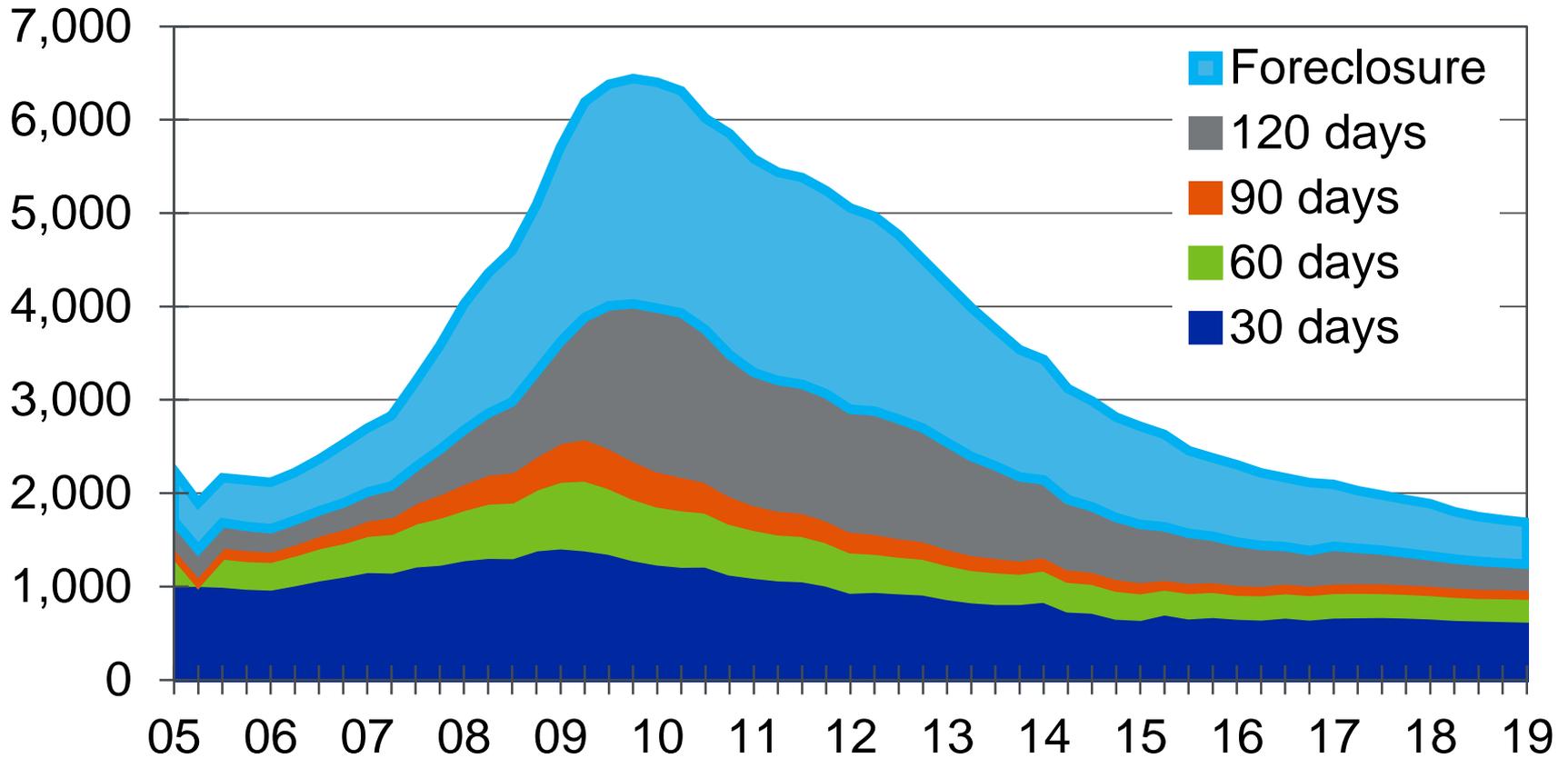


Managing Mortgage Credit Risk

Credit Conditions are Pristine

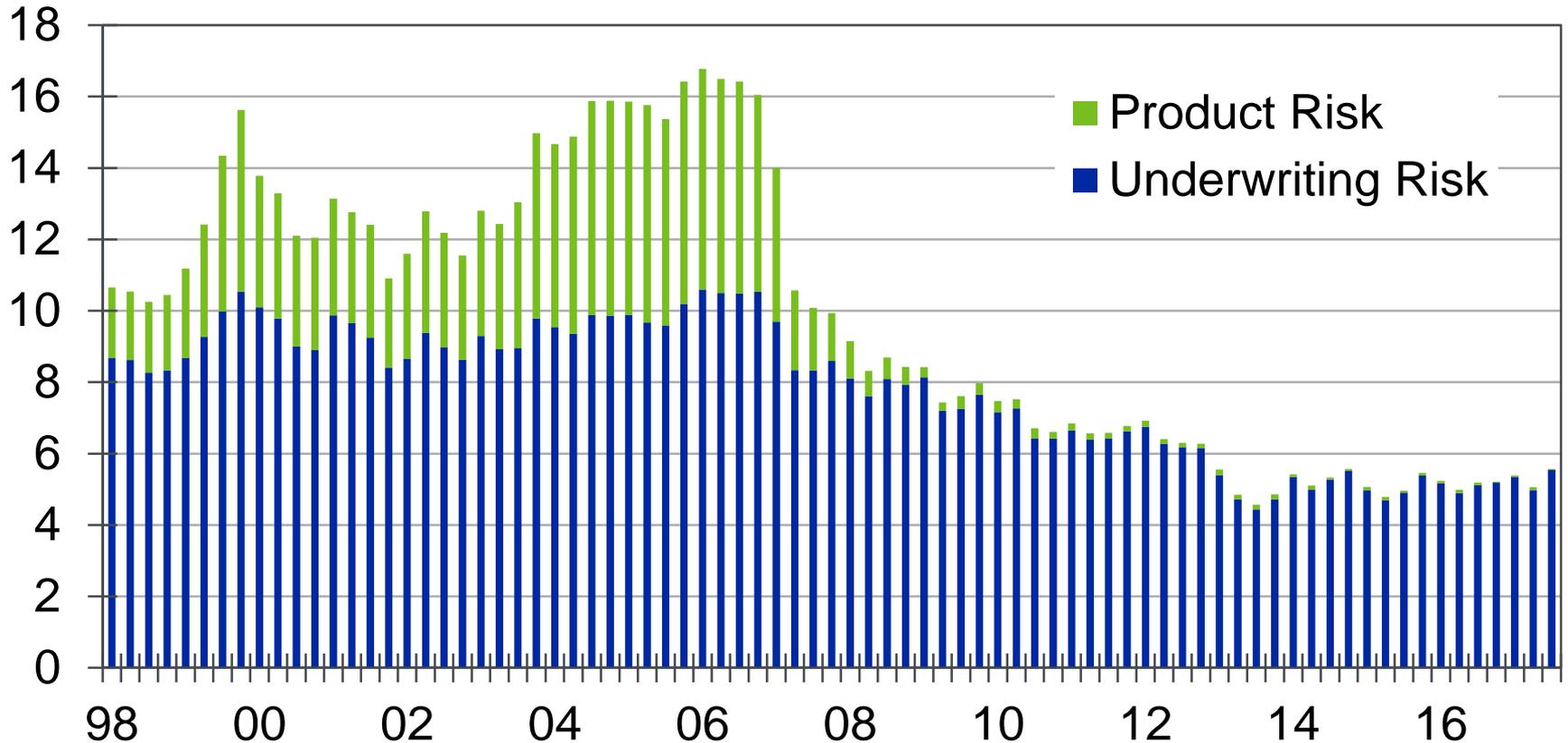
Troubled first mortgage loans, the



Sources: Equifax, Moody's Analytics

Underwriting Remains Tight

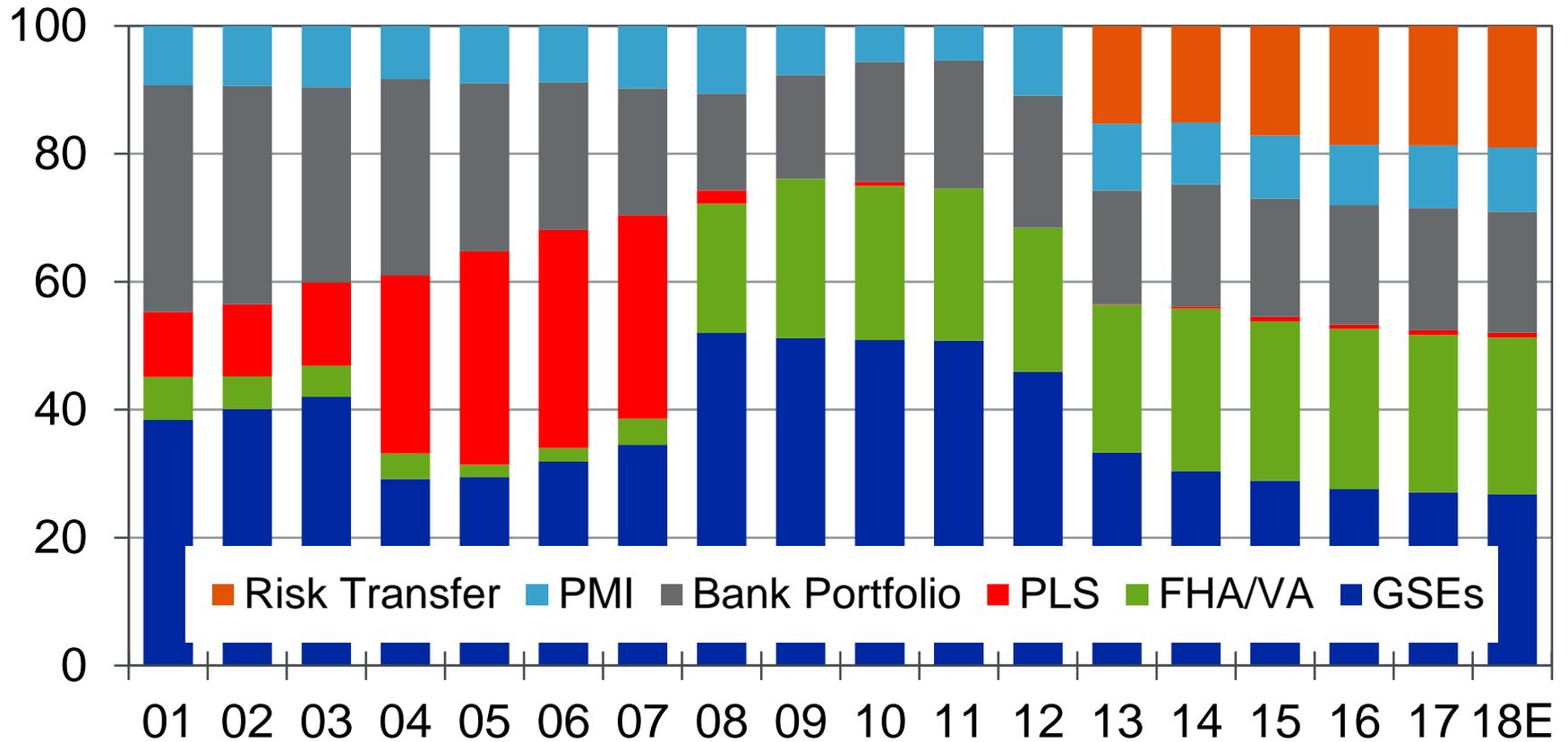
Expected severe delinquency rate for single family originations, %



Sources: Urban Institute Housing Finance Center

De Facto GSE Reform

Credit risk share of residential mortgage originations, %



Sources: Fannie Mae, Moody's Analytics

Capital Framework Preserves Mortgage Rates...

...for the typical borrower through the business cycle...

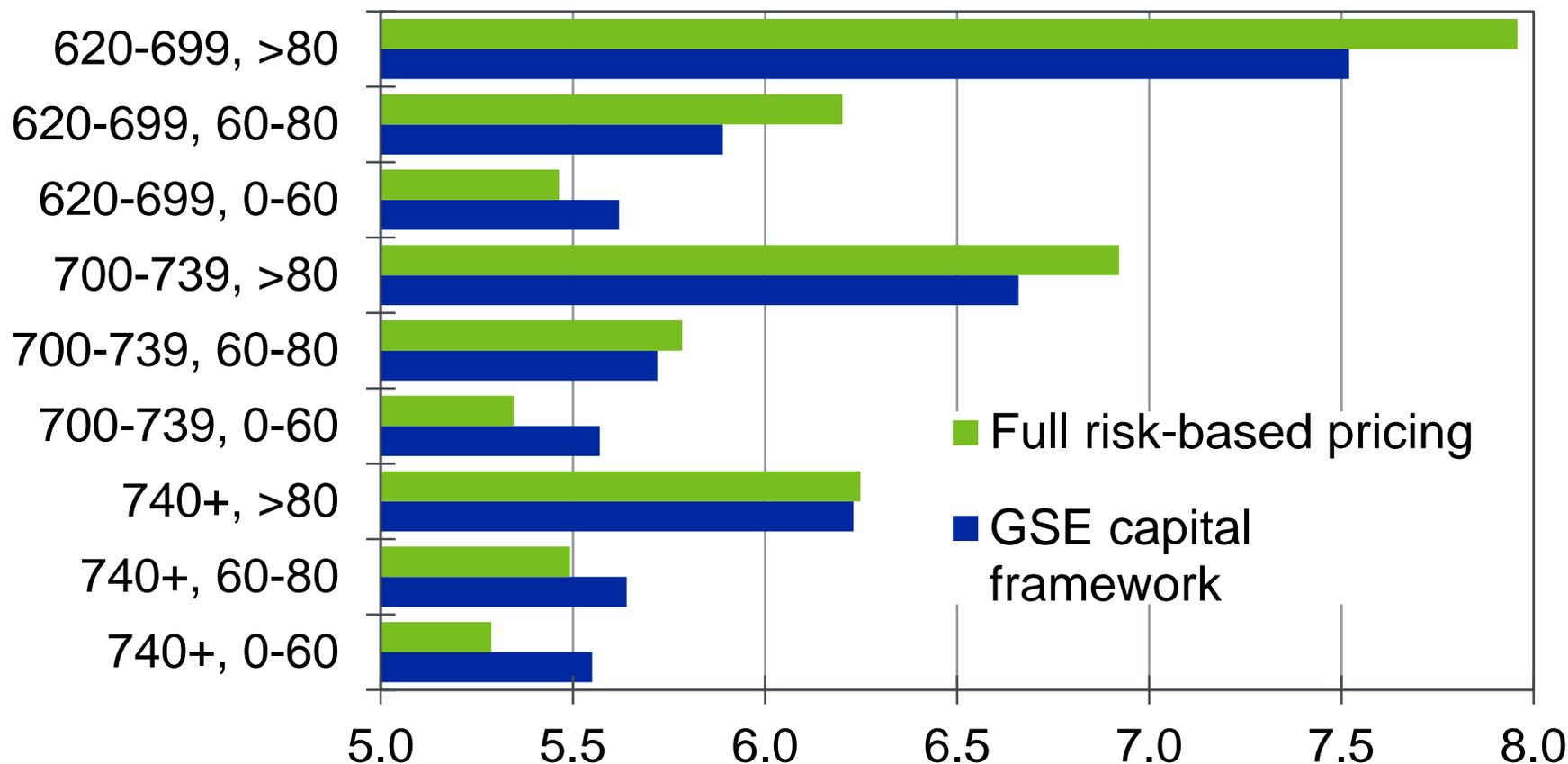
Mortgage Rate	5.50
Yield on Mortgage Securities	440 bps
Servicing and Origination Compensation	50 bps
G-fee	60 bps
Cost of Capital	32 bps
Expected credit losses	12 bps
Administrative costs	6 bps
Payroll tax surcharge	10 bps

	Capitalization	Cost
Cost of Capital	4.74%	32 bps
Common Equity	3.24%	38 bps
Debt or Risk Syndication	1.5%	6 bps
Less: Return on Cash Reserves to Pay for Losses		-12 bps

Assumptions	
Before-Tax Cost of Common Equity	11.7%
After-Tax Cost of Common Equity	9.0%
Pre-Tax Return on Unlevered Capital	3.7%
10-Year Treasury Yield	3.7%
MBS Spread with Treasury yield	0.7%
Tax Rate	23%

...And Across the Credit Distribution

Mortgage rates under capital framework and risk-based pricing, %



Source: Moody's Analytics

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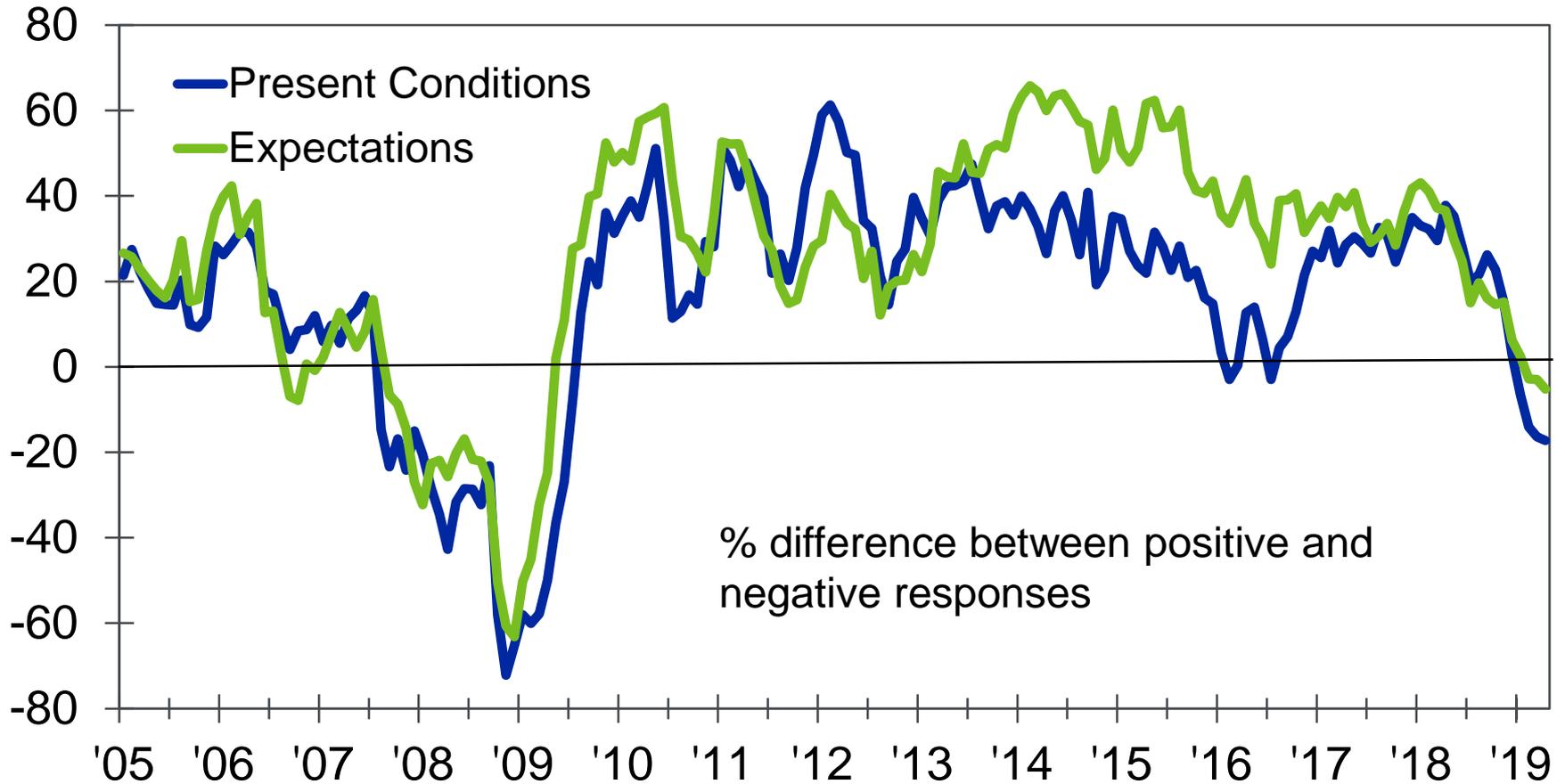
Past Its Prime

Mark Zandi, Chief Economist, Moody's Analytics

April 2019

The Expansion Wobbles...

Moody's Analytics business sentiment survey



Source: Moody's Analytics

...But Should Hold Firm

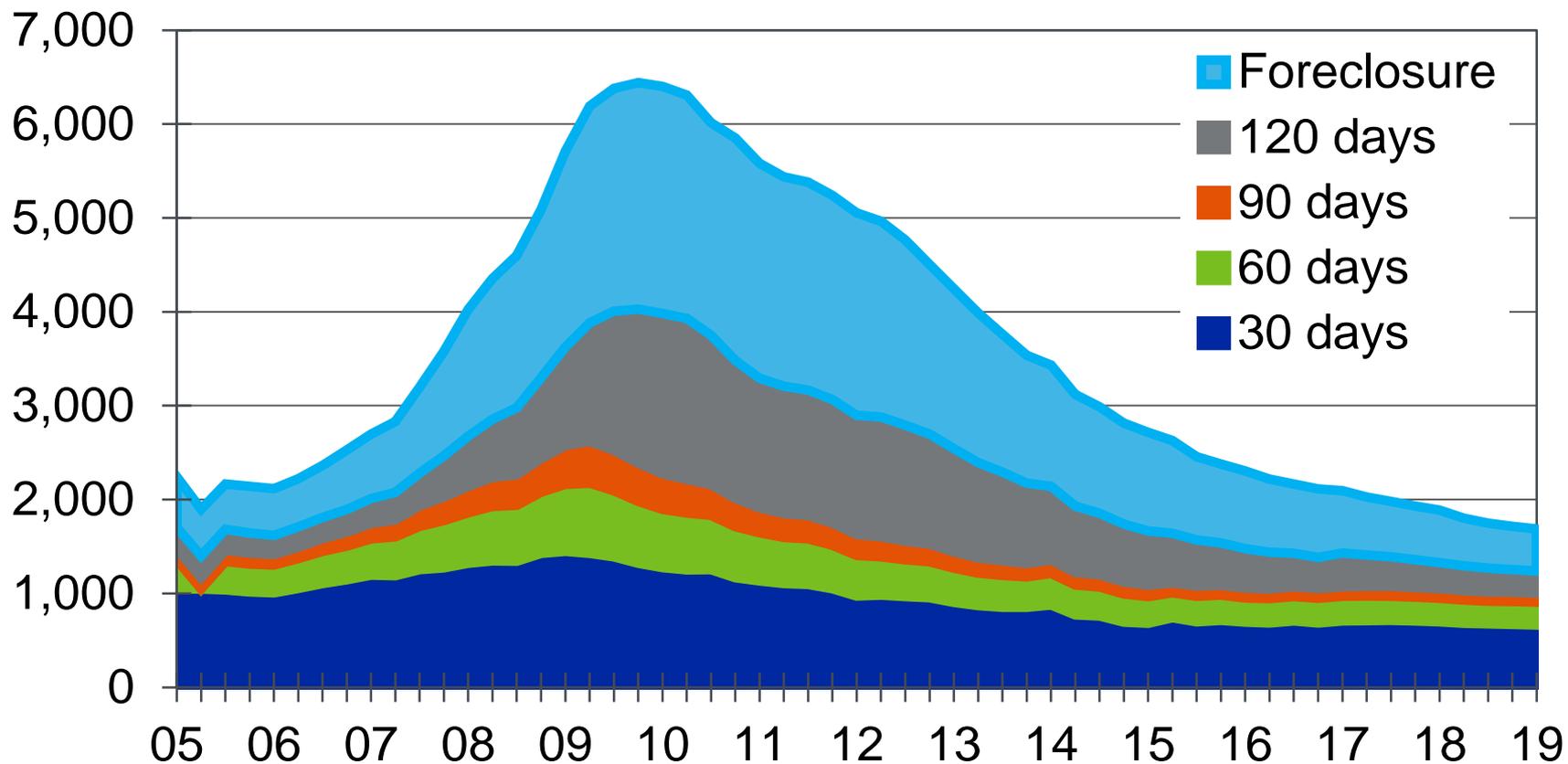
Number unemployed and underemployed per job opening



Sources: BLS, Moody's Analytics

Mortgage Credit Quality is Excellent...

