A microsimulation model to evaluate Italian households' financial vulnerability

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The analysis and conclusions expressed in this paper are those of the author and should not be interpreted as those of the Bank of Italy.

What the paper does?

- We build a microsumulation model to monitor how households' financial vulnerability evolves over time under expected macroeconomic conditions, stress scenarios and alternative policy interventions
- The vulnerability of indebted households is summarized by the debt-service ratio (DSR), defined as the share of debt payments to income: $DSR > 30$ per cent
- Starting from household-level data from the Italian Survey on Household Income and Wealth (SHIW) and, matching them with macro forecasts on debt and income, we project the future path of households' indebtedness and debt-service ratio.

Contributions and results

- Main contributions to the literature:
  - we impose some structure in the evolution of debt for existing mortgages: for each household we compute its loan payment in each period using the standard amortization formula
  - we explicitly model mortgage terminations taking into account microeconomic data on mortgage duration and starting year
  - we present a way of introducing mortgage originations obtained from gathering observations into groups with similar characteristics
  - the aggregate dynamics are constrained to match higher frequency, macro data on total debt and income
- Under alternative scenarios of stress, no significant change in the share of vulnerable households
  $\longrightarrow$ no significant risk for the financial stability coming from the Italian household sector

Data: microeconomic variables

The Survey of Household income and Wealth:

- survey conducted on a biennial basis by Bank of Italy
- households' data:
  - demographic characteristics (age, education, employment status of the head of household);
  - income;
  - debt (type, outstanding amount, length, amount of annual instalment, interest rate).
- the panel is unbalanced, hence we group obs:
  a)by income quartile to estimate income process
  b)by individual characteristics (age, education, occupation) for mortgage originations

Data: microeconomic variables (Cont.)

- In the analysis, we use the 2002-2012 SHIW waves.
- About 8,000 obs in each wave.
- In 2012, 12.4% had mortgage and about 10% had consumer credit debt.
- Average outstanding debt of about €78,000 and starting value of the debt of €115,000, in 2012.
- About 50% of mortgages were fixed rate mortgages, about 50% were variable ones.

Data: macroeconomic variables

Benchmark for the aggregate dynamics resulting from the model.

Three sources:
1) National accounts for income growth
2) Internal macro-econometric model's projections on lending volumes to households for house purchases
3) Historical data and projections of the three-month Euribor obtained from futures contracts

	2013	**2014**	**2015**
Income growth rate	0.1	2.4	2.9
Total debt growth	-1.0	-0.3	1.8
3m Euribor	0.21	0.27	0.32

The model: income growth dynamics

For each class j, process for the growth of

- disposable income (d)

- disposable income gross of fin. charges, net of imputed rent (g):

$log(y^k_{j,t}) - log(y^k_{j,t-1}) \sim N(\mu^k_j, \sigma^k_j)$ for $j = 1, 2, 3, 4,\ k = d, g$

	y^d growth		y^g growth	
	μ^d	σ^d	μ^g	σ^g
1st-25th percentile	0.035	0.034	0.039	0.025
25th-50th percentile	0.029	0.023	0.029	0.025
50th -75th percentile	0.026	0.026	0.025	0.023
75th -100th percentile	0.025	0.024	0.023	0.024

Ajusted by common factor to match macro data in each period.

	2013	**2014**	**2015**
Adjustment factor	0.974	0.970	0.971
Income growth (national accounts)	0.1	2.4	2.9
Income growth (model)	0.1	2.4	2.9

The model: debt growth dynamics

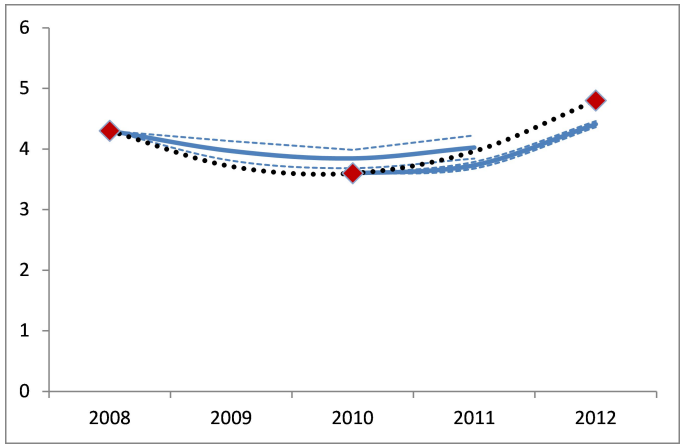
- Existing debts
  a) Mortgage debt: French amortization schedule
  $R_{y,i,t} = MDebt_{y,i,t}(1 + r_{y,i,t})^A \frac{r_{y,i,t}}{(1+r_{y,i,t})^A - 1}$
  b) Consumer debt: Annual repayment is fixed
- Mortgage originations: we compute the percentage of originations in each household group using the last three waves and project it forward
- Mortgage terminations: the SHIW provides information on mortgage length

