

AMHERST HORIZONS

20 MARKET 23 OUTLOOK



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Executive Summary

Executive Summary

U.S. SINGLE-FAMILY HOUSING

MARKET IS EXPECTED TO COOL DOWN AT A GRADUAL PACE

- Home prices grew 5.9% in 2022, despite the increase in interest rates and selloff in equity markets, and remain ~40% higher than pre-pandemic levels
- Housing prices are resilient as the job market has held up well so far, and wages are continuing to grow. Consumer balance sheets also remain healthy
- While demand for home purchases is down, new listing volumes are also lower. As a result, for-sale inventories are running 20-25% below 2019 levels, supporting the existing homes market
- Despite all the tailwinds, we expect home prices to decline at a gradual rate in 2023
- Pressure might come from the new-build market as the supply of new homes nears an all-time high and demand has almost dropped to the March 2020 lockdown lows
- Rents have been less elastic and fared better than prices, growing at 0.5% per month as of November 2022

SPECIAL TOPICS

THE U.S. IS SHORT 4.6MN HOUSING UNITS

- There is a deficit of 1.6mn housing units for existing households—1.1mn single-family units and 0.5mn multifamily units
- In addition, overall household count remains depressed despite a sharp uptick in household formation over the past couple of years
- Relative to early/mid 2000s, we believe there is still a 3mn deficit in households

DON'T STAND PAT ON 60/40 PORTFOLIOS

- We suggest real estate is an ideal candidate for reducing risk in a traditional stock + bond portfolio
- Real estate has generated a higher Sharpe ratio over the past forty years, and is somewhat uncorrelated with stocks and bonds
- This is particularly relevant in periods of high inflation when a flat efficient frontier calls for defensive positioning, which in turn implies a higher allocation to real estate



Executive Summary

U.S. COMMERCIAL REAL ESTATE

OFFICE AND RETAIL ARE UNDER PRESSURE AGAIN

- CRE prices peaked in August 2022 and have been moderately declining since then, according to RCA
- Offices remain under great pressure as workplace usage in big cities is still at 40-60% of 2019 levels
- Retail demand is running below pre-pandemic levels as e-commerce maintains the market share gained during the pandemic
- Industrial is holding up, supported by demand for rental space from online sellers
- People still tend to spend ~5% more time at home compared to pre-COVID baseline. In addition to the prevailing under-supply of housing units, we believe this will continue to support demand for housing

SECURITIZED PRODUCTS

FOLLOW THE FEDERAL RESERVE ("FED")

- Contractionary monetary policy resulted in cheapening across all spread products
- Mortgage-backed securities ("MBS") spreads are at the widest level of the past decade, save for a brief period during the onset of the COVID-19 pandemic
- Supply/demand technicals are negative for the mortgage basis
- We expect elevated supply (\$1.2tn) to the private market over 2023 and 2024 from organic net issuance and runoff from the Fed's MBS portfolio
- The bulk of this will need to be absorbed by money managers, the most valuation-sensitive investor group. As a result, spreads are likely to stay wide
- We estimate that the mortgage basis has room to widen further by 25-30 basis points ("bps")

A photograph of a row of modern, two-story houses with light-colored siding and dark shutters. The houses have gabled roofs and some have small front porches. The image is overlaid with a semi-transparent teal color. The text "Housing Market Expectations for 2023" is written in white, serif font across the middle of the image.

Housing Market Expectations for 2023

Markets roiled in 2022 as inflation reached a 40-year high

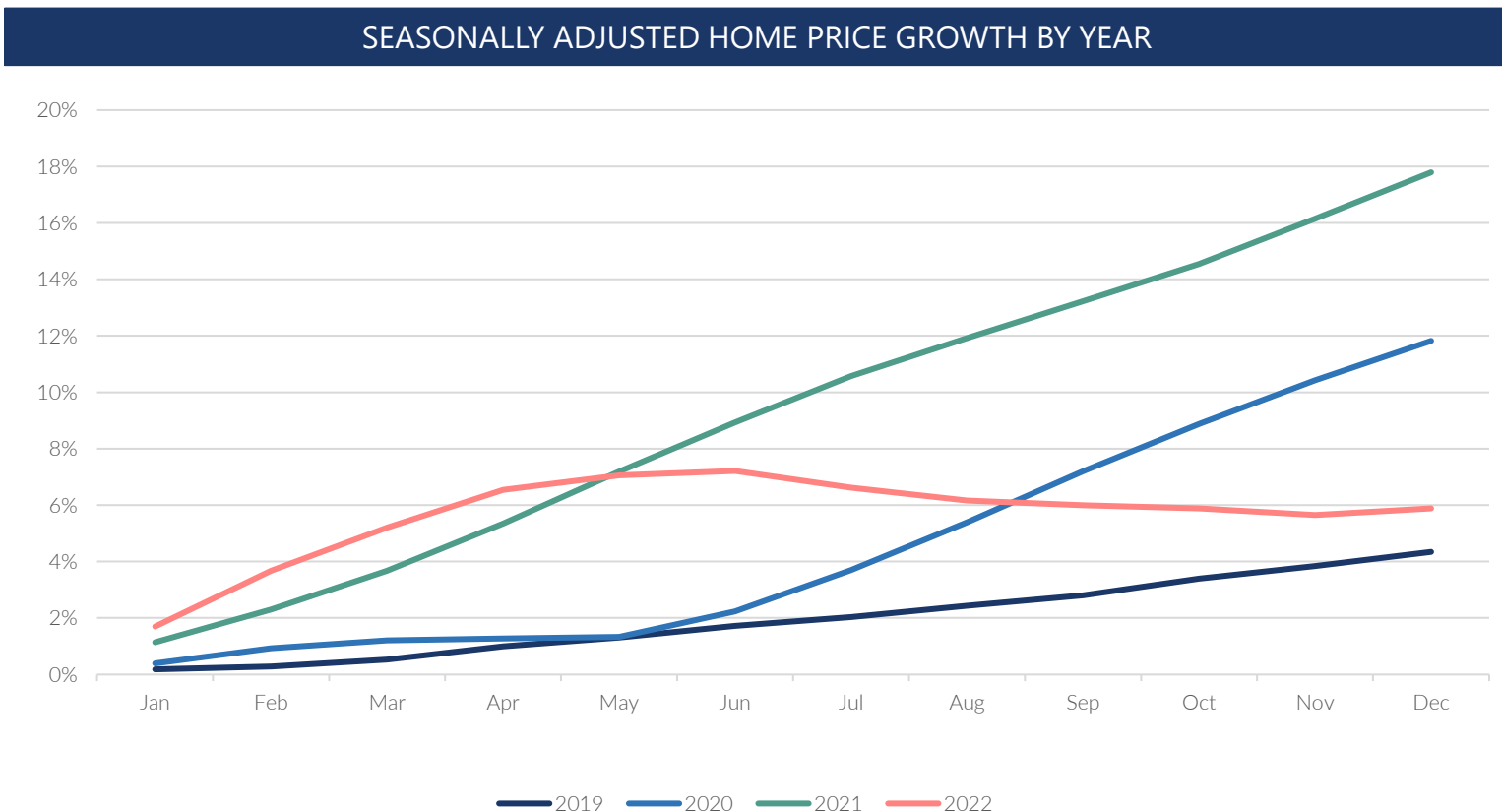
- Monetary and fiscal tightening had a broad swath of effects in 2022 – a selloff in capital markets, economic stagnation and a decline in consumer confidence over 2022
- The S&P 500 was down 19% for the year, and IG/HY spreads widened 32bps/195bps
- Record-high inflation readings and the resulting aggressive Fed tightening have greatly increased the risk of a recession

KEY PERFORMANCE INDICATORS: ECONOMY, MARKETS, CONSUMERS										
	METRIC	2014	2015	2016	2017	2018	2019	2020	2021	2022
Economic Fundamentals	GDP YoY ¹ Growth(%)	2.9%	2.2%	2.1%	2.7%	2.5%	2.6%	-2.3%	4.9%	0.3%
	CPI Inflation YoY (%)	0.8%	0.7%	2.1%	2.1%	1.9%	2.3%	1.4%	7.0%	6.5%
	Non-Farm Payrolls Monthly Average (000s)	250	227	195	176	193	178	-785	537	375
	Commercial Property Price Growth (%)	11.1%	8.6%	7.6%	6.9%	6.5%	7.2%	6.1%	22.9%	4.9%
Capital Markets	S&P 500 Price Return	11%	-1%	10%	20%	-6%	29%	16%	27%	-19%
	CDX IG Spread Change (bps)	4	22	-21	-19	39	-42	5	0	32
	CDX HY Spread Change (bps)	52	113	-115	-48	143	-169	13	0	195
	CMBS BBB Spread Change (bps)	-12	212	-75	-135	60	-135	150	-45	349
Consumer Confidence	University of Michigan Consumer Sentiment YoY Change	2	9	-1	5	2	-2	-14	-10	-21
	Conference Board Consumer Confidence Index YoY Change	9	11	2	21	10	-2	-26	29	-7

¹Year-over-Year; Source: Bloomberg, US Bureau of Economic Analysis, US Bureau of Labor Statistics, RCA, University of Michigan, Conference Board as of Dec 2022

Home prices were up 6% in 2022 despite higher rates

- Despite overall weakness in the economy and capital markets, single-family home prices were up 5.9% based on the Amherst Home Price Index (“HPI”) in 2022
- This is lower than the record of 18% in 2021, but about two percentage points (pp) higher than in 2019

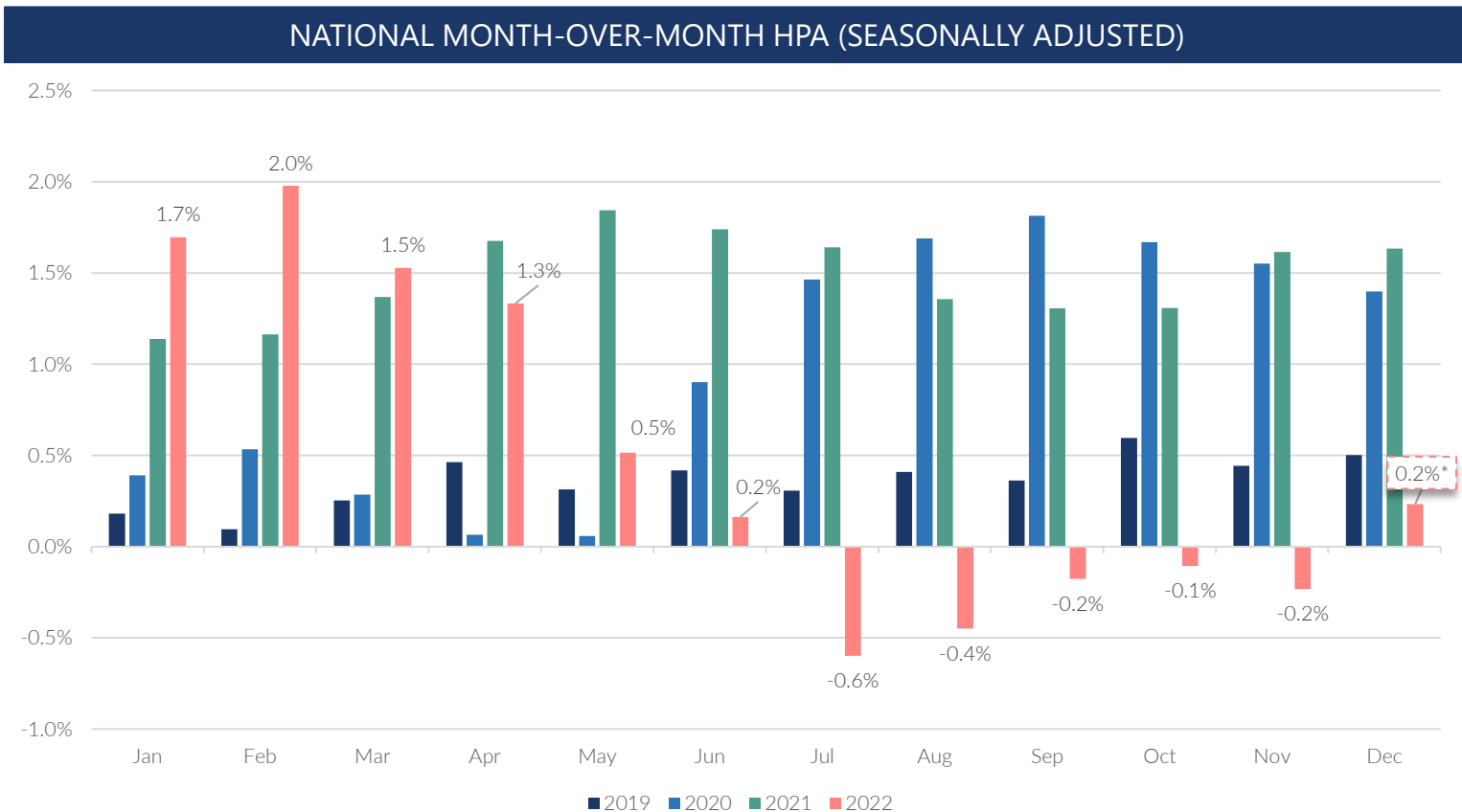


Source: Amherst Estimates as of Dec 2022



Recent home price drop has been gradual so far

- The sharpest declines occurred in July to August 2022 when prices dropped 0.4-0.6% for two consecutive months
- From September to November 2022, home prices showed moderate decline of 0.1-0.2% per month (on a seasonally adjusted basis). According to early December data readings, home price growth is back in positive territory



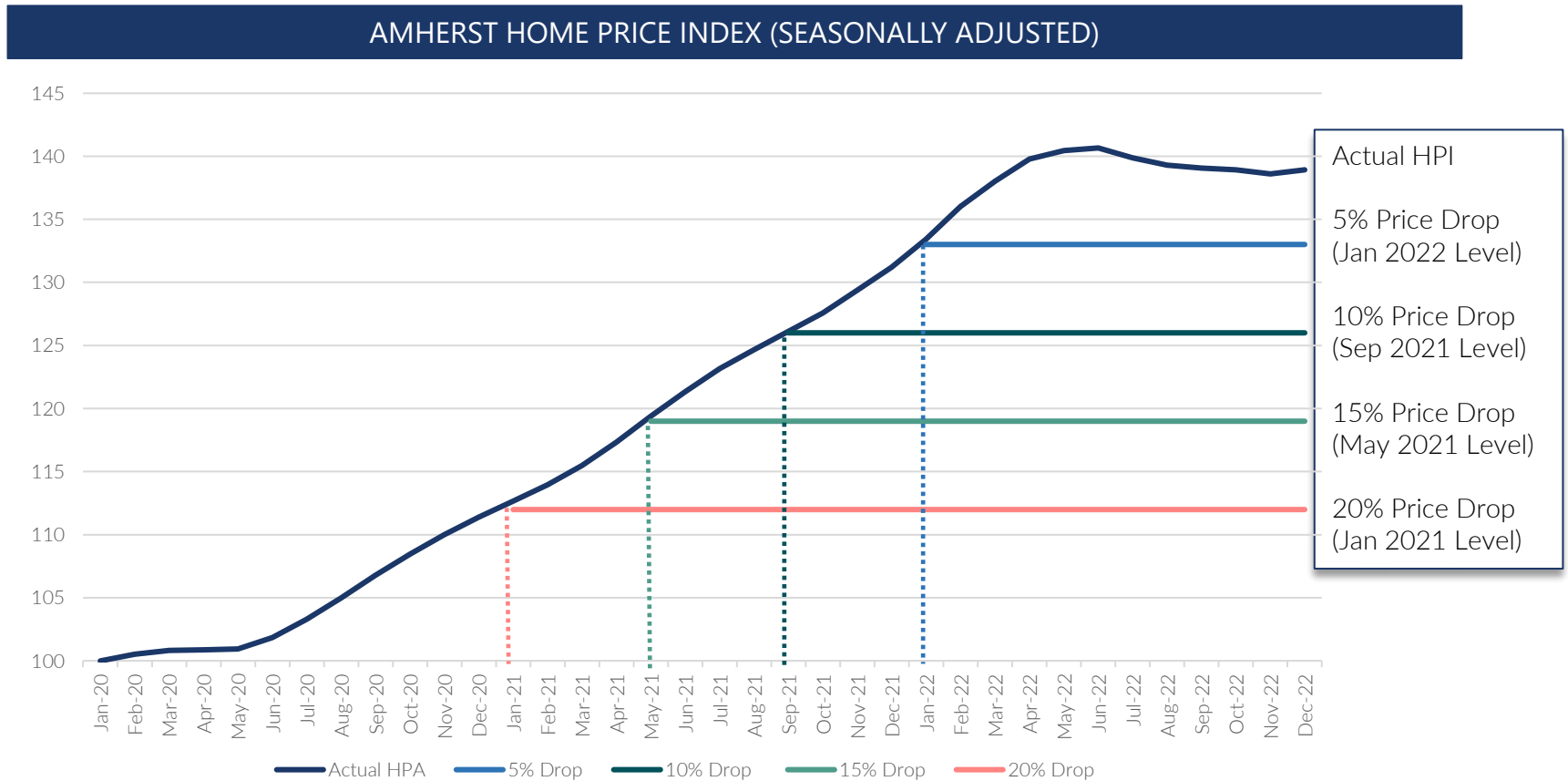
Source: Amherst Estimates as of Dec 2022

* Preliminary estimate



The decline is miniscule in comparison to the run-up in prices

- Home prices are ~40% higher than January 2020 levels
- Even if home prices decline by 15% from here, they would still be at mid-2021 levels and translate to 5% annualized growth since January 2020



Source: Amherst Estimates as of Jan 2023



Significant variation in performance across markets

- The once 'red-hot' markets like Las Vegas, Phoenix, Austin and Salt Lake City have witnessed consecutive months of decline in home prices
- Some markets in the U.S. still had positive home price appreciation in the last three months based on Amherst indices

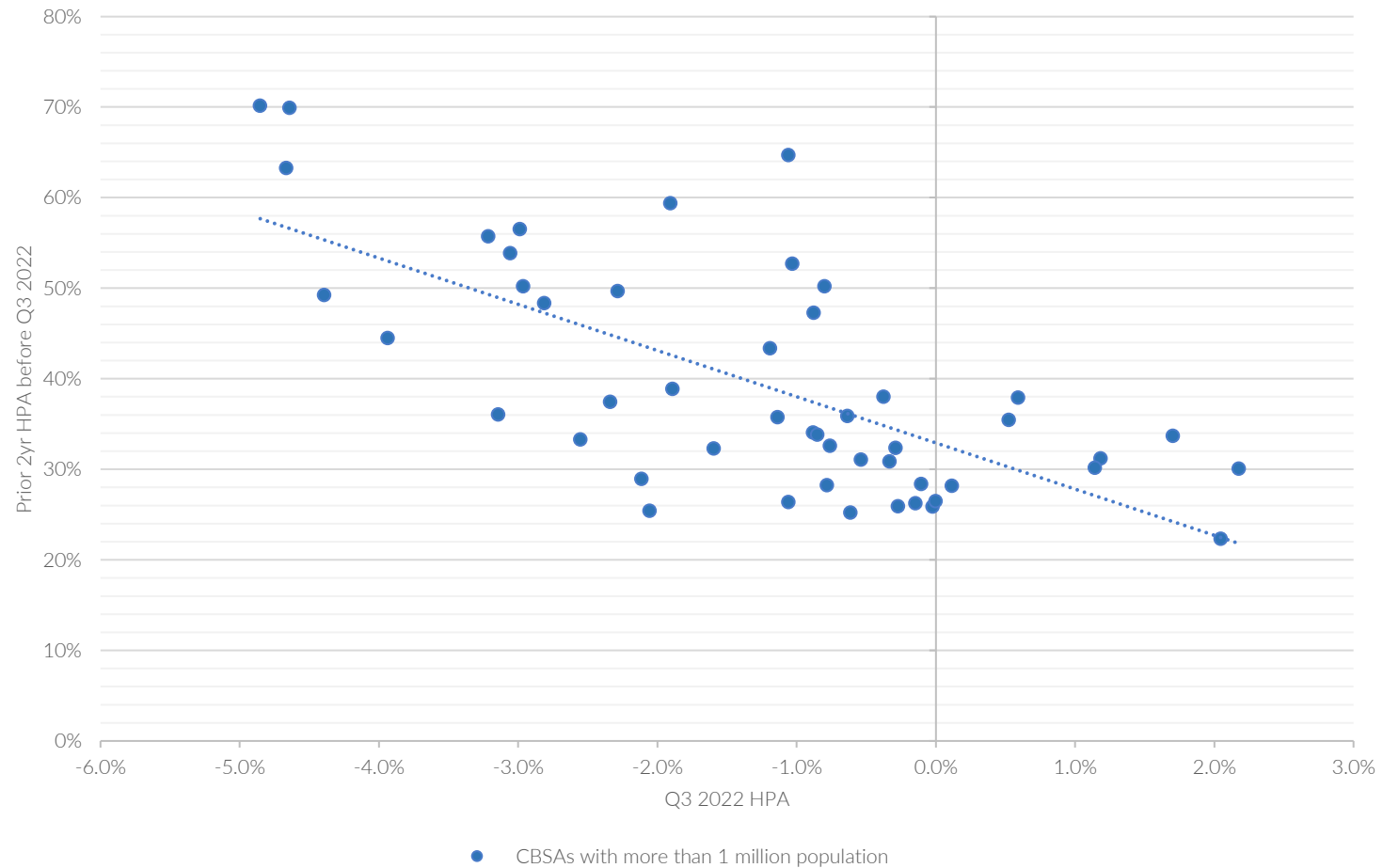
SEASONALLY ADJUSTED HOME PRICE APPRECIATION AS OF DEC 2022				
	3 Month	6 Month	9 Month	12 Month
Fort Myers	-4.3%	-7.2%	-4.8%	4.7%
Austin	-3.9%	-8.1%	-7.9%	-3.1%
Las Vegas	-3.9%	-7.7%	-5.3%	1.3%
Raleigh	-2.8%	-6.2%	-3.9%	4.4%
Salt Lake City	-2.8%	-5.6%	-6.6%	0.3%
Seattle	-2.6%	-7.0%	-10.1%	-2.4%
Phoenix	-2.6%	-7.3%	-4.2%	1.6%
Nashville	-2.6%	-4.7%	-0.6%	7.4%
Tucson	-2.0%	-4.8%	-1.4%	4.1%
Charlotte	-2.0%	-2.8%	-0.2%	7.1%
San Antonio	-1.8%	-2.5%	-0.8%	5.1%
Denver	-1.7%	-3.3%	-3.7%	2.1%
Minneapolis	-1.6%	-2.5%	-0.6%	2.5%
Indianapolis	-1.3%	-0.8%	-0.1%	4.4%
Jacksonville	-1.3%	-3.1%	4.1%	11.3%
Tampa	-1.1%	-2.2%	3.3%	12.9%
Huntsville	-1.1%	-0.4%	1.0%	5.2%
Houston	-1.1%	-1.8%	1.7%	7.7%
Dallas	-1.0%	-3.9%	-1.2%	7.3%
Kansas City	-0.7%	-0.2%	0.3%	5.5%
Atlanta	-0.7%	-1.6%	1.2%	7.7%
Orlando	-0.4%	-1.2%	4.1%	12.4%
Cincinnati	-0.1%	-0.2%	2.4%	6.2%
U.S.	-0.1%	-1.2%	0.6%	5.9%
Memphis	0.0%	0.6%	2.9%	7.4%
Louisville	0.2%	0.6%	2.5%	5.7%
Oklahoma City	0.2%	2.4%	4.7%	9.1%
Birmingham	0.4%	-0.5%	2.5%	6.7%
St Louis	0.5%	0.3%	1.9%	6.0%
Palm Bay	1.0%	-2.5%	4.5%	13.1%
Knoxville	1.3%	1.2%	6.1%	13.6%
Cleveland	2.3%	1.4%	3.6%	7.4%
Columbus	2.4%	1.0%	2.5%	8.0%
Greensboro	3.0%	-0.1%	4.7%	10.8%