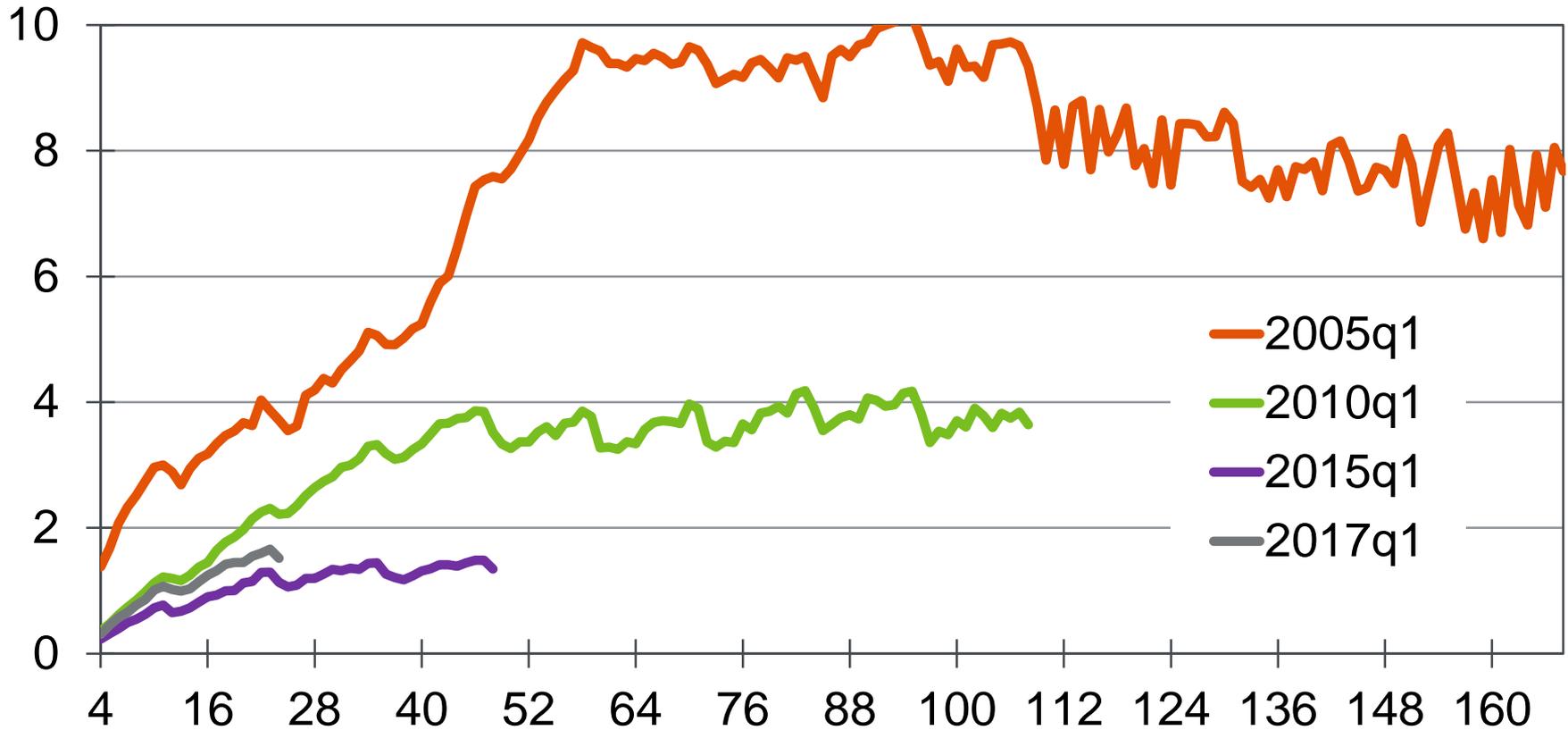
Troubled first mortgage loans, the



Sources: Equifax, Moody's Analytics

...But Past Its Prime

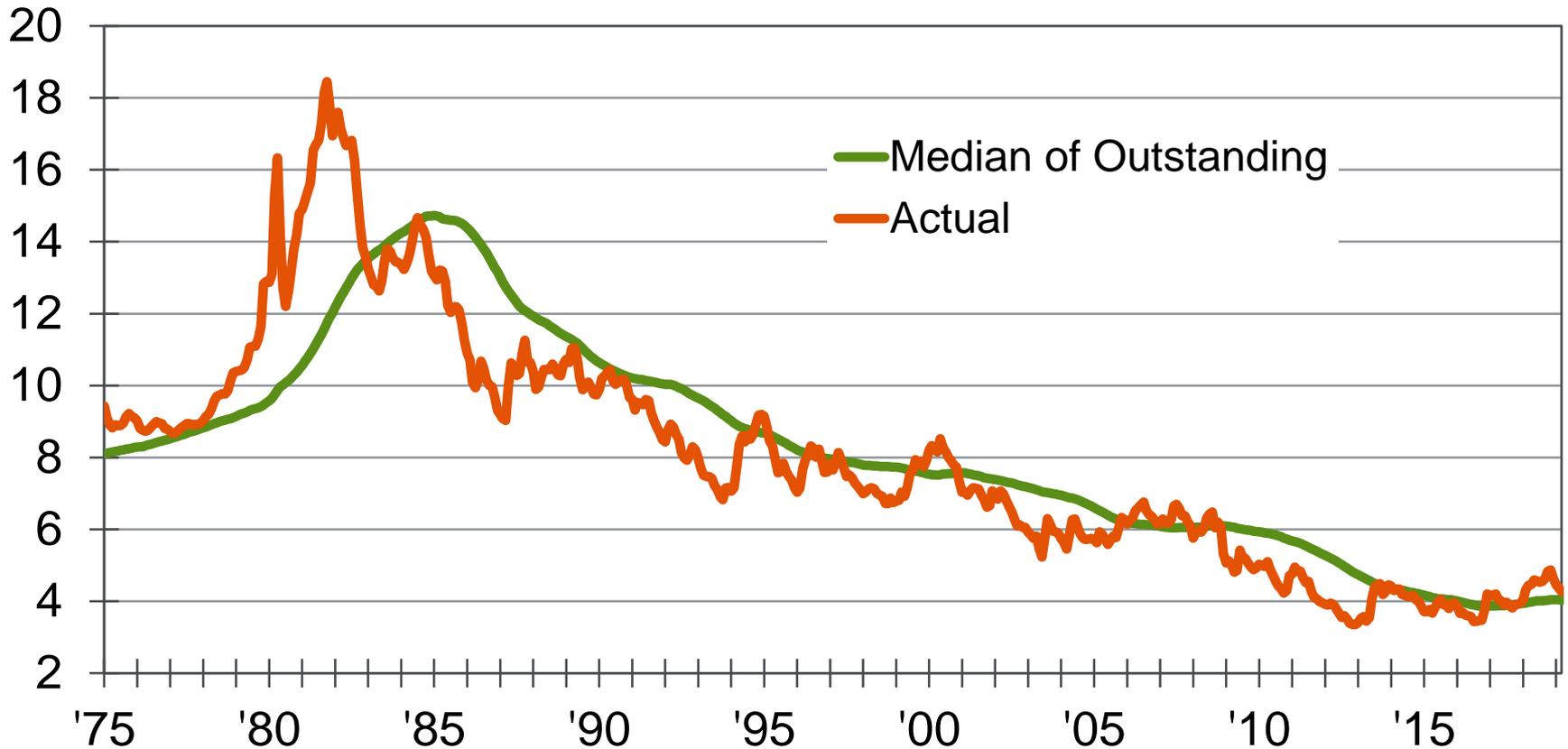
Delinquency rate, % of \$, months since origination by origination qrt



Sources: Equifax, Moody's Analytics

Mortgage Rates Matter...

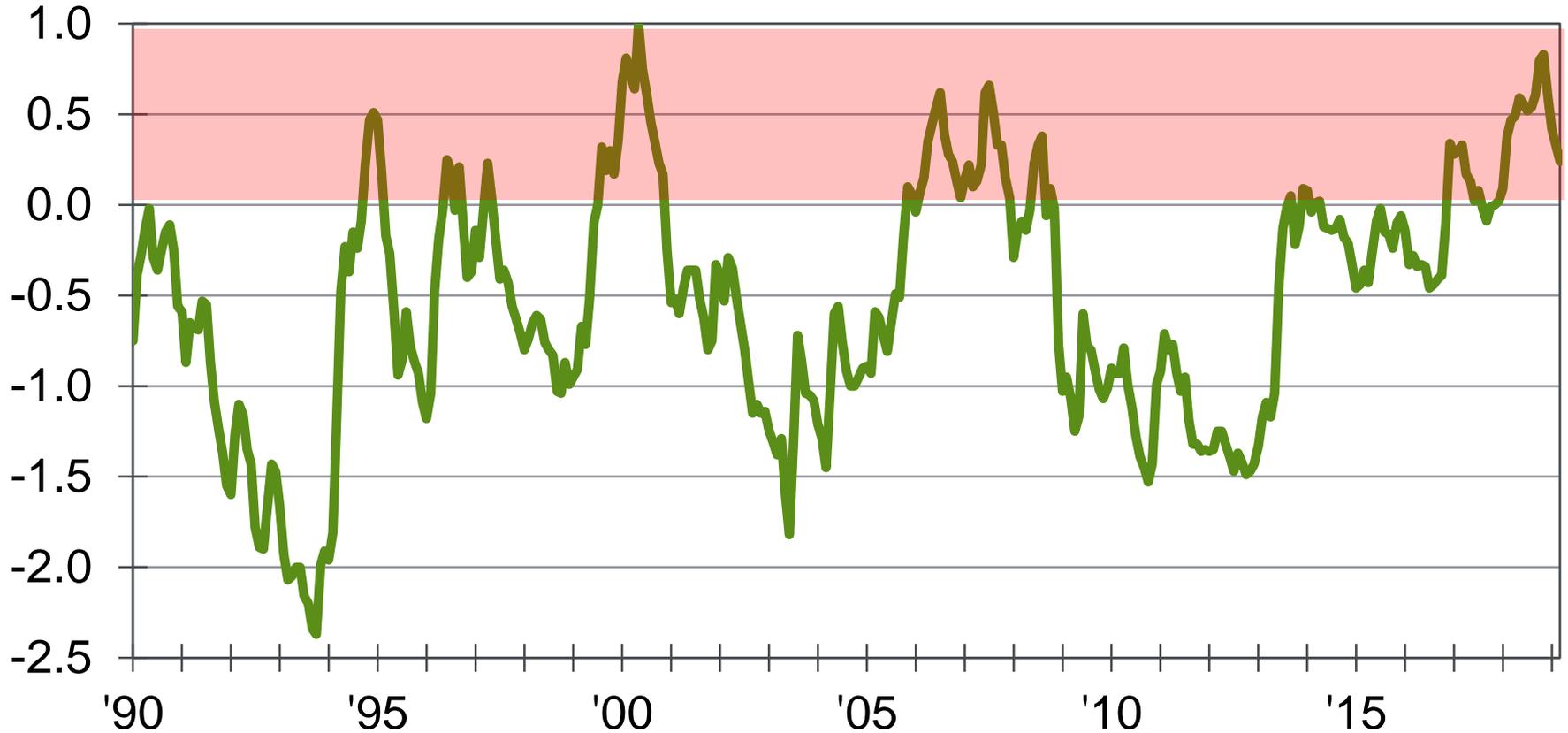
30-year fixed rate mortgage, %



Sources: Freddie Mac, Equifax, Moody's Analytics

...A Lot

Difference between actual and median fixed mortgage rate, %



Sources: Freddie Mac, Equifax, Moody's Analytics

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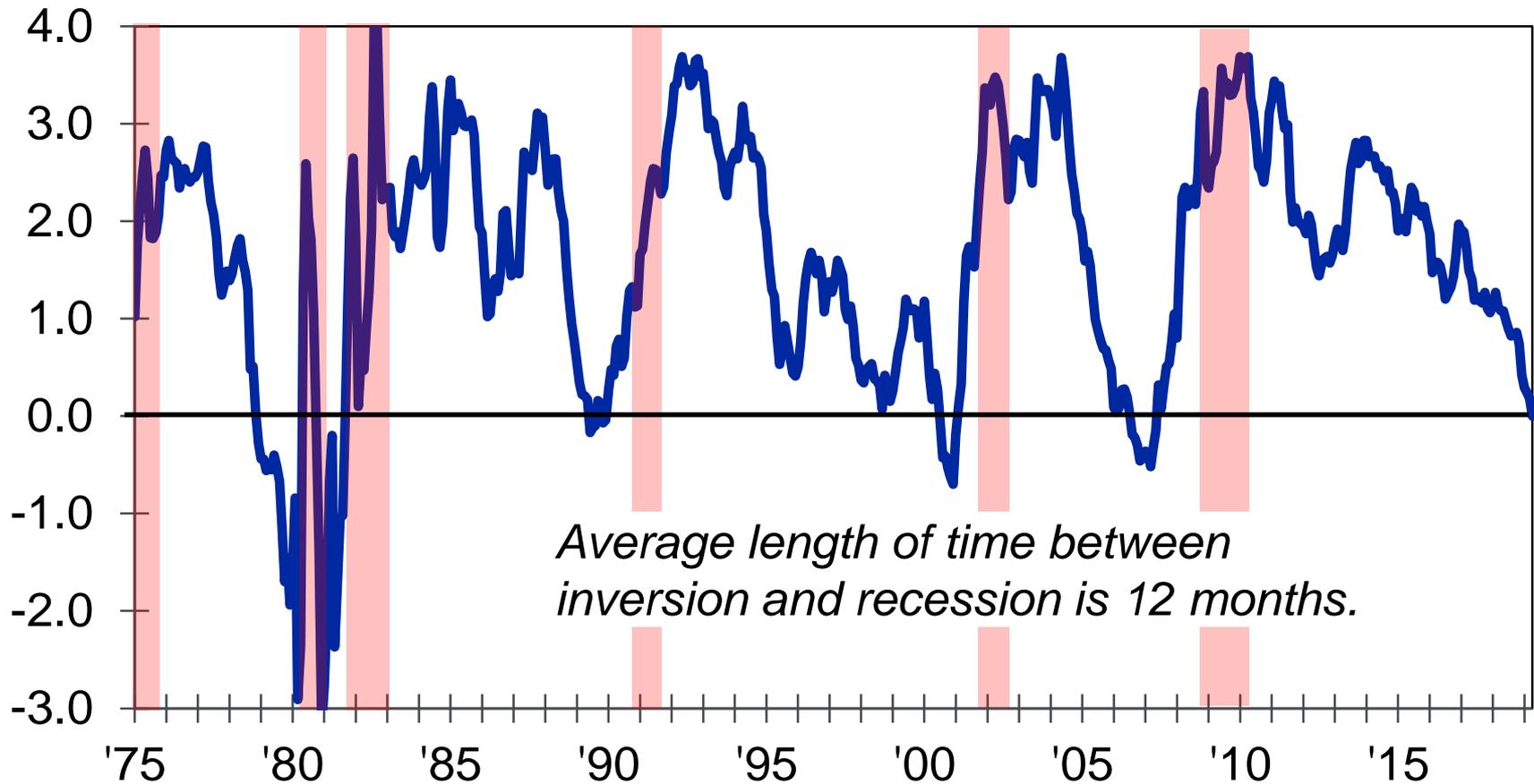
Housing On a Razor's Edge

Mark Zandi, Chief Economist, Moody's Analytics

April 2019

The Treasury Yield Curve Sends a Warning

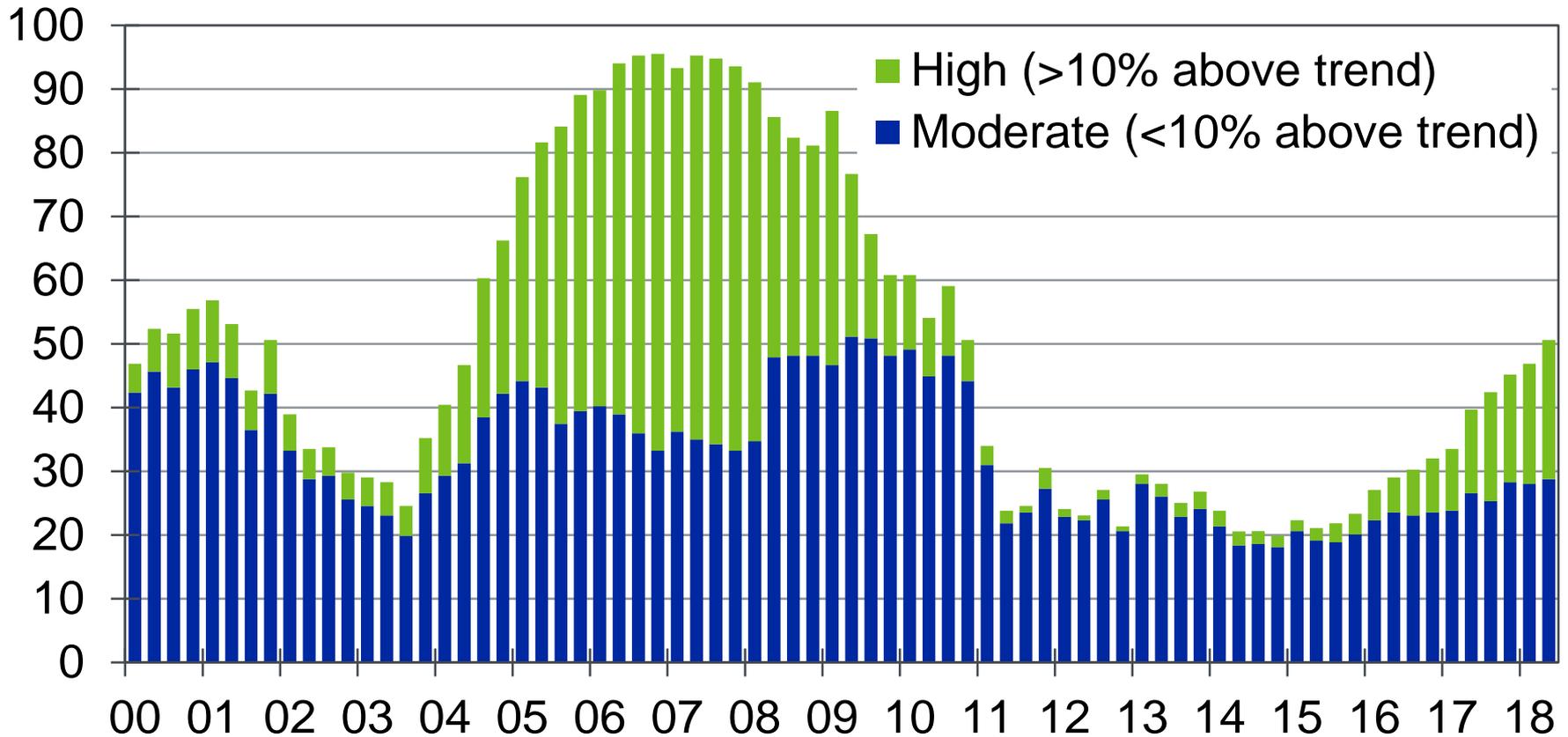
Difference between 10-yr Treasury yield and 3-mo EBY, %



Sources: Federal Reserve, Moody's Analytics

Housing Values Look Stretched

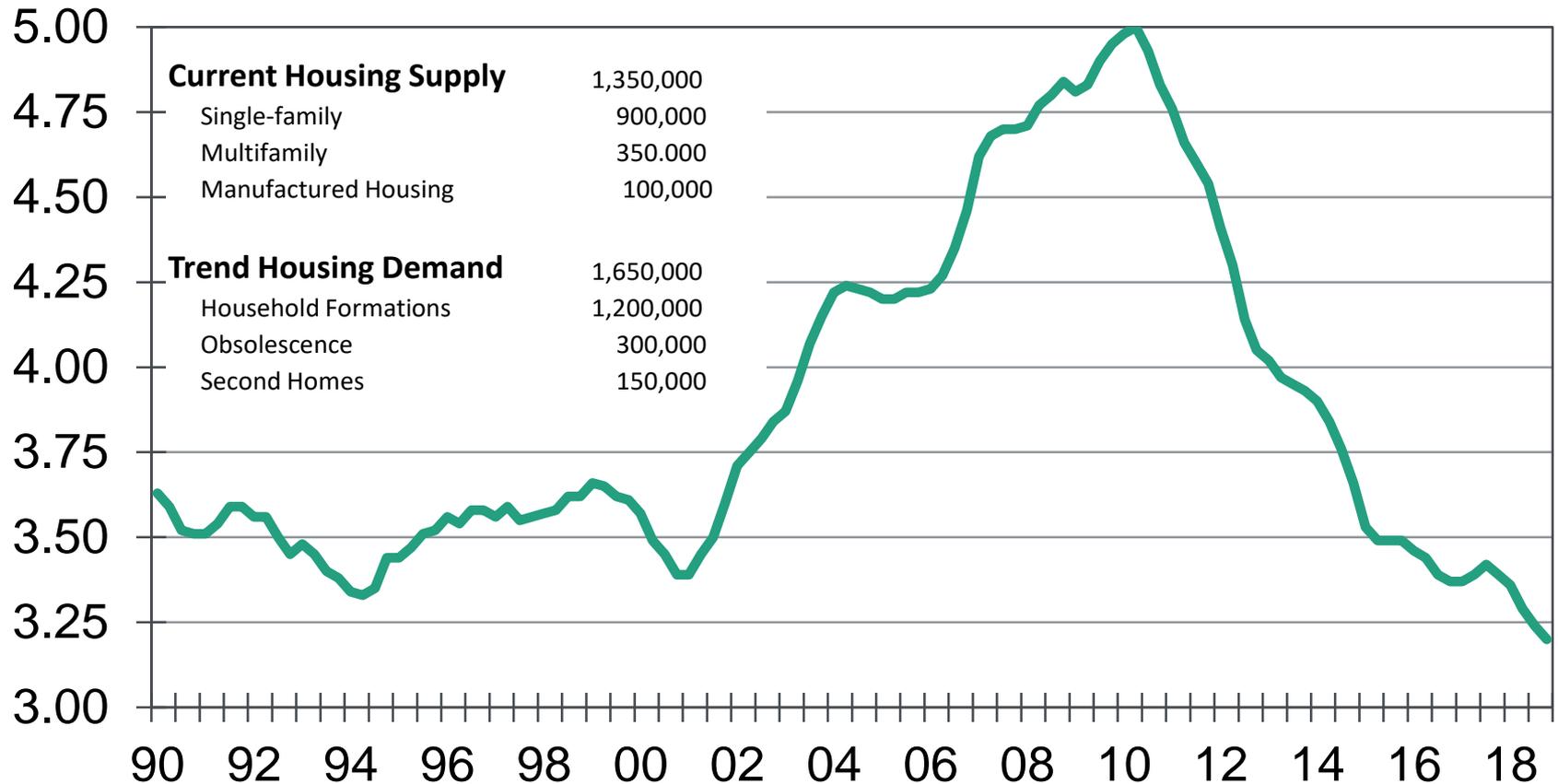
% of metro areas with FHFA HPI above trend value



Sources: FHFA, Moody's Analytics

Severe Housing Shortage

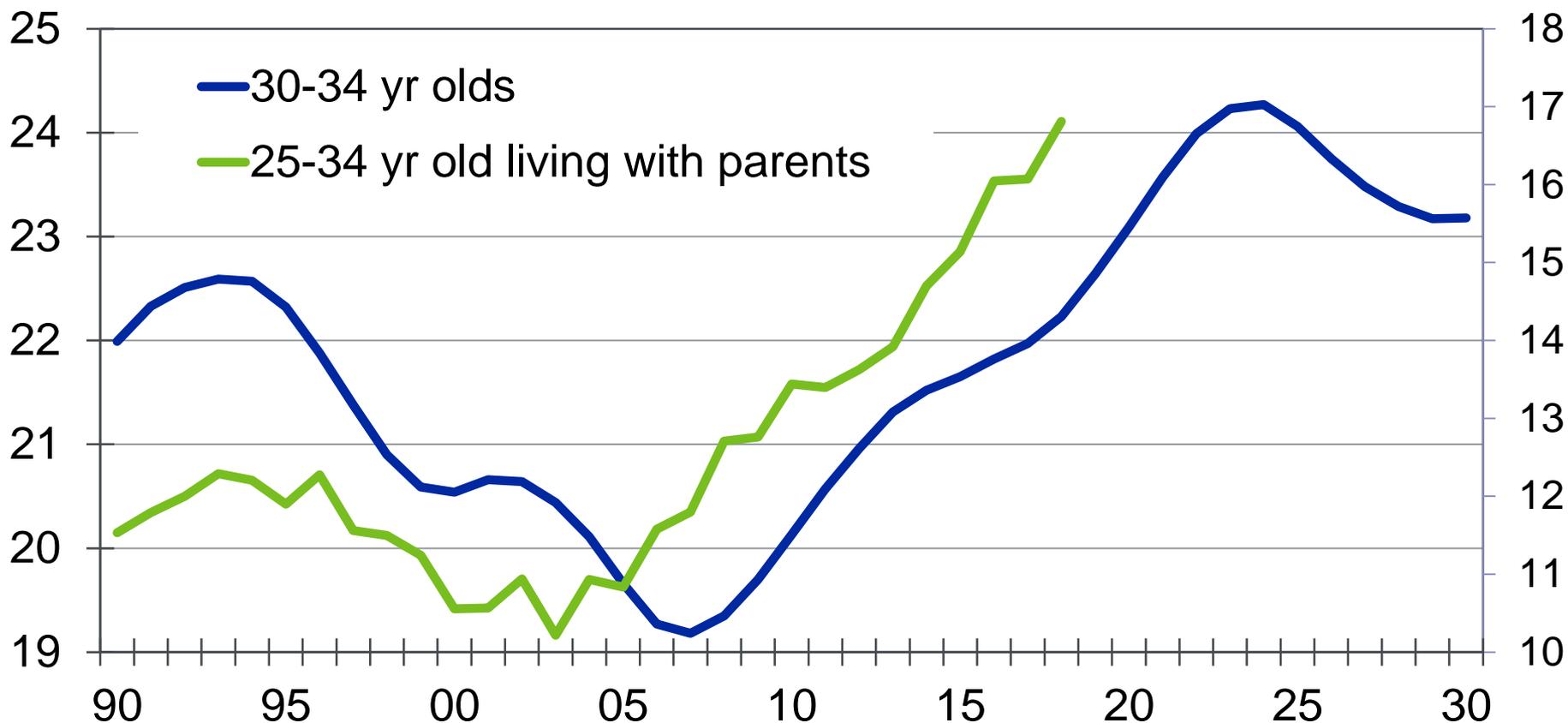
Vacancy rate, homes for sale and rent, 4-qrt MA, %