Total annual payments: $R_{i,t} = \sum_y R_{y,i,t}$

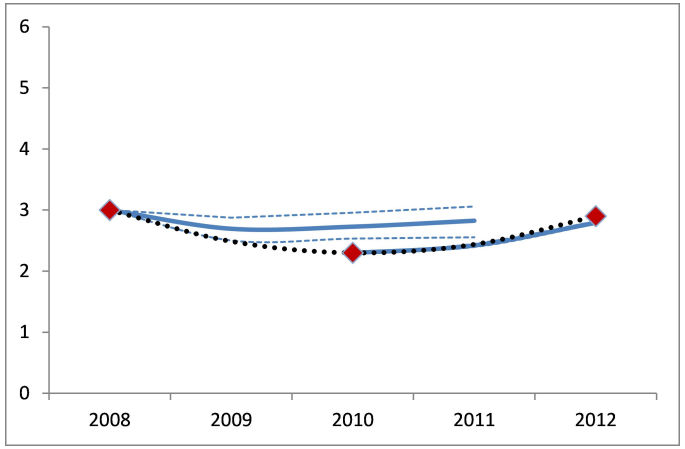
	2013	**2014**	**2015**
Total debt growth (BoI macro model)	-1.0	-0.3	1.8
Total debt growth (model with originations)	-1.0	-0.3	1.8
Total debt growth (model without originations)	-5.1	-5.7	-6.1