Markets that went up the most are declining faster

- The markets that witnessed the biggest home price appreciation in the last two years are going through the biggest declines

Q3 2022 HPA VS. PRIOR 2-YEAR HPA (Q2 2020 – Q2 2022)

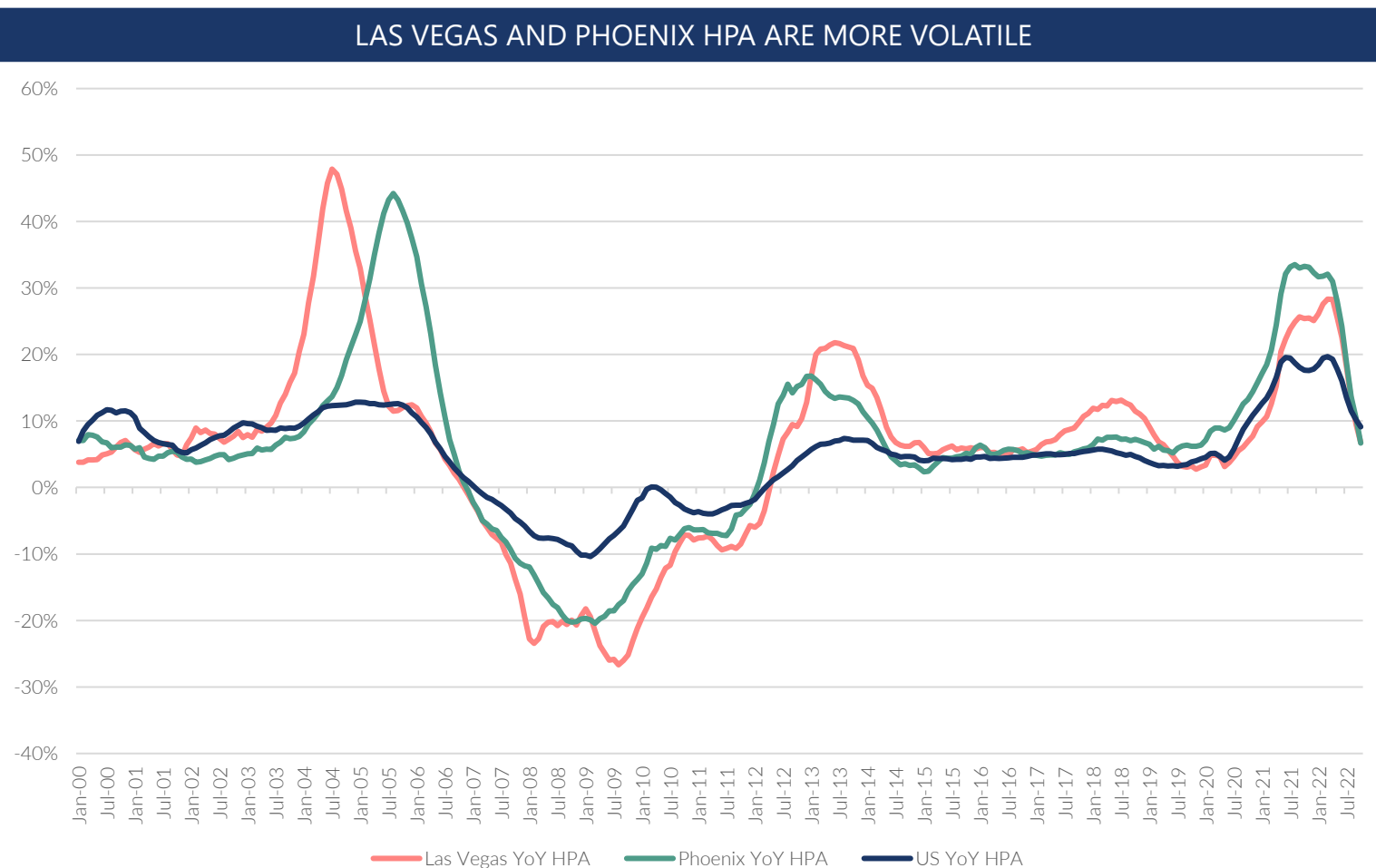


Source: Amherst Estimates as of Dec 2022



Many of the declining markets have historically been high beta

- Many of these markets, like Las Vegas and Phoenix, are high beta
- HPA in these markets has been higher than the U.S. average in good times and lower in bad times



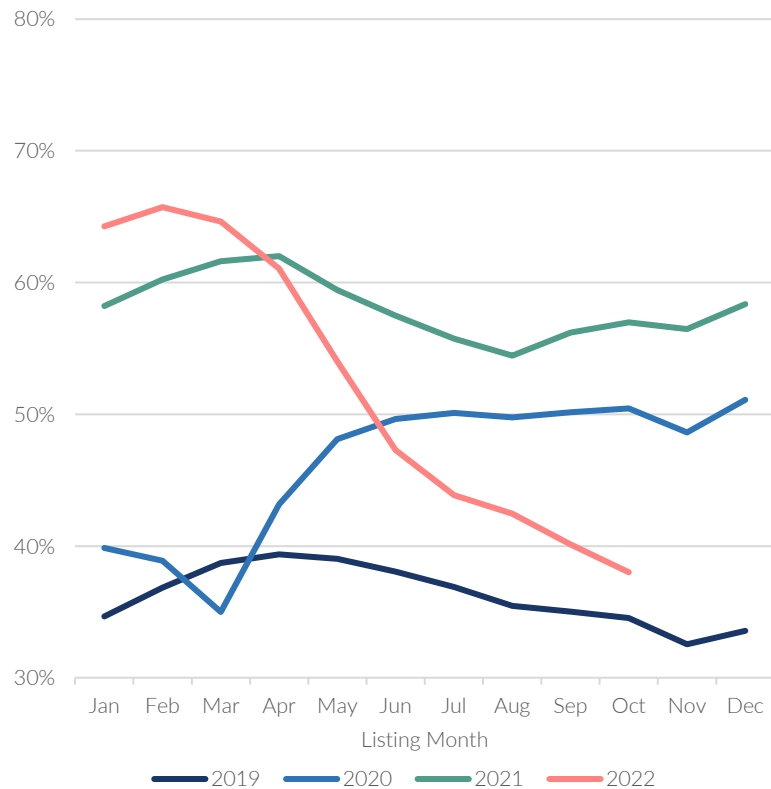
Source: Amherst Estimates as of Dec 2022



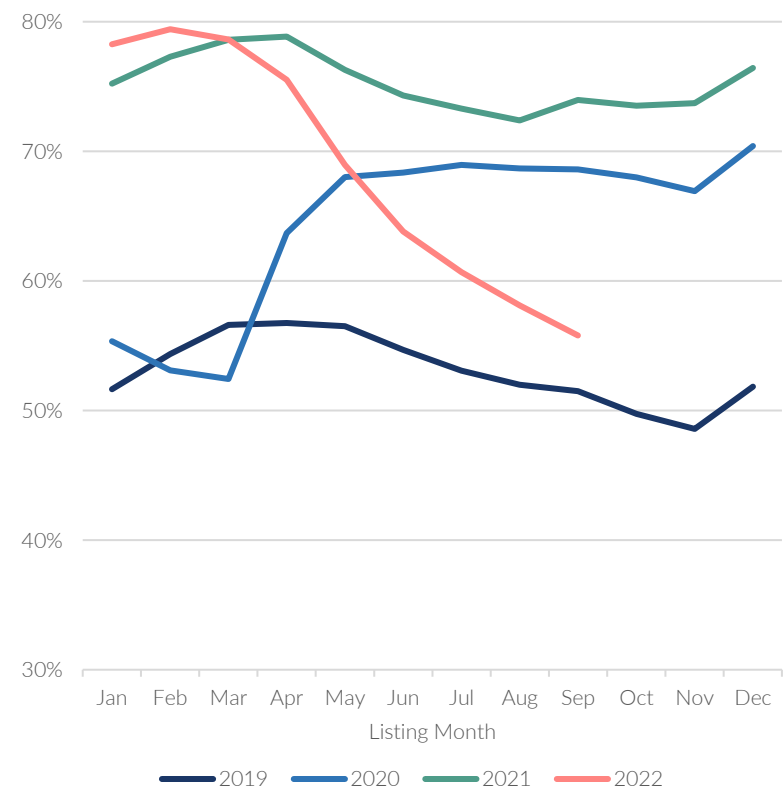
For-sale absorption is still running above 2019 levels

- Absorption is measured as a percentage of for-sale of listings that are sold by day 60 and day 90 since the listing day

60-DAY SALES VELOCITY



90-DAY SALES VELOCITY



Source: Amherst Estimates as of Jan 2023; Last data point for 60-day sales velocity is Oct 2022, and last data point for 90-day sales velocity is Sep 2022



Most markets have higher absorption rates now than 2019

- 60-day seasonally adjusted sales velocity is running above the 2019 levels in most markets

60-DAY SEASONALLY ADJUSTED SALES ABSORPTION				
Region	Oct-22	Oct-21	Oct-20	Oct-19
US	44.1%	60.8%	54.1%	39.6%
Amherst Markets	46.8%	65.3%	58.1%	42.2%
Cincinnati	69.4%	67.0%	65.4%	51.2%
Louisville	65.3%	61.6%	64.6%	51.5%
Oklahoma City	60.9%	66.4%	60.8%	46.5%
Huntsville	60.6%	72.1%	58.3%	50.9%
Memphis	60.5%	70.0%	62.1%	48.5%
Cleveland	57.3%	58.9%	56.3%	38.4%
St Louis	56.5%	57.3%	54.4%	39.6%
Knoxville	56.1%	69.4%	62.6%	48.8%
Kansas City	54.6%	64.5%	63.1%	48.5%
Seattle	54.5%	84.7%	78.9%	60.2%
Charlotte	53.8%	70.3%	60.2%	43.8%
Bay Area	53.0%	71.0%	69.6%	55.6%
Raleigh	51.2%	72.7%	60.8%	42.0%
Boston	50.6%	50.0%	49.6%	33.7%
Dallas	50.4%	72.0%	59.6%	42.1%
Atlanta	46.6%	66.1%	53.9%	38.1%
San Antonio	46.5%	63.1%	48.8%	35.4%
Houston	45.8%	57.4%	46.1%	29.1%
Denver	45.1%	70.6%	66.2%	47.4%
Tucson	44.8%	65.1%	66.4%	48.9%
San Diego	44.2%	65.5%	65.9%	47.0%
Salt Lake City	43.4%	77.4%	77.7%	51.7%
Chicago	43.2%	46.1%	42.1%	25.5%
Orlando	42.3%	62.1%	50.5%	38.6%
Nashville	42.3%	65.0%	54.0%	40.2%
Minneapolis	42.2%	50.4%	49.9%	36.6%
Jacksonville	39.8%	63.2%	51.2%	35.6%
Tampa	39.2%	66.2%	53.7%	39.2%
Palm Bay	36.7%	58.7%	49.5%	31.0%
Austin	34.9%	69.7%	67.4%	48.5%
Los Angeles	32.7%	55.7%	52.4%	39.2%
Phoenix	30.7%	68.8%	68.9%	54.1%
Miami	30.2%	45.8%	37.3%	25.6%
New York	14.0%	13.1%	11.4%	8.6%

Source: Amherst Estimates as of Jan 2023; Last data point for 60-day sales velocity is Oct 2022



What may explain the resilience in home prices?

- The job market so far has held up well and incomes/wages are continuing to grow
- Consumers are sitting on high excess savings from the last couple of years, which allows them to spend more on goods and services
- The resetting of the mortgage universe to a much lower mortgage rate during the 2020-2021 rate rally has put more money in the hands of consumers every month
- Personal Consumption Expenditure (PCE) has grown by \$3tn since February 2020 and remains strong
- In addition, population growth is back to pre-pandemic levels driven by a recovery in international migration
- While demand for homes has declined, the supply of new listings has also come down meaningfully
- All of the above have helped support the housing market

Source: BEA; Census Bureau; Amherst Estimates



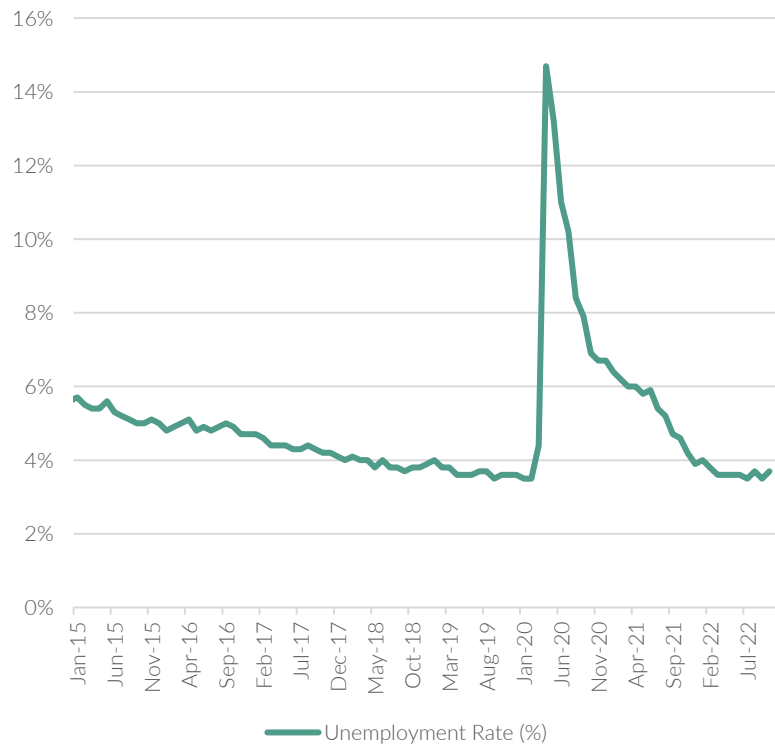
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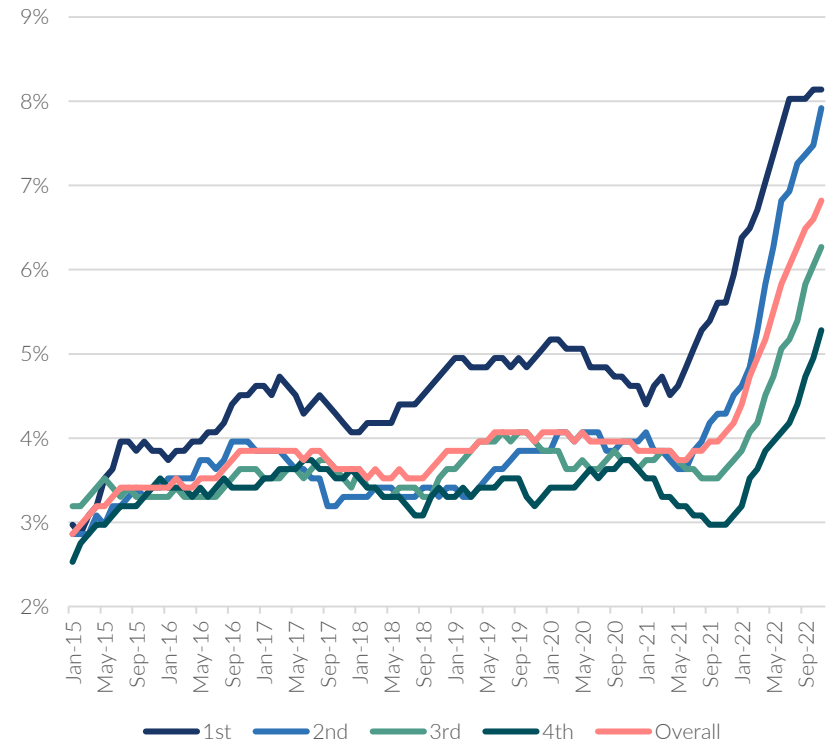
The employment picture looks very healthy

- The unemployment rate has remained at historically low levels
- Wage growth has been strong, especially for the lower income quartiles where most of the renter population is concentrated

UNEMPLOYMENT RATE: STAYS AT LOW LEVEL



WAGE GROWTH YOY BY INCOME QUARTILE (12-M MA)



Source: Amherst Estimates as of Dec 2022; Atlanta Fed as of Dec 2022; BLS as of Nov 2022



Many cities witnessed significant aggregate income growth

- Employment grew rapidly in high HPA areas. In most cities, aggregate income growth has come from higher-wage sectors

AGGREGATE INCOME GROWTH				
Market	3-year Growth in Aggregate Labor Income	3-year Employment Growth	3-year Income Growth (Per Worker)	Share of Growth Coming from the High-Paying Sectors (Information, Financial, Professional Services)
Austin-Round Rock-Georgetown, TX	31%	11%	18%	55%
Boise City, ID	27%	9%	16%	31%
Raleigh-Cary, NC	26%	8%	17%	51%
Dallas-Fort Worth-Arlington, TX	26%	9%	16%	49%
Riverside-San Bernardino-Ontario, CA	25%	8%	16%	22%
Jacksonville, FL	24%	6%	17%	47%
Nashville-Davidson--Murfreesboro--Franklin, TN	23%	6%	16%	43%
Tampa-St. Petersburg-Clearwater, FL	23%	6%	16%	46%
North Port-Sarasota-Bradenton, FL	23%	8%	14%	30%
Knoxville, TN	23%	6%	16%	37%
Durham-Chapel Hill, NC	23%	6%	16%	43%
Charlotte-Concord-Gastonia, NC-SC	23%	6%	16%	46%
Salt Lake City, UT	22%	5%	16%	35%
Phoenix-Mesa-Chandler, AZ	22%	6%	16%	36%
Atlanta-Sandy Springs-Alpharetta, GA	22%	4%	16%	51%
Miami-Fort Lauderdale-Pompano Beach, FL	21%	4%	16%	42%
Las Vegas-Henderson-Paradise, NV	20%	2%	17%	32%
Charleston-North Charleston, SC	20%	4%	15%	47%
Orlando-Kissimmee-Sanford, FL	20%	3%	16%	46%
Fresno, CA	19%	4%	15%	13%
Colorado Springs, CO	19%	3%	16%	36%
San Antonio-New Braunfels, TX	19%	3%	15%	40%
Indianapolis-Carmel-Anderson, IN	19%	2%	16%	38%
Denver-Aurora-Lakewood, CO	19%	2%	16%	51%
Little Rock-North Little Rock-Conway, AR	18%	2%	16%	29%
Houston-The Woodlands-Sugar Land, TX	18%	4%	14%	34%
Greenville-Anderson, SC	18%	2%	15%	32%