Sources: Census Bureau, Moody's Analytics

Millennials Will Be a Housing Tailwind

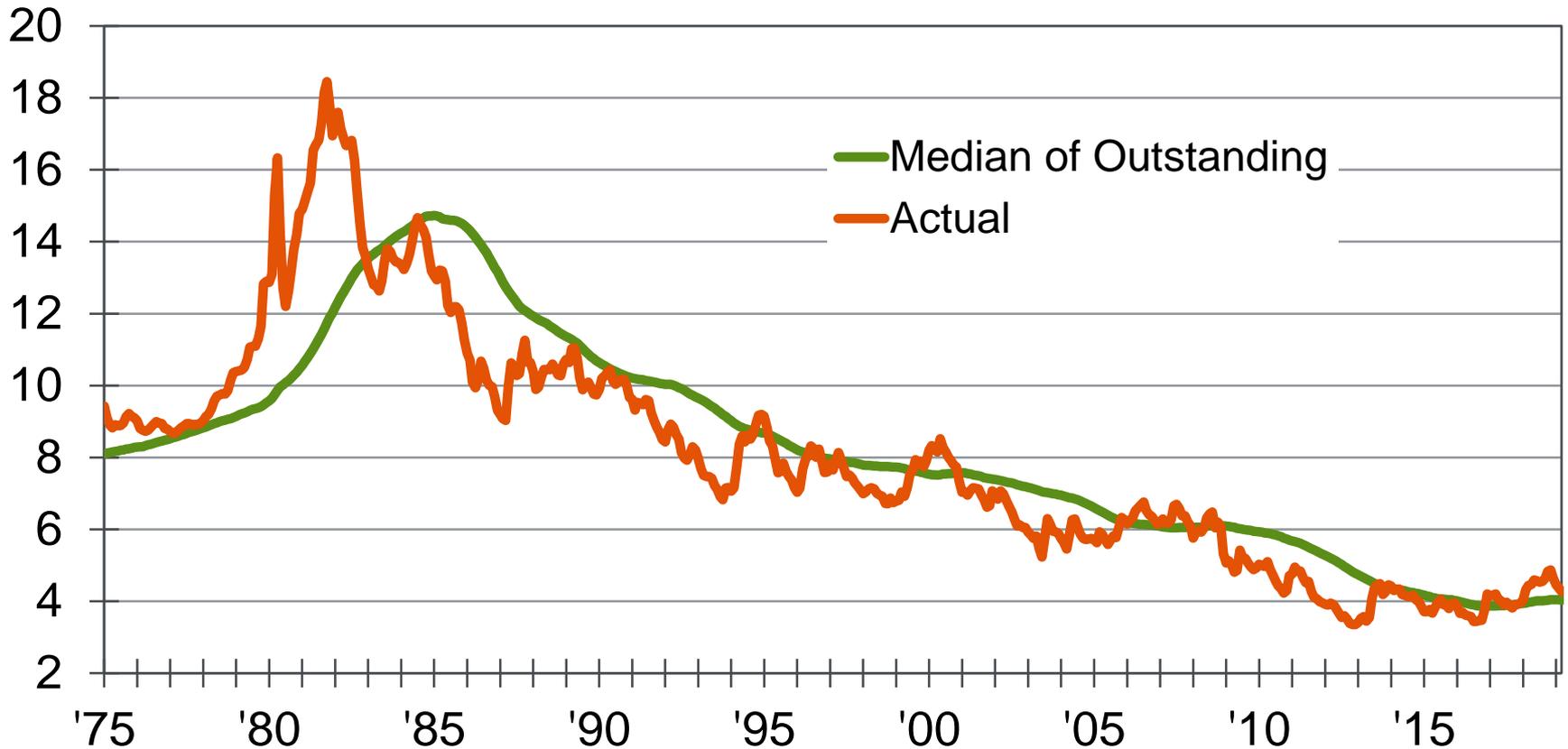
Millions



Sources: Census Bureau, Moody's Analytics

Mortgage Rates Matter (a lot)

30-year fixed rate mortgage, %



Sources: Freddie Mac, Equifax, Moody's Analytics

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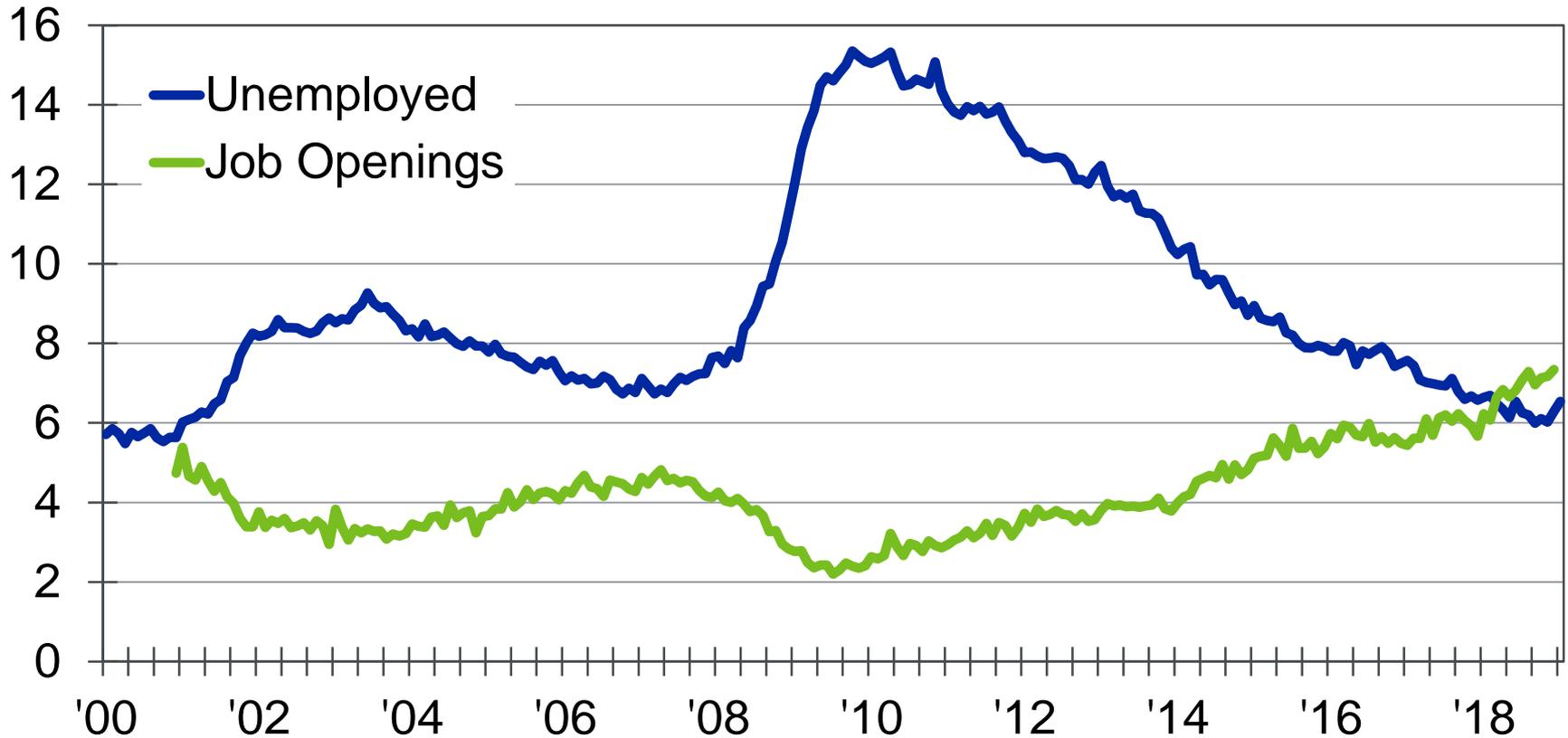
Housing Cross-Currents

Mark Zandi, Chief Economist, Moody's Analytics

March 2019

More Job Openings Than Unemployed

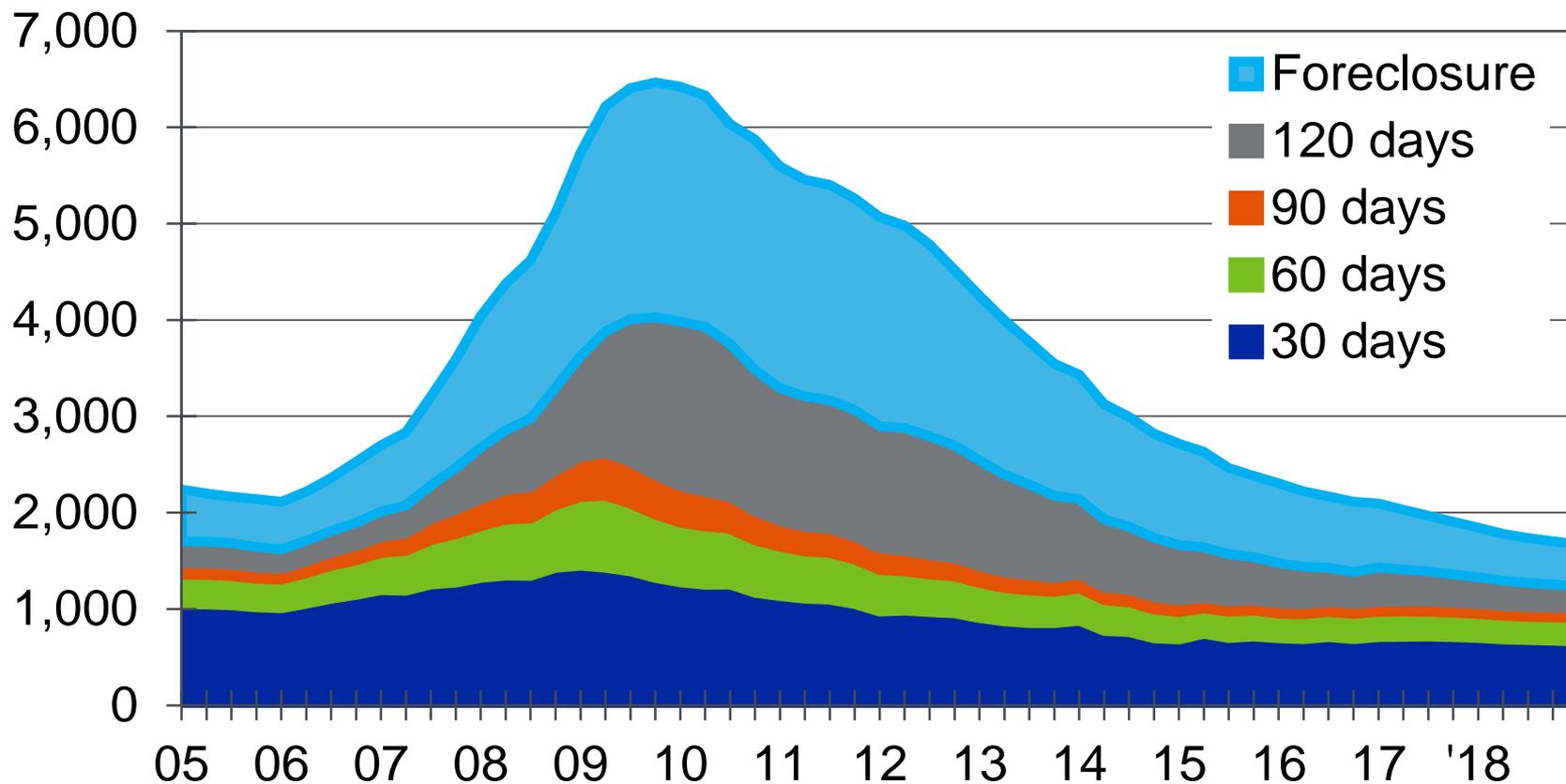
Millions



Sources: BLS, Moody's Analytics

Mortgage Quality is Pristine

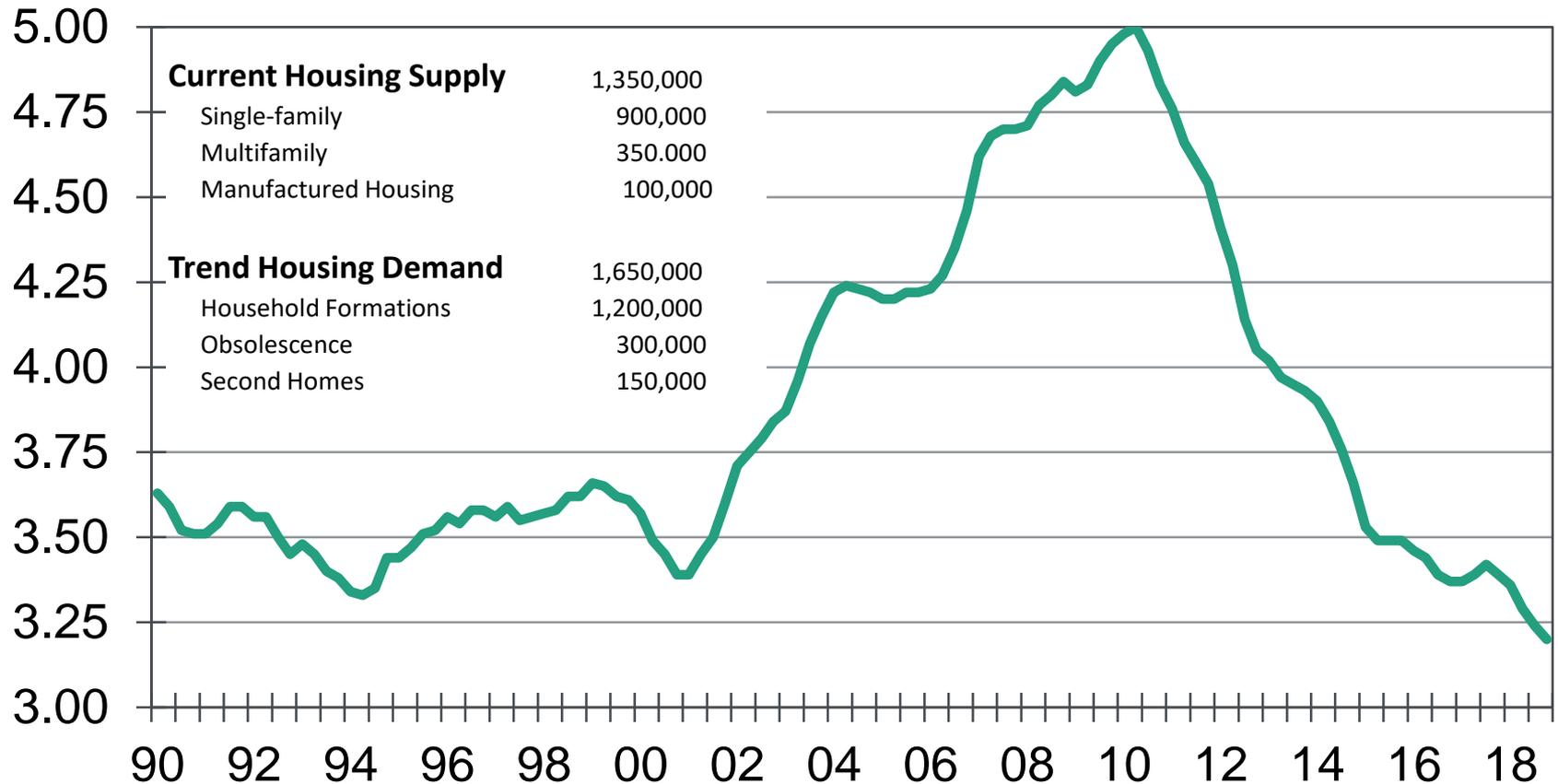
Troubled first mortgage loans, the



Sources: Equifax, Moody's Analytics

Increasingly Severe Housing Shortage...

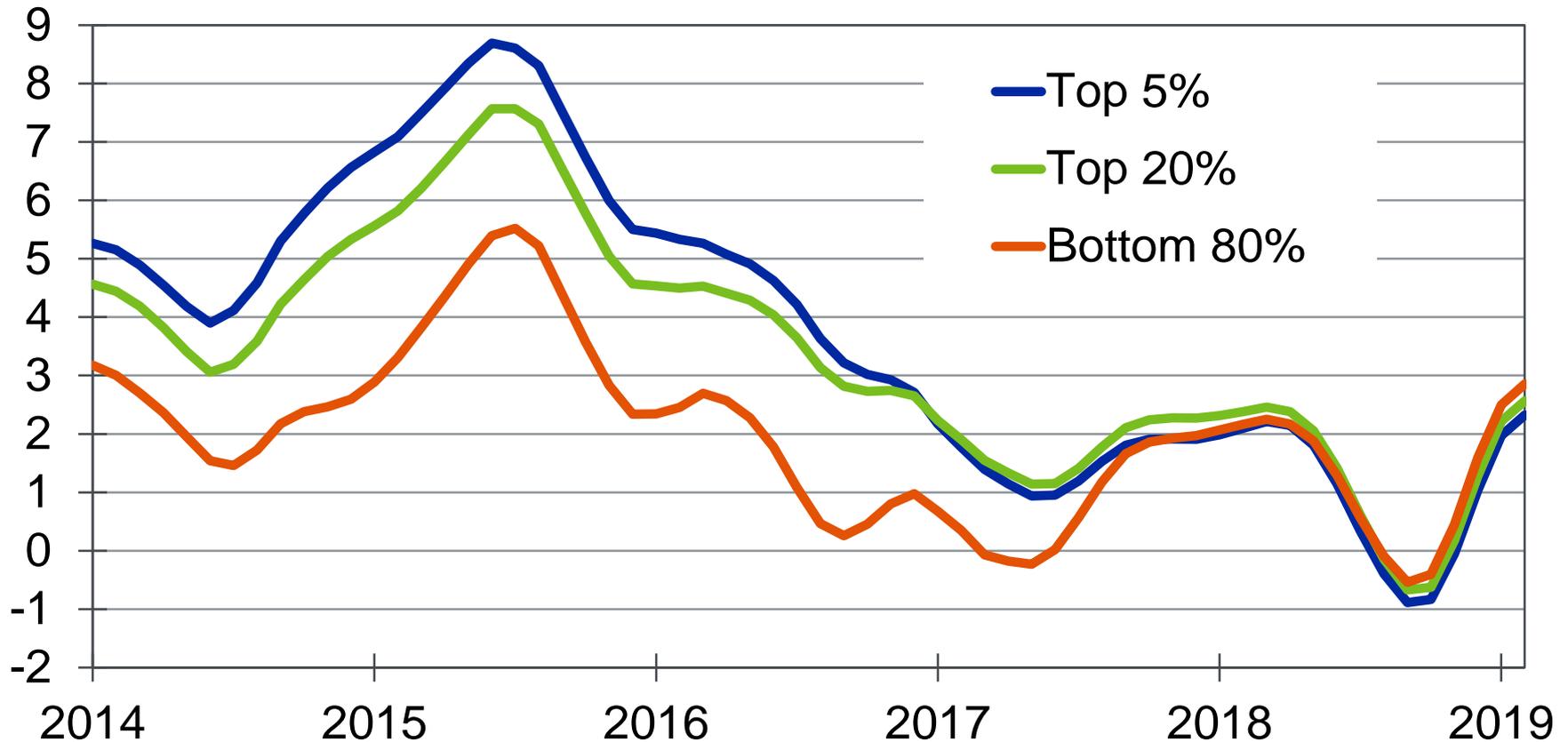
Vacancy rate, homes for sale and rent, 4-qrt MA, %



Sources: Census Bureau, Moody's Analytics

...Particularly For Affordable Housing

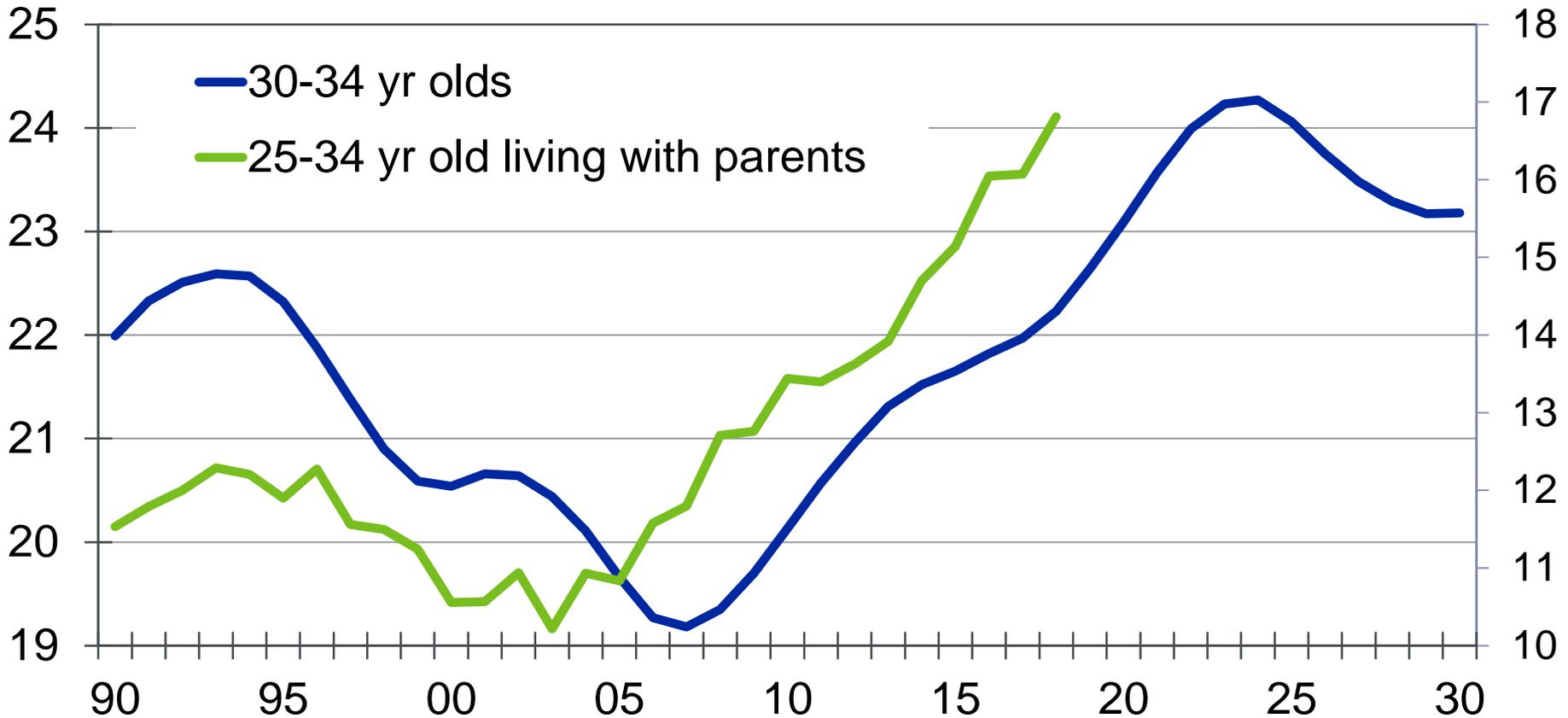
County household weighted average of rents by rent by sq-ft tiers, % change yr ago