Backtesting

Percentage of vulnerable households in the population

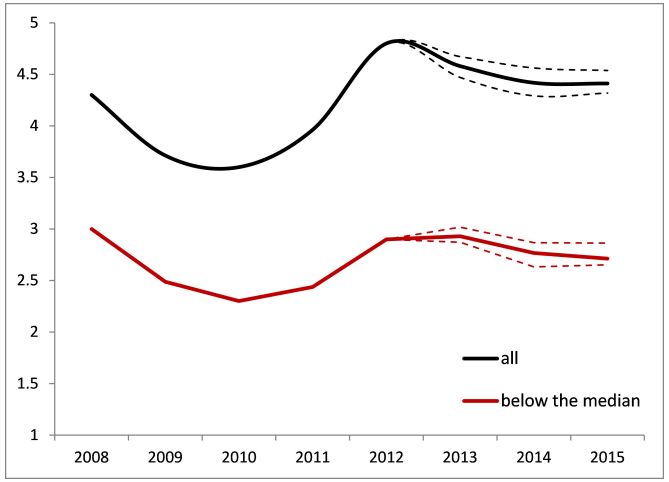


Percentage of vulnerable households with income below the median

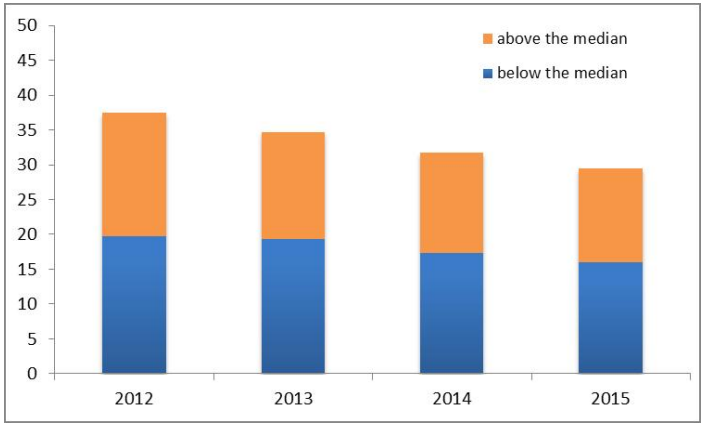


Main results: baseline scenario

Percentage of vulnerable households in total households



Percentage of debt held by all vulnerable households



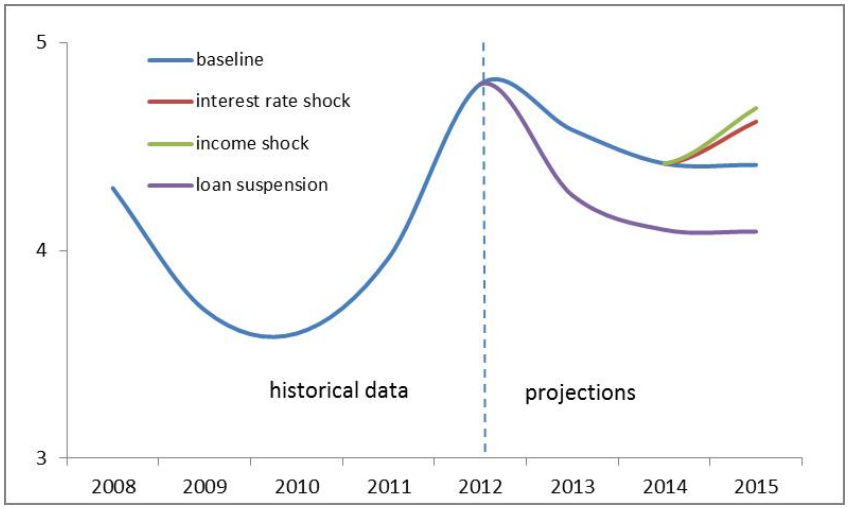
Main results: baseline scenario (Cont.)

Percentage of vulnerable households by age, education and occupation

	2012	2013	2014	2015
Age				
<35	16.8	14.2	12.9	10.7
35-44	33.5	31.1	29.3	28.9
45-54	28.4	32.7	35.0	35.7
55-64	9.4	9.6	11.0	12.2
>65	11.9	11.9	11.3	12.1
Education				
No education or primary education	6.2	6.3	6.3	6.1
Lower secondary education	39.7	38.4	38.3	36.0
Upper secondary school	39.7	40.6	41.2	45.3
Undergraduate or post-graduate	14.5	14.8	14.4	13.6
Occupation				
Not working	16.0	15.7	15.1	14.4
Working	84.0	84.2	84.8	85.4

Extended baseline scenario and stress test scenarios

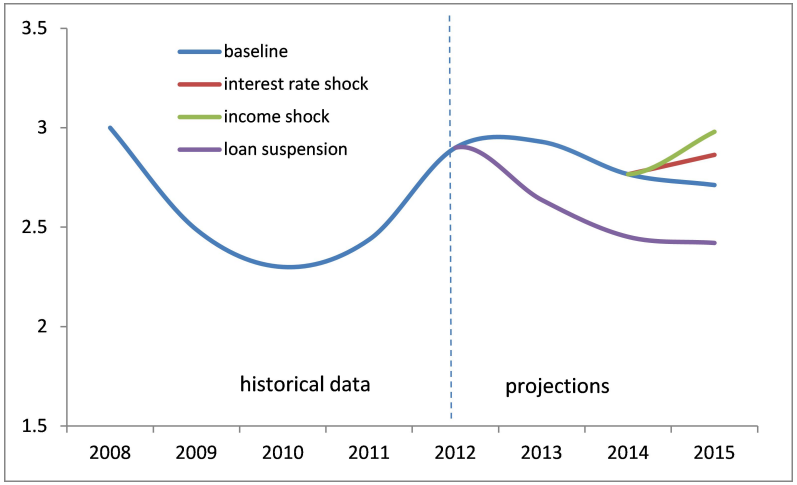
Percentage of vulnerable households with income below the median in total households