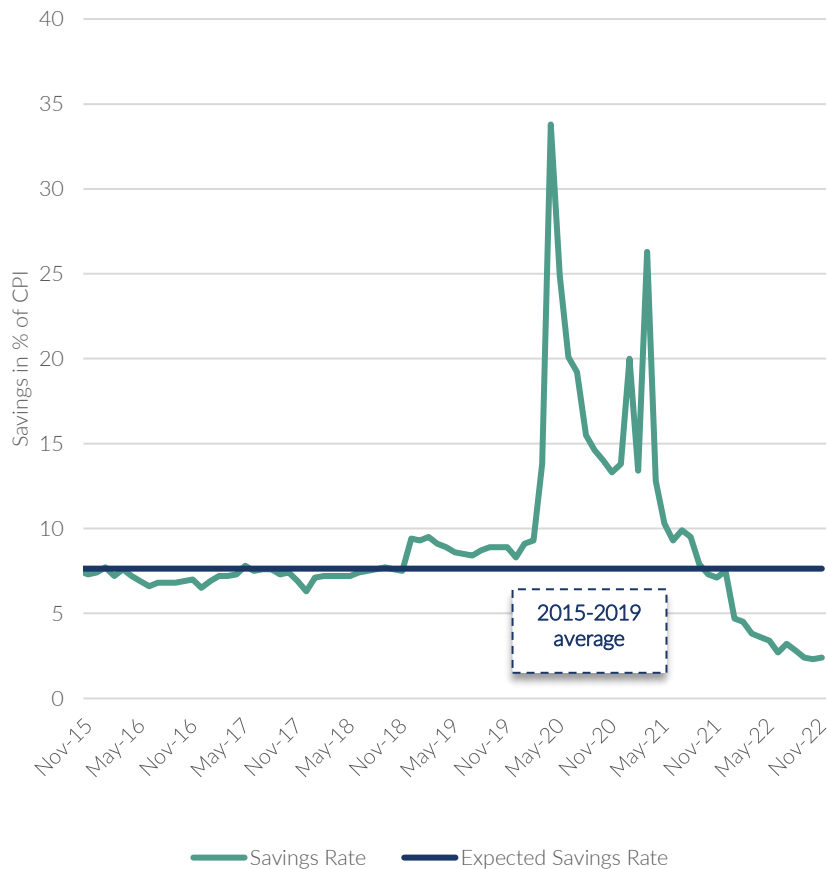
Source: Amherst Estimate as of Nov 2022



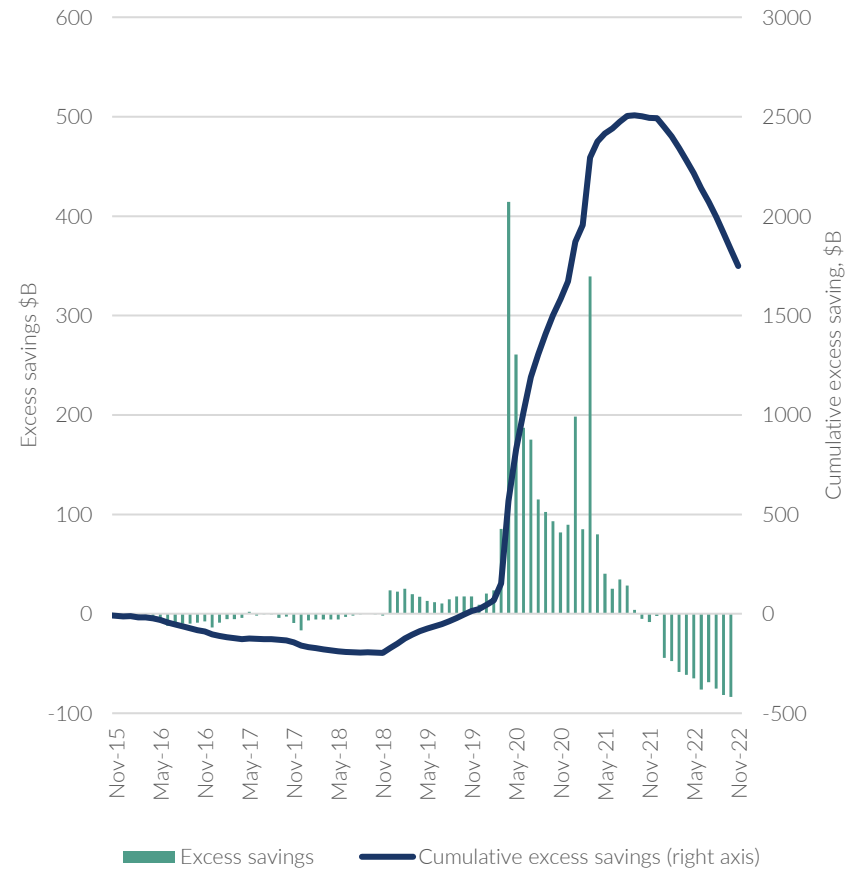
Excess savings in the economy remain high despite coming down recently

- Since the pandemic, U.S. consumers have accumulated over \$1.5tn in excess savings, as of the end of November 2022
- Personal savings have since declined sharply, but cumulative savings are still massive

SAVING RATE OF PERSONAL INCOME (%)



\$2TN EXCESS SAVINGS ACCUMULATED

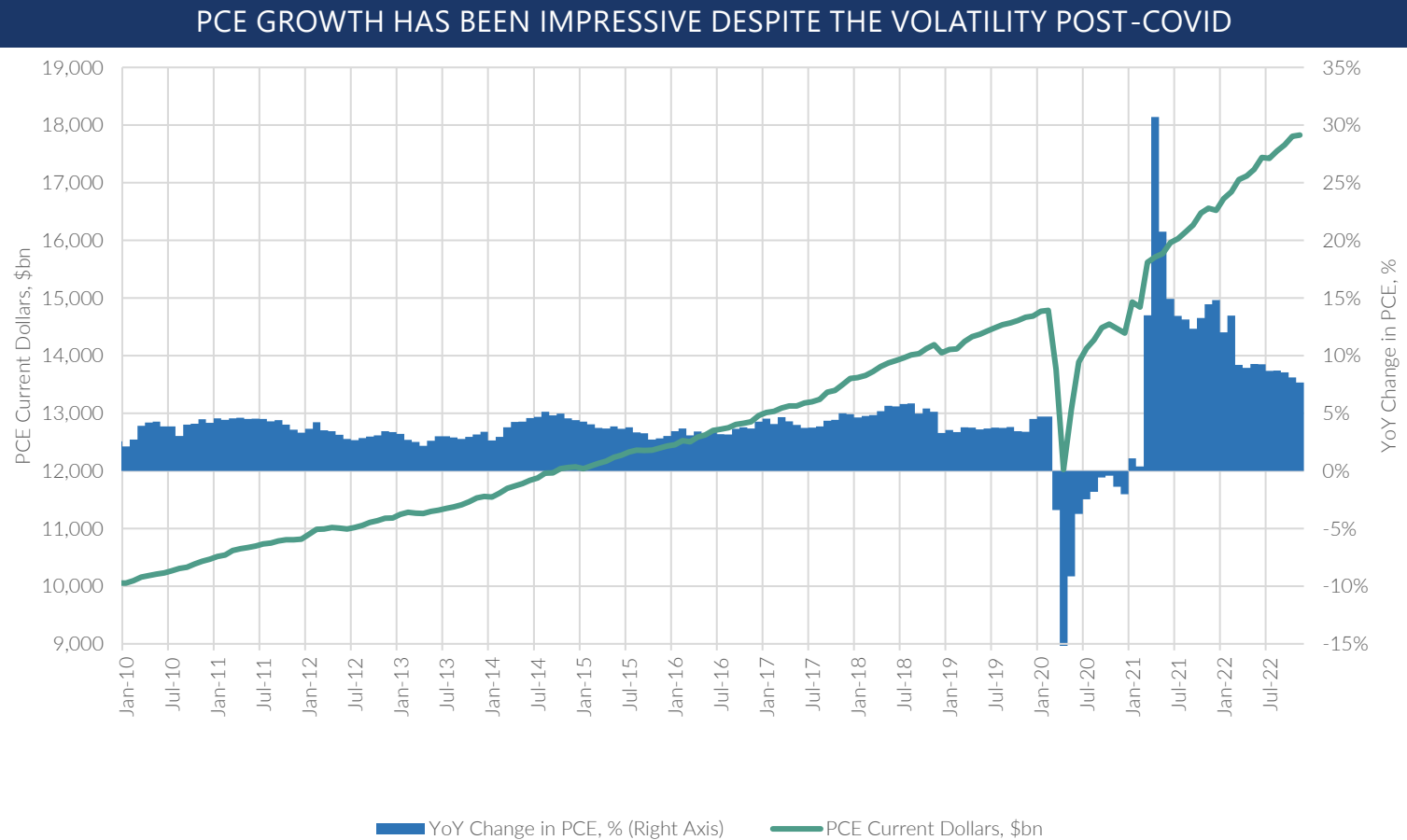


Source: U.S. Bureau of Economic Analysis; Amherst Estimates as of Dec 2022



Consumer spending has remained strong

- PCE has increased from \$14.8tn in February 2020 to \$17.8tn in November 2022 (most recent data)

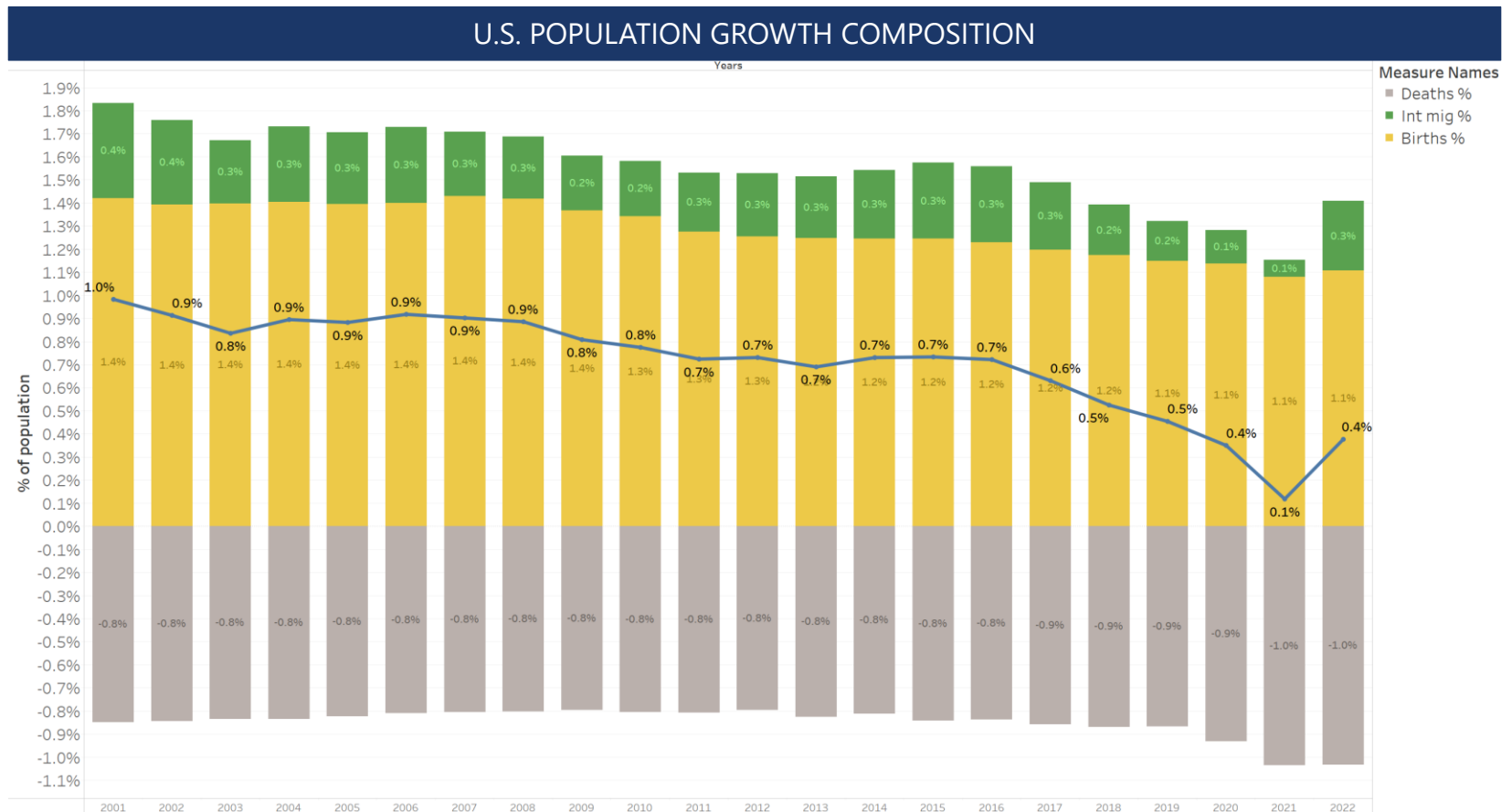


Source: PCE data is from the Bureau of Economic Analysis retrieved as of Jan 2023. Last data point is Nov 2022



Population growth provided additional support for housing demand in 2022

- In 2021, the U.S. population growth plummeted to 0.1%, the slowest growth year on record
- Contributing factors were a near stoppage in international migration, as well as a ~20bps increase in mortality rate, driven directly by COVID-related deaths and pressure on the healthcare system
- In 2022, population growth rebounded to 0.4% driven by the recovery of international migration to more normal levels



Source: PEP Census Survey as of Dec 2022



2023 Outlook

- Housing has historically done well in rising rate environments. Since 2000, home prices have risen in ~93% of instances where there has been a trailing 12-month increase of 0-1% in 10-Year U.S. Treasury rates
- While demand for home purchases is down, new listing volumes are also lower, as there are no forced sellers in the existing home sales market. For-sale inventories are running 20-25% below the 2019 levels. This is consistent with the lower mobility seen in the timely U.S. Postal Service data. We expect transaction volumes in existing markets to be low in the coming months
- Despite lower supply, we expect higher interest rates to continue to put pressure on home prices. We expect home prices to decrease further, but at a gradual rate. Affordability may improve, both with lower home prices and wage inflation, as well as potentially lower interest rates in the future
- We may see faster declines in the new-build market as the supply of new homes nears an all-time high and demand has almost dropped to the March 2020 lockdown lows
- Most new-build homes are located far from the Census Bureau Statistical Area (CBSA) centers, and home prices in these outlying areas will likely be under greater pressure in 2023

Source: Amherst Home Price Index; Bloomberg, Corelogic MLS database; Amherst Estimates



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Home prices have historically done well in rising-rate environments

- Home prices have historically grown faster in environments in which rates are rising, rather than falling
- Since 2000, home prices have risen in ~93% of instances where there has been a trailing 12-month increase of 0-1% in 10-Year U.S. Treasury rates
- On the contrary, home price appreciation has been positive in only ~65% of cases in which 10-Year U.S. Treasury rates have fallen by the same 0-1% magnitude

HOME PRICE APPRECIATION IN RISING RATE ENVIRONMENT¹

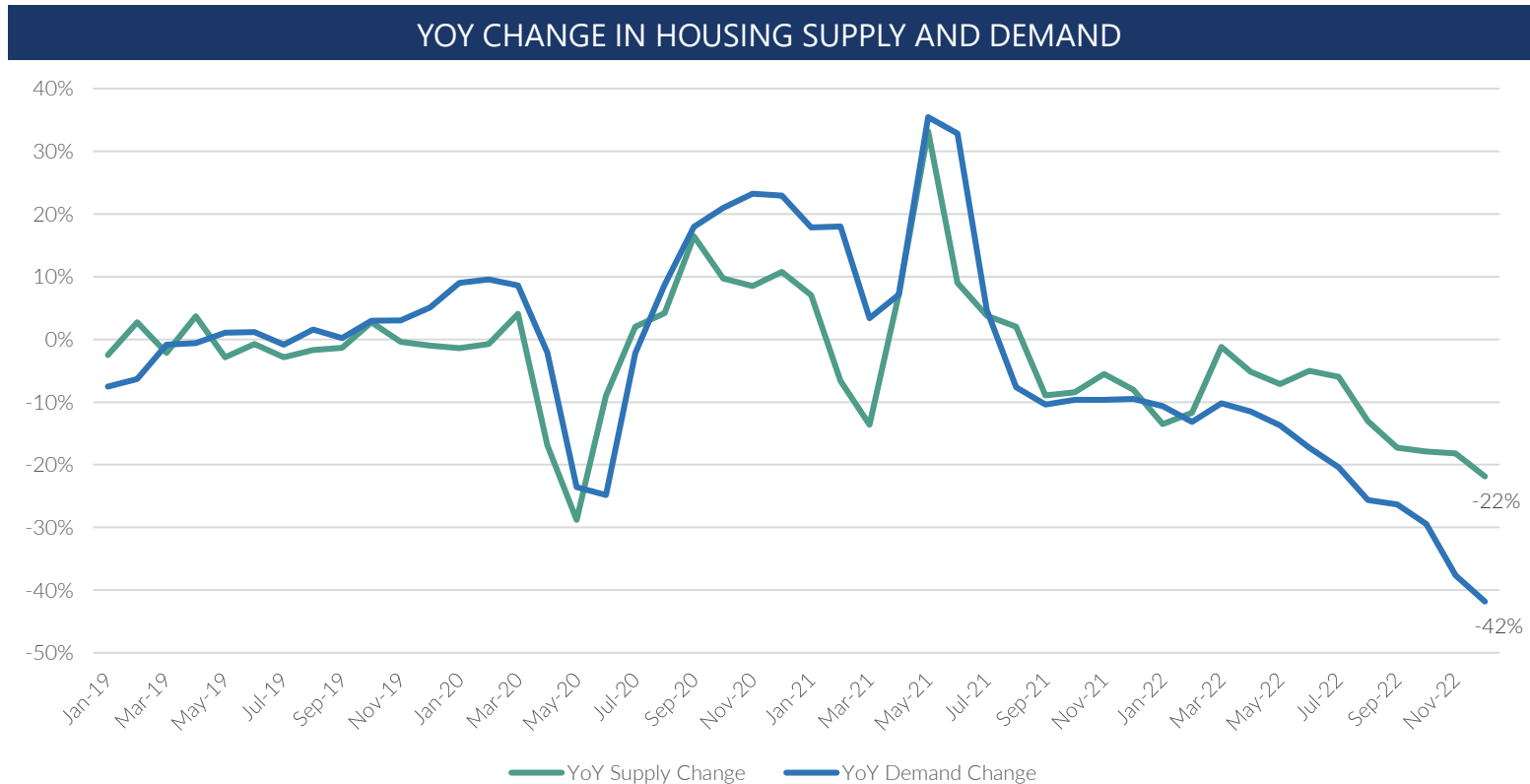
10-Year U.S. Treasury YoY Change	-2% to -1%	-1% to -0.5%	-0.5% to 0	0 to 0.5%	0.5% to 1%	1% to 2%
Home Price Growth	2.7%	2.3%	2.7%	6.5%	9.1%	9.3%
Instances with Positive Home Price Appreciation (%)	72%	65%	64%	91%	93%	87%

Source: Amherst Home Price Index; Bloomberg 1) Data from Jan 2000 to Sep 2022



Housing demand is lower, but new listing volume is also lower

- Supply (new listings) is down around -22% YoY, as sellers are discouraged by the recent price declines and the high mortgage rates that prevail if they need to finance another home
- This has prevented inventories from rising quickly, despite the drop in demand

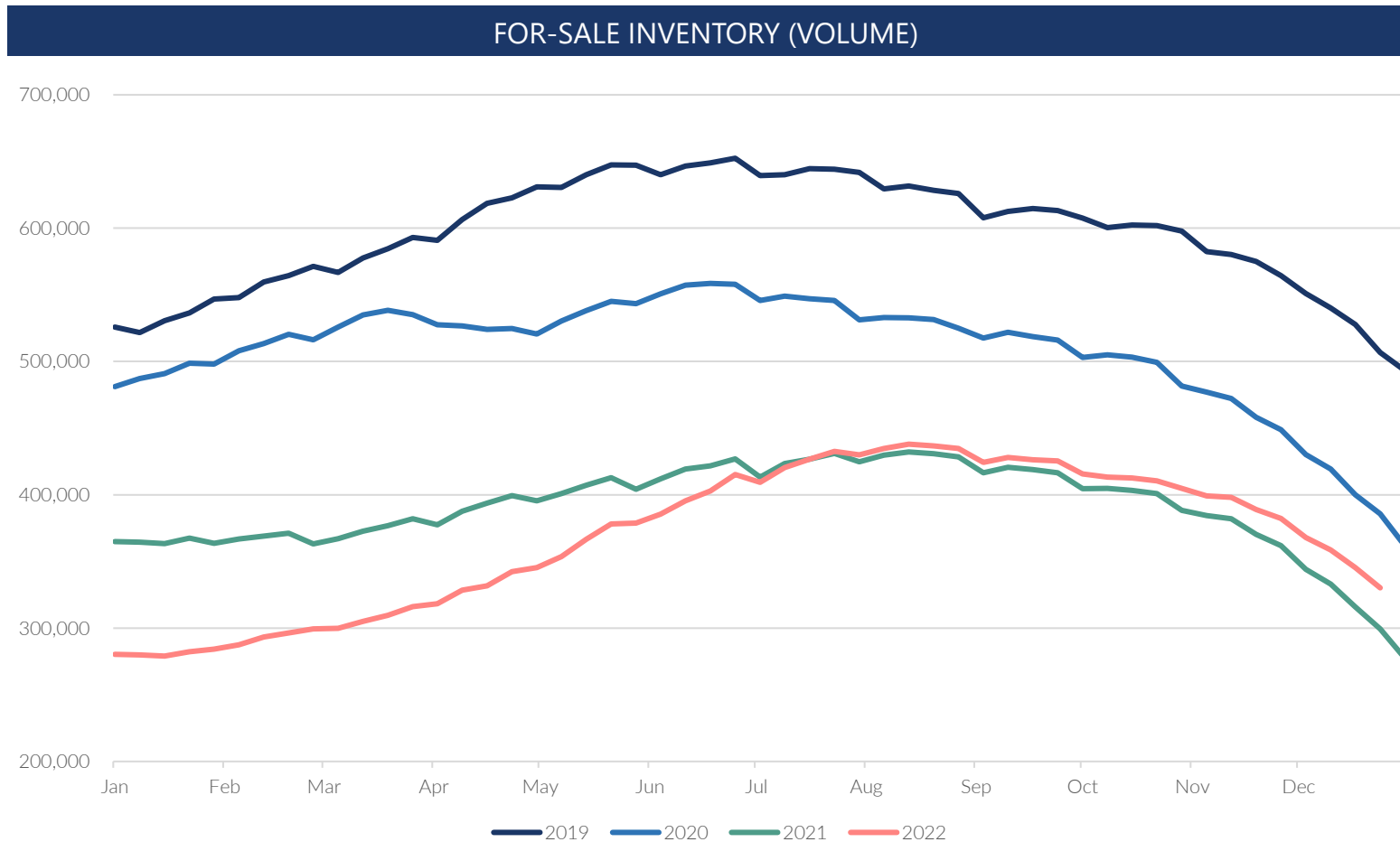


Source: Amherst Estimates as of Jan 2023



As a result, inventory is still much lower than 2019 levels

- For-sale housing supply has recovered from the historically tight levels, but remains significantly lower than pre-pandemic levels