Sources: Zillow, Moody's Analytics

Millennials Will Be a Housing Tailwind

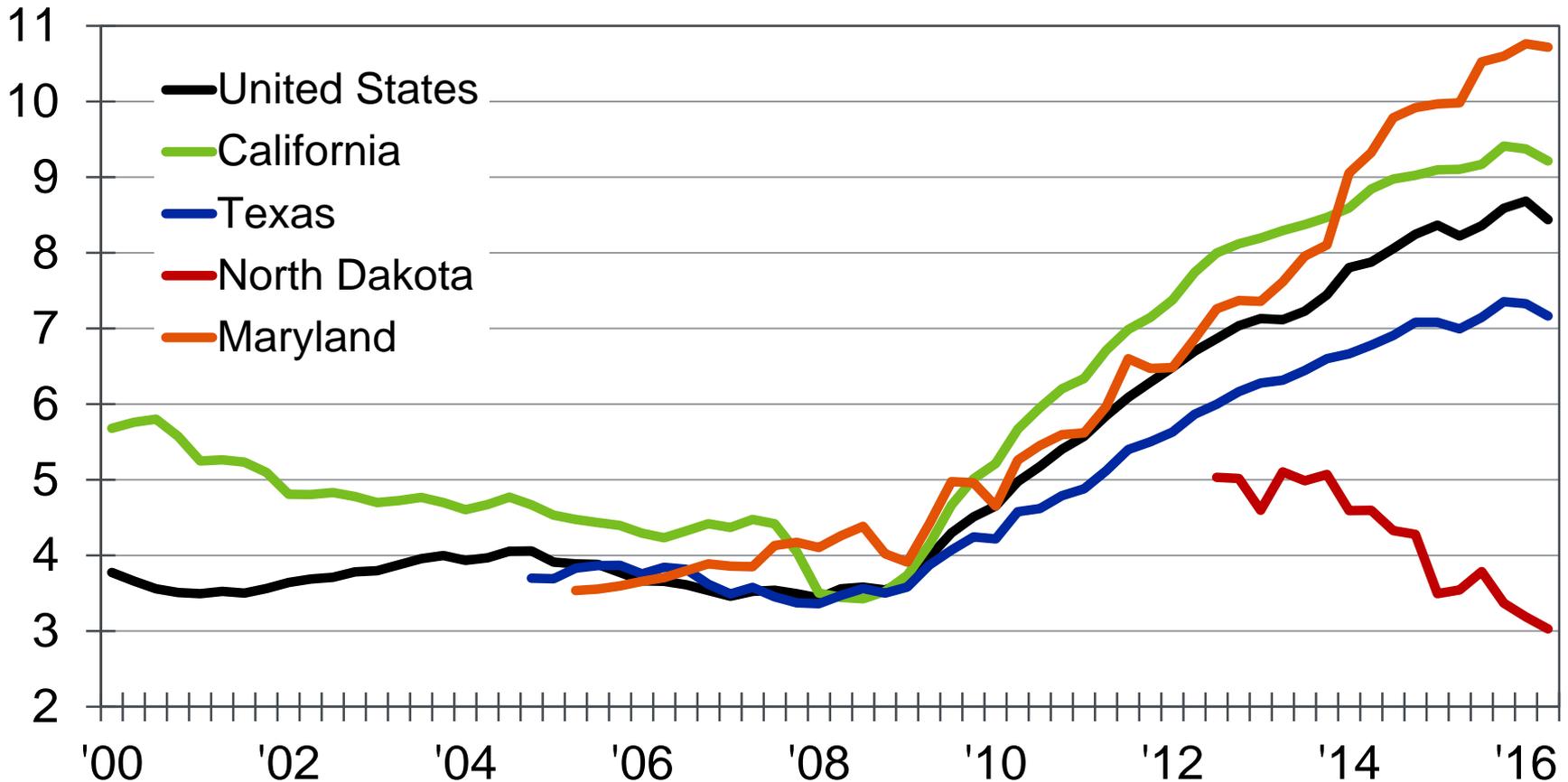
Millions



Sources: Census Bureau, Moody's Analytics

Aging Population Stays in Place

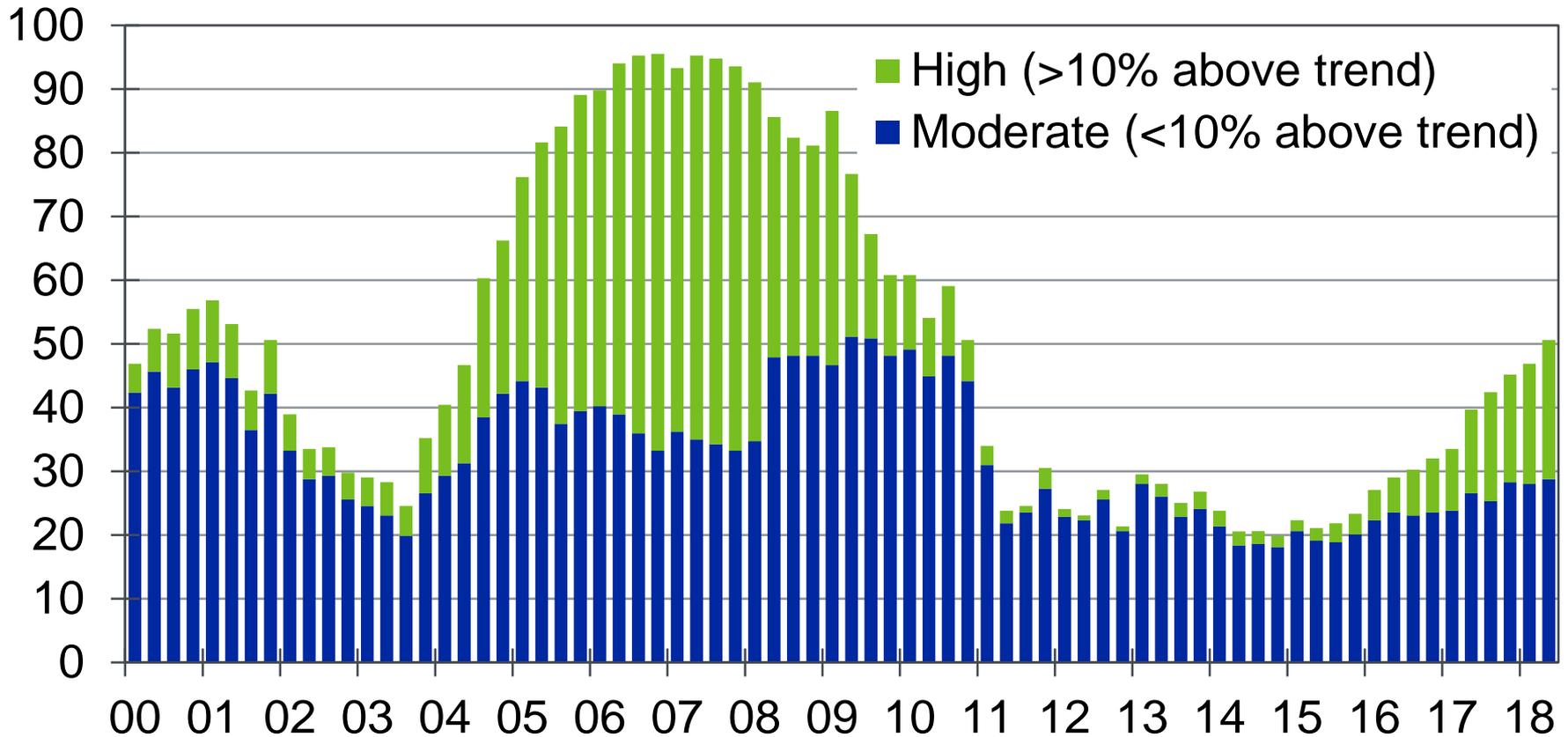
Median homeownership tenure, years



Sources: First American, Moody's Analytics

Housing Values Look Stretched

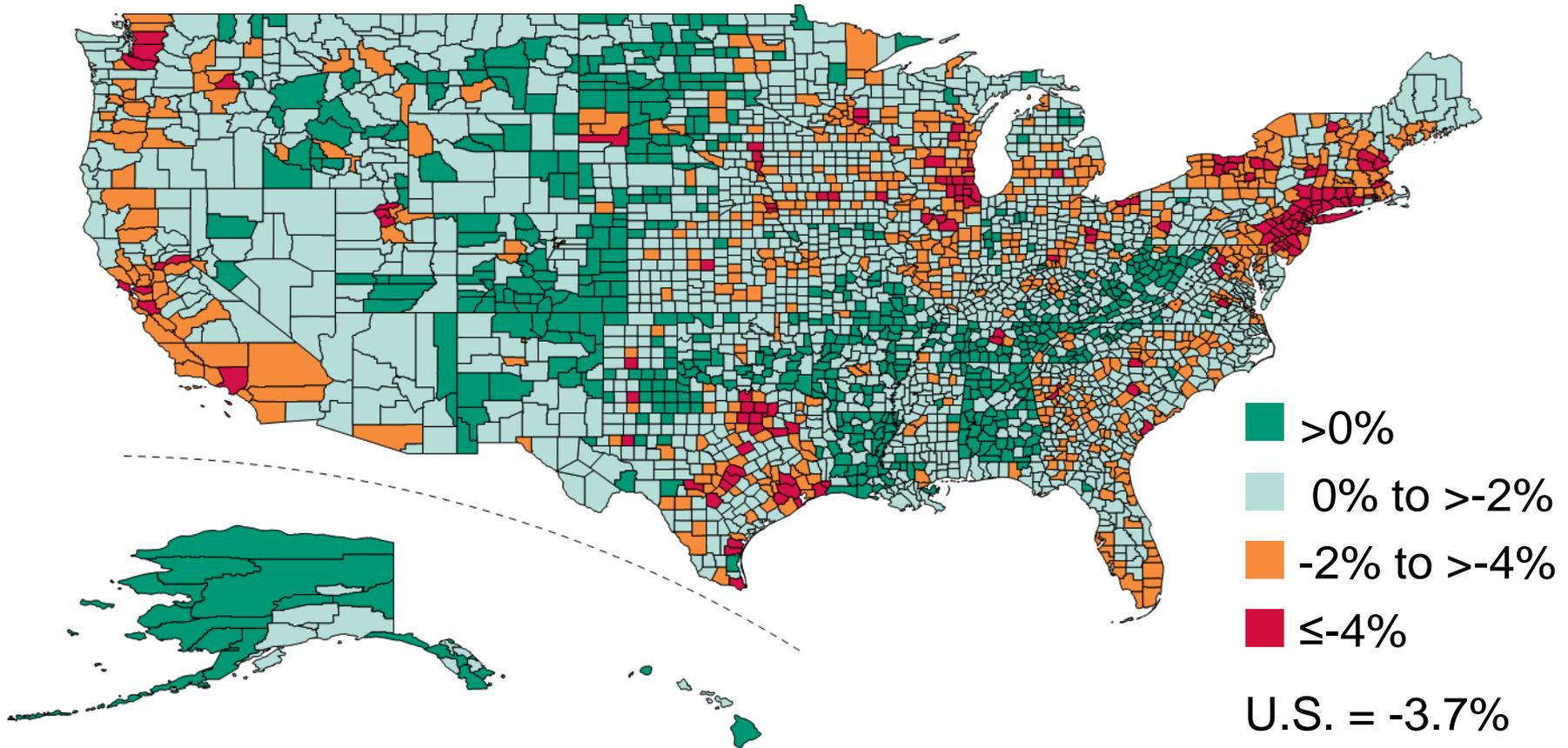
% of metro areas with FHFA HPI above trend value



Sources: FHFA, Moody's Analytics

Trump Tax Legislation Hurts House Prices

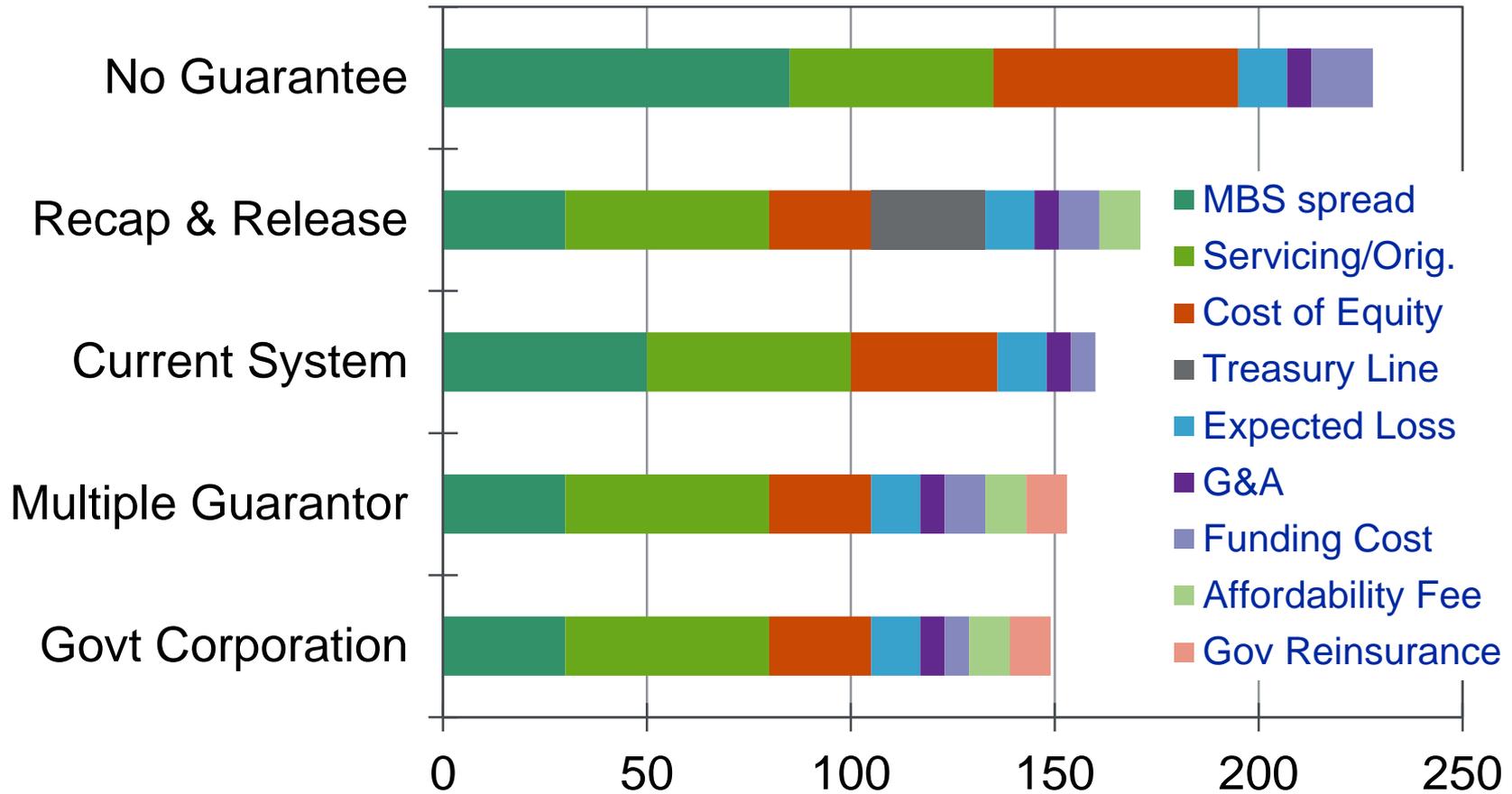
FHFA HPI, ppt peak change due to tax law



Sources: FHFA, IRS, Moody's Analytics

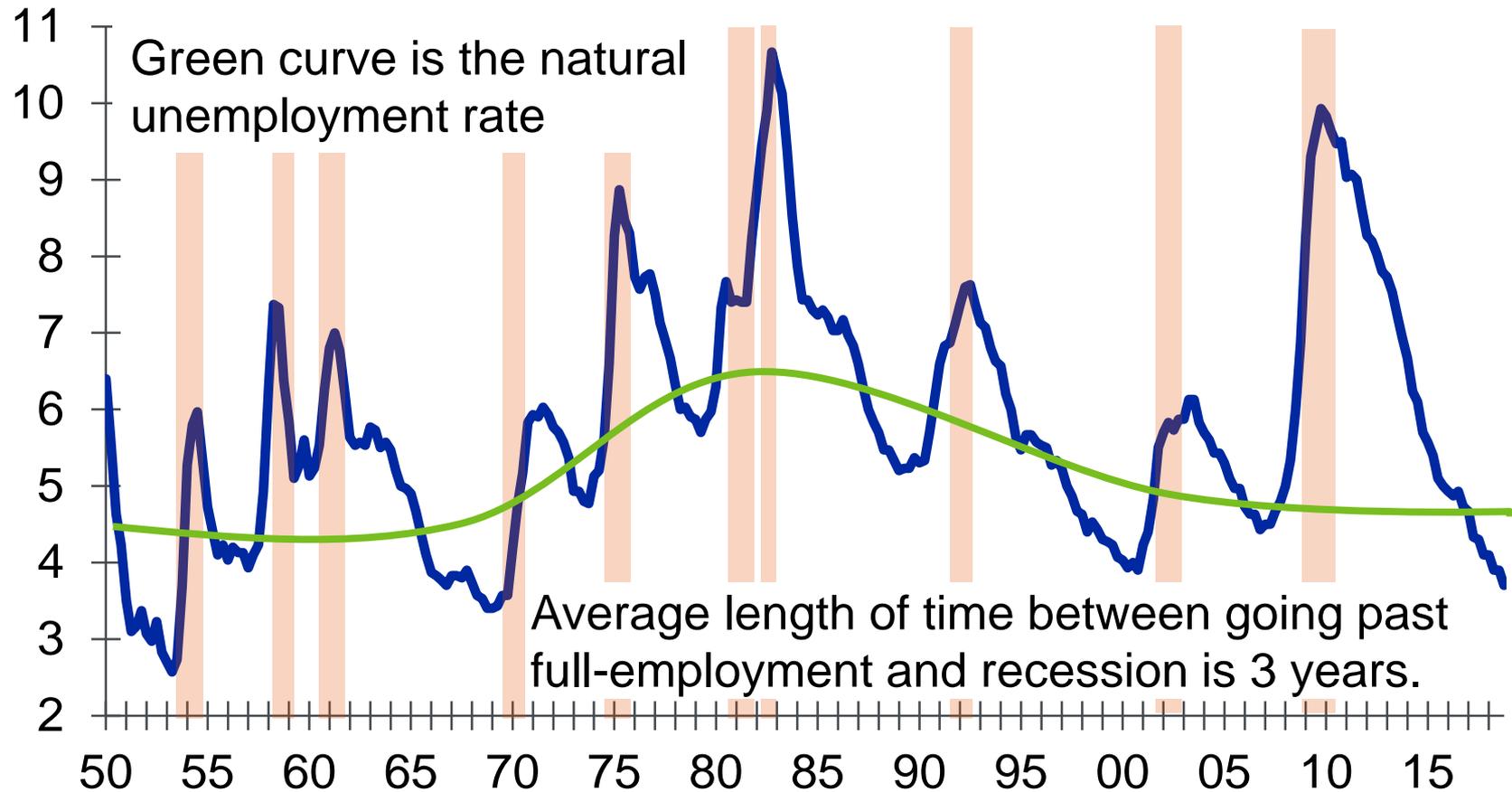
Mortgage Rates Under Different Systems

Mortgage rate spread over Treasuries, bps



The Next Recession Comes Into View...

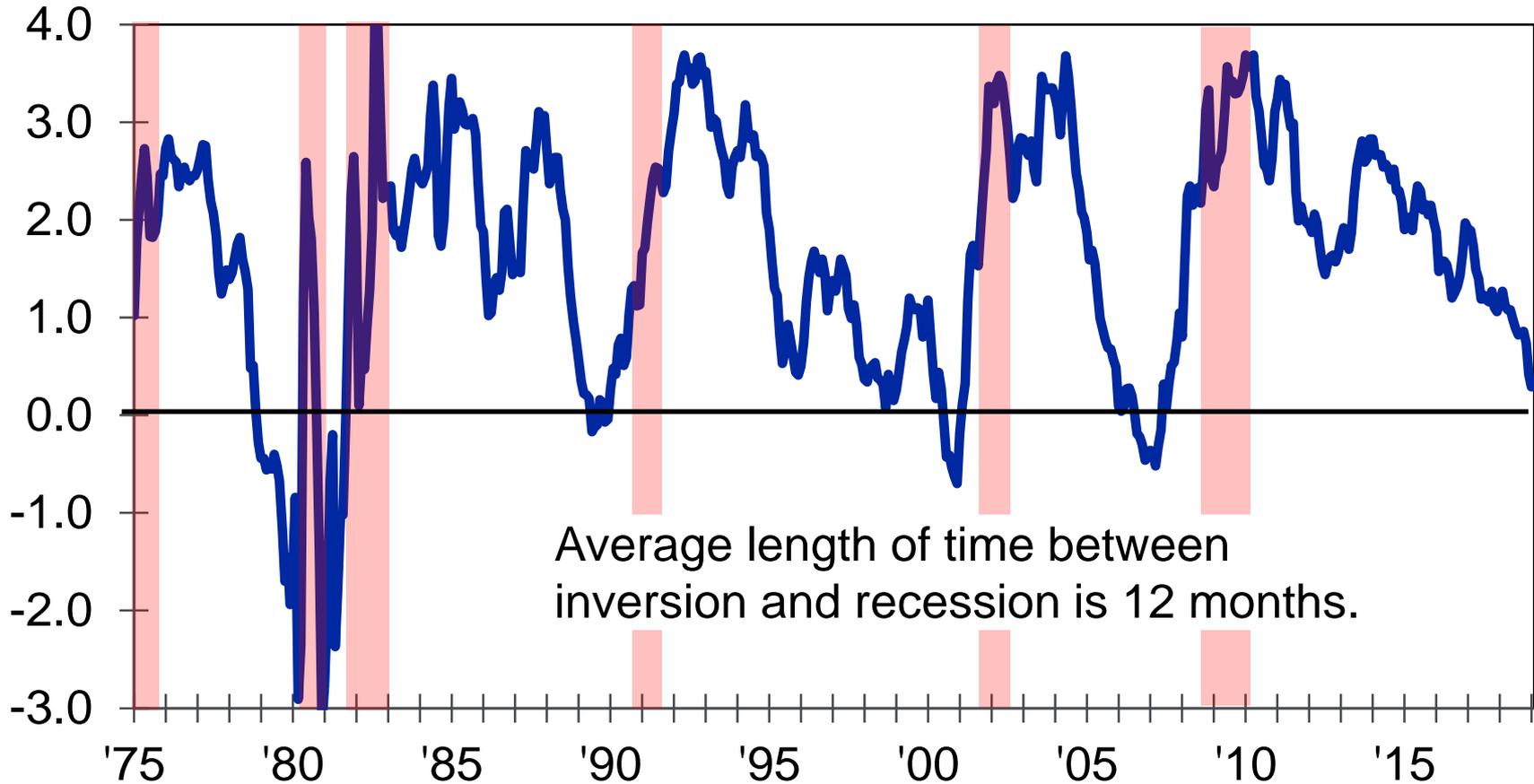
Unemployment rate, %



Sources: BLS, Moody's Analytics

..as the Yield Curve Sends a Warning...

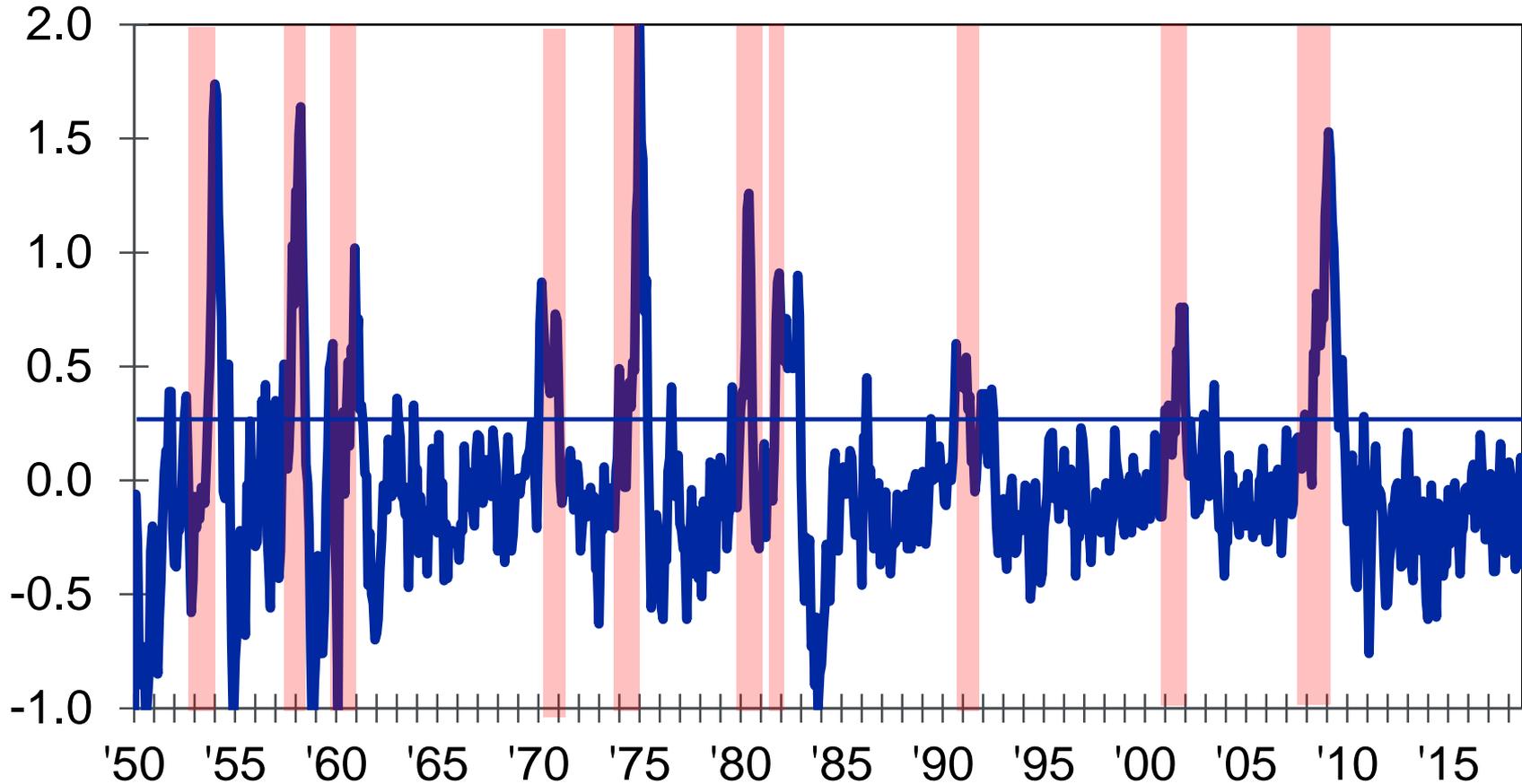
Difference between 10-yr and 3-mo EBY, %



Sources: Federal Reserve, Moody's Analytics

...And Landing the Economic Plane is Hard

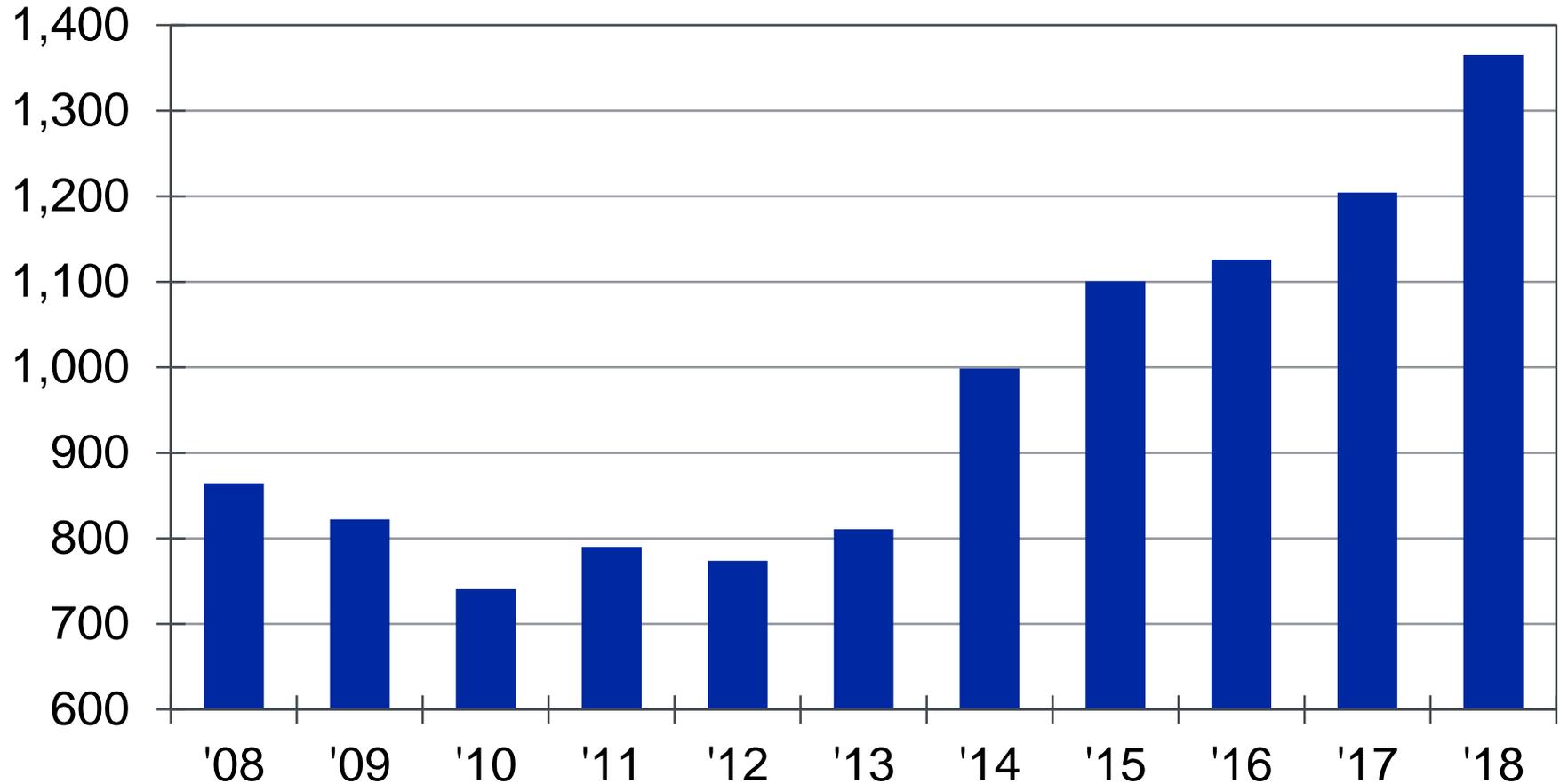
3-month change in the unemployment rate, ppt



Sources: BLS, Moody's Analytics

Leveraged Firms Leverage Up...

