Misalignment of Housing Growth and Population Trends: Cohort Size and Lagging Measurements through Recession and Recovery

Dowell Myers, Hyojung Lee, and JungHo Park
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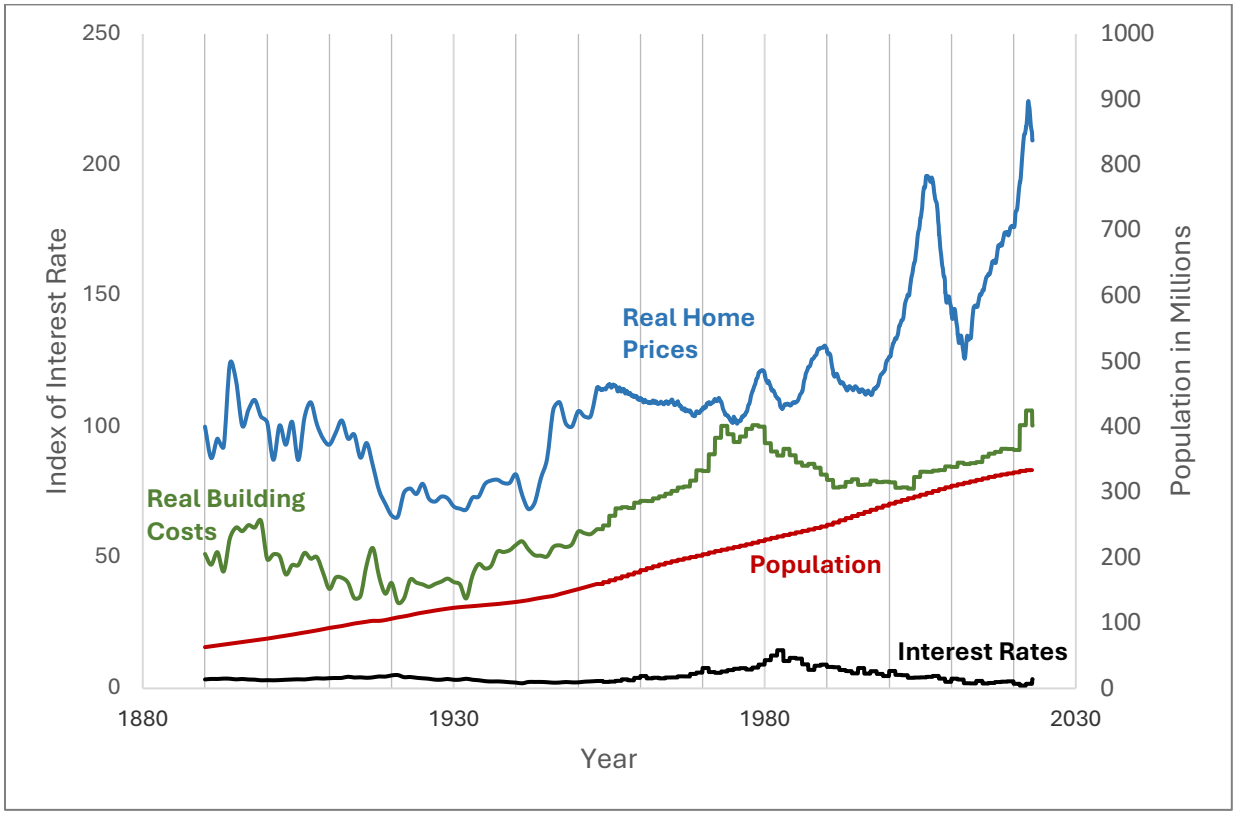
Online APPENDIX