Source: Amherst tabulation of Corelogic MLS database as of Jan 2023 Note: Inventory and absorption numbers are based on Amherst markets and major CBSAs in the U.S



Lower inventory levels are visible across cities

- For-sale inventory is growing fast in some markets, but remains significantly lower than historical standards

DECEMBER 2022 INVENTORY VS. SAME PERIOD SINCE 2018				
Region	Vs. 2021	Vs. 2020	Vs. 2019	Vs. 2018
Amherst Markets	14.7%	-12.7%	-35.3%	-39.8%
Los Angeles	52.8%	27.8%	1.8%	-11.4%
Salt Lake City	51.7%	0.7%	-37.3%	-46.5%
Huntsville	38.2%	-1.7%	-22.7%	-32.5%
Palm Bay	37.8%	-10.1%	-33.3%	-49.1%
Austin	35.2%	32.2%	-11.1%	-16.1%
Denver	33.8%	29.3%	-7.9%	-8.6%
Tampa	32.6%	-8.0%	-36.9%	-42.8%
Tucson	27.7%	16.4%	-15.2%	-30.3%
Phoenix	25.9%	12.2%	-12.1%	-32.9%
Birmingham	23.8%	-14.4%	-29.4%	-36.9%
Knoxville	23.7%	-26.1%	-38.8%	-41.0%
Miami	22.8%	-12.2%	-33.3%	-40.5%
Seattle	20.3%	-3.7%	-19.4%	-29.0%
Orlando	20.1%	-16.4%	-37.2%	-42.5%
Jacksonville	19.7%	-4.5%	-40.3%	-44.8%
Minneapolis	19.1%	-13.9%	-35.6%	-36.2%
San Antonio	12.7%	-20.1%	-41.1%	-35.8%
Columbus	12.3%	-5.8%	-30.4%	-33.7%
Louisville	10.9%	1.4%	-15.2%	-22.6%
Nashville	10.1%	-50.8%	-58.5%	-59.6%
Oklahoma City	9.3%	8.9%	6.9%	7.0%
Atlanta	4.9%	-20.1%	-46.0%	-47.2%
Memphis	4.8%	-12.0%	-31.9%	-38.0%
Houston	1.2%	-26.6%	-46.5%	-44.3%
Kansas City	-0.9%	-22.8%	-33.2%	-38.0%
Charlotte	-4.7%	-27.5%	-42.9%	-48.1%
Cleveland	-6.2%	-6.9%	-31.9%	-36.1%
Raleigh	-7.2%	-36.1%	-52.2%	-59.6%
St Louis	-15.8%	-32.2%	-45.5%	-51.6%
Greensboro	-16.5%	-34.0%	-51.0%	-55.3%
Cincinnati	-20.6%	-37.2%	-52.3%	-59.9%

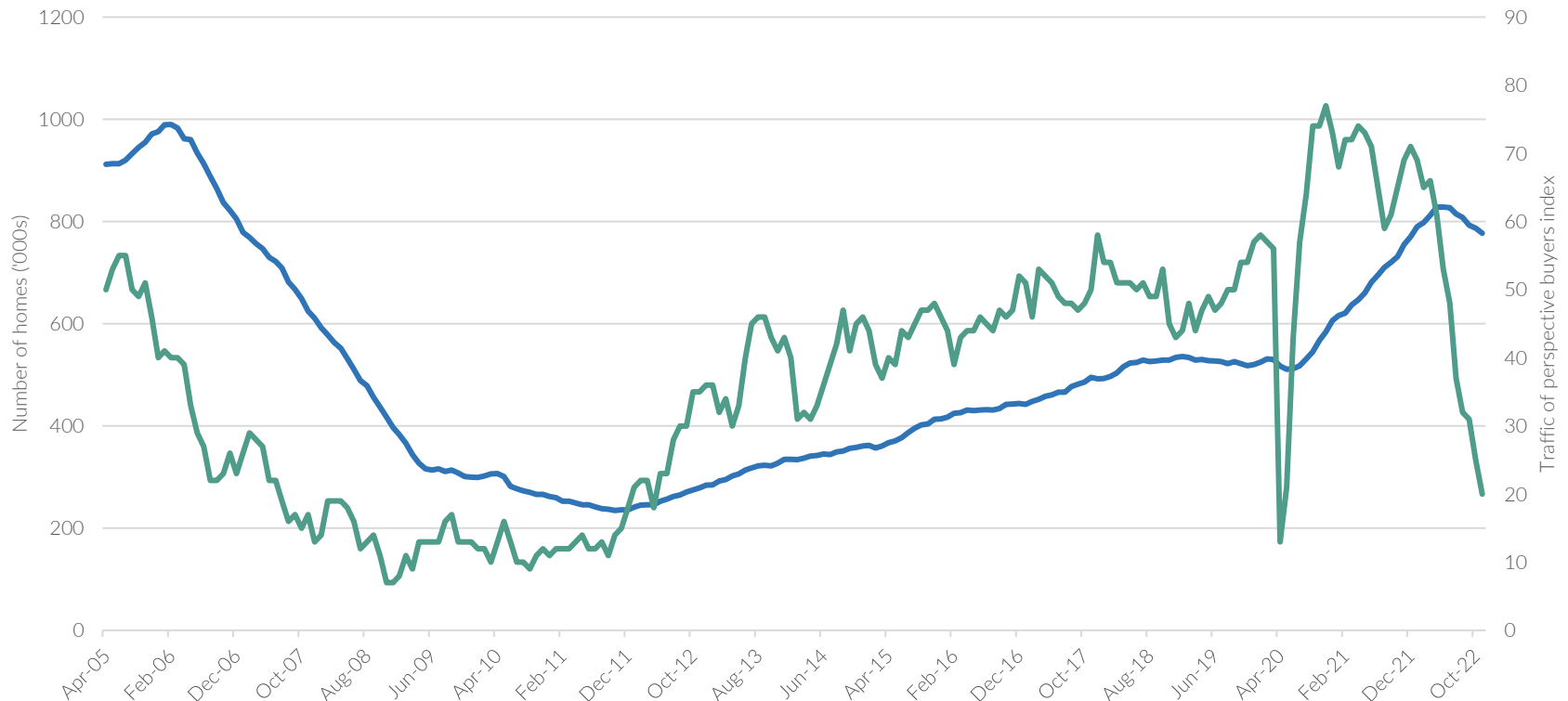
Source: Amherst Estimates as of Jan 2023



New-build market may witness disproportionate stress

- Amherst forecasting model expects prices to decline by 3%-4% in 2023. New-build market will likely witness disproportionate stress
- The number of single-family homes under construction is near all-time high, while traffic of prospective home buyers is barely hovering over the low levels of the March 2020 lockdown
- New home prices may already be declining faster than what transaction prices suggest, as builders are offering incentives including mortgage rate buydowns

NEW-BUILD SUPPLY AND DEMAND



Source: Amherst Estimates as of Jan 2023

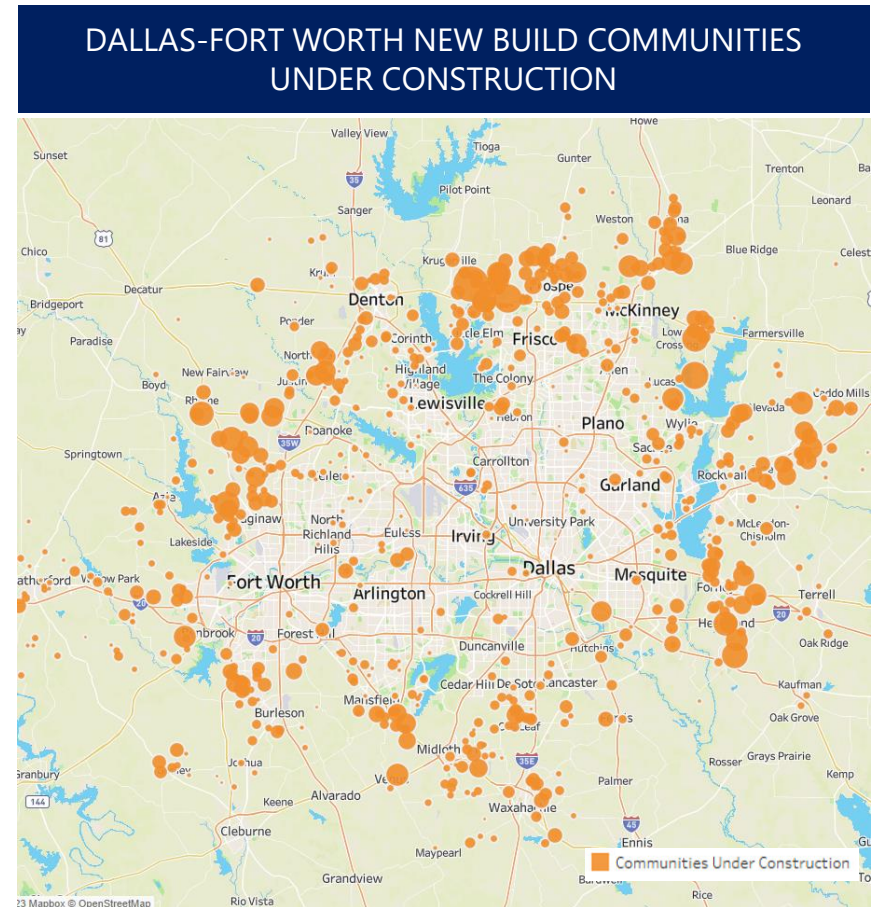
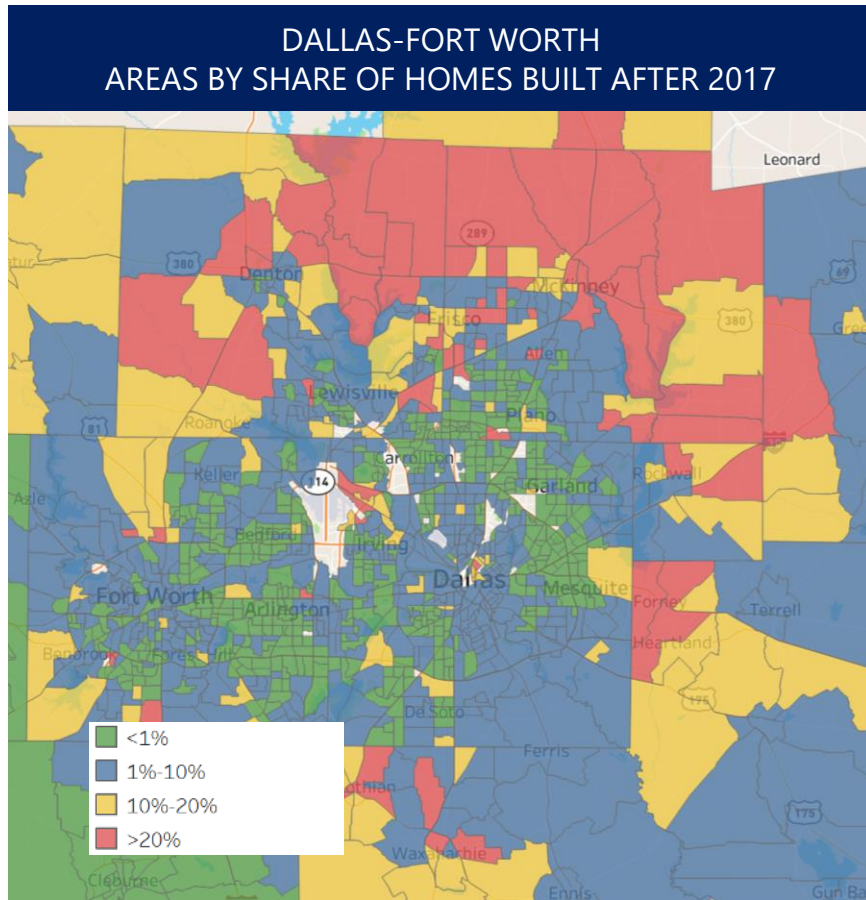
— SF Homes Under Construction (la)

— Traffic of prospective home buyers (ra)



Outlying areas will face greater price pressures

- Most new-build homes are located far away from CBSA centers and may come under greater pressure



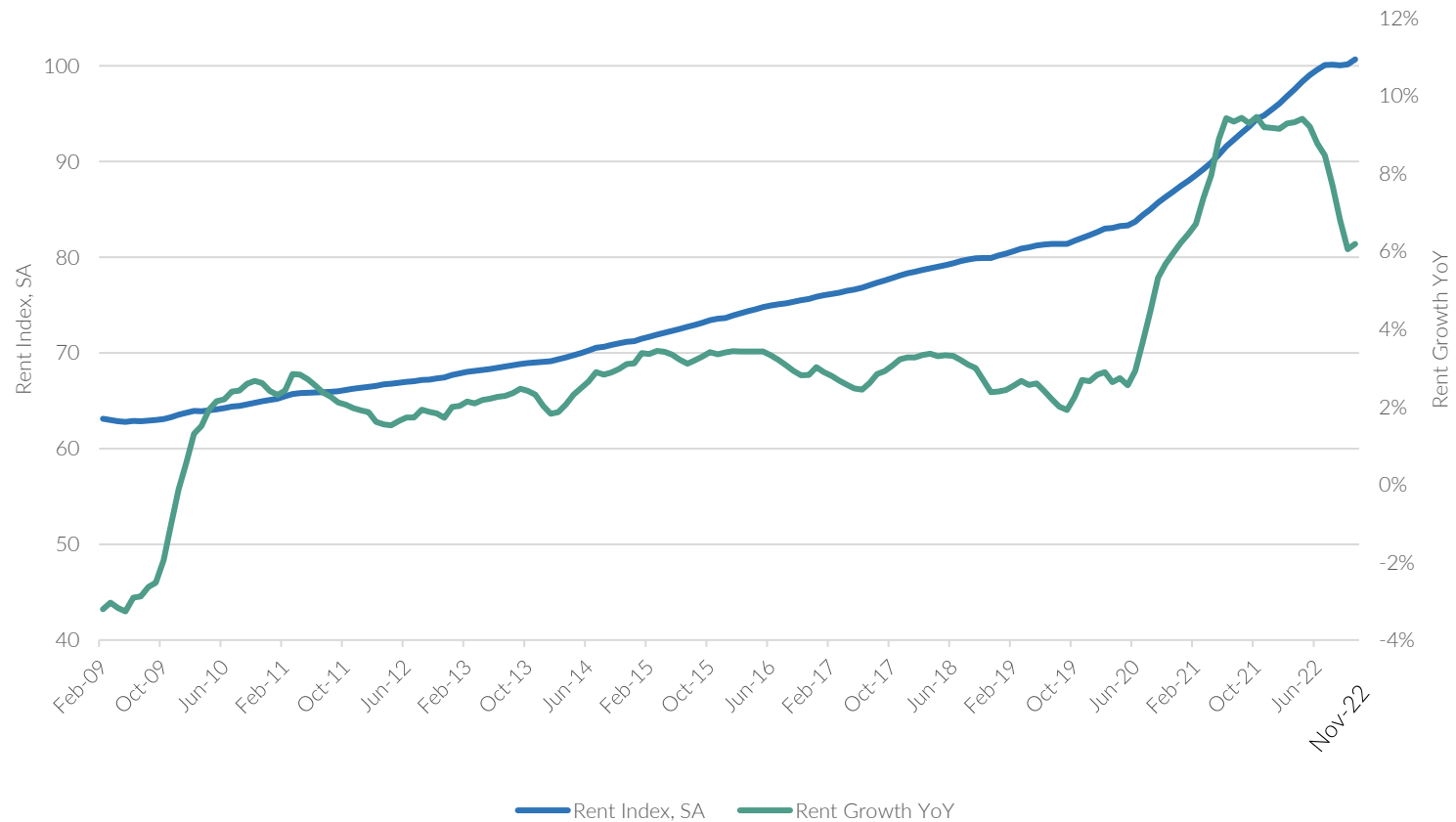
Source: Zonda Metrostudy; Amherst Estimates as of Jan 2023



Rents are generally less elastic and saw more support from the marketplace

- Rents continued to grow on a seasonally adjusted basis, even in the second half of 2022
- For-lease inventory has returned to pre-pandemic levels, but lease absorption is still running higher than pre-pandemic levels

AMHERST RENT GROWTH INDEX AND RENT GROWTH (FEB 2009 – NOV 2022)



Source: The Amherst Rent Index as of Jan 2023. Last data point in Nov 2022



Rents have historically grown faster in rising-rate environments

- Rents have historically grown faster in environments in which interest rates are rising
- However, in contrast to home prices, rents are less volatile. Since 2000 monthly rent growth was positive in 93% of instances, regardless of the interest rate environment, compared with 76% of instances for home prices

RENT GROWTH IN RISING-RATE ENVIRONMENT¹

10-Year U.S. Treasury YoY Change	-2% to -1%	-1% to -0.5%	-0.5% to 0	0 to 0.5%	0.5% to 1%	1% to 2%
Rent Growth	2.4%	2.5%	2.4%	3.2%	5.1%	5.3%
Instances with Positive Rent Growth (%)	100%	88%	87%	100%	100%	83%

Source: Amherst Rent index; Bloomberg 1) Data from Jan 2000 to Sep 2022



SVAR model implies 0.5% higher annual rent growth for four years after 400bp of hikes

- The Board of Governors of the Federal Reserve System published a paper in 2019 examining the effect of contractionary monetary policy on rents (Authors Daniel A. Dias & Joao B. Duarte); we replicated the SVAR model used in the paper
- This SVAR model suggests that 100bps of tightening results in about 10-15bps of additional annualized growth over the next four years, all other factors held constant
- For context, with 425-450bps of rate hikes seen in 2022, we should expect 0.5pp higher annualized rent growth for the next four years

HYPOTHETICAL SVAR MODEL RENT GROWTH SCENARIOS

Months After Hike	\$ Rent		
	Base Case - No Hike 3% Annual Rent Growth	100bps Hike	400bps Hike
0	\$1,800	\$1,800	\$1,800
12	\$1,854	\$1,864	\$1,892
24	\$1,910	\$1,921	\$1,956
36	\$1,967	\$1,980	\$2,017
48	\$2,026	\$2,036	\$2,066

Months After Hike	Annualized Rent Growth		
	Base Case - No Hike 3% Annual Rent Growth	100bps Hike	400bps Hike
12	3.0%	3.5%	5.1%
24	3.0%	3.3%	4.2%
36	3.0%	3.2%	3.9%
48	3.0%	3.1%	3.5%

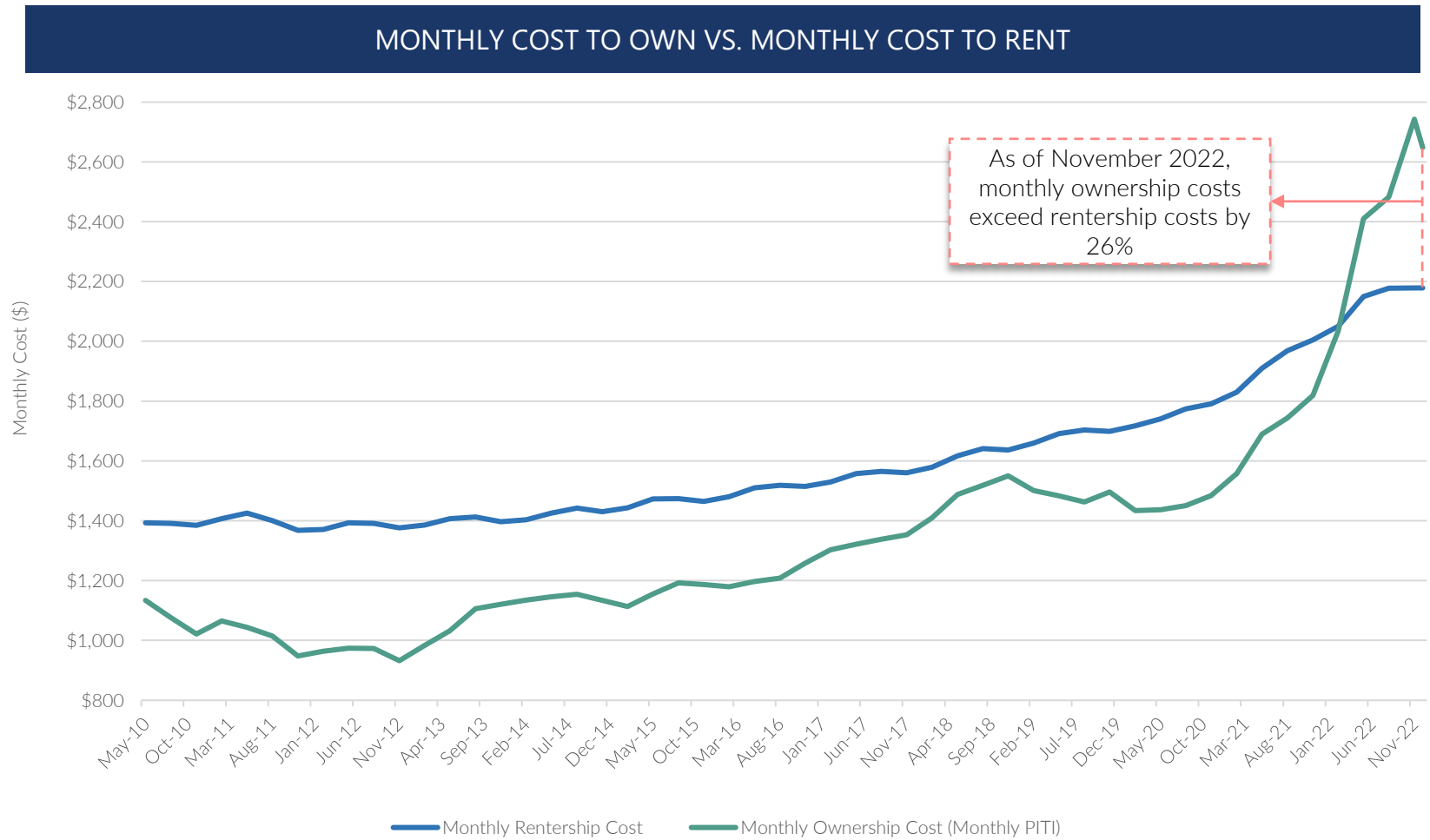
Note: Structural Vector Autoregressions (SVARs) are a multivariate, linear representation of a vector of observables on its own lags. The SVAR looks to isolate the impact of monetary policy on rents from other macro variables