Leveraged Loans, Bil\$

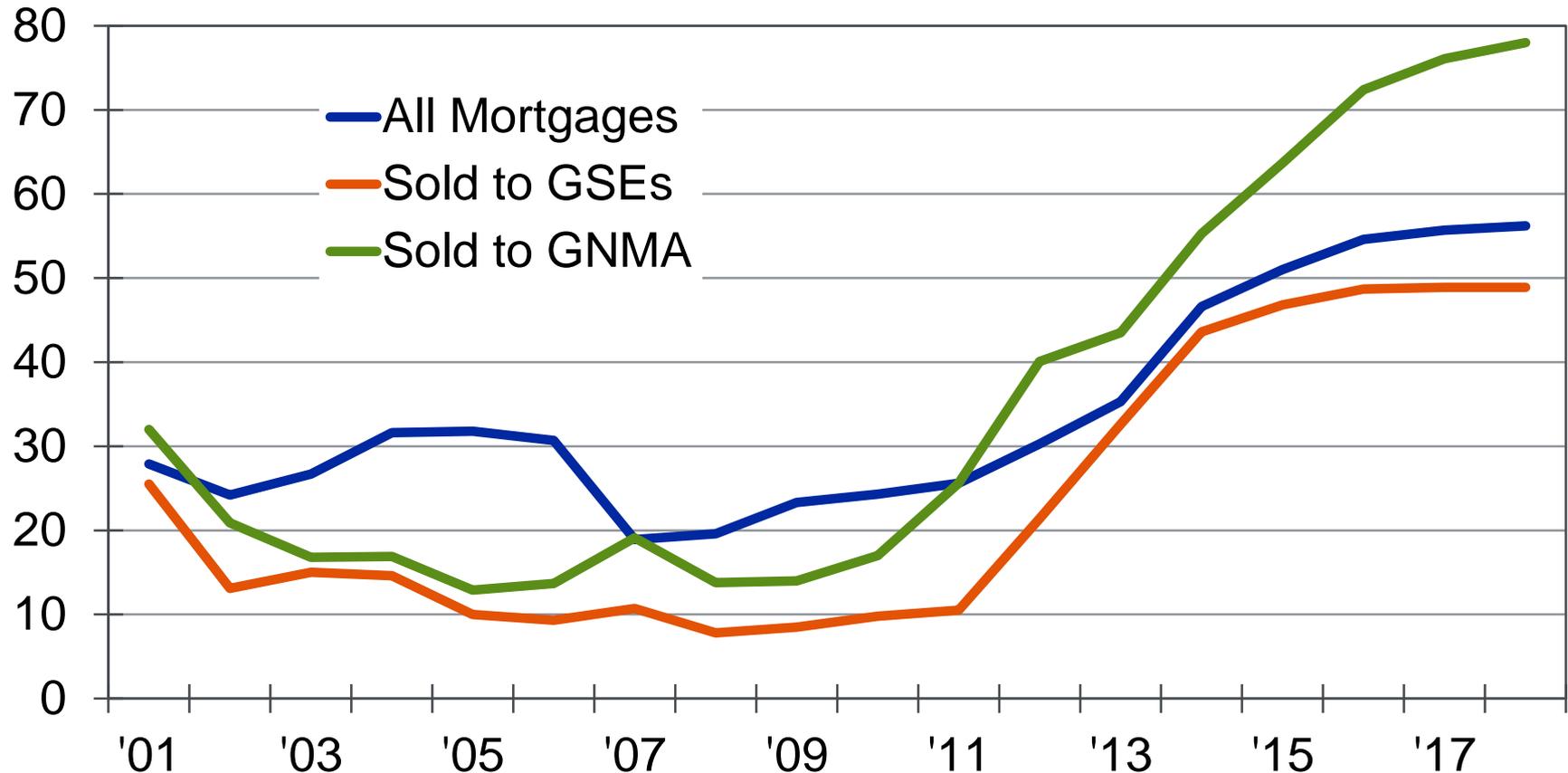


Sources: IMF, Moody's

Note: 2018 issuance is YTD annualized

...And the Shadow System Expands

% of mortgage originations originated by nonbanks



Sources: Federal Reserve, Brookings

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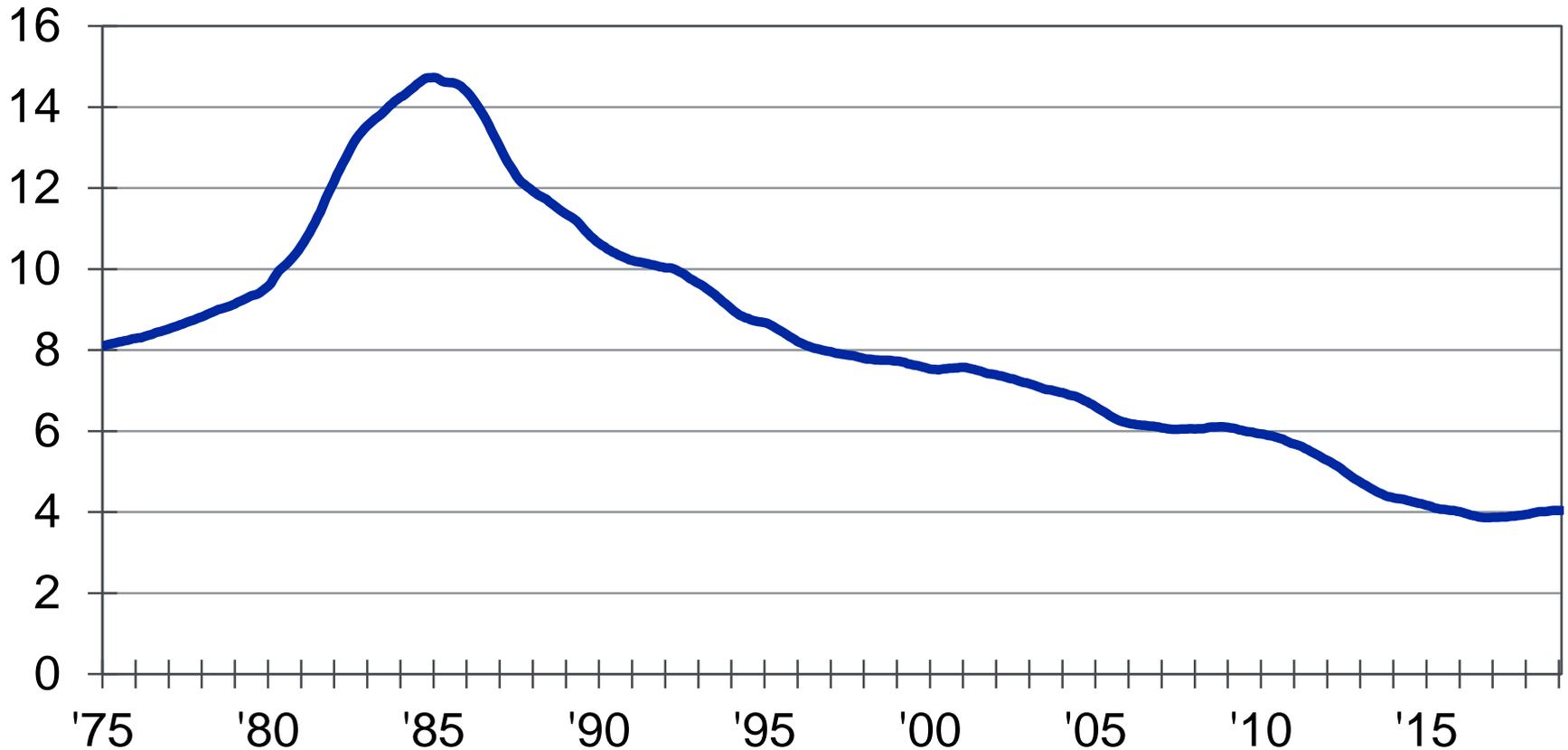
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Mortgage Rates Matter

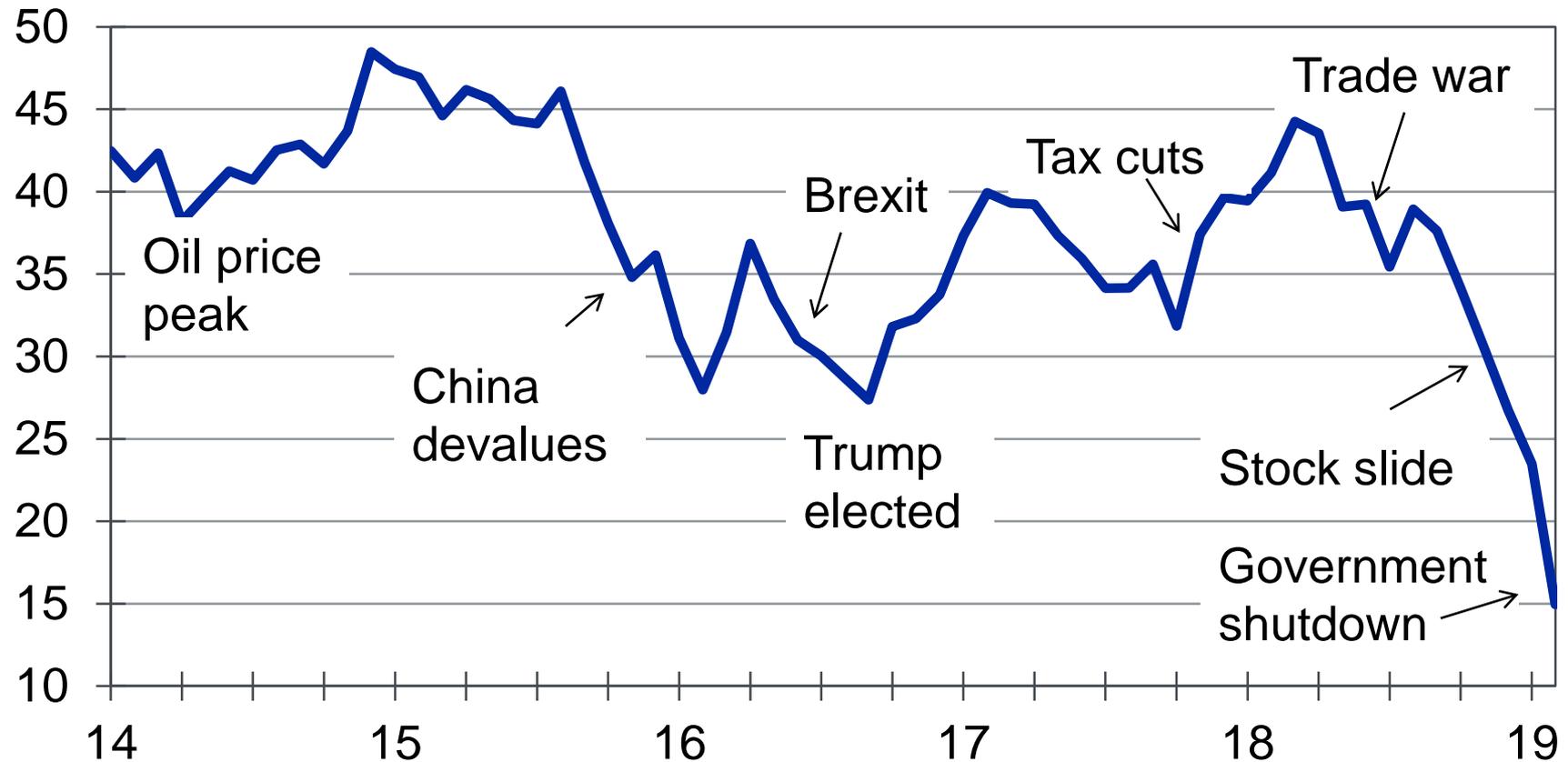
Median mortgage rate on outstanding mortgage loans, %



Sources: Freddie Mac, Equifax, Moody's Analytics

Geopolitics Threaten the Expansion...

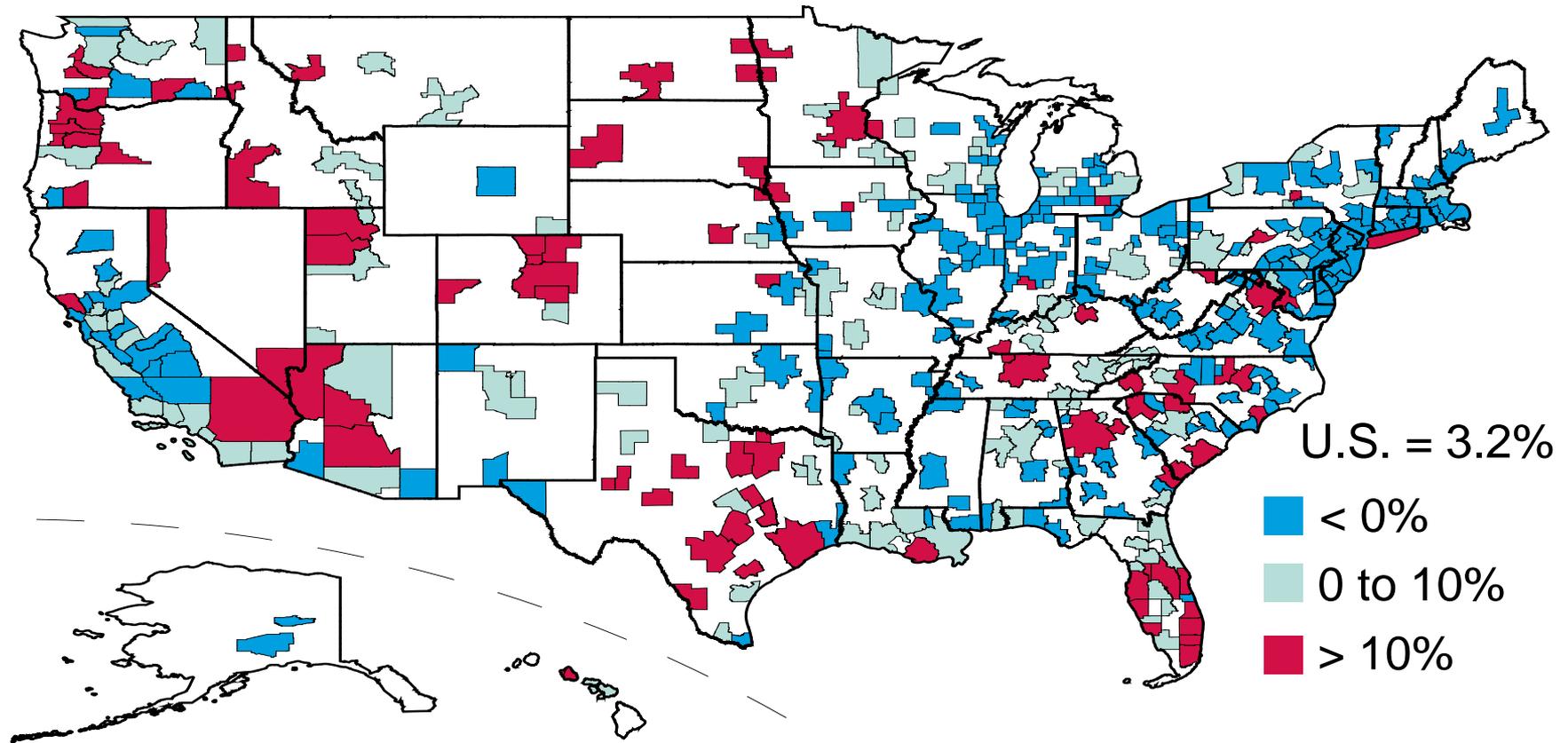
Business sentiment diffusion index, net % positive



Source: Moody's Analytics

Overvaluation Index, Metro Areas

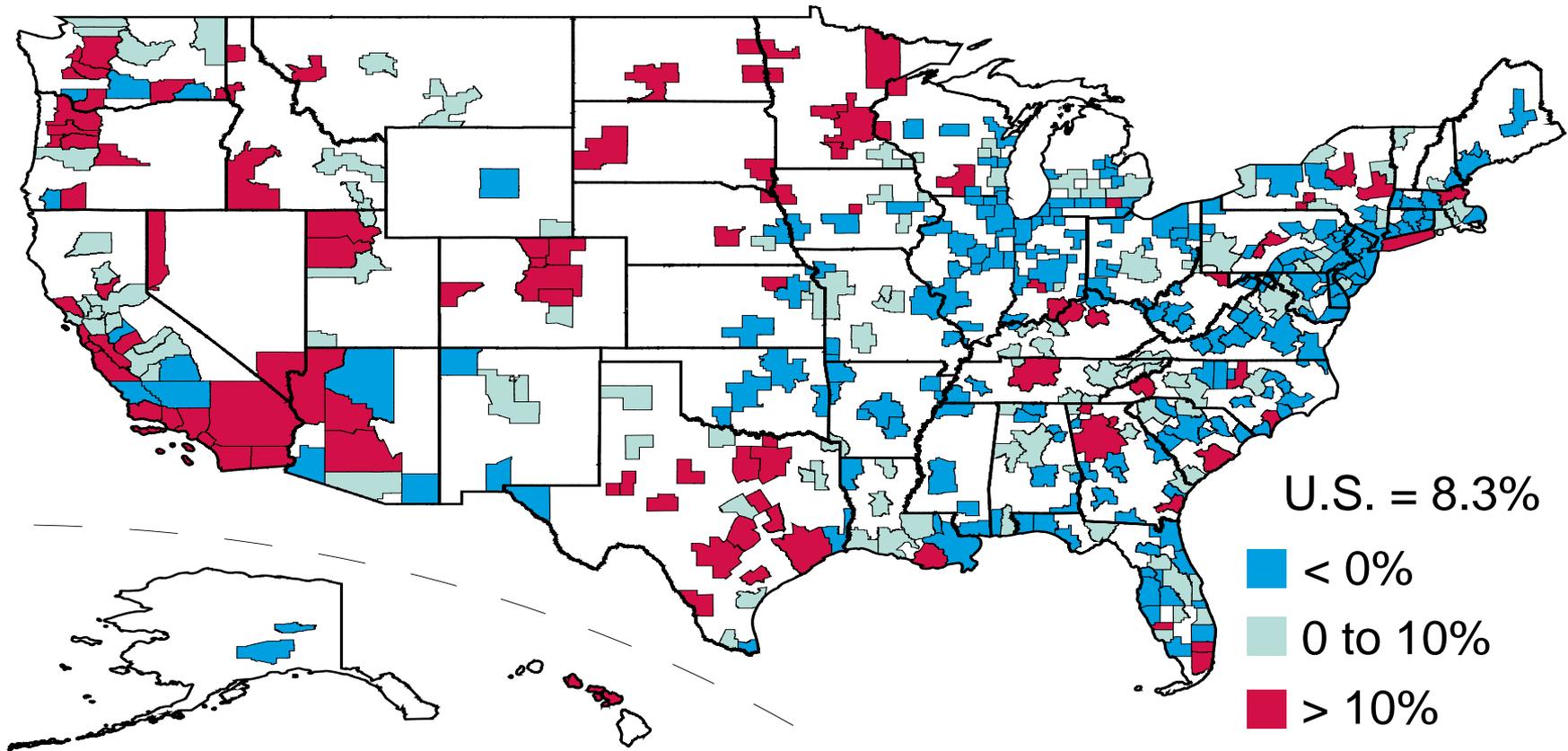
FHFA all-transactions index, % above equilibrium trend, 2018Q2



Sources: FHFA, BEA, Census Bureau, Moody's Analytics

Overvaluation Index, Metro Areas

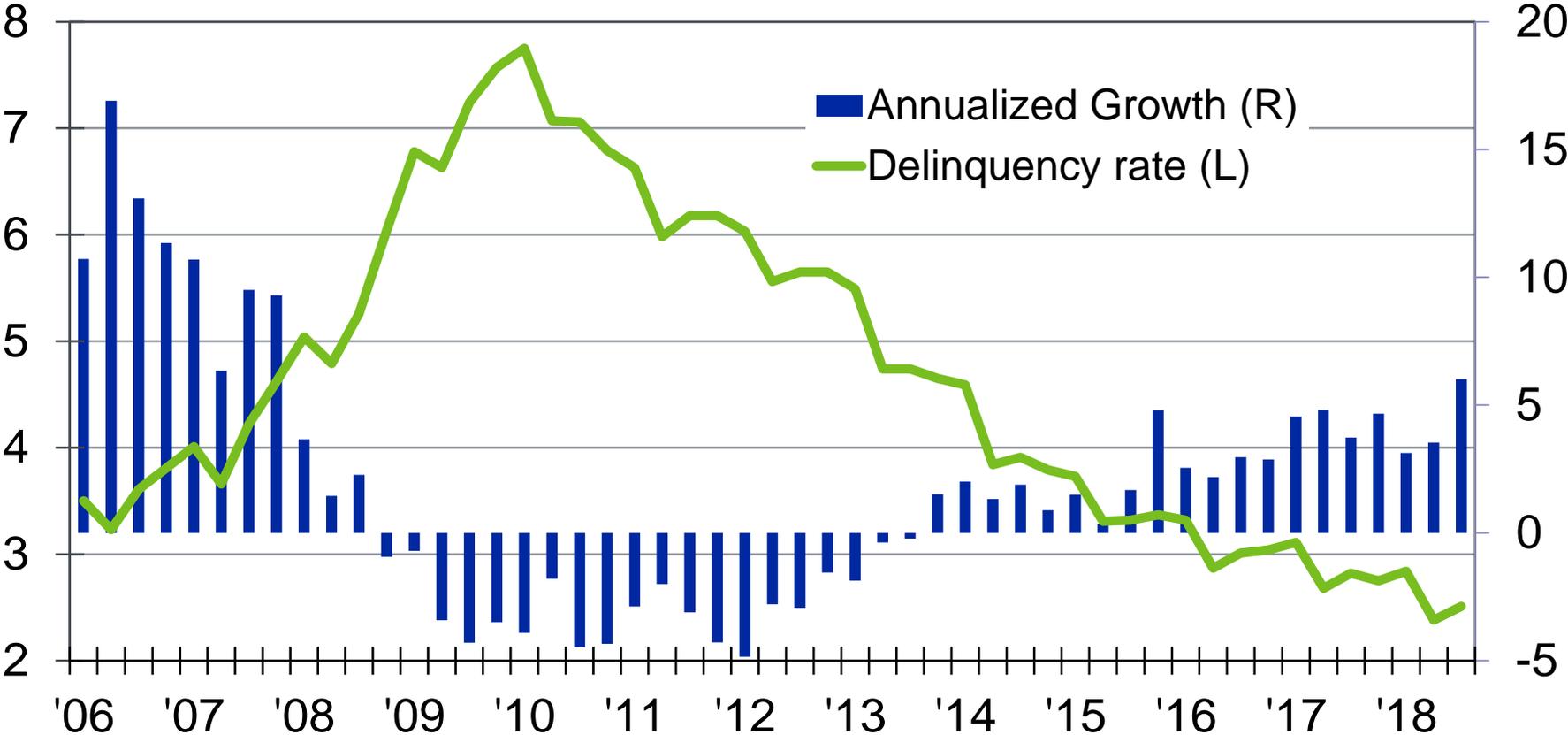
Case-Shiller index, % above or below equilibrium trend, 2018Q2