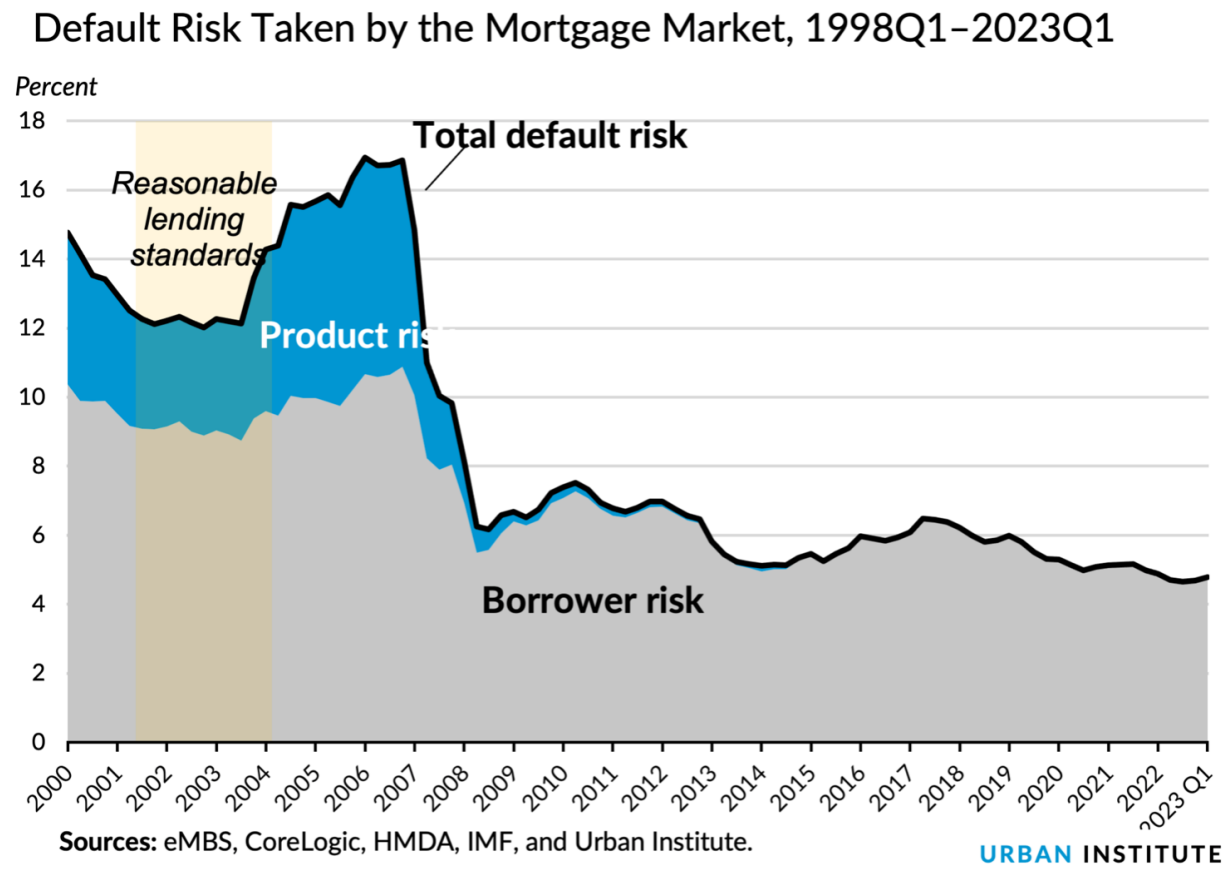
Figure A1. Updated, Recreation of Robert Shiller's Figure 3.1, from *Irrational Exuberance*



Source: Data on the Robert Shiller website http://irrationalexuberance.com/main.html?src=%2F. Graphic recreated by Alycia Cheng from Shiller's data and closely resembling the graphic posted on the same website, which is an update in color of Figure 3.1 in *Irrational Exuberance*.

Note: The original graph (Figure 3.1 in the book) is in black and white, while the online version maintained and updated by Prof. Shiller is in the colors shown here, including total population as a straight, upper-sloping red line. This figure supports his thesis of the housing chapter in the book that the increasing extreme volatility in inflation-adjusted home prices since 1995 is uncorrelated with total population growth or other fundamentals of supply and demand.

Figure A2. Lead Exhibit of the Urban Institute Housing Credit Availability Index (HCAI)



Source: Exact image is copied from the Urban Institute website (with permission): https://www.urban.org/policy-centers/housing-finance-policy-center/projects/housing-credit-availability-index
Note: The Urban Institute's Housing Finance Policy Center analysis team led by Laurie Goodman (@MortgageLaurie) has devised a system of quantification of loose versus tight lending standards, based on the exhibited willingness of lenders to accept default risk. This index estimates two separate risk components—the product risk and the borrower risk—then making visible the changes in mortgage lending over time. Further explanation is below.

The Urban Institute explains the Housing Credit Availability Index thus: "The HCAI measures the percentage of owner-occupied home purchase loans that are likely to default—that is, go unpaid for more than 90 days past their due date. A lower HCAI indicates that lenders are unwilling to tolerate defaults and are imposing tighter lending standards, making it harder to get a loan. A higher HCAI indicates that lenders are willing to tolerate defaults and are taking more risks, making it easier to get a loan." (quoted from the HCAI website sourced above)

The Index has two components. "Product risk" is dependent on the characteristics of the loan: fixed or variable rate, 30-year term versus shorter term (5 years or 10 years), degree of required documentation of borrower income, down payment requirement, etc. Default risk is highly

correlated with riskier products (the traditional 30-year, fixed-rate, full documented loan being safest). “Borrower risk” is based on characteristics of the borrower, including credit score, sources of income, and employment history.

