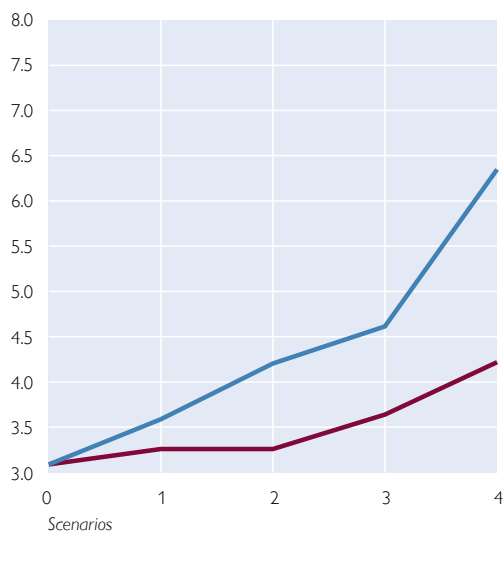
#### Vulnerable households

% of indebted households



#### Debt at risk

% of total household debt



Source: Eurosystem HFCS 2017, OeNB.

Note: Vulnerable households are households whose  $FM < 0$ .

relative increase by almost 40%. By contrast, the increase is relatively small following the interest rate shock. In the latter case, the share of vulnerable households only increases from just above 5.2% to 5.7%. On the other hand, turning to the share of debt held by vulnerable households in scenario 4, we find that debt at risk increases by about 37% after the inflation shock and by almost 106% – from 3.1% to 6.4% – after the interest rate shock. Hence, the interest rate change has a higher impact than the inflation shock on the aggregate level of household liabilities, which may turn into loans that cannot be repaid. This result is due to the fact that interest rate changes impact mortgage holders with larger outstanding amounts more, while inflation affects everybody, and particularly poor debtors with a relatively low level of nonmortgage debt may turn vulnerable.

### 2.3 Combined scenario and comparison with the euro area

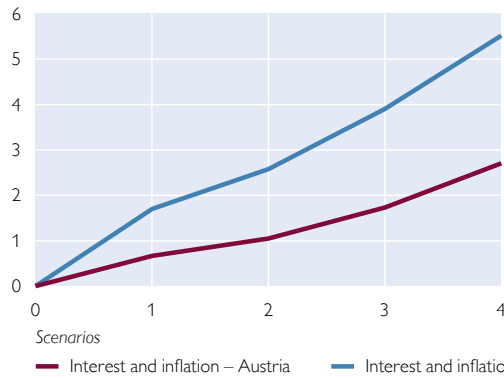
In the real world, households are obviously affected by a combination of these shocks at the same time. Therefore, we simulate scenarios 1 to 4 for both shocks at the same time and put the results in an international context, comparing the results for Austria with euro area figures.<sup>11</sup> Recall from section 1 that both the share of vulnerable households as well as the share of debt held by these households is larger in the euro area than in Austria.

<sup>11</sup> Note that Austria is included in the euro area figures.

### Combined microsimulation: results for Austria and the euro area

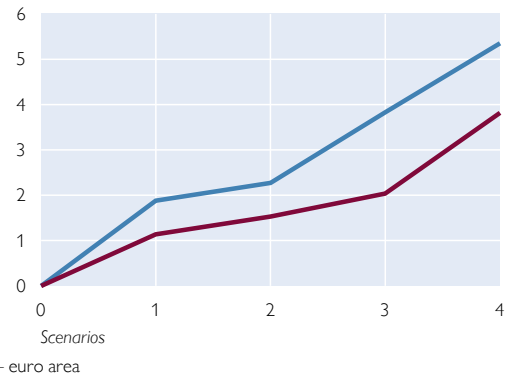
#### Vulnerable households

Percentage point change (from baseline)



#### Debt at risk

Percentage point change (from baseline)



Source: Eurosystem HFCS 2017, OeNB.

Note: Vulnerable households are households whose FM < 0.

Chart 3 shows the percentage point increase of the share of vulnerable households and the share of debt held by these households after each scenario of a combined shock for both Austria and the euro area. Obviously, the resulting increases are higher in the combined shock than in each shock separately (scenario 4 in Austria: +2.7 percentage points for vulnerable households and +3.8 percentage points for debt at risk compared to the baseline of 5.2% and 3.1% respectively). The increases in percentage points follow a similar trajectory in Austria and the euro area. The percentage point increase in both vulnerable households and debt at risk in the euro area is even larger than in Austria over all scenarios. Relative to the different starting levels, however, this translates into larger relative increases in Austria. Given Austrian households' high sensitivity to inflation and interest rate shocks, the continued monitoring and analysis of potential associated risks seems warranted.<sup>12</sup>

### 3 Conclusion

In this study, we perform simple simulations of interest rate and inflation shock scenarios to measure the impact of such shocks on the number of financially vulnerable households and debt at risk. Our results suggest significant differences in the magnitude of relative increases after inflation and interest rate shocks. The shocks impact both the share of financially vulnerable households and the share of debt held by these households in Austria and the euro area. Inflation has a larger impact on the number of financially vulnerable households, while interest rate changes have a larger impact on the level of debt at risk.

We acknowledge the limitations of this type of short exercise given the reference period and the limited information on consumption expenditure available in the HFCS. Further research could better take into account dynamic changes – such as rising real estate prices and their impact on mortgage demand – or use the new wave of the HFCS once it becomes available.