Sources: CoreLogic, FHFA, BEA, Census Bureau Moody's Analytics

SF Mortgage Market is Sturdy

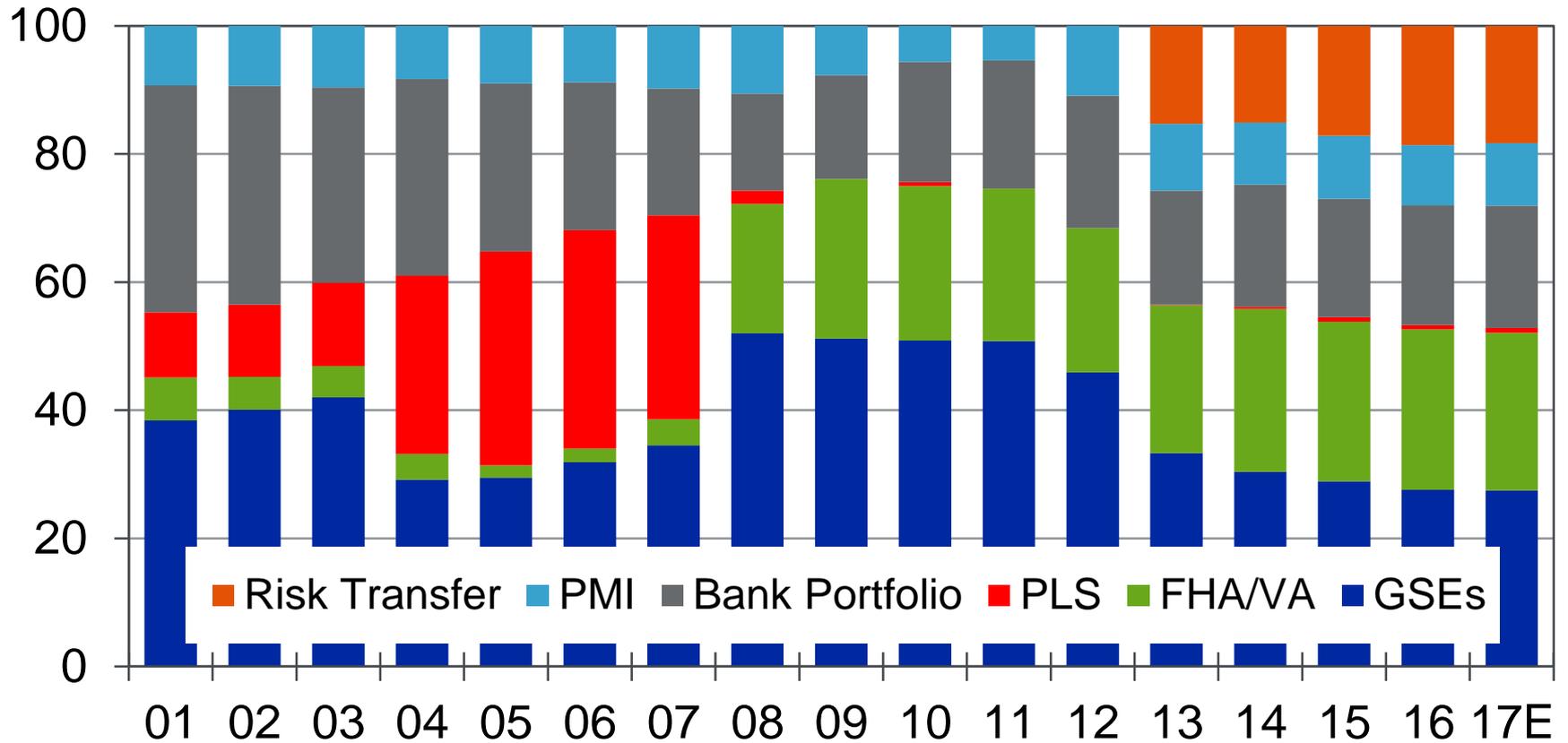
Single family mortgages outstanding



Sources: Equifax, Moody's Analytics

De Facto GSE Reform

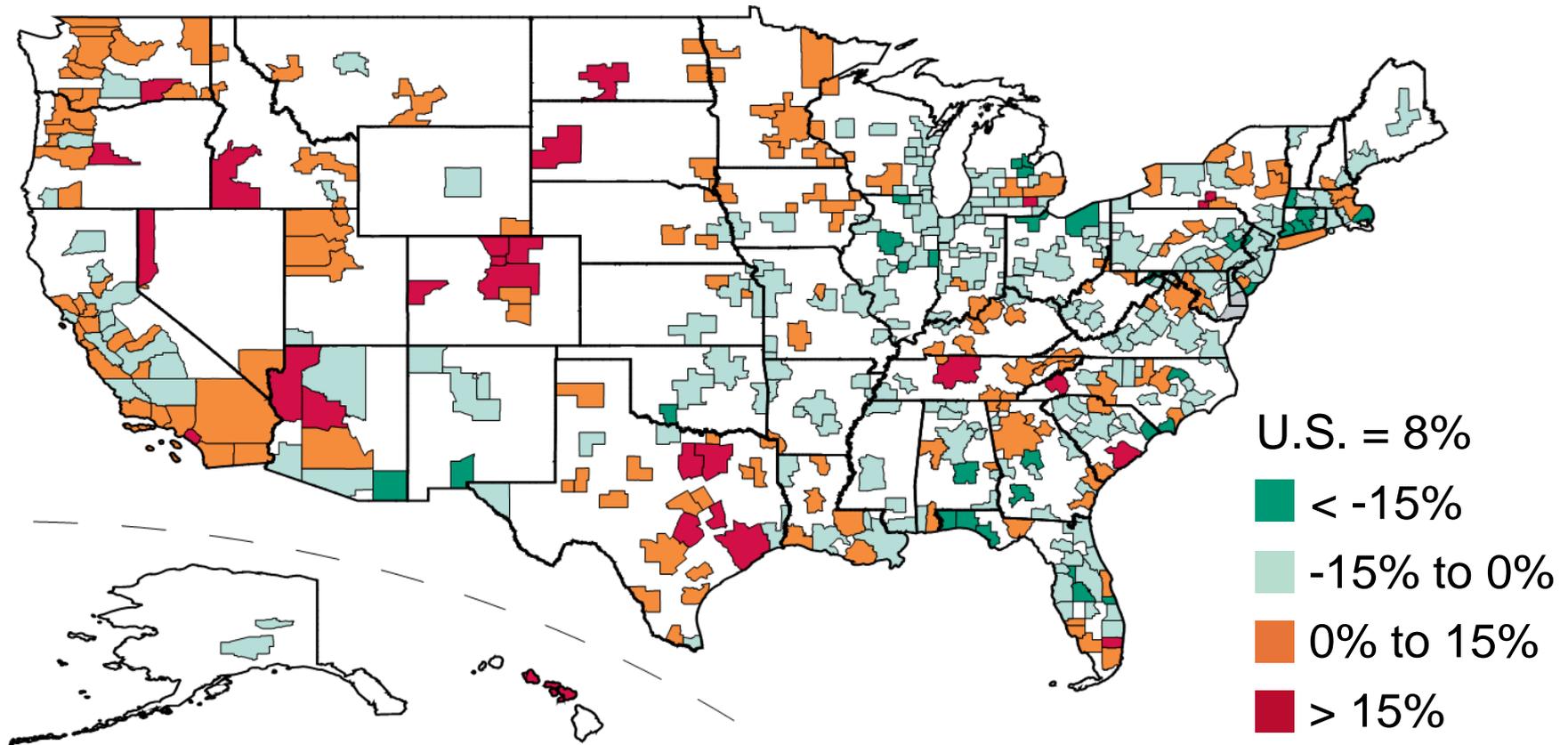
Credit risk share of residential mortgage originations, %



Sources: Fannie Mae, Moody's Analytics

Valuation May Soon Become an Issue

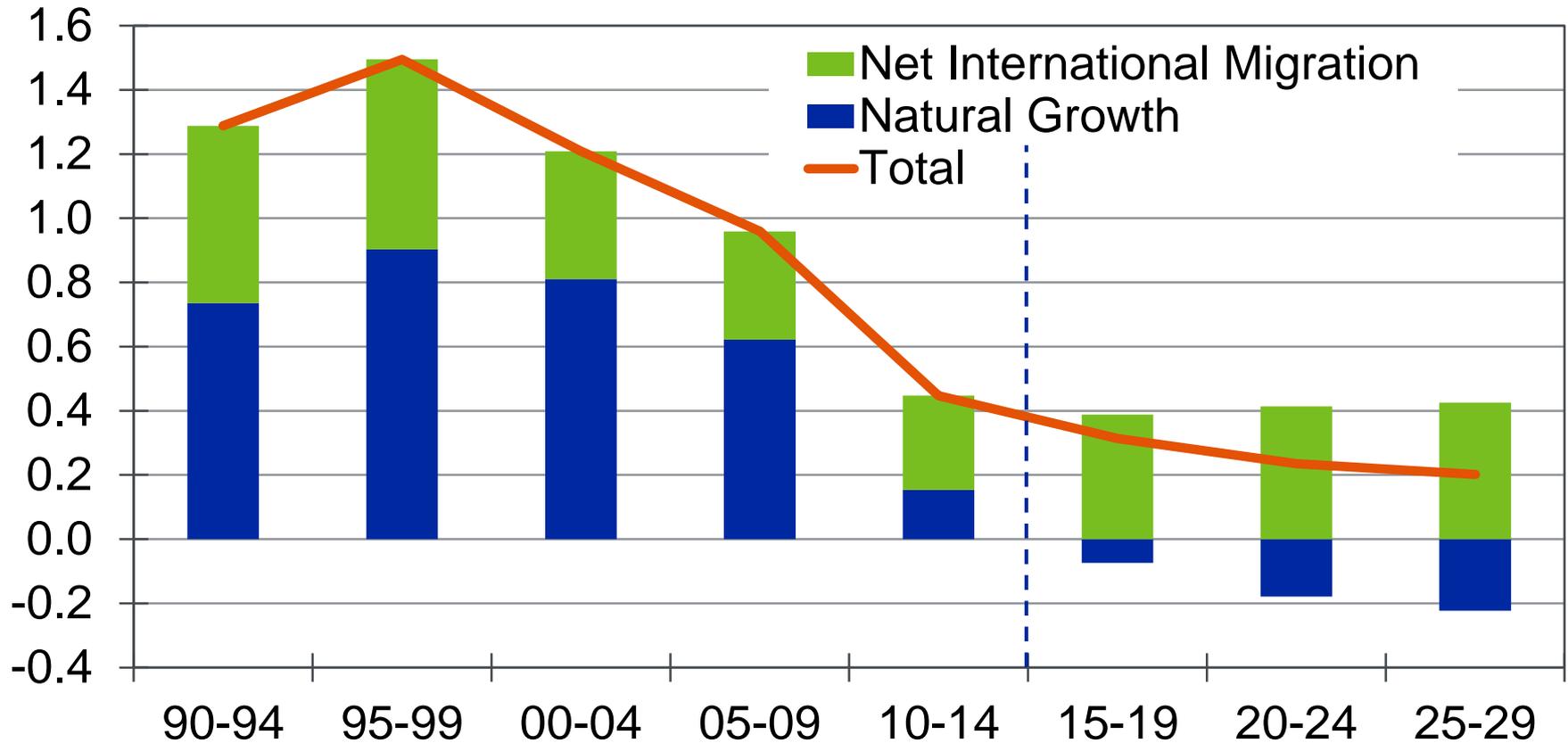
Case-Shiller index, % over or undervalued, 2017q4



Sources: CoreLogic, FHFA, Moody's Analytics

We Need More Immigration, Not Less

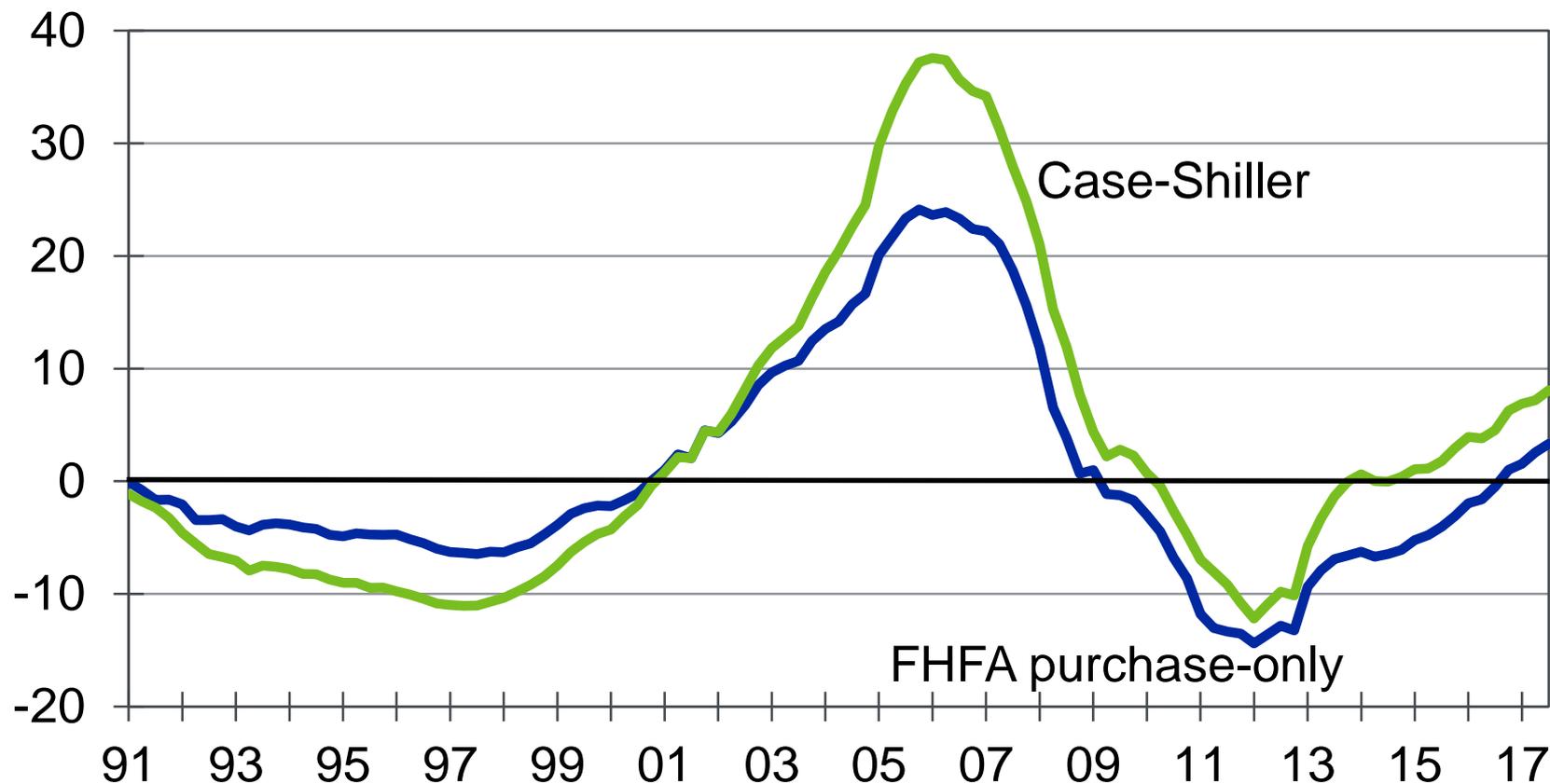
Contribution to working age population growth, ppt, 5-yr avg



Sources: Census Bureau, Moody's Analytics

Valuation Bears Watching...

U.S. house price indexes, % over equilibrium trend



Sources: CoreLogic, FHFA, Moody's Analytics

...as More Markets Appear Overvalued...

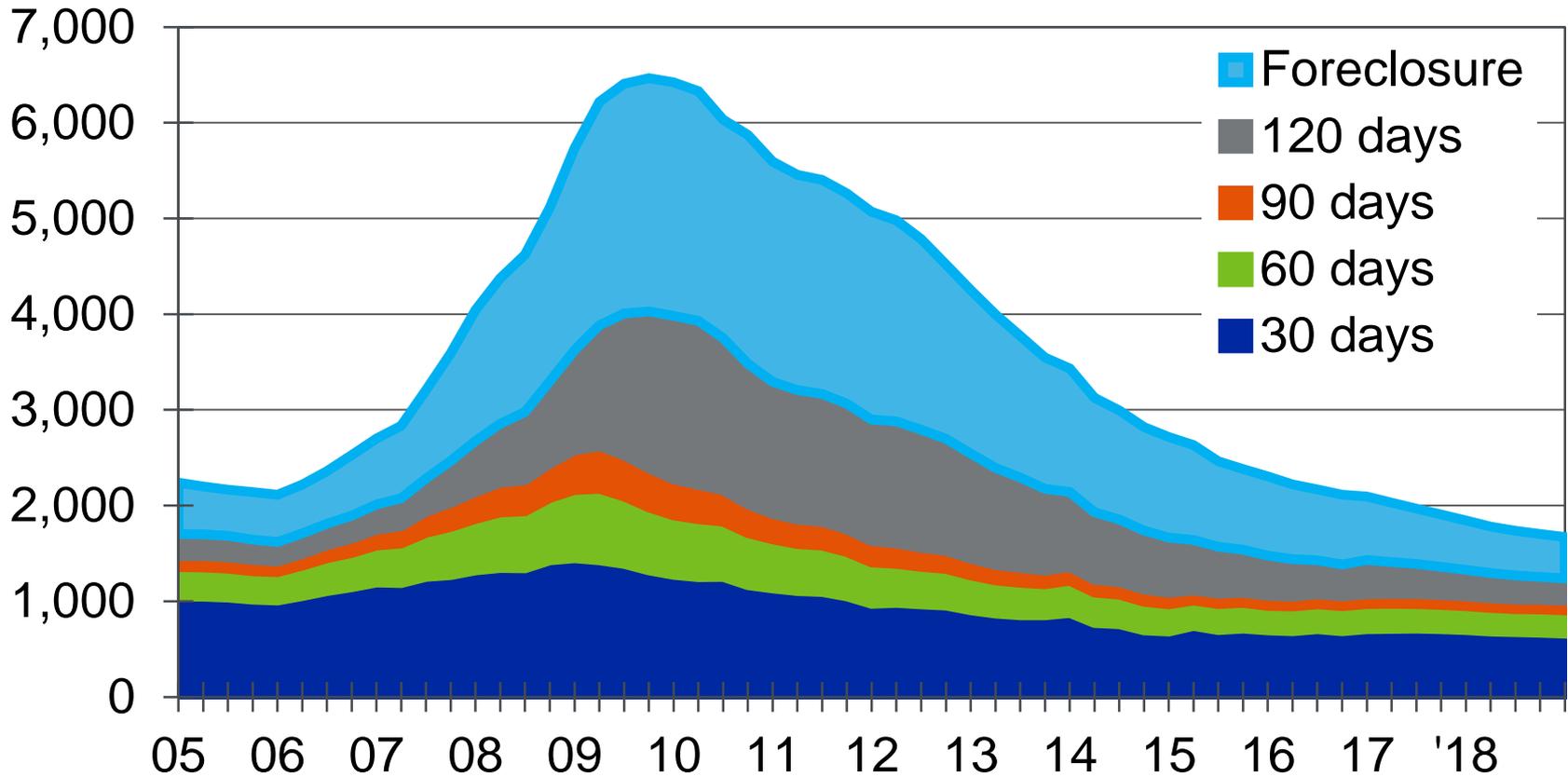
% of metro areas

% Overvalued	2016Q3	2017Q3
<-10%	21%	17%
-9.99 to 0%	43%	40%
0 to 9.99%	38%	28%
>10%	8%	16%

Sources: CoreLogic, FHFA, Moody's Analytics

Mortgage Quality Is Pristine

Troubled first mortgage loans, the



Sources: Equifax, Moody's Analytics

Assessing the GSEs' Capital Framework

Capital Framework Preserves Mortgage Rates...

...for the typical borrower through the business cycle...

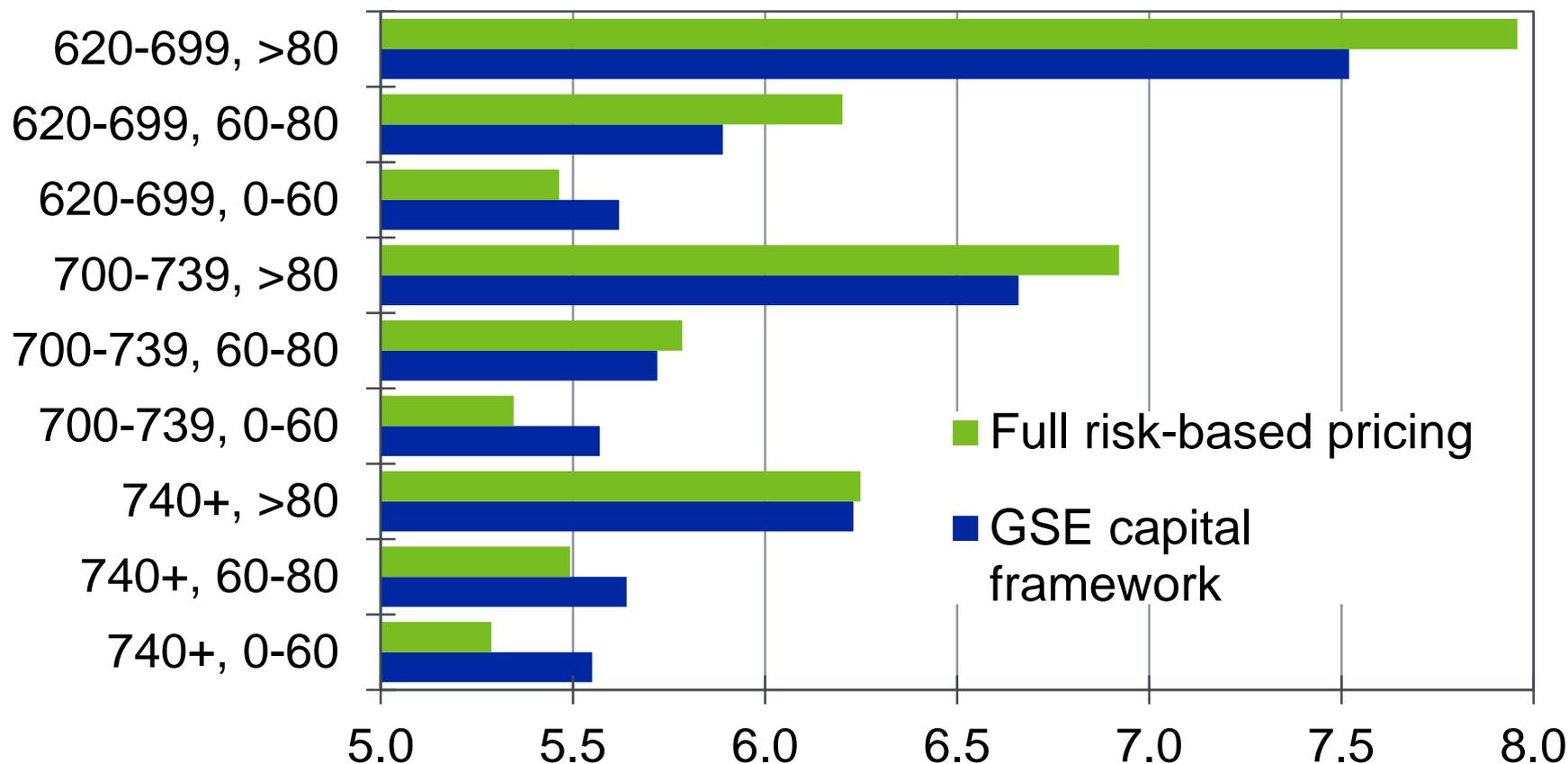
Mortgage Rate	5.50
Yield on Mortgage Securities	440 bps
Servicing and Origination Compensation	50 bps
G-fee	60 bps
Cost of Capital	32 bps
Expected credit losses	12 bps
Administrative costs	6 bps
Payroll tax surcharge	10 bps

	Capitalization	Cost
Cost of Capital	4.74%	32 bps
Common Equity	3.24%	38 bps
Debt or Risk Syndication	1.5%	6 bps
Less: Return on Cash Reserves to Pay for Losses		-12 bps

Assumptions	
Before-Tax Cost of Common Equity	11.7%
After-Tax Cost of Common Equity	9.0%
Pre-Tax Return on Unlevered Capital	3.7%
10-Year Treasury Yield	3.7%
MBS Spread with Treasury yield	0.7%
Tax Rate	23%

...And Across the Credit Distribution

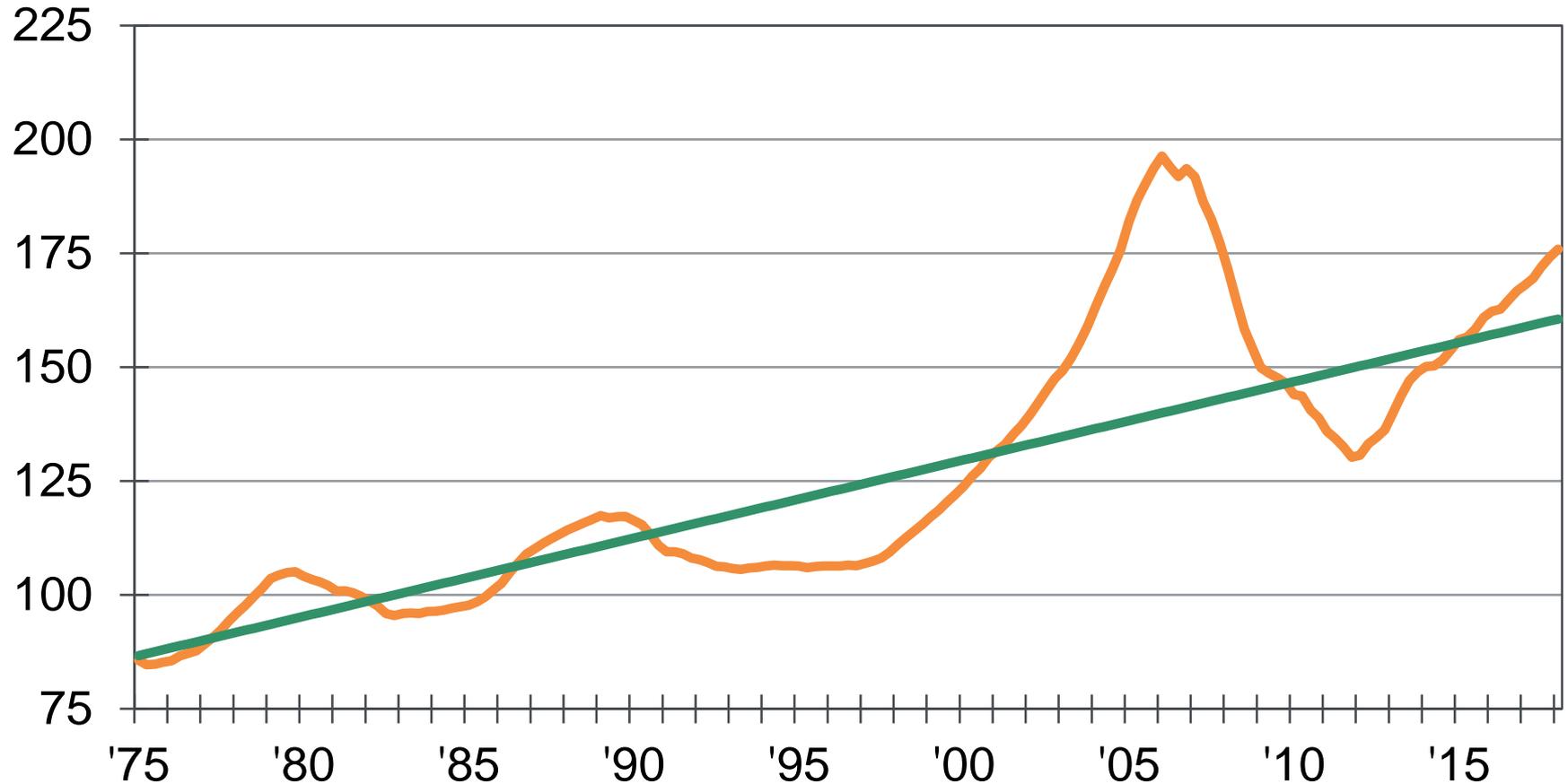
Mortgage rates under capital framework and risk-based pricing, %



Source: Moody's Analytics

As House Prices Rise Above Their Trend...