The index graph (updated quarterly) shows that product risk was at its greatest during the housing bubble leading up to the financial crisis, while subsequently product risk was largely eliminated. Borrower risk also has declined substantially, although lenders accepted borrowers with slightly greater risk in certain periods (2010-13 or 2017-18). In the period from 2020 to 2022 (the pandemic) lenders became ever more stringent about loan approvals (or possibly loan applicants had rising qualifications so that there was less risk to lenders).

The Urban Institute highlights the index period from mid-2001 through the end of 2003 as a period of “reasonable lending standards” that preceded the escalation of risk due to lax lending standards by loan underwriters from 2004 to early 2007. Against this pre-bubble norm, it is apparent that mortgage credit has been very sharply constricted over the last decade. The great contribution of the HCAI is both its quantification and visualization of the changing balance of loose versus tight lending standards for home mortgage seekers.

Table A1. Summary of Total Households Observed and Expected, If 2000 Age-Race/Ethnicity-specific Householder Rates Held Constant, by Owners, Renters, and Total Households, U.S. (in 1,000s)

A. Number of Owner-occupied Units

	2000	2006 # of HHs	2006 % of Simulated	2011 # of HHs	2011 % of Simulated	2016 # of HHs	2016 % of Simulated	2021 # of HHs	2021 % of Simulated
Observed	69,819	75,075		74,376		75,103		83,487	
Simulated by 2000 rates	69,819	75,194		79,420		83,710		87,051	
Observed less simulated	0	–119	–0.2%	–5,044	–6.4%	–8,607	–10.3%	–3,565	–4.1%
NH-White	0	–416	–0.7%	–3,543	–5.7%	–5,692	–9.0%	–2,890	–4.6%
Black	0	–255	–4.1%	–1,034	–14.8%	–1,778	–23.2%	–1,292	–16.3%
Asian & P.I.	0	205	8.8%	14	0.5%	–4	–0.1%	435	11.8%
Hispanic	0	302	5.4%	–435	–6.4%	–985	–12.3%	32	0.4%
Other	0	46	4.3%	–46	–3.6%	–148	–9.7%	150	4.9%

B. Number of Renter-occupied Units

	2000	2006 # of HHs	2006 % of Simulated	2011 # of HHs	2011 % of Simulated	2016 # of HHs	2016 % of Simulated	2021 # of HHs	2021 % of Simulated
Observed	35,662	36,543		40,615		43,758		44,058	
Simulated by 2000 rates	35,662	38,465		40,655		43,114		45,083	
Observed less simulated	0	–1,922	–5.0%	–40	–0.1%	644	1.5%	–1,025	–2.3%
NH-White	0	–1,248	–5.6%	239	1.1%	662	2.9%	–159	–0.7%
Black	0	–34	–0.5%	183	2.4%	437	5.4%	309	3.8%
Asian & P.I.	0	–243	–12.6%	–213	–9.6%	–291	–11.0%	–416	–14.5%
Hispanic	0	–312	–4.9%	–166	–2.2%	–118	–1.4%	–432	–4.6%
Other	0	–85	–8.7%	–82	–6.8%	–47	–3.4%	–327	–12.4%

C. Number of Total Households

	2000	2006 # of HHs	2006 % of Simulated	2011 # of HHs	2011 % of Simulated	2016 # of HHs	2016 % of Simulated	2021 # of HHs	2021 % of Simulated
Observed	105,480	111,617		114,992		118,860		127,545	
Simulated by 2000 rates	105,480	113,659		120,076		126,824		132,134	
Observed less simulated	0	–2,041	–1.8%	–5,084	–4.2%	–7,964	–6.3%	–4,590	–3.5%
NH-White	0	–1,664	–2.0%	–3,304	–3.9%	–5,031	–5.9%	–3,049	–3.6%
Black	0	–290	–2.2%	–852	–5.9%	–1,341	–8.5%	–983	–6.1%
Asian & P.I.	0	–38	–0.9%	–200	–4.1%	–295	–5.0%	19	0.3%

Hispanic	0	–11	–0.1%	–601	–4.2%	–1,102	–6.7%	–399	–2.1%
Other	0	–39	–1.9%	–128	–5.1%	–195	–6.6%	–178	–3.1%

Source: Authors' analysis based on the Census 2000 SF-1 and the 2006–2021 American Community Survey (ACS) Public Use Microdata Sample (PUMS) data.
Note: The share of simulated was calculated by dividing the number of observed households less simulated households by the number of simulated households observed by tenure for each race/ethnic group in each survey year.