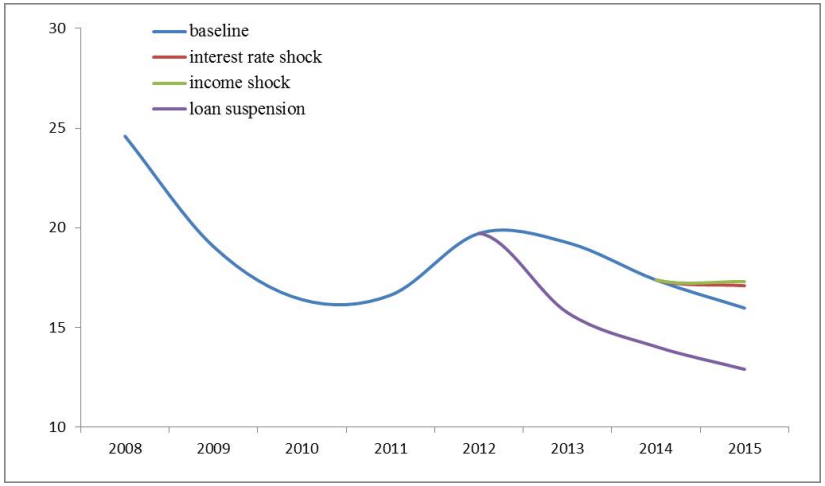
	2012	2013	2014	2015			
				Base	Susp. paymts	Int. rate shock	Income shock
Central est.	4.8	4.6	4.4	4.4	4.1	4.6	4.7
10-90th pct	-	*4.5-4.7*	*4.3-4.6*	*4.3-4.5*	*3.9-4.2*	*4.5-4.7*	*4.6-4.8*

Focusing on households with income below the median

Percentage of vulnerable households in total households

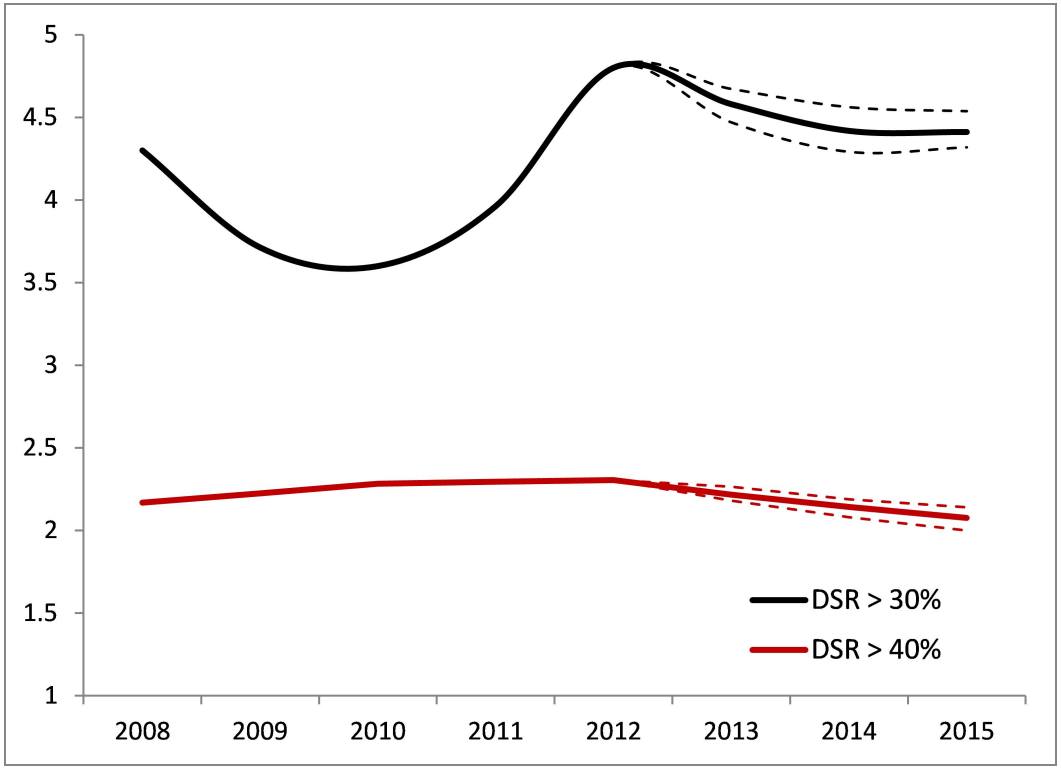


Percentage of debt held by vulnerable households



Alternative definition of vulnerability: DSR > 40 per cent

Percentage of vulnerable households in total households



Conclusions

- We build a microsimulation model to monitor the financial vulnerability of Italian households.
- Starting from household-level data from the SHIW and, matching them with macroeconomic forecasts on debt and income, we project the future path of households' indebtedness and debt-service ratio.
- We find that the share of vulnerable households over the total population is projected to be about stable between 2012 and 2014, with a slight decrease in 2015 due to positive income growth.