Source: Dias, Daniel A. and Duarte, João B., Monetary Policy, Housing Rents and Inflation Dynamics (May 2019). International Finance Discussion Paper No. 1248, Amherst estimates



Dramatic increase in the cost to own a home should boost for-lease demand

- Following the rapid increase in mortgage rates, the cost of ownership far exceeds the cost to lease and should further boost leasing demand

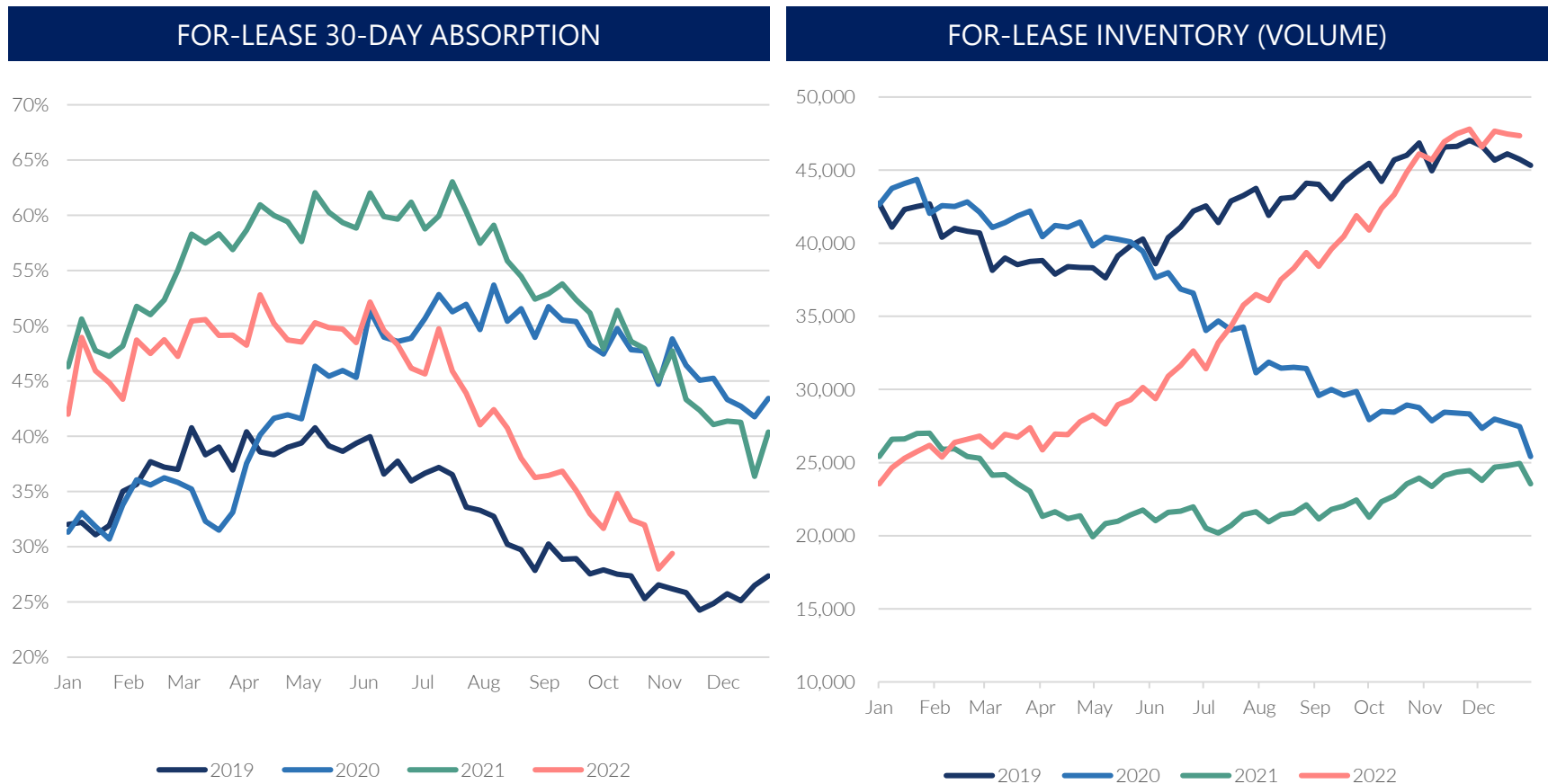


Source: Amherst Estimate as of Dec 2022



For-lease absorptions are running above 2019 levels

- Rental inventory has risen from the abnormally low levels of 2021, but inventory levels are still comparable to 2019
- Leasing velocity has also come down from very high levels in 2020 and 2021, but is still running above 2019 absorption levels



Source: Amherst Tabulation of Corelogic MLS database as of Dec 2022; Note: Inventory and absorption numbers are based on Amherst markets and major CBSAs in the U.S.



A photograph of a row of suburban houses with a teal overlay. The houses are two-story with gabled roofs and front porches. A sidewalk runs along the front of the houses, and a street lamp is visible on the left. The text "Special Topic: Housing Excess/Deficit" is overlaid in white.

Special Topic: Housing Excess/Deficit

Framing the question

Judging the level of excess/deficit in the housing market involves answering two questions:

Question 1: Do we have enough housing units for the number of U.S. households?

- We evaluate this by calculating current vacancy vs. 'steady-state' vacancy
- The steady state vacancy rate depends on the elasticity of supply/demand curves, but we approximate this to be the historical average vacancy in each market
- Vacancy rates are currently running 110bps below historical averages – suggesting a deficit of 1.6mn housing units
- Of the 1.6mn aggregate housing unit deficit, we estimate single-family deficits to be 1.1mn units and multifamily deficit of 0.5mn units

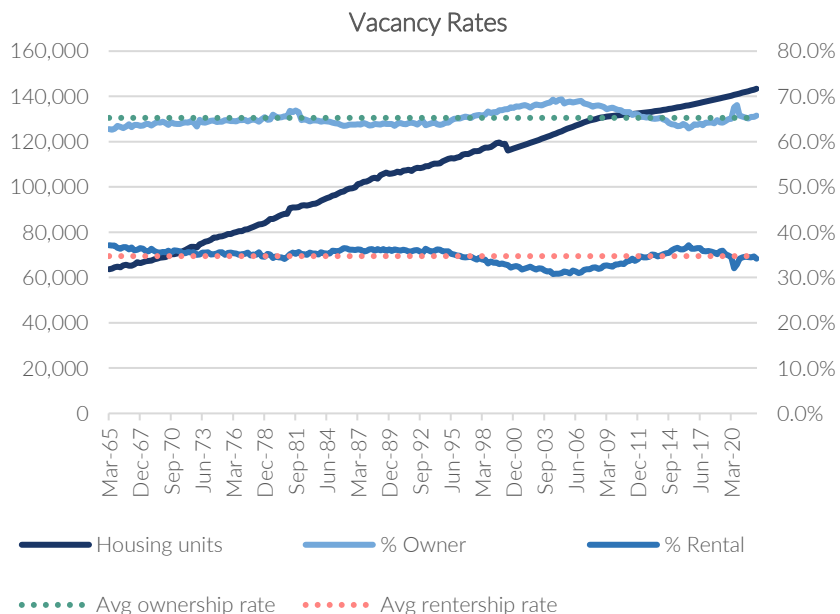
Question 2: Are there adequate households for the U.S. population?

- The propensity of people to form households is referred to as the headship rate
- Headship rate varies based on age, marital status, race, employment status and income levels. The composition of the population in the U.S. that is based on these metrics has changed over time
- We select different base years (2001-2003, 2005-2007, 2006-2018 and 2010-2018) and calculate headship rates for different demographic/economic segments of the population. We then apply these headship rates to the current population distribution
- We see about ~3mn household deficit relative to 2001-2003 and 2005-2007, adequate households relative to 2006-2018 and 1mn excess relative to 2010-2018

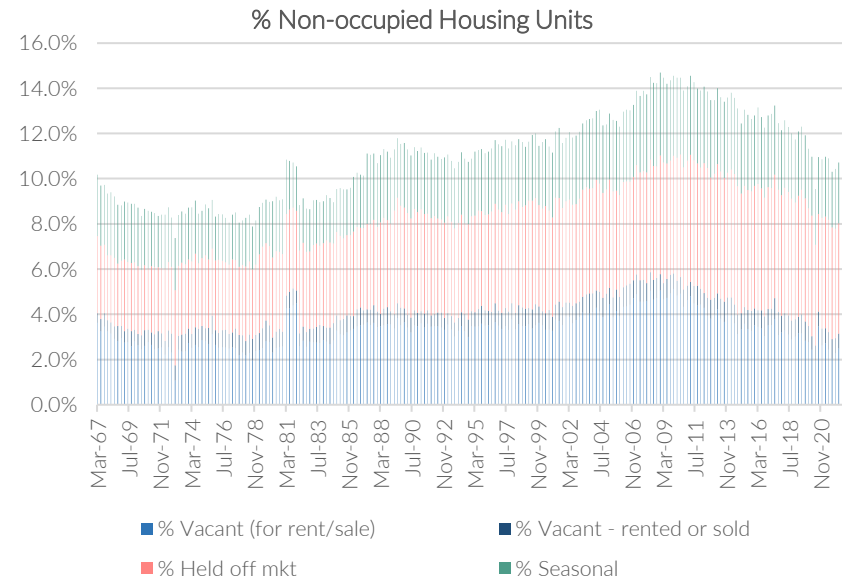
Vacancy rates are near their all-time lows

- Housing units have grown at a 1.42% compound annual growth rate (CAGR) over the past 60 years
- The U.S. is currently at a 66%/34% ownership/rentership rate—in line with historical averages
- The percentage of units occupied is 89.4% vs. 89.0% historically. Vacant for-sale and for-rent units are 2.3% of stock, vs 3.3% historically, a ~110bp deficit. There is also 5% of the housing stock held off market, compared to 4.2% historically¹
- The number of units held off market is not correlated with home price; thus, it is likely driven by an aging housing stock that is in increasing need of repair/rehabilitation
- Assuming historical vacancy rates are the equilibrium, a vacancy rate above this level represents housing excess and below this level represents a deficit
- Based on this, we estimate a total housing deficit of ~1.6mn units

HOUSING UNIT CHARACTERISTICS OVER TIME



WHY UNITS ARE UNOCCUPIED



Source: Census; Amherst Estimate as of Dec 2022; 1) About a third of stock was held off market for repair, and another third for personal/family reasons, with storage, legal reasons, preparation to rent/sell/demolish being cited as the remaining reasons

Twice the deficit of single-family units vs. multifamily units

- Different regions have different 'steady-state' vacancy levels
- In recognition of this, we estimate deficits by comparing current vacancy rates with historical averages (2012-2019) at a CBSA-level
- The number of multifamily units in the U.S. was 39.7mn in 2021, with a vacancy rate of 9.0%. The historical vacancy rate (weighted average, by region) is 10.3%, which translates to a unit deficit of ~500k units
- Similarly, the number of single-family units in the U.S. was 116mn, with a vacancy rate of 3.8%. This is ~1.0pp lower than the historical average, which implies a single-family unit deficit of ~1.1mn units

DISTRIBUTION OF HOUSING UNIT DEFICIT BETWEEN SINGLE-FAMILY AND MULTIFAMILY					
Housing Type	# Units (mn)	2021 Vacancy	Steady-State Vacancy ('12-'19 Avg.)	Vacancy Rate Deficit	Unit Deficit ('000s)
Single-Family	116.0	3.8%	4.8%	-1.0%	-1,147
Multifamily	39.7	9.0%	10.3%	-1.2%	-496
Total	155.8	5.3%	6.4%	-1.1%	-1,684

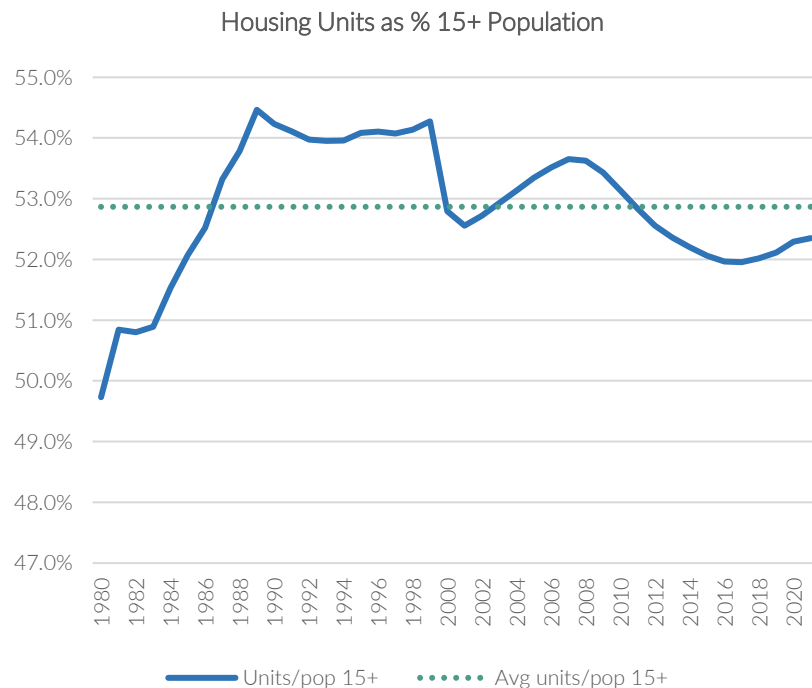
Source: Census; Amherst Estimate as of Dec 2022



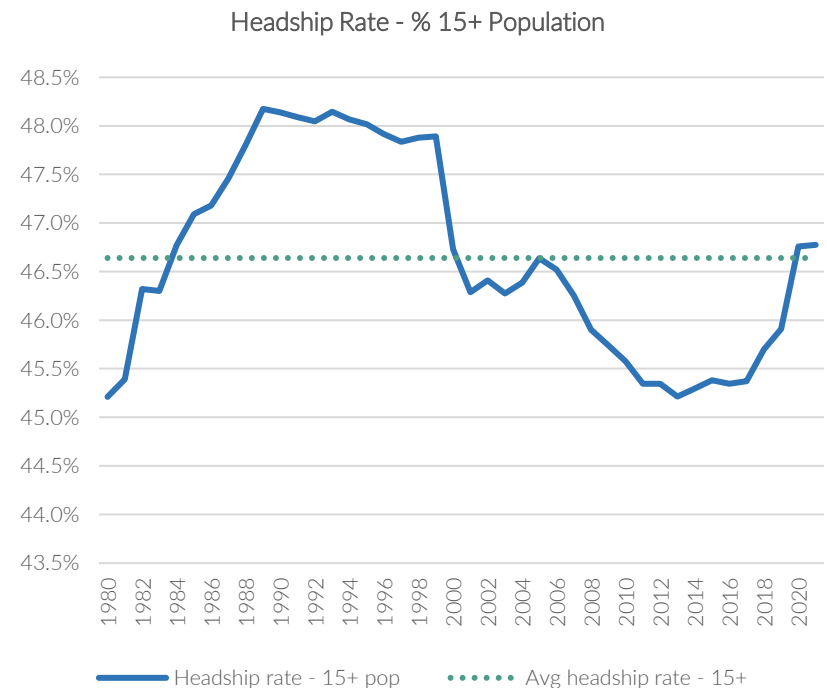
Are there too few households vs. expected?

- As a proportion of the population over 15 years of age:
 - Housing units are 52.3%, about 50bps below the long-term average, which equates to a deficit of 1.4mn homes
 - Headship rate (households vs. population) of the 15+ is 46.8%, right around long-term average
- However, the population has aged over time, and the headship rate grows as people age
- We attempt to build an age-based headship rate model to account for demographic changes over the past 60 years

HOUSING UNITS VS. POPULATION



HOUSEHOLDS VS. POPULATION



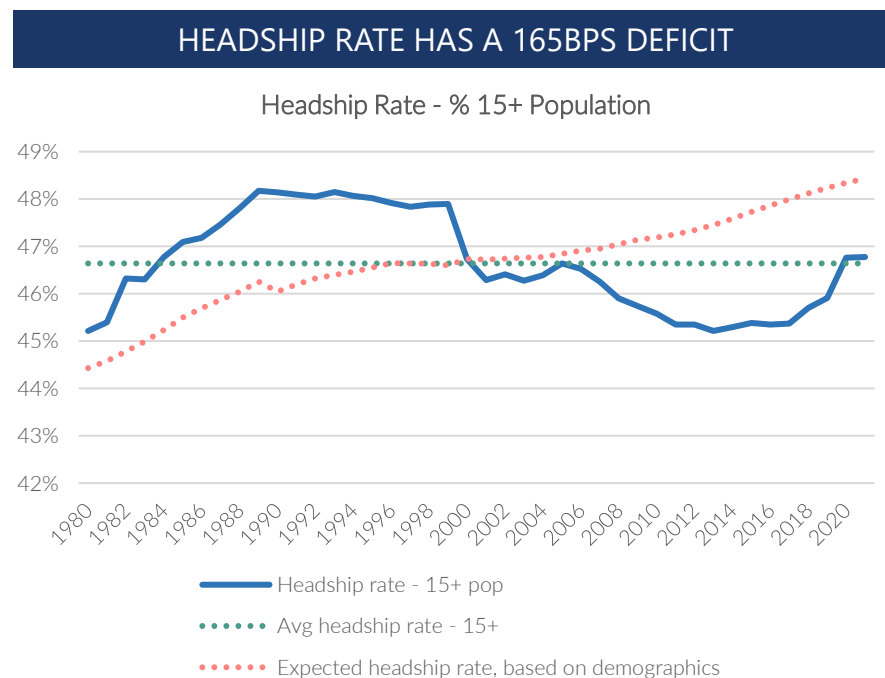
Source: Census; Amherst Estimate as of Dec 2022



A simplistic headship rate model suggests 4.5mn fewer households exist today

- We develop a headship rate model based on age brackets
- As seen below, the headship rate for 15–24-year-old is in the low-teens % and increases with age
- We've also seen headship rates by age decline over time. For example, 47.3% of 25–34-year-olds formed households in 2005, and this has dropped to 44.1% currently
- Taking the average headship rates over the past 20 years, we calculate a demographics-adjusted expected headship rate over time
- Based on this, headship rates are presently 165bp lower than history would suggest, implying a deficit of 4.5mn households
- A more sophisticated headship model that takes into account ethnicity, marriage rates and employment status would imply a lower headship rate today than before

HEADSHIP RATES BY AGE, OVER TIME							
Year	2000	2005	2010	2015	2019	2020	2021
15-24	18.3%	17.4%	13.5%	12.2%	12.5%	12.2%	13.4%
25-34	48.1%	47.3%	44.5%	41.8%	41.8%	41.7%	44.1%
35-44	53.8%	53.4%	52.6%	51.3%	51.0%	51.0%	52.3%
45-54	56.0%	56.1%	55.7%	54.8%	54.3%	54.4%	55.1%
55-64	58.1%	58.2%	58.1%	57.1%	57.3%	58.1%	57.9%
65-74	62.2%	61.7%	61.4%	60.7%	60.9%	61.6%	61.5%
75-84	68.1%	67.3%	66.4%	64.4%	64.3%	64.4%	64.2%
85+	71.4%	71.5%	69.9%	68.5%	68.9%	69.2%	68.5%



Source: Census; Amherst Estimate as of Dec 2022



A simplistic model may not capture changes in demographics and preferences

- The early 2000s had the highest headship rates
 - Headship rates declined through 2017 and began to reverse in 2018
- The COVID-19 pandemic saw a sharp rise in headship rates
 - This was also true for most demographic sub-groups
 - Using 2010-2018 as 'base years' will yield lower household deficits
 - Using pre-2008 headship rates will yield higher household deficits
- Common drivers of headship rate
 - Home prices have grown faster than incomes over the past two decades, inhibiting household formation.
 - Credit boxes for mortgages were also tightened, making it more difficult for low-credit households to get mortgages
 - Headship rates among 15-24-year-old households fell most dramatically since the Great Financial Crisis (GFC), driven largely by increased college enrollment
 - Headship rates among the 25-34-year-old population also fell sharply – the 'millennials in the basement' phenomenon
 - The commonly cited reasons are increased student loan debt and income inequality
 - We also find that lower marriage rates and a rising Hispanic/Asian population are explanatory factors

Summary of Population Over Age 15 (Millions)			
Year	Households	Population	Headship
2000	104.71	209.50	50.0%
2001	106.42	212.79	50.0%
2002	107.36	216.10	49.7%
2003	108.42	218.28	49.7%
2004	109.89	220.82	49.8%
2005	111.06	223.53	49.7%
2006	111.61	226.26	49.3%
2007	112.37	228.42	49.2%
2008	113.10	230.67	49.0%
2009	113.61	232.83	48.8%
2010	114.56	235.95	48.6%
2011	114.99	238.34	48.2%
2012	115.96	240.70	48.2%
2013	116.29	242.98	47.9%
2014	117.25	245.70	47.7%
2015	118.20	248.26	47.6%
2016	118.86	250.00	47.5%
2017	120.06	252.62	47.5%
2018	121.52	254.22	47.8%
2019	122.80	255.54	48.1%
2020	124.39	257.17	48.4%
2021	127.54	259.43	49.2%

*Data exclude group quarters

Source: Census; Amherst Estimate as of Dec 2022



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Building an advanced headship rate model

- We create a more comprehensive headship rate model for the U.S. population based on the following factors
- Demographic characteristics
 - **Age:** [Tailwind] The population of the U.S. has skewed older over the past two decades. This benefits household formation, as older people have higher headship rates
 - **Marital Status:** [Headwind] 32% of the population was single in 2021 vs. 26% in 2000, while the share of married people has dropped from 55% to 50%. Single people have significantly lower rates of household formation
 - **Race/Ethnicity:** [Headwind] Hispanic, Asian and other populations have lower headship rates and have seen their share of the population rise from 19% in 2000 to 28% currently
- Economic characteristics
 - **Employment:** [Headwind during recessions, tailwind at other times] This is more cyclical, and depresses household formation during recessions, as civilians employed and those in the Armed forces have higher headship rates
 - **Income:** [Headwind during recessions, tailwind at other times] Headship rates rise with income. Even if unemployment rates were 'normal,' but wages did not pick up, it would lead to depressed household formation (2012-2015 timeframe)

HEADSHIP RATE AND POPULATION BY DEMOGRAPHIC/ECONOMIC CHARACTERISTICS															
Demographic characteristics		Age						Marital Status			Race/Ethnicity				
		15-25	25-35	35-45	45-55	55-65	65+	Married	Never married	Other	White	Black	Hispanic	Asian	Other
	Headship rate	13.4	44.1	52.3	55.1	57.9	62.9	48.5	35.7	74.8	52.1	51.1	40.8	41.7	46.1
	% Population	14%	17%	17%	15%	16%	21%	50%	32%	18%	61%	11%	17%	6%	5%
Economic characteristics		Employment Status					Income								
		Employed		Not in labor force		Unemployed	0-25k		25-50k		50-75k	75-100k		100k+	
	Headship rate	51.2		46.7		39.9	37.3		54.4		61.1	63.2		66.7	
	% Population	60%		36%		4%	46%		25%		13%	7%		9%	

Source: Census; Amherst Estimate as of Dec 2022



The advanced model suggests ~3mn deficit in households

- We expand the age-based headship rate model to include race, employment and personal income, and marital status
 - We also delineate the housing deficit by unit type, including Single Family (SF), Multifamily (MF), and Other categories
- Headship rates have been declining since the early 2000s until 2018 when the trend reversed
 - 2021 saw a dramatic rise in headship rates. Headship rates within demographic subcategories reached or surpassed their early 2000s rates
 - Significant heterogeneity remains within demographic categories. Households aged <35 remain 4-5pp+ lower than their early 2000s headship rates
- Headship rates from years 2006-2007 suggest a nationwide deficit of 2.7mn households
 - 87% (2.32mn units) of this deficit is among single-family homes, and a deficit of only 40k multifamily units
 - Using the 2006-2018 average, the single-family home deficit drops to 500k homes with an excess of 47k multifamily units

DEFICIT ESTIMATES BY HEADSHIP RATES (IN MILLIONS)

Base year	2019					2021				
	2001-2003**	2006-2007	2006-2018	2010-2018	2020-2021	2001-2003**	2006-2007	2006-2018	2010-2018	2020-2021
Observed Households	122.80	122.80	122.80	122.80	122.80	127.54	127.54	127.54	127.54	127.54
Expected Households	130.59	129.54	126.92	125.88	125.53	130.59	130.22	127.70	126.68	126.47
Deficit	7.79	6.74	4.12	3.08	2.73	3.05	2.68	0.16	-0.86	-1.07
SF	5.66	5.03	3.16	2.45	1.77	2.71	2.32	0.50	-0.20	-0.81
MF	1.49	1.23	0.70	0.47	0.89	-0.10	0.04	-0.47	-0.69	-0.22
Other	0.64	0.48	0.26	0.17	0.07	0.43	0.32	0.12	0.03	-0.04

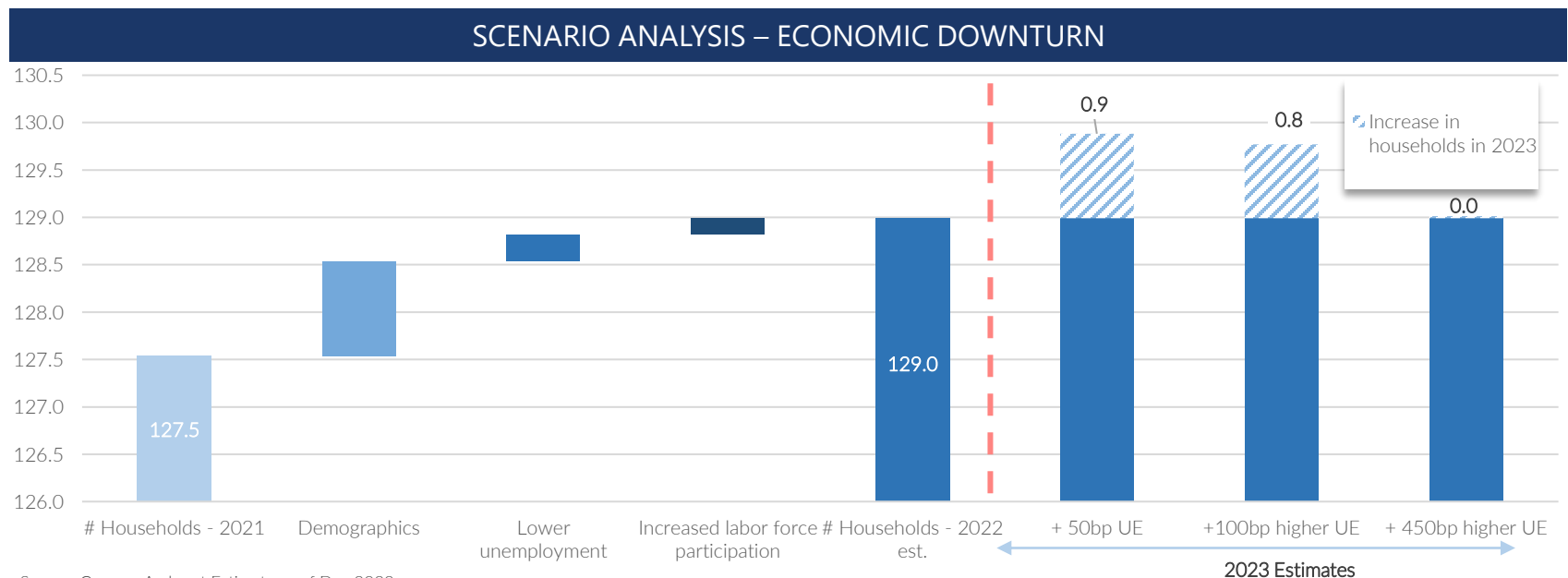
Source: Census; Amherst Estimate as of Dec 2022

** does not include Hispanic delineation. Using the 2001-2003 average, but without Hispanic delineation, results in a deficit of 2.71mn single-family units and an excess of 100k multifamily units Including Hispanic delineation in race tends to raise household deficits



Household formation may slow down, but will remain positive in 2023

- While age, marital status and race are slow-moving characteristics of a population, unemployment and income are more cyclical
- In a steady state, we expect U.S. population growth of 1.6mn (60bp) and expect household growth to average ~1mn per year (76bps)
- From mid-2021 to now, Bureau of Labor Statistics (BLS) data show that the unemployment rate has fallen from 5.4% to 3.7%, and the labor force participation rate has risen about 50bps. All else equal, this implies an increase in expected households of ~450k (35bps)
- All together, we believe there were likely 129mn households in 2022, ~1.4mn more versus 2021
- For 2023, we present three scenarios for household growth. We have the steady-state 1mn household growth from demographics/migration in all three, offset by
 - Scenario 1: 50bps higher unemployment rate -110k households, resulting total household growth of 900k
 - Scenario 2: 100bps higher unemployment rate -220k households, resulting total household growth of 800k
 - Scenario 3: 450bps higher unemployment rate -980k households, resulting no household growth



A row of suburban houses with a teal overlay. The houses are two-story with gabled roofs and white siding. A sidewalk runs along the front of the houses, and a street lamp is visible on the left. The text is overlaid on the left side of the image.

Special Topic: Don't Stand Pat On 60/40 Portfolios

Real estate has provided better risk-adjusted returns over last 30 years

- Stocks are high risk-high return, bonds are low risk-low return
- Real estate has historically experienced only slightly higher volatility than bonds but has generated meaningfully higher returns
- Real estate returns are less than stocks, but the Sharpe ratio is far higher
- We find that there isn't a whole lot of correlation between the assets (mild negative correlation)
- This suggests real estate is an ideal candidate for reducing risk in a traditional stock + bond portfolio

RETURNS & VOLATILITY PROFILE: STOCKS, BONDS AND REAL ESTATE			
Jun 1988 - now	Stocks	Bonds	Real estate
Average Return	11.9%	5.7%	7.8%
Standard Deviation of Returns	15.5%	4.1%	4.3%
Average Excess Return Over Risk-Free Rate	9.1%	2.9%	5.0%
Standard Deviation of Excess Returns	15.5%	4.0%	4.4%
Sharpe Ratio	0.6x	0.7x	1.1x

LITTLE CORRELATION: REAL ESTATE VS. STOCKS OR BONDS			
Correlation matrix	Stocks	Bonds	Real estate
Stocks	100.0%	-6.8%	9.7%
Bonds	-6.8%	100.0%	-20.7%
Real Estate	9.7%	-20.7%	100.0%

Source: Bloomberg, NCREIF, Amherst estimates; Note: We use quarterly historical data for stocks (S&P 500), bonds (US Agg. Index) and real estate (NCREIF property index) and 3-month Treasury bills as a proxy for the risk-free rate



Real estate should be a bigger portion of diversified portfolios

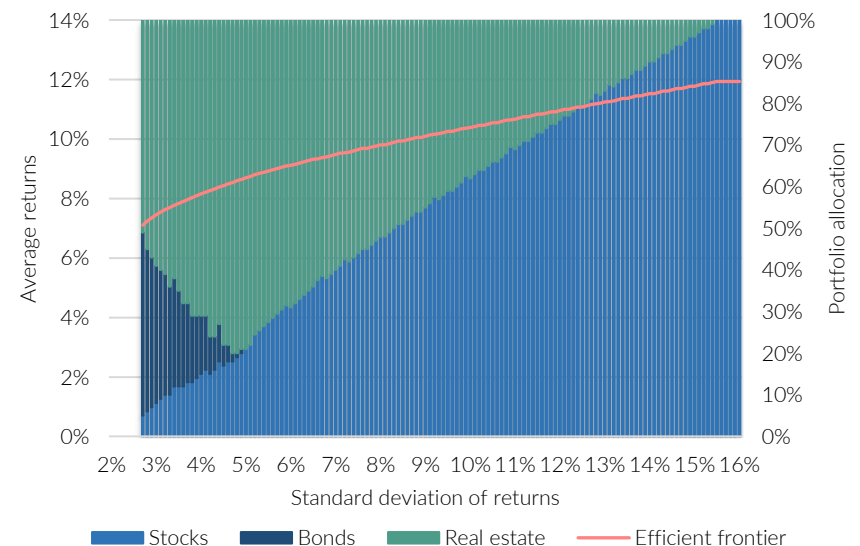
- For a desired standard deviation of returns, there is a portfolio mix which maximizes returns
- Plotting these gives us an efficient frontier for portfolio allocation
- Adding real estate to a traditional stock + bond portfolio pushes the efficient frontier meaningfully higher, thus enhancing returns for every risk threshold
- Each point on the efficient frontier has a specific allocation to the three asset classes
- The lowest-risk portfolio (2.7% vol) consists primarily of bonds (44%) and real estate (56%). As the risk thresholds rise, we see that bond allocation falls sharply, and allocation to stocks and real estate rises
- Unless the risk tolerance is too low or too high, the efficient frontier always has a healthy allocation to real estate

ADDING REAL ESTATE IMPROVES RETURN PROFILE OF A STOCK+BOND PORTFOLIO



Source: Bloomberg, NCREIF, Amherst estimates

PORTFOLIO COMPOSITION – EFFICIENT FRONTIER



Portfolio construction during periods of high and low inflation

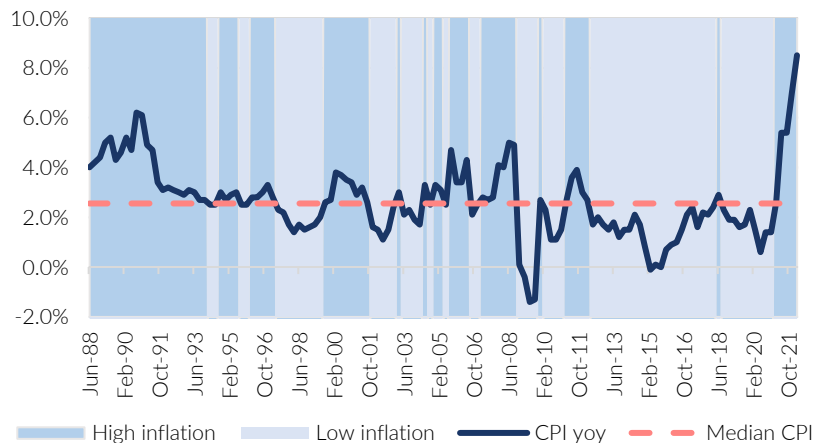
- We define high inflation time periods as those quarters where CPI was above the median level (2.6% annualized), and low inflation for those below
- Average returns for stocks are far lower in a high inflation environment, while those of bonds and real estate are higher
- We repeat the efficiency frontier analysis for data in high and low inflation time periods separately
- When inflation is high, the efficiency frontier is
 - Lower (harder to generate returns), except at low-vol targets
 - Very flat (less incremental return for incremental risk)
- This calls for more defensive positioning when inflation is high (targeting lower vol)

RETURN CHARACTERISTICS – HIGH VS. LOW INFLATION ENVIRONMENTS

High Inflation Periods	Stocks	Bonds	Real Estate
Avg return	9.2%	5.9%	8.1%
Std dev	13.1%	4.6%	4.0%
Sharpe	0.4x	0.4x	1.0x

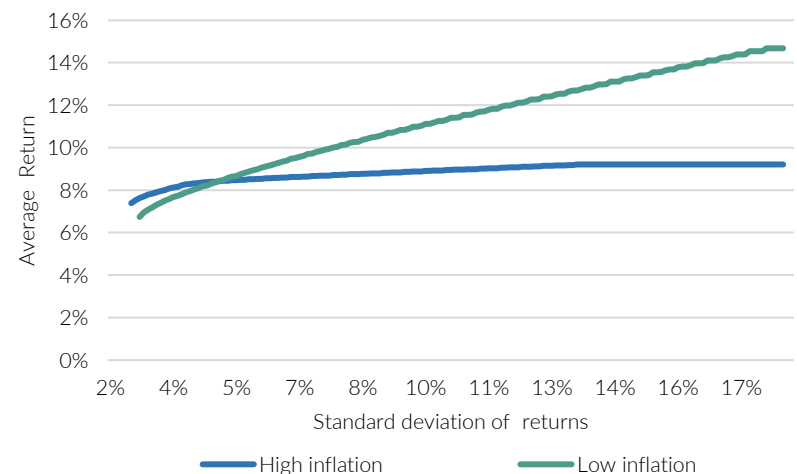
Low Inflation Periods	Stocks	Bonds	Real Estate
Avg return	14.7%	5.5%	7.6%
Std dev	17.5%	3.6%	4.6%
Sharpe	0.7x	1.1x	1.3x

PERIODS OF HIGH AND LOW INFLATION IN THE U.S.



Source: Bloomberg, NCREIF, Amherst estimates

EFFICIENT FRONTIER HIGH VS. LOW INFLATION ENVIRONMENTS



Optimal real estate allocation is higher in an inflationary environment

- The portfolio with the maximum returns (and very high-risk threshold) is one with a 100% stock allocation
- The highest Sharpe ratio portfolio mostly consists of bonds and real estate
- The incremental return per unit of risk falls off sharply in high inflation environments
- Therefore, investors may be better off targeting a 3-5% range volatility level when inflation is high. The stock allocation is roughly the same in both environments, but the efficient portfolio is more geared towards real estate vs. bonds in high inflation periods
- It may make sense in low inflation environments to extend out the risk curve, where the allocation to stocks rises at the expense of real estate

Efficient Frontier Portfolio – High vs. Low Inflation Environments										
		High Inflation Regime					Low Inflation Regime			
Portfolio Positioning		% Avg Return	% Stocks	% Bonds	%Real Estate		% Avg Return	% Stocks	% Bonds	% Real Estate
Max return		9.2	100	0	0		14.7	100	0	0
Max Sharpe		7.5	6	32	62		6.9	6	54	40
Vol target (%)	2.6	7.6	8	26	66		6.7	6	60	34
	3	7.8	10	20	70		7.1	8	50	42
	4	8.3	16	0	84		8.0	16	36	48
	5	8.5	32	0	68		8.6	22	24	54
	6	8.6	42	0	58		9.2	28	16	56
	7	8.7	50	0	50		9.8	32	2	66
	8	8.7	58	0	42		10.3	40	6	54
	9	8.8	66	0	34		10.8	46	0	54
	10	8.9	74	0	26		11.3	52	0	48
	11	9.0	82	0	18		11.7	60	6	34
	12	9.1	90	0	10		12.2	66	4	30

Source: Bloomberg, NCREIF, Amherst estimates



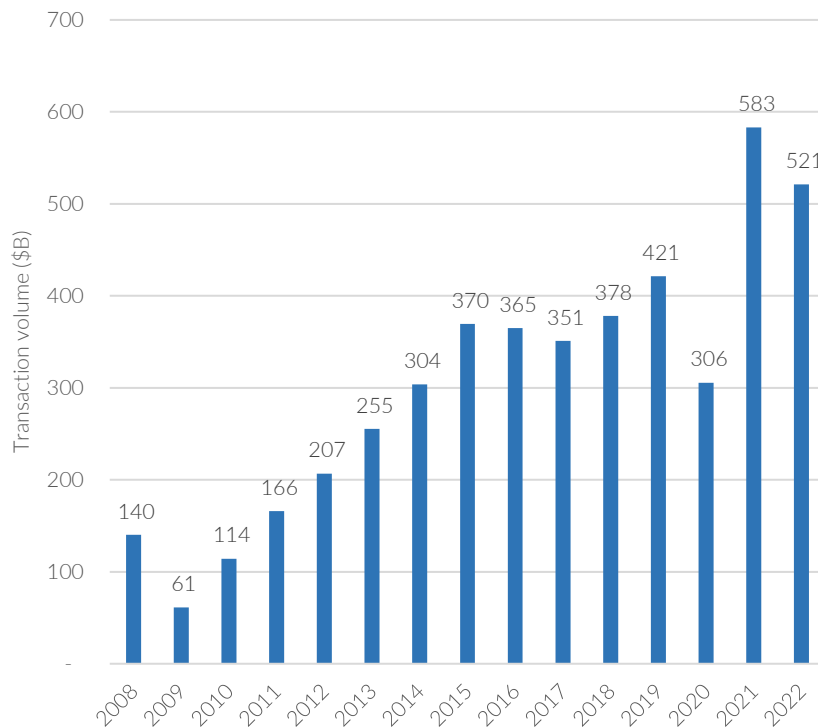


Commercial Real Estate

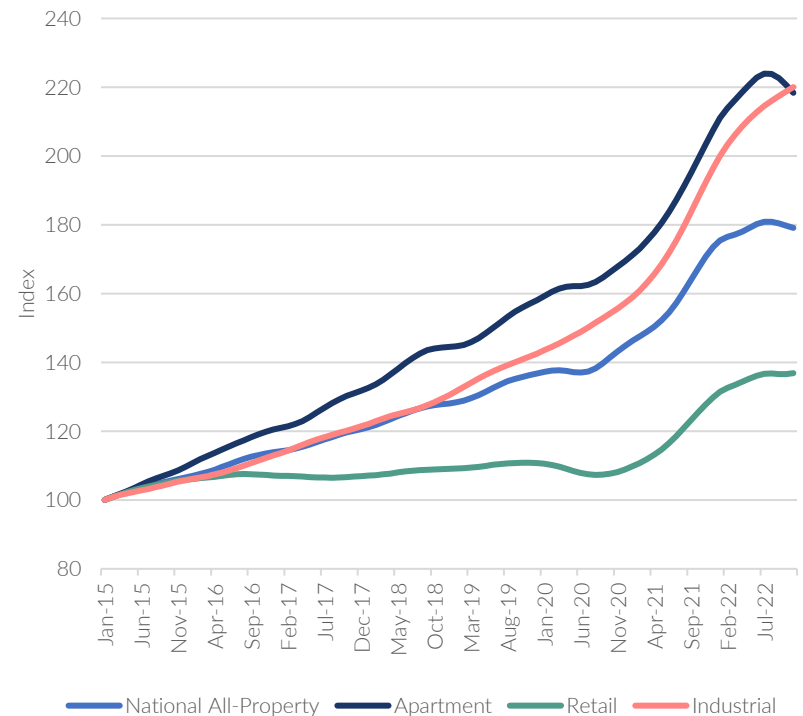
CRE property prices are declining since summer

- CRE prices have grown 4.9% YoY as of November 2022. According to RCA, the all-properties Commercial Property Price Index (CPPI) reached a peak in Summer 2022 and has been moderately declining since then. Multifamily properties saw the sharpest decline of 2.5% over the past three months
- Alternative CPPI from Green Street suggest 13% YoY decline in CRE prices in 2022

TRANSACTION VOLUME IS DOWN 11%



CPPI IS DECLINING FROM SUMMER PEAK



Source: Costar, RCA, Green street as of Nov 2022



Public markets pricing shows 10%-35% decline in 2022 across the board

- SFR and Industrial REITs have meaningfully outperformed other REIT sub-sectors since the onset of the COVID-19 pandemic but saw 17-23% declines in 2022

PUBLIC SECTOR REIT ENTERPRISE VALUE CHANGE BY REAL ESTATE SECTOR ¹		
	December 31, 2019 – December 30, 2022	2022
Industrial	54.8%	-16.8%
Self Storage	31.5%	-23.5%
Single-Family Rental	26.7%	-22.6%
Retail	19.5%	-9.1%
Multifamily	-15.3%	-29.6%
Hotel	-38.2%	-34.3%
Office	-41.3%	-34.6%
S&P 500	18.5%	-19.4%

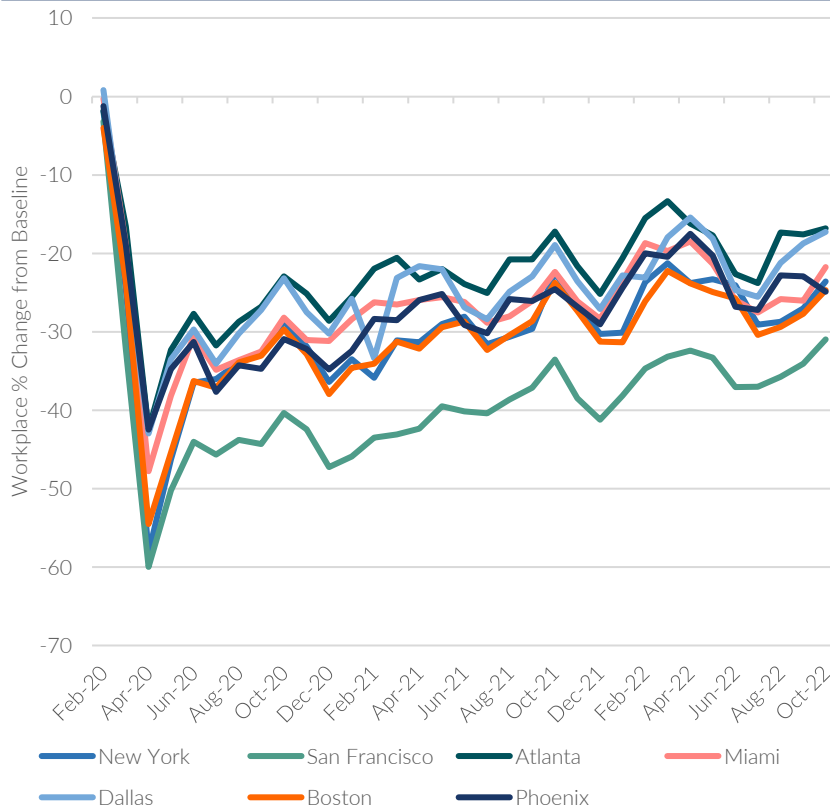
Source: Amherst calculated based upon Bloomberg data and company filings; As of 12/30/22



Office workplaces are still underutilized

- Office workplace usage is still in a slow recovery mode from the COVID-19 pandemic. Based on Google mobility reports, employees are still spending 10-30% less time in the workplace than pre-pandemic levels, as of October 2022
- An alternative metric from Kastle Systems tracks the number of people entering offices on Wednesdays and shows a 40-60% decline relative to the baseline

WORKPLACE USAGE (GOOGLE MOBILITY)



Source: Google Mobility Report as of Oct 2022

OFFICE WORKER TRAFFIC

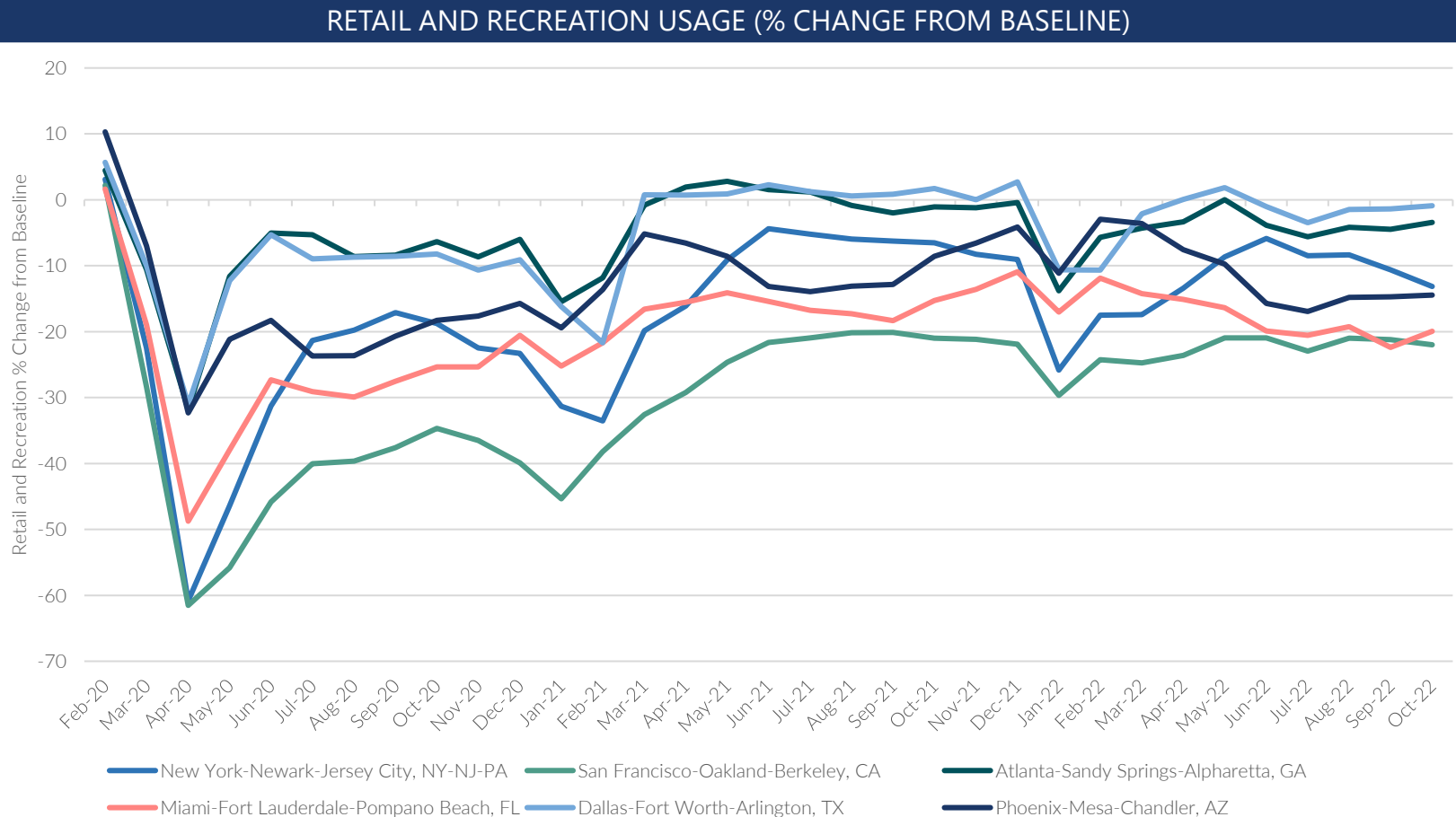


Source: Kastle Systems as of Dec 2022 Kastle's reach of buildings, businesses and cardholders secured generates millions of access events daily as users enter office complexes, and individual company workspaces. Charted percentages are based on daily unique authorized user entries for Wednesdays in each market relative to a pre-COVID baseline.



Retail demand is below pre-pandemic level in most cities

- As of October 2022, retail demand is below pre-pandemic levels in most large metro areas
- More consumers prefer to shop online, even post-pandemic. As of Q3 2022, e-commerce sales comprised 14% of all retail sales in the U.S. versus 10% in Q4 2019 according to U.S. Department of Commerce



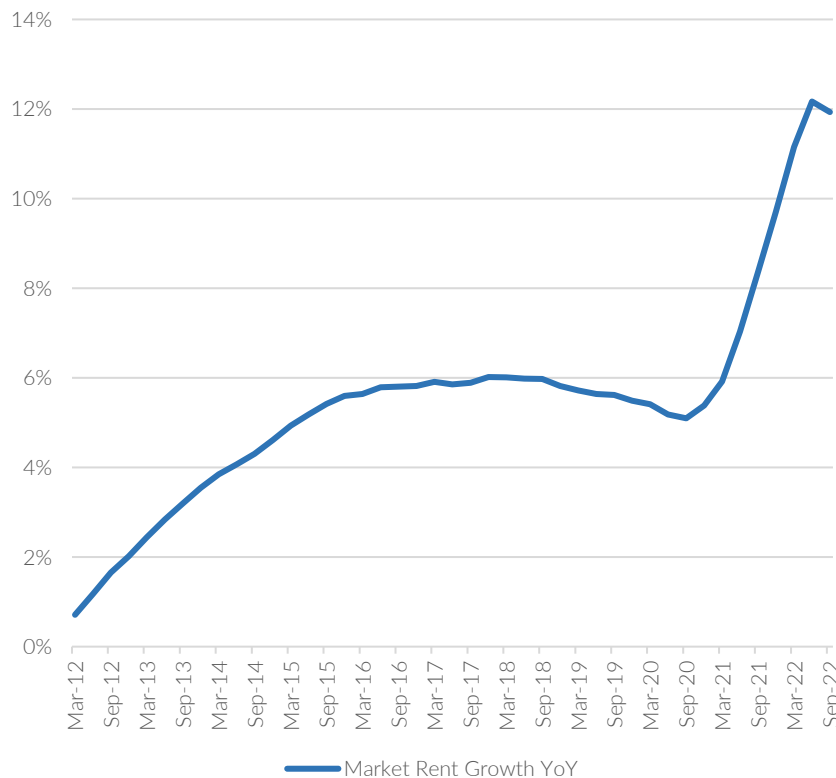
Source: Google Mobility Report as of Oct 2022



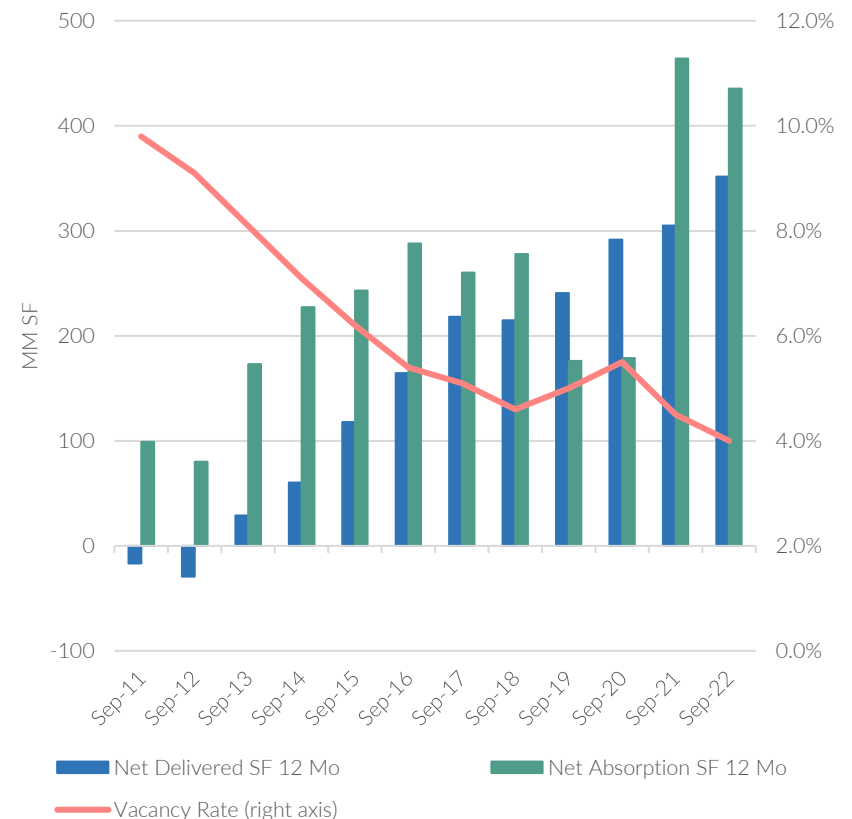
Industrial sector is holding up

- The industrial sector posted the strongest rent growth among CRE asset classes at 11.9%, as of Q3 2022
- Industrial construction (measured by square feet) remains high at 435mm square feet, as of Q3 2022. Net absorption is expected to remain strong and outpace the supply in the near term

INDUSTRIAL RENT GROWTH SLOWING SLIGHTLY (MAR 2012 – SEP 2022)



DEMAND IS STILL STRONG (SEP 2011 – SEP 2022)



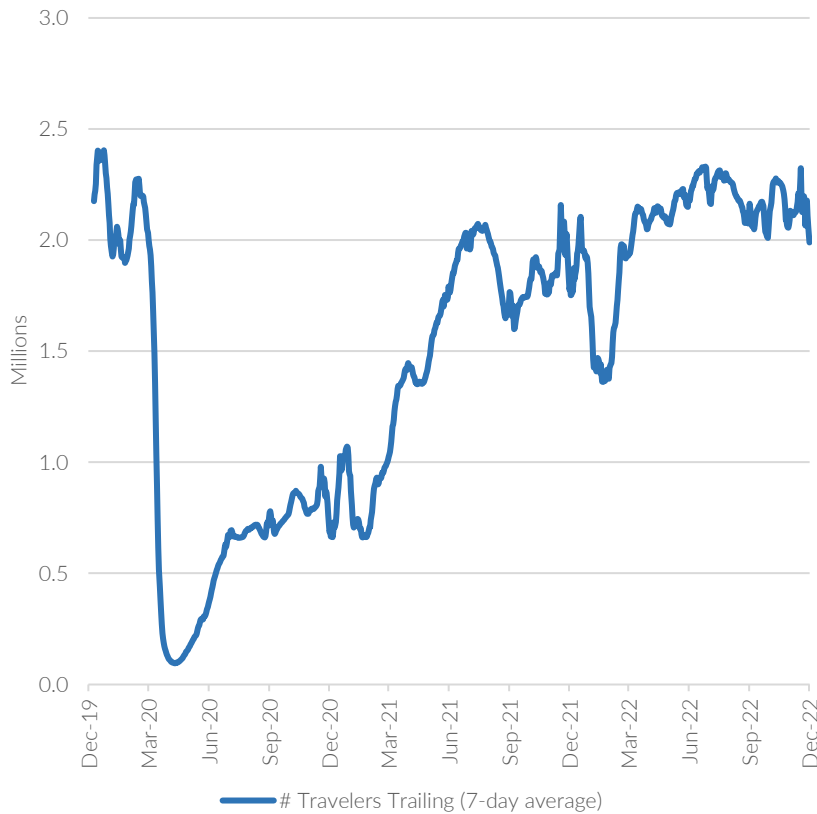
Source: Costar as of Dec 2022



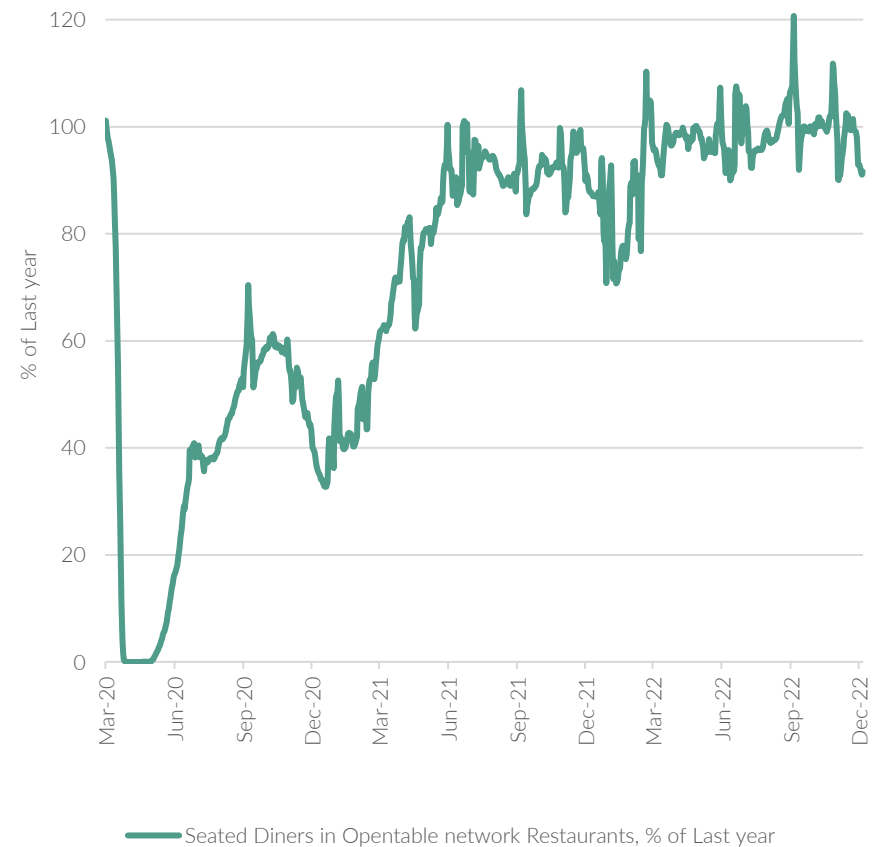
Travel and restaurant demand have fully recovered to pre-pandemic levels

- Despite occasional continued concerns around new variants, travel demand and restaurant demand recovered fully by 2021 and have exceeded pre-pandemic levels respectively

AIR TRAVEL DEMAND HAS RECOVERED



RESTAURANT DEMAND HAS RECOVERED



Source: Transportation Security Administration, US Government (TSA) as of Dec 2022

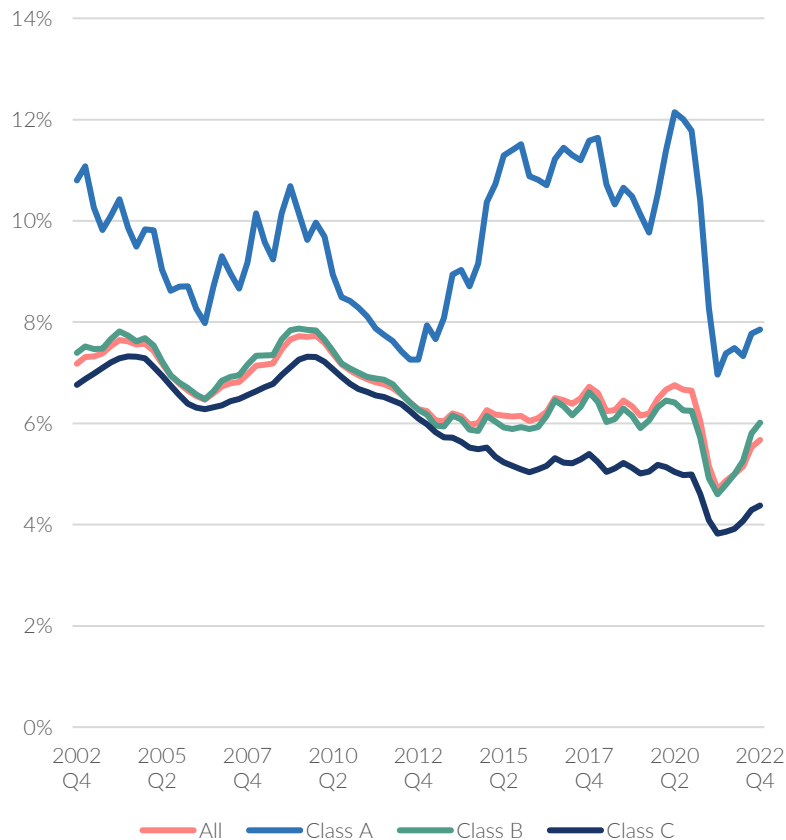
Source: Opentable.com as of Jan 2023



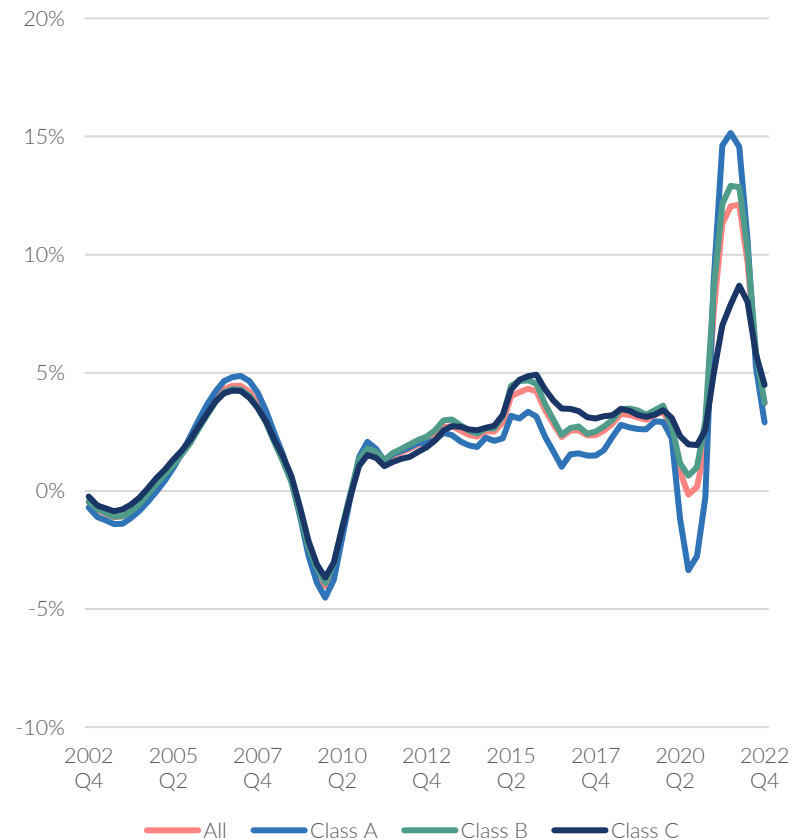
Apartment vacancy is slightly rising

- Apartment vacancy rates slightly increased across the board since 2021 Q3, but are still at historically low levels
- The low vacancy rates have driven rent growth across the overall apartment sector

APARTMENT – VACANCY RATES (%)



APARTMENT – ANNUAL RENT GROWTH (%)

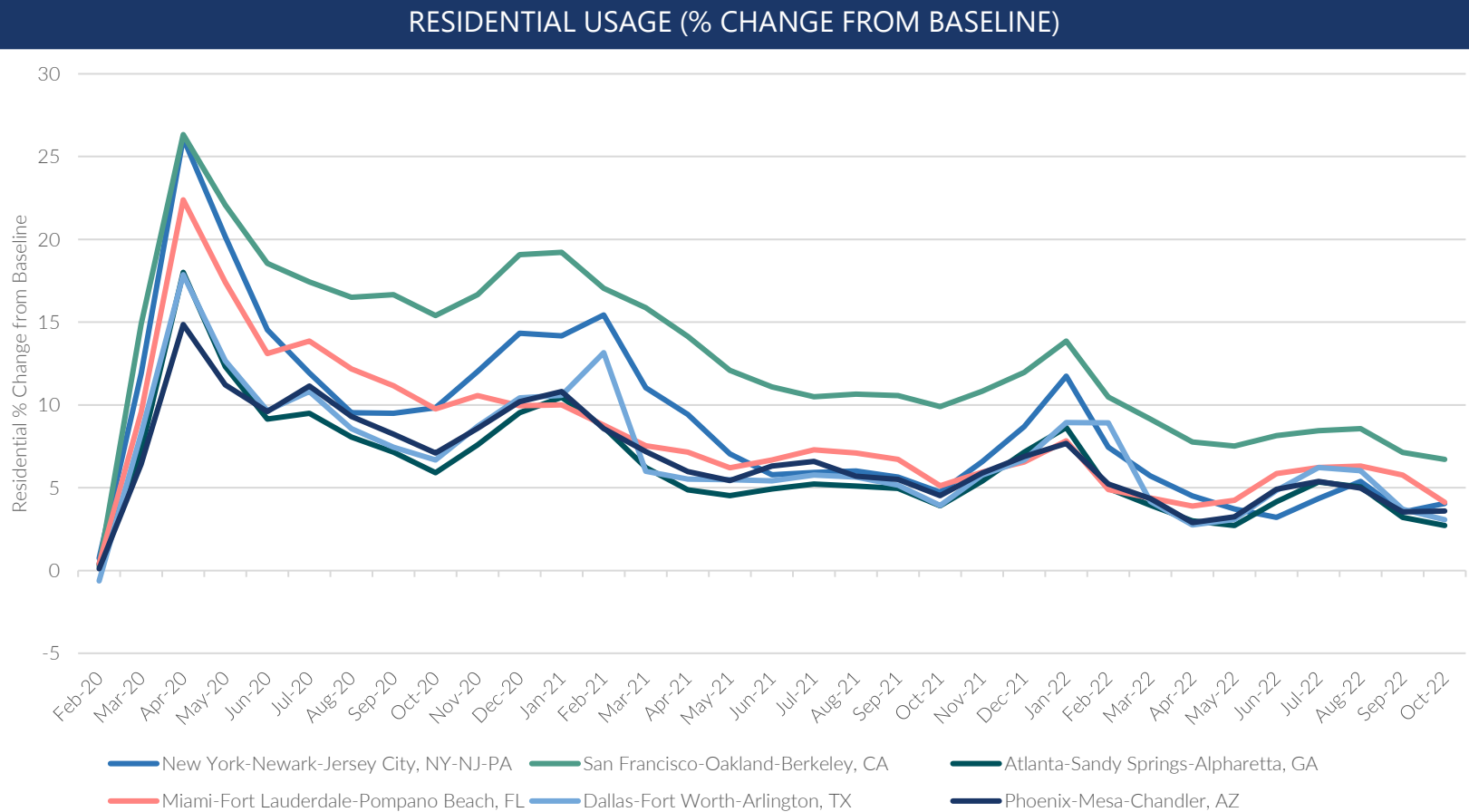


Source: Costar as of Dec 2022



5% more time spent at home drives demand for housing

- Residential usage has been declining since the pandemic peak in spring 2020; however, time spent at home remains higher than pre-pandemic levels leading to sustained demand for larger residential spaces
- This has translated into a strong recovery in apartment rents and vacancy levels



Source: Google Mobility Report as of Oct 2022



Where will CRE cap rates go?

- We model public market implied cap rates as a function of five-year real rates, five-year break-evens and credit
- Cap rates increase with real rates and rising credit spreads but decrease as break-even rates increase; this is due to higher expected NOI growth accompanying higher inflation
- Over the next year, the forward curve implies 7bps higher break-evens and 27bps lower real rates. We assume credit spreads (CDX IG) stay constant
- Our model suggests that cap rates will compress 8bps if this scenario plays out

PUBLIC MARKET IMPLIED CAP RATE MODEL



	5y Break-Evens (%)	5y Real Rate (%)	CDX IG (bp)	IYR Cap Rate: 3F Model
Current	2.24	1.68	79.41	5.56%
1-year forward	2.31	1.41	79.41	5.48%
Change	0.07	-0.27	0.00	-7.9 bp

Cap rate model sensitivity

12bp lower cap rate for 100bp higher 5y breakevens

27bp higher cap rate for 100bp higher 5y real rate

15bp higher cap rate for 10bp higher CDX IG

Source: Bloomberg, Amherst estimates as of Dec 2022



The background image shows a row of modern, two-story houses with white siding and dark shutters. The houses have a mix of gabled and hipped roofs. In the foreground, there is a sidewalk and some landscaping. The entire image is overlaid with a teal color filter.

Relative Value in Securitized Products

Mortgages – wide to wider

- Contractionary monetary policy resulted in cheapening across all spread products, and agency MBS was no different
- The onset of QT also resulted in elevated supply of MBS to the market
- The MBS fixed-rate index widened 80bps YTD in OAS (swap) terms from the lows in early 2021
- This has brought spread levels to the widest level of the past decade, except for a brief period during the onset of the COVID-19 pandemic

MBS INDEX OAS AT THE WIDES OF THE PAST DECADE



Source: Bloomberg, Amherst estimates



Expect elevated supply over the next couple of years

- The effective supply private market sees is organic net issuance plus Fed runoff/sales
- The amount of supply that the market needs to absorb over the next couple of years is close to all-time highs, likely around \$1.2trn over the next two years
- We estimate net issuance as a function of new home sales, existing home sales and cash-out refis – expect this to be low (\$325-\$375bn) in 2023/2024
- The table below shows the historical supply as a percentage of the market – this has ranged from the lows of -5.6%/-4.6% in 2013/2020 (QE programs) to a high of 7% in 2018-2019 (QT) and 7.5% in 2022 (elevated net issuance)
- This number could be in the 6.5-7% range in each of 2023 and 2024 in a Fed-runoff scenario and could rise to 8.5% in the event the Fed pursues sales to meet its \$35bn monthly cap

AGENCY MBS – HISTORICAL SUPPLY/DEMAND												
(\$bn)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022E	2023E	2024E
Supply side												
Net issuance	240	80	170	240	320	285	225	510	870	530	325	375
Demand side												
Federal Reserve	530	210	10	0	10	-155	-220	820	475	-80	-225	-225
Banks + Savings + Credit Unions	10	30	135	120	120	80	140	410	475			
GSEs	-80	-50	-45	-30	0	-20	5	-60	-40			
Overseas	0	40	30	110	65	95	80	-30	30			
REITs	-90	10	-30	0	40	20	35	-70	-10			
Money managers	-130	-160	70	40	85	265	185	-560	-60			
Net Issuance + Fed	-290	-130	160	240	310	440	445	-310	395	610	550	600
Size of the agency MBS market (EOY)	5,390	5,470	5,640	5,880	6,200	6,480	6,710	7,220	8,090	8,620	8,920	9,270
% supply - Fed runoff scenario	-5.6%	-2.4%	2.9%	4.3%	5.3%	7.1%	6.9%	-4.6%	5.5%	7.5%	6.4%	6.7%
% supply - Fed active sales scenario											8.4%	8.6%

Source: Nomura, Amherst estimates



Depending on Fed actions, supply could be even higher

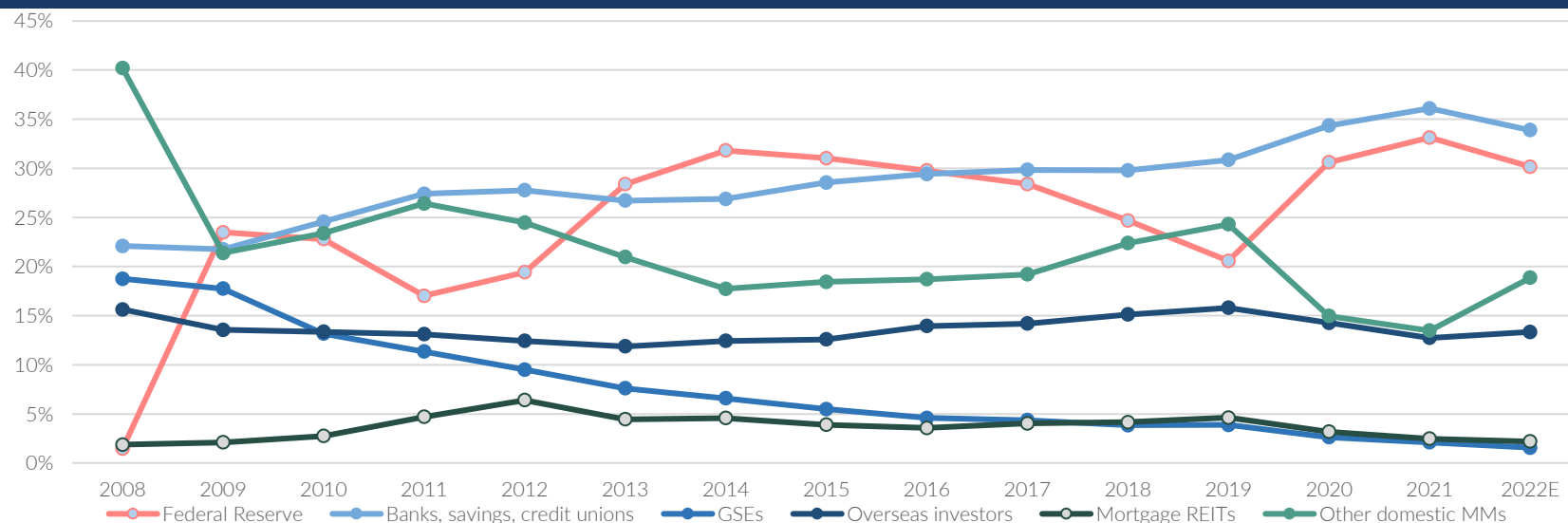
- The Federal Reserve has a \$35bn monthly cap on the reduction of the MBS portfolio
- However, given elevated rates, it is unlikely they will reach the cap through run-off alone
- We outline two scenarios:
 - Fed run-off – purely via paydowns, which should bring ~\$20bn/month in supply to the market or about \$225bn annually
 - Fed sales – the Fed actively sells MBS in addition to paydowns to bring supply to \$35bn/month, or \$420bn/year
- In the post-meeting press conference on September 21, 2022, Fed Chair Powell said MBS sales were not under consideration ‘anytime soon’, making run-off our base case
- In the event of a rally in interest rates, MBS run-off from the Fed portfolio would pick up, and organic net issuance would be higher as well. As a result, we expect the mortgage basis to trade somewhat directionally with rates — widening into a rally and tightening into a selloff



Who might absorb \$1.2tn of supply over the next two years?

- The owners of agency MBS have changed significantly over the years
 - The Fed owns a third of the market now versus nothing pre-GFC
 - Banks own another third, up from 22% pre-GFC
 - The GSEs owned 18% of the market in their heydays, but now own 2%
 - Mortgage REITs owned as much as 6% of the market in 2012, and now own 2%
 - Other domestic money managers' share has halved from 40% in 2008 to 19%
- Of these, the Fed is a completely non-economic buyer/seller. Banks are somewhat less valuation sensitive with their ownership of Treasuries/MBS driven mostly by excess of core deposit growth over loan growth. Money managers are the most valuation-sensitive
- We expect money managers (the most valuation-sensitive owners) to be the primary demand source for the elevated supply over the next couple of years, bolstering our expectation that spreads should remain wide for the foreseeable future

SHARE OF FED AND BANKS HAS RISEN, WHILE THAT OF GSES AND MONEY MANAGERS HAS DECLINED



Source: Nomura, Amherst estimates



Banks are unlikely to be large buyers

- Banks were net sellers of ~\$200bn in MBS in 2022
- We expect bank demand to remain muted in 2023, as well, because of the reserves-RRP interplay that has occurred
- We have seen bank reserve balances fall significantly (down \$1.1tn in 2022), despite QT just beginning – a stark difference from the 2018-2019 QT episode
- This is on account of RRP balances at the Fed rising sharply (+\$700bn) due to reduced T-bill supply and more demand from money market funds
- If RRP balances stay constant, at the expected pace of QT, bank reserves will fall by another \$1tn by the end of 2023, bringing them to the levels that led to funding stress in 2019
- Banks will therefore seek to maintain adequate reserve balances (meaning less security purchases) until more clarity is obtained as to how the Fed will address this issue

BANKS WERE NET SELLERS OF MBS IN 2022



CHANGES IN FED BALANCE SHEET (\$BN)

	EOY 2022	EOY 2021	Change
Fed Assets			
Securities	8,153	8,289	-136
Treasuries	5,501	5,652	-151
MBS	2,650	2,635	15
Fed Liabilities			
Currency	2,303	2,234	70
Reverse Repo (RRP)	2,576	1,876	700
Reserve Balances	3,018	4,116	-1,098

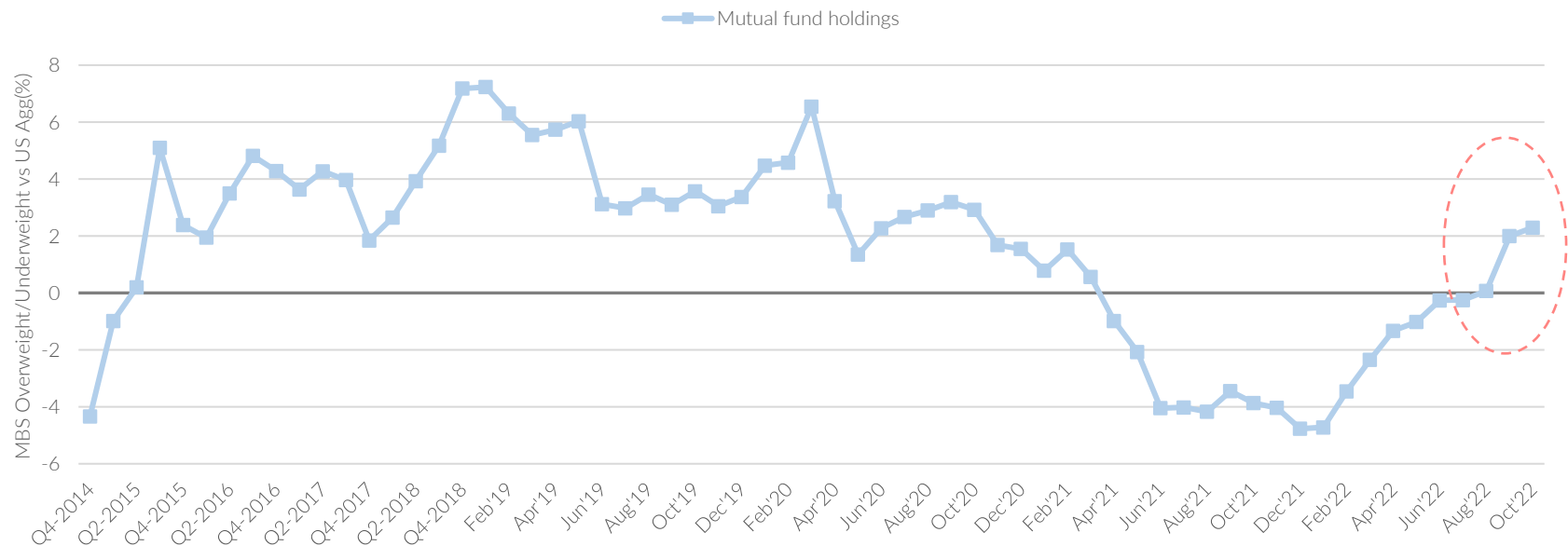
Source: Federal Reserve, Amherst estimates



Money managers need wide spreads/more inflows

- An analysis of large fixed-income fund holdings shows that money managers are slightly overweight MBS relative to the U.S. Aggregate Bond (AGG), from being underweight earlier in 2022
- Historically, MBS holdings have ranged from 4% underweight to 6-7% overweight
- Excluding REITs, we believe money managers hold ~\$1.6tn in agency MBS currently. At a 28% U.S. MBS allocation in the AGG, this works out to AUM of \$5.7tn
- Going from the current 2% overweight to 6-7% overweight would lead to demand of ~\$250bn, still a small portion of the \$1.2tn supply we expect over the next two years
- Purchases beyond this may require new inflows, which in turn require attractive valuations

MONEY MANAGERS ARE SLIGHTLY OVERWEIGHT MBS



Source: Bloomberg, Citigroup, Fund fillings



Other sources of demand

Mortgage REITs

- We estimate that mortgage REITs own ~\$200bn of agency MBS
- They have historically owned significantly more in the past (>\$300bn pre-pandemic); however, a number have scaled down holdings after facing margin calls in March/April 2020
- Mortgage REITs continued to shed holdings in 2022 into the sharp basis widening. A number are now operating at a lower capital position and, absent meaningful equity raises, should continue to have limited capacity for further addition

GSEs

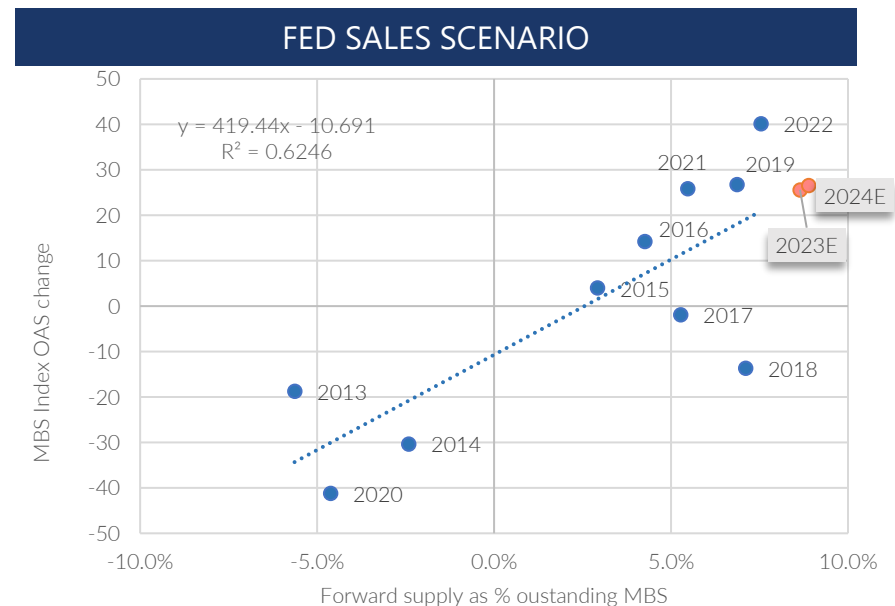
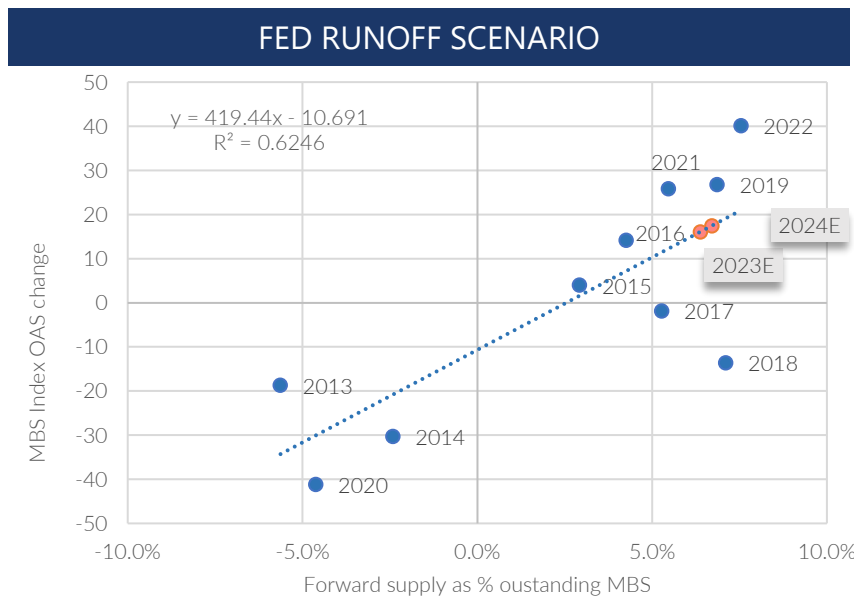
- Fannie Mae and Freddie Mac continue to operate under the portfolio caps set by the Preferred Share Purchase Agreement, and their agency MBS holdings should remain roughly flat

Overseas investors

- The picture for overseas demand for MBS remains somewhat mixed
- While nominal MBS yields are higher, this is not the case on an FX-hedged basis for many currencies

Spreads could widen another 25-30bps through mid-2024

- We find there is broad correlation between MBS Index OAS changes and forward supply
 - The market prices in supply changes sooner than when they actually occur (our regressions indicate a six-month lead)
 - For example, below we plot spread changes from June 