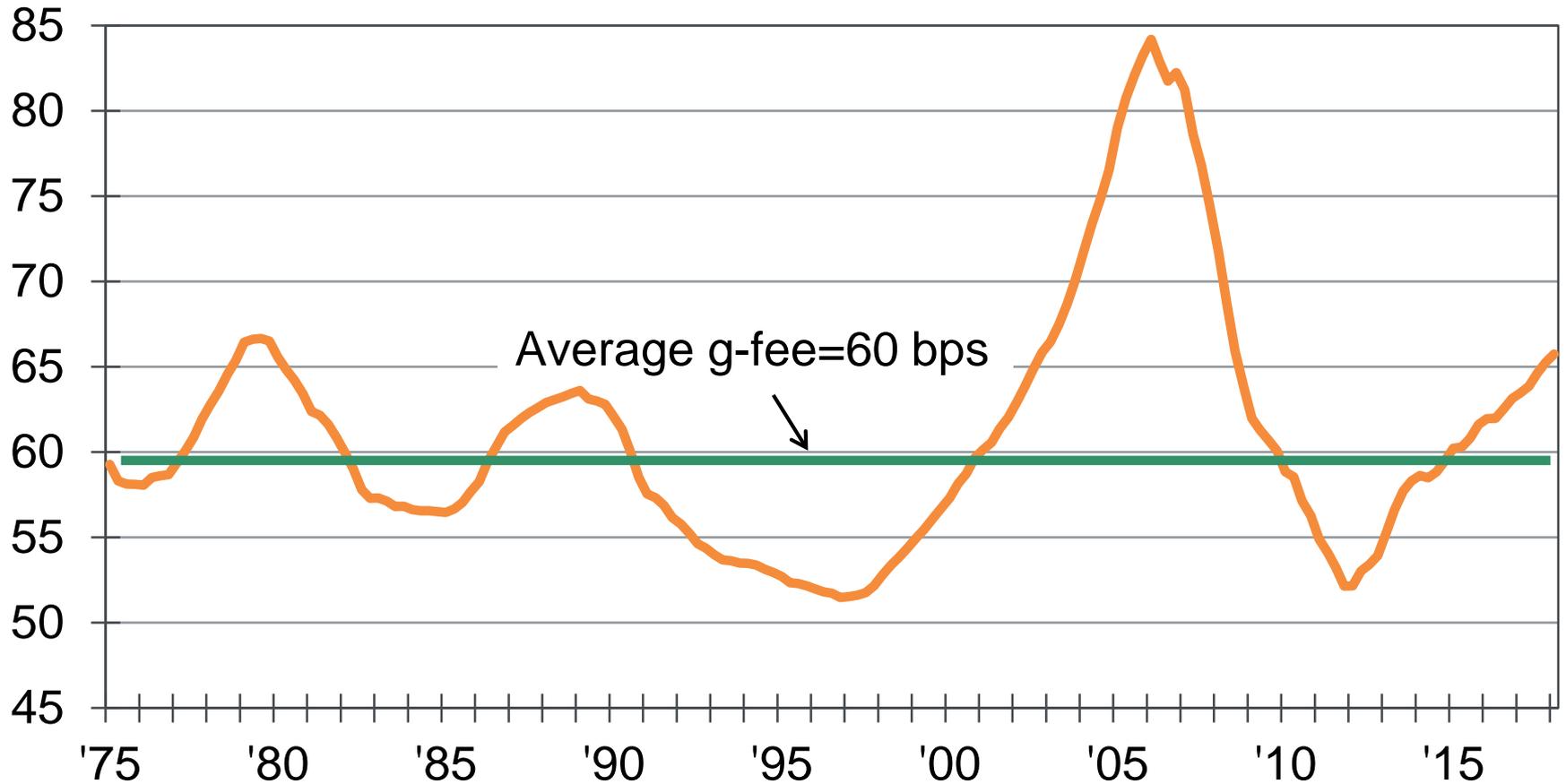
Real Case-Shiller[®] House Price Index, 1983Q1=100



Sources: CoreLogic, Moody's Analytics

...G-Fees Rise Above Their Cyclical Average

Cyclically adjusted g-fee



Source: Moody's Analytics

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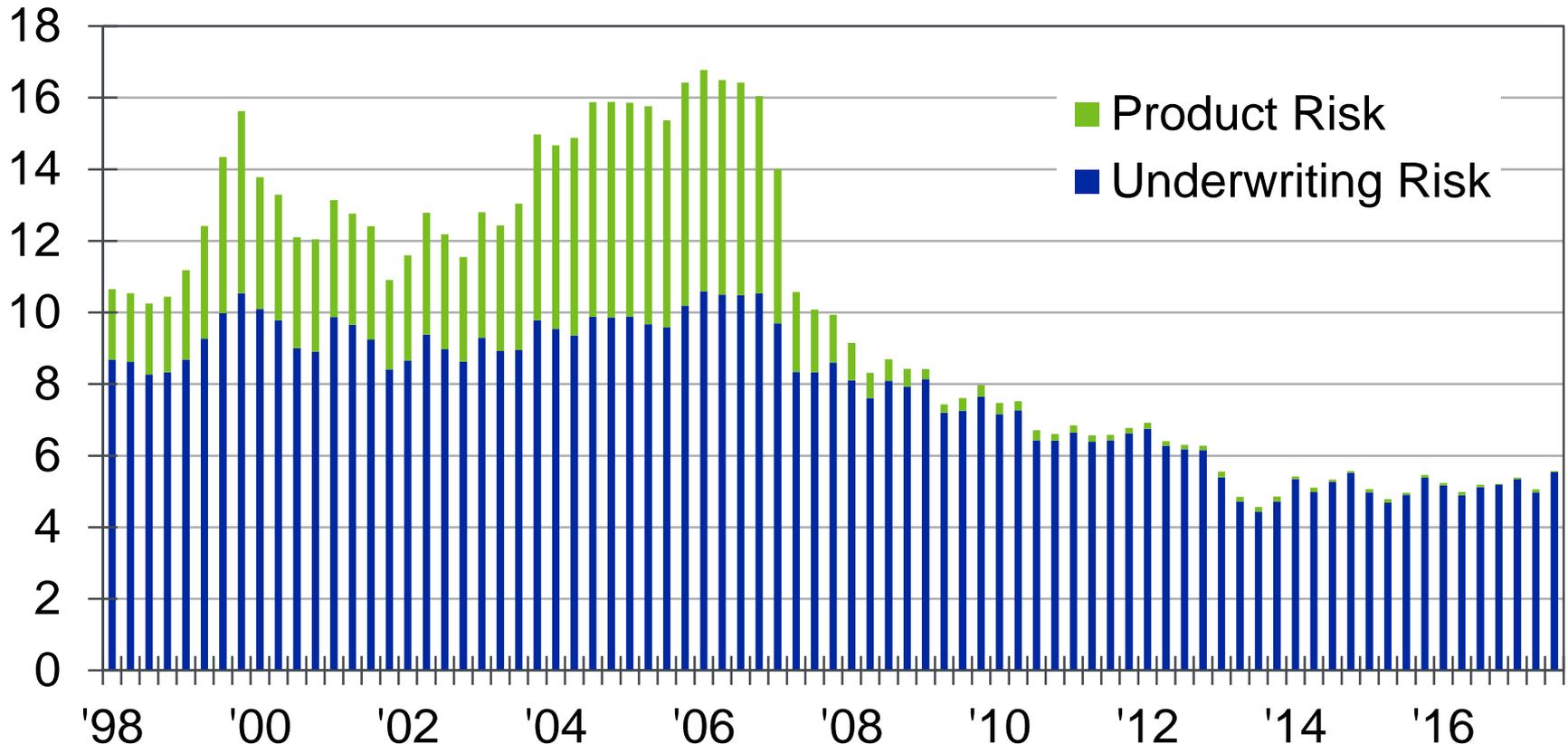
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The Credit Box: Past, Present, Future

Mortgage Credit Conditions Remain Tight

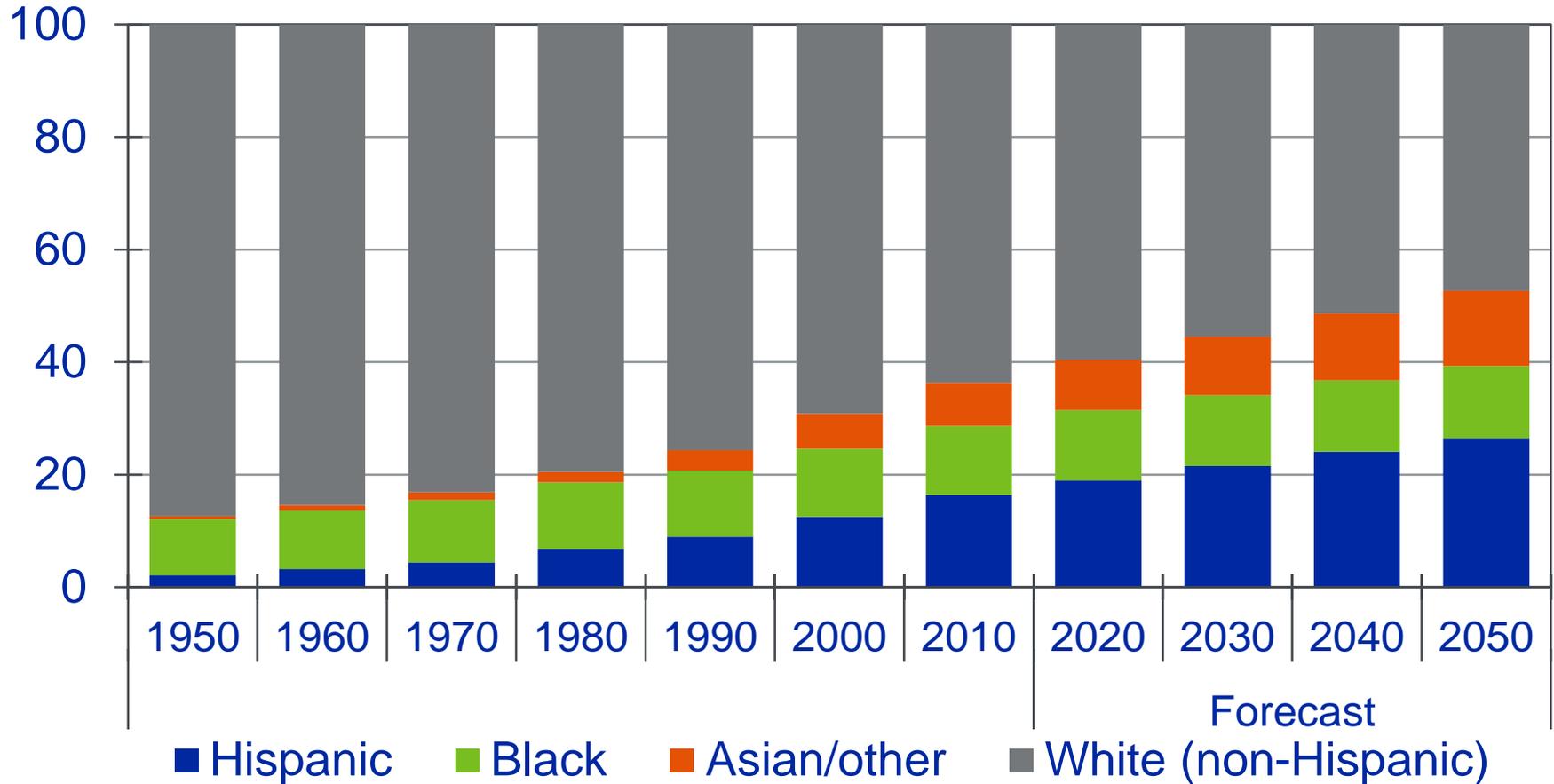
Expected severe delinquency rate for SF loan originations, %



Sources: Urban Institute Housing Finance Center

Minority Becomes Majority By 2050

% of population



Sources: Census Bureau, Moody's Analytics

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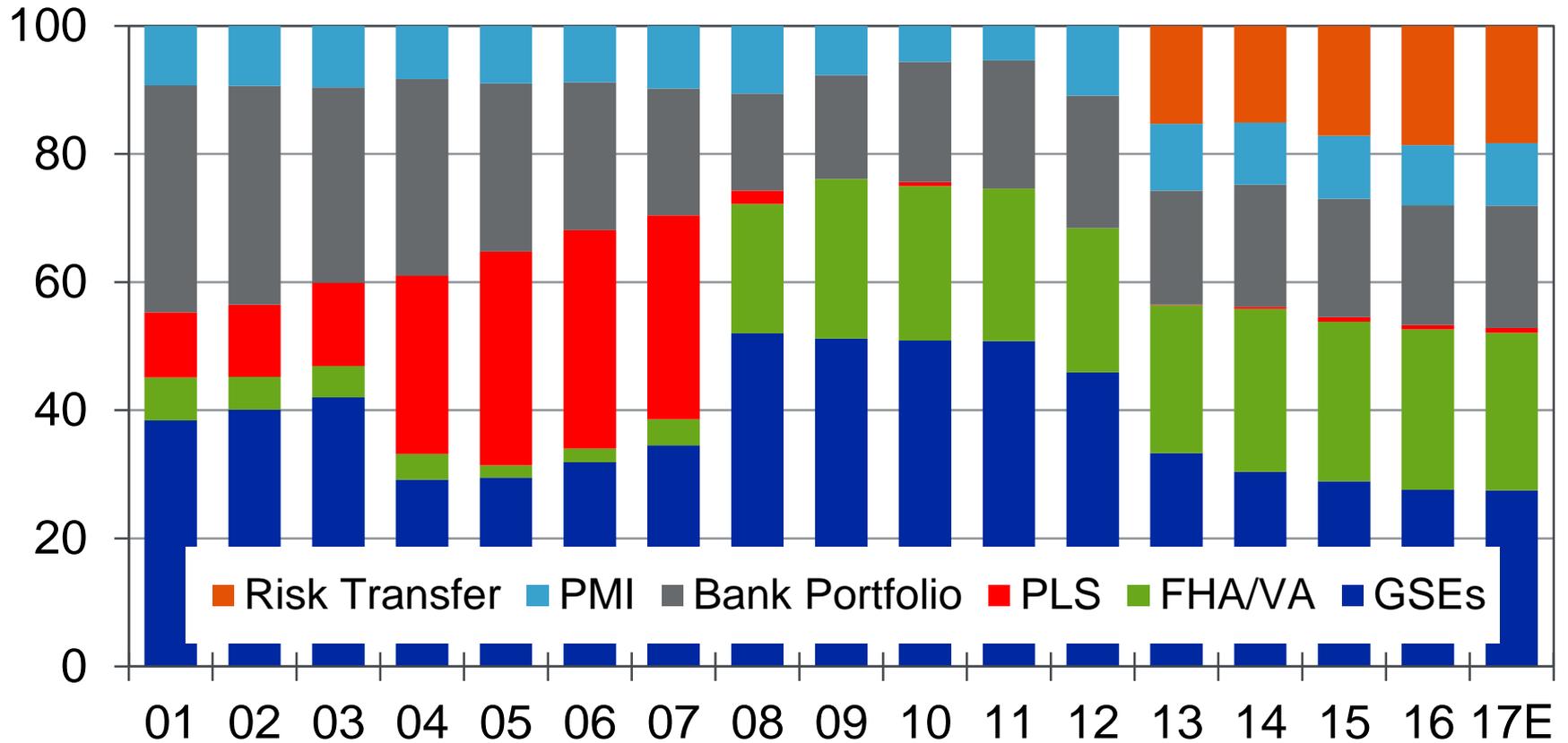
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Economics of GSE Reform

De Facto GSE Reform

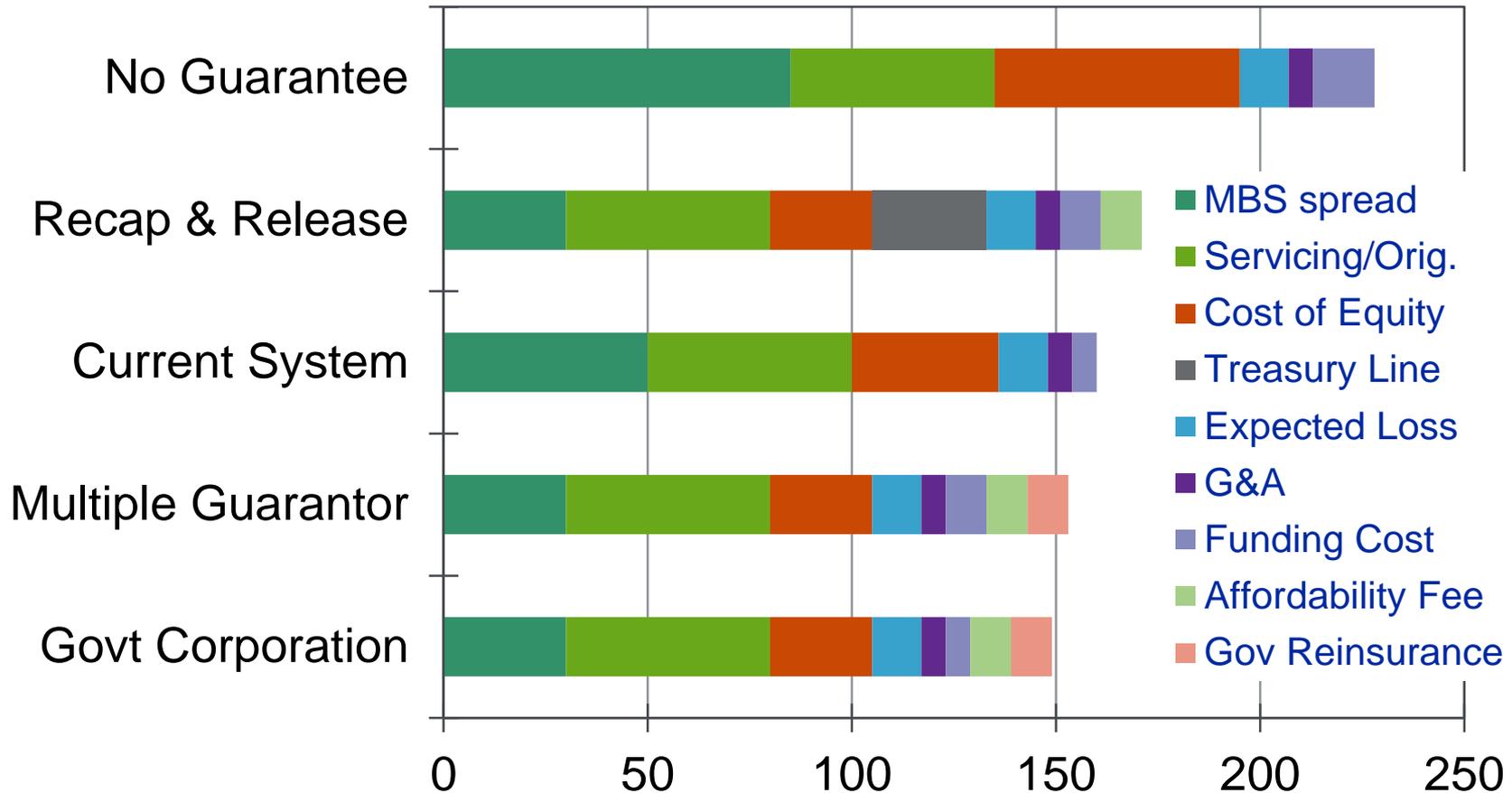
Credit risk share of residential mortgage originations, %



Sources: Fannie Mae, Moody's Analytics

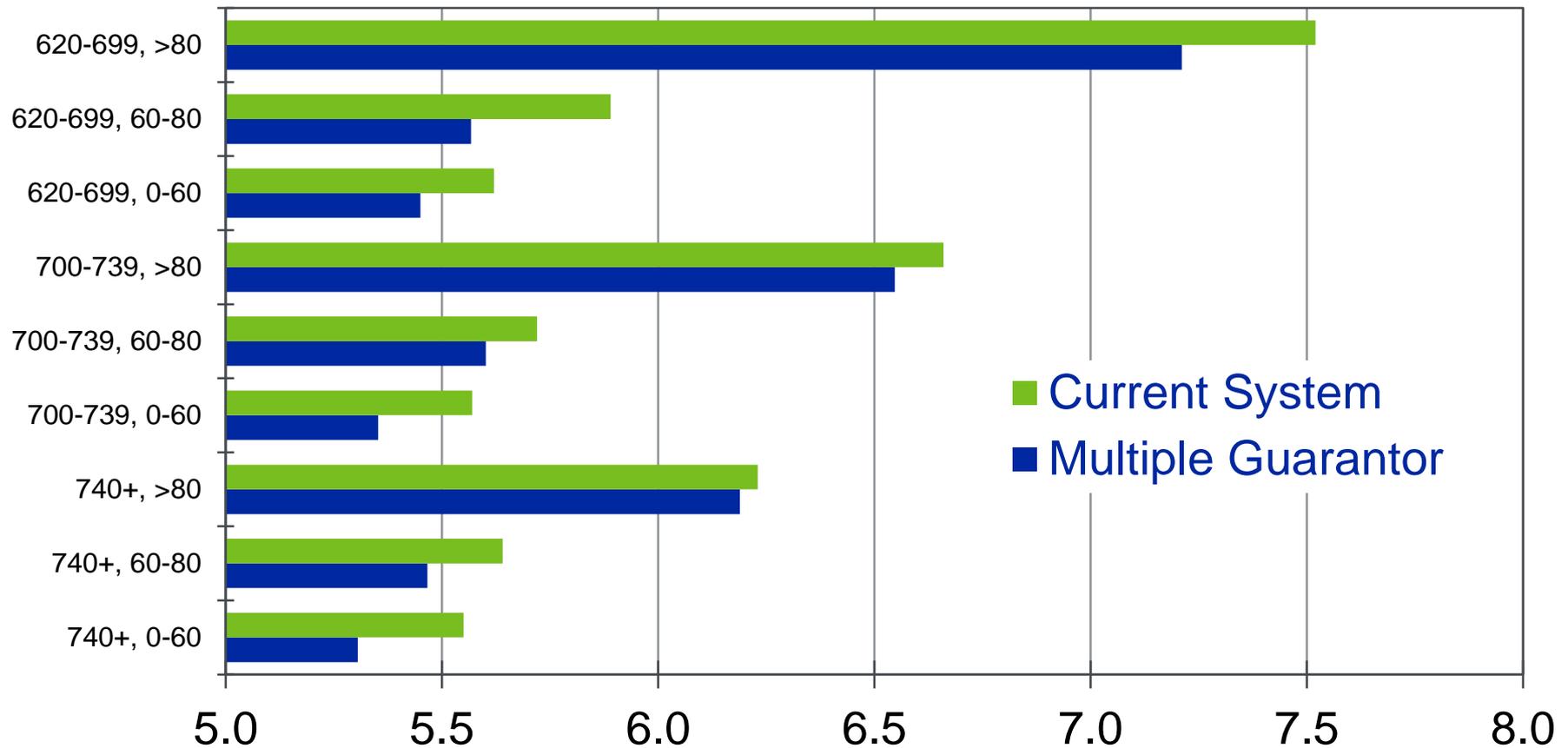
Mortgage Rates Under Different Systems

Mortgage rate spread over Treasuries, bps



Multiple Guarantor System Can Deliver...

...Lower Mortgage Rates Across the Credit Distribution



Source: Moody's Analytics

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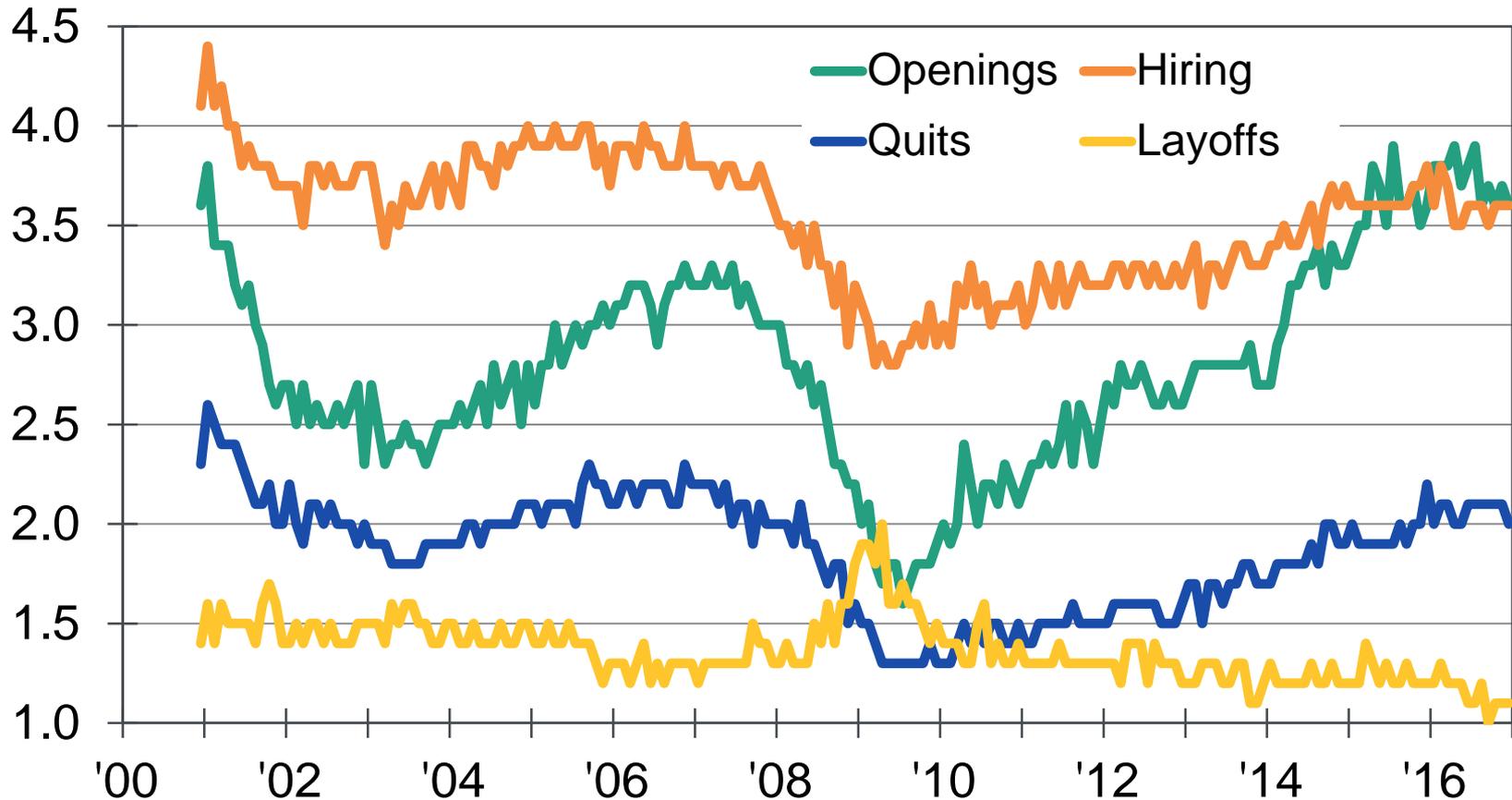
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What's Next For Housing?

MARK ZANDI, CHIEF ECONOMIST

Trump Inherits a Full Employment Economy

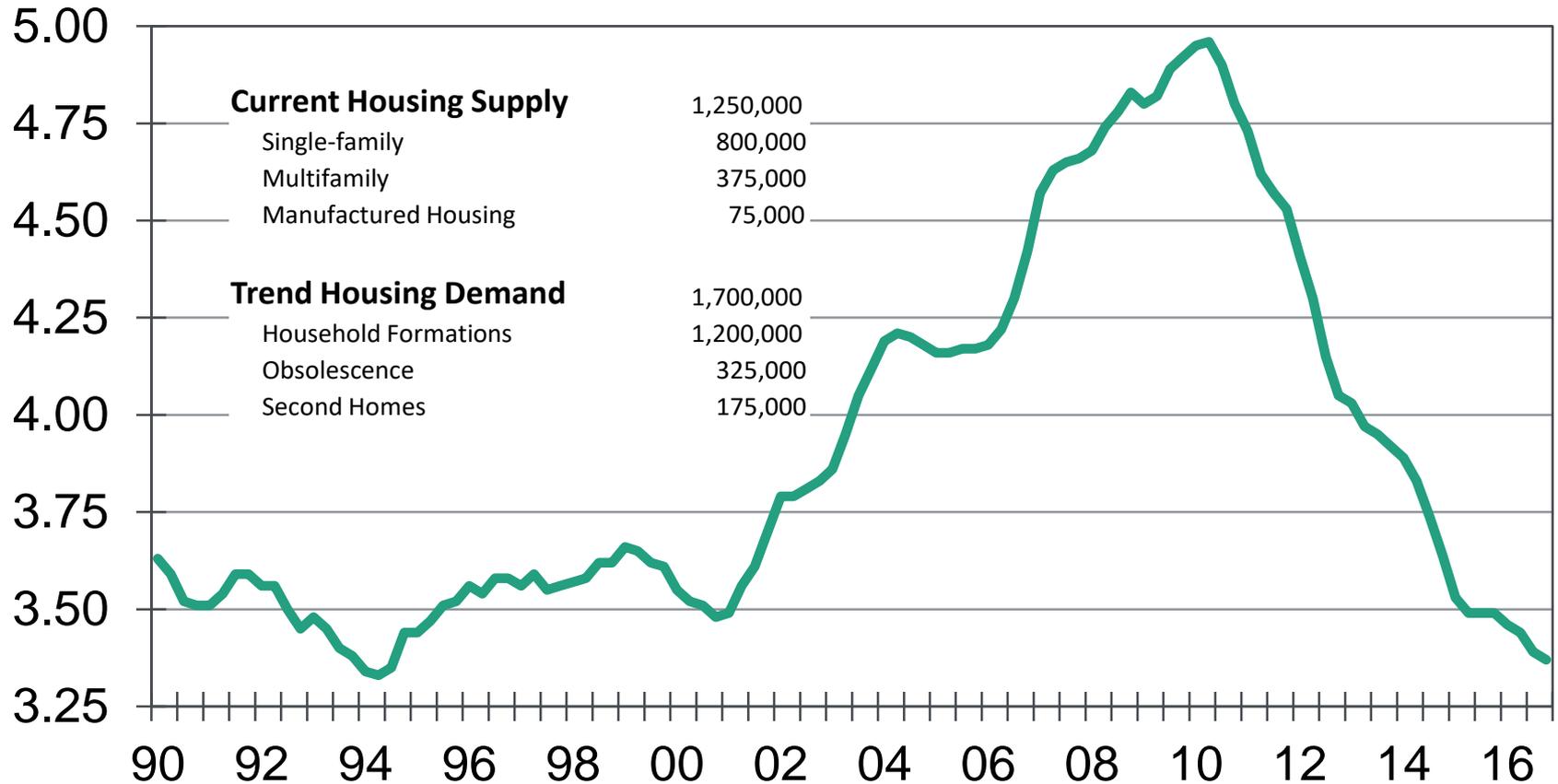
Rate, % of labor force



Sources: BLS, Moody's Analytics

No Vacancy

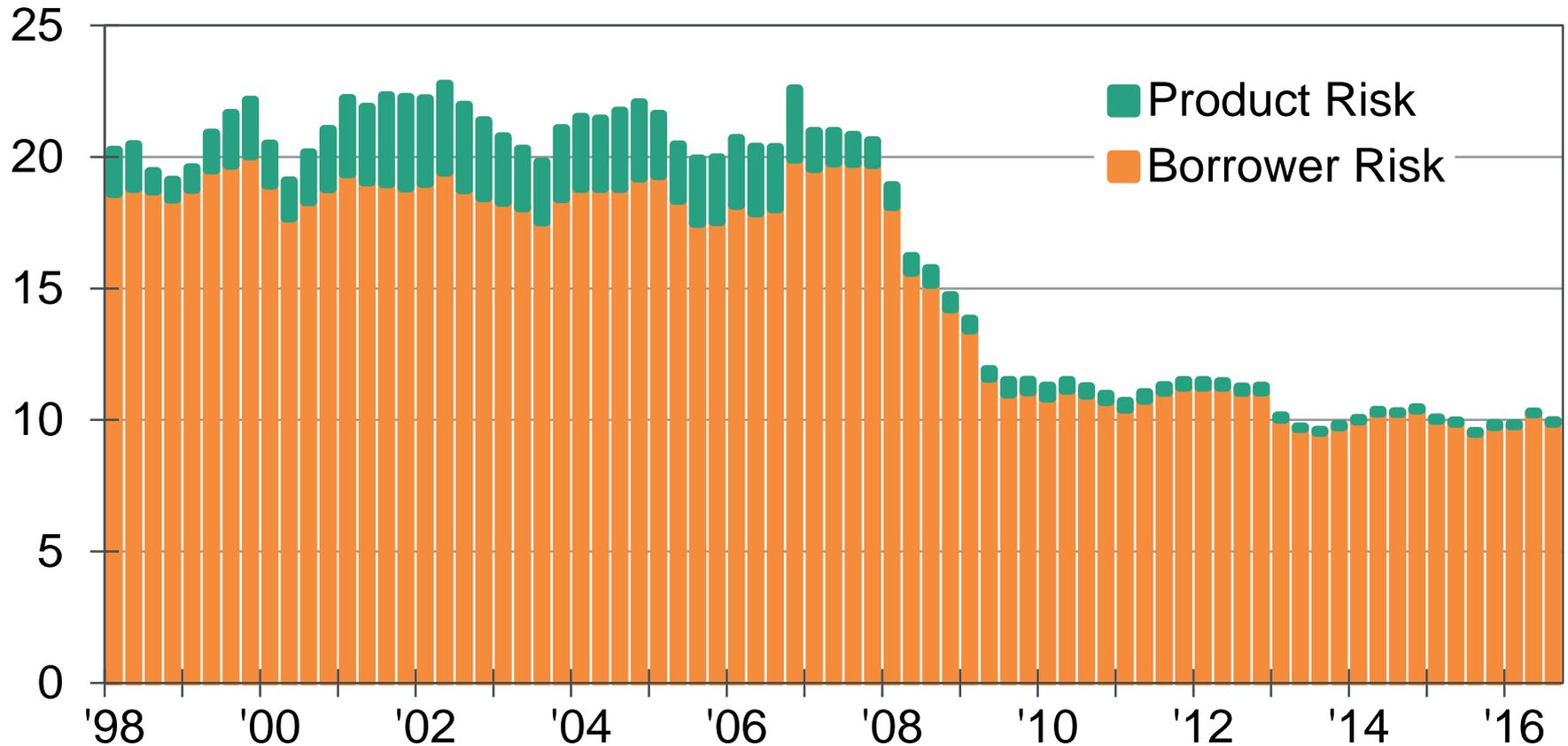
Vacancy rate, homes for sale and rent, 4-qrt MA, %



Sources: Census Bureau, Moody's Analytics

Tight Mortgage Credit Box

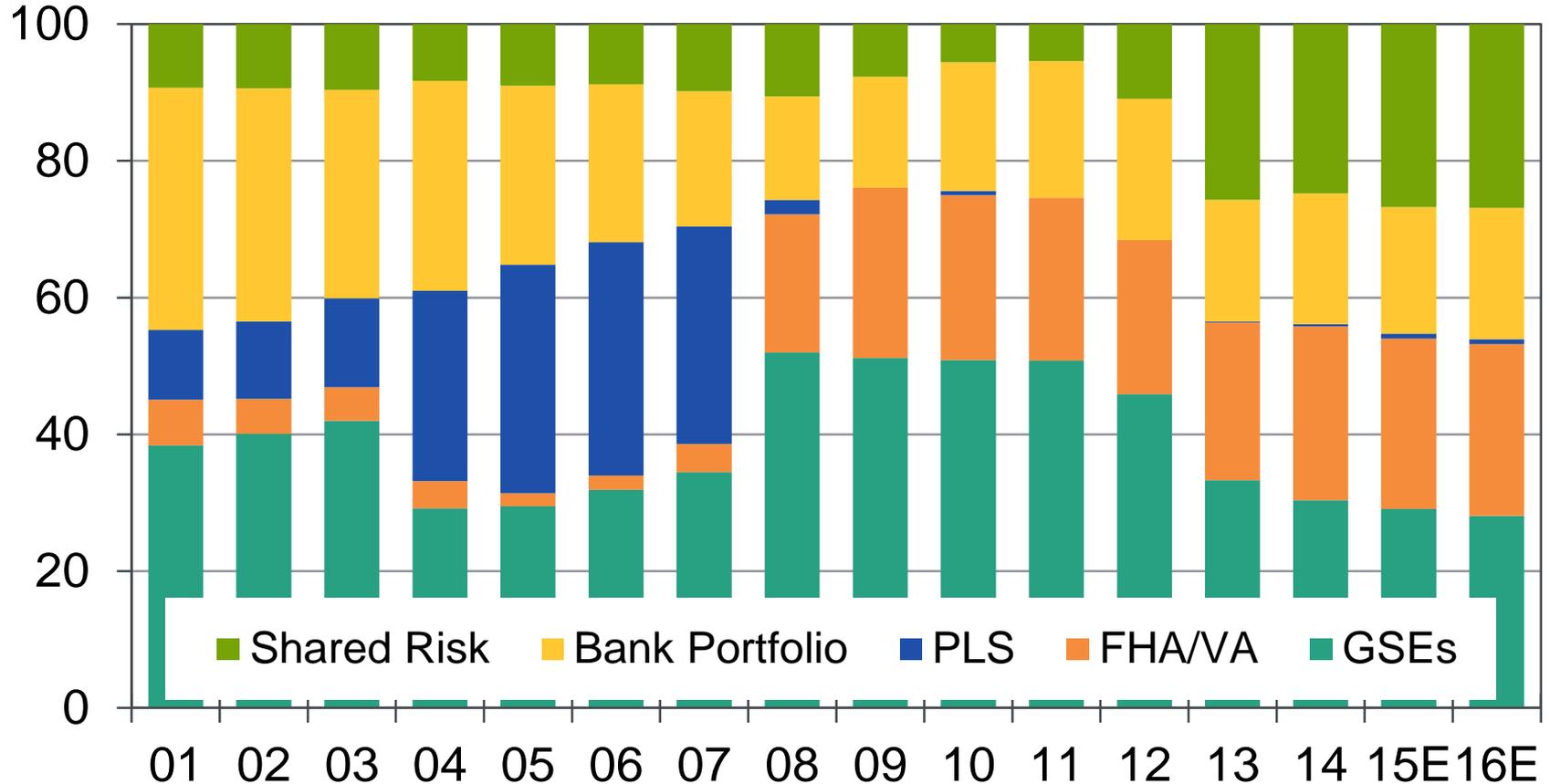
Government loans, expected default rate due to..., %



Source: Urban Institute

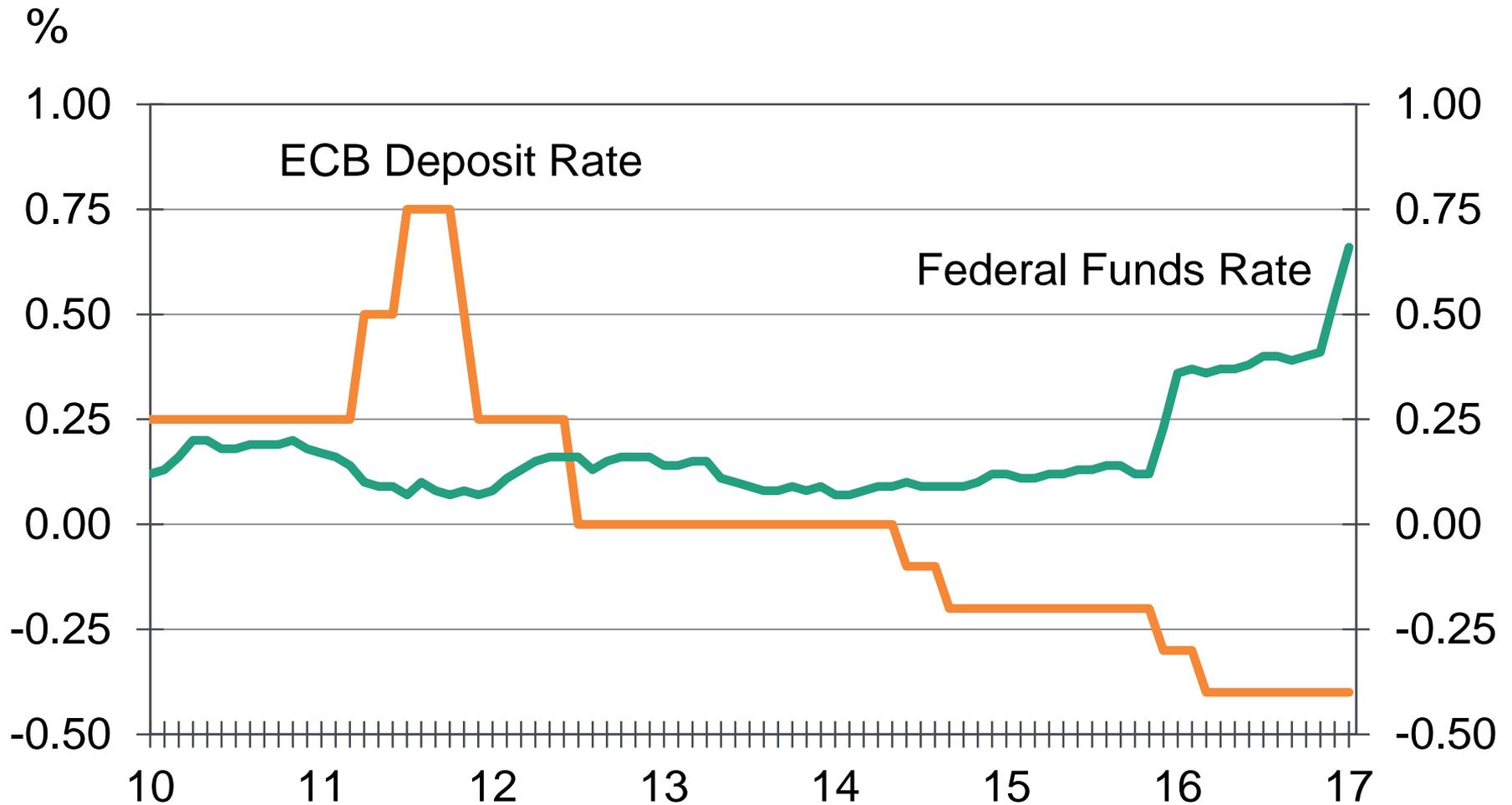
Who's Taking Mortgage Credit Risk

Credit risk share of residential mortgage originations, %



Sources: Fannie Mae, Moody's Analytics

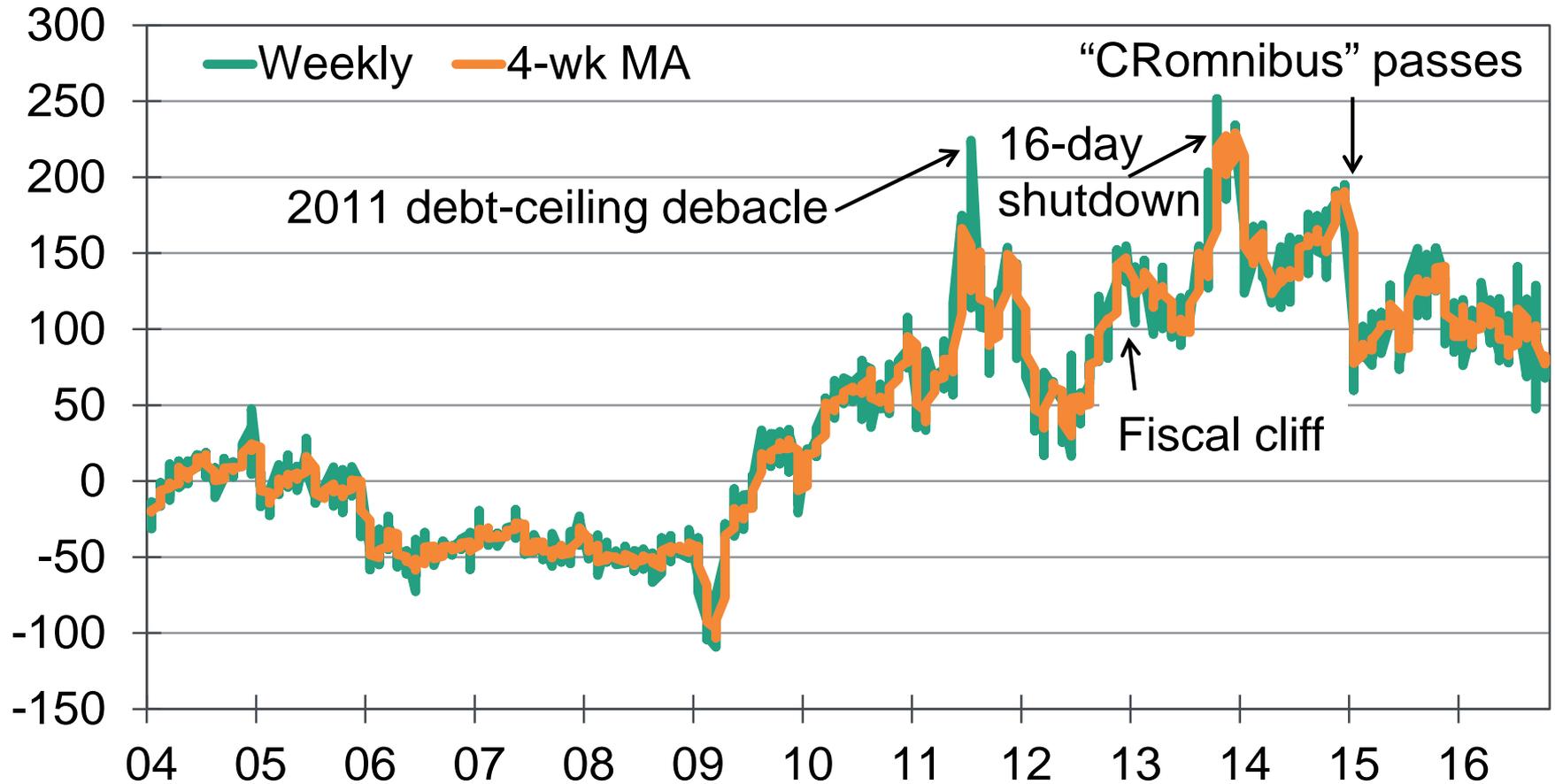
Monetary Policy Normalization Could Be Messy



Sources: ECB, Federal Reserve, Moody's Analytics

Highly Uncertain Fiscal Policy

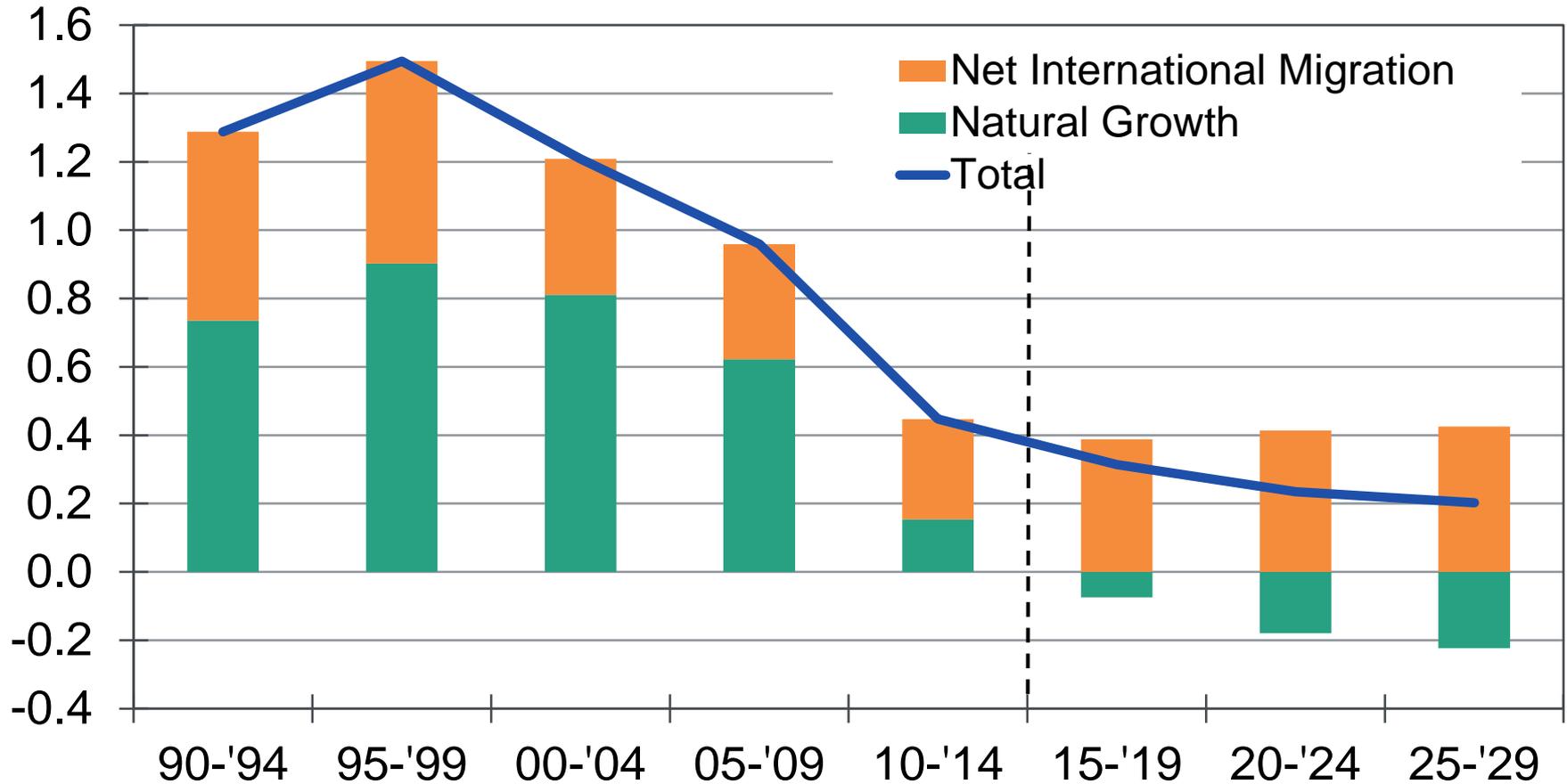
Fiscal policy uncertainty, 2004-2005=0



Source: Moody's Analytics

Economy Needs More Immigration, Not Less

Contribution to working age population growth, ppt, 5 yr avg



Sources: Census Bureau, Moody's Analytics

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