<sup>12</sup> The literature cited in this short study gives a good first overview of the work done in this field in Austria.

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## Annex

Table A1

### Vulnerable households by household characteristics

	Austria			Euro area		
	As share of all households	As share of households with mortgage debt	As share of households with nonmortgage debt	As share of all households	As share of households with mortgage debt	As share of households with nonmortgage debt
All	1.7	1.1	2.8	7.1	7.9	7.9
Gender <sup>1</sup>						
Male	1.5	1.4	2.8	6.4	7.4	7.7
Female	1.9	0.8	2.8	7.8	8.8	8.1
Gross income						
1-20 percentile	6.7	10.6	10.9	22.8	52.3	28.6
21-40 percentile	1.1	2.0	1.4	6.6	21.0	9.9
41-60 percentile	0.4	1.8	0.8	3.6	8.5	5.9
61-80 percentile	0.1	0.0	0.3	1.6	3.2	1.9
81-100 percentile	0.2	0.5	0.9	0.9	1.6	1.4
Gross wealth						
1-20 percentile	4.1	.	5.7	11.8	6.0	12.0
21-40 percentile	0.8	0.0	1.5	7.8	11.4	8.9
41-60 percentile	1.1	0.3	1.3	5.5	7.2	4.6
61-80 percentile	1.2	1.6	1.4	4.7	5.9	5.2
81-100 percentile	1.2	0.9	2.4	5.7	9.8	8.2
Age <sup>1</sup>						
16 to 30	4.3	3.0	5.9	11.6	8.7	9.5
31-59	1.9	0.9	2.6	7.4	7.2	8.1
60+	0.7	1.3	0.0	5.4	11.2	6.0
Household size						
1 household member	2.0	2.5	3.4	9.1	12.1	10.5
2 household members	1.2	0.8	2.4	5.3	8.0	6.4
3 household members	0.4	0.4	0.8	6.3	6.9	7.1
4 household members	3.2	1.2	3.7	7.0	6.4	7.7
Education level <sup>1</sup>						
Primary or lower	4.6	0.0	12.1	6.2	12.6	10.5
Secondary	1.7	1.1	3.0	7.7	9.0	7.6
Tertiary	1.5	1.1	1.7	6.4	6.1	7.6
Household main residence						
Owner	1.1	1.1	1.5	5.2	7.4	5.9
Renter <sup>2</sup>	2.2	0.6	3.5	9.6	14.5	10.1

Source: Eurosystem HFCS 2017, OeNB.

<sup>1</sup> Statistics refer to the head of household.

<sup>2</sup> For simplicity, "renter" includes part owners and people that live in the main residence for free.



Table A2

### Variable definitions

Measure (short)	Measure	Formula in words	Formula with variables	Financially vulnerable if	Explanation
DStI	Debt service to income	$= \frac{\text{debt service}}{\text{monthly net income}}$	$= \frac{DL2000}{DI2000net/12}$	>0.4	A household is considered to be financially vulnerable if it must use more than 40% of its monthly net income for monthly debt service payment.
DtI	Debt to income	$= \frac{\text{total outstanding debt}}{\text{yearly net income}}$	$= \frac{DL1000}{DI2000net}$	>4	A household is considered to be financially vulnerable if its total outstanding debt is more than 4 times higher than its yearly net income.
DtA	Debt to asset	$= \frac{\text{total outstanding debt}}{\text{total assets}}$	$= \frac{DL1000}{DA3001}$	>0.75	A household is considered to be financially vulnerable if the ratio of its total outstanding debt to its total assets is higher than 0.75.
FM	Financial margin	$= (\text{annual net income})$ $- (\text{annual consumption})$ $- (\text{annual debt service})$ ... where $\text{consumption} = \text{food} + \text{utilities} + \text{rent} + \text{trips and holidays}$	$= (DI2000net)$ $- 12 * (HI0100 + HI0200 + HI0210 + HB2300 + HI0230 / 12)$ $- (12 * DL2000)$	<0	A household is considered to be financially vulnerable if its annual consumption and annual debt service exceed its annual net income.
SD	Subjective distress	Some questions based on HI0600 and HI0700 in the HFCS			A household is considered to be financially vulnerable if it indicates that expenses are above income and the additional expenses are financed by overdrafts, loans, financial help from others or by leaving bills unpaid.

Source: Authors' compilation.

Note: HI0100=monthly amount spent on food at home, HI0200=amount spent on food outside home, HI0210=monthly amount spent on utilities, HB2300=monthly amount spent on rent, HI0230=annual expenditure on trips and holidays.

Table A3

### Additional variable definitions

Variables of interest	Formula in words	Formula with variables	Explanation
Share of financially vulnerable households (FV HH)	$= \frac{\text{number of FV HH}}{\text{number of indebted HH}}$	$= \frac{\sum FM}{\sum DL1000i}$	Share of financially vulnerable households as a percentage of indebted households.
Debt at risk	$= \frac{\text{total outstanding debt held by FV HH}}{\text{total outstanding debt held by all HH}}$	$= \frac{\sum FM * DL1000}{\sum DL1000}$	Total outstanding debt held by financially vulnerable households as a percentage of total outstanding debt held by all households.

Source: Authors' compilation.

Note: HI0100=monthly amount spent on food at home, HI0200=amount spent on food outside home, HI0210=monthly amount spent on utilities, HB2300=monthly amount spent on rent, HI0230=annual expenditure on trips and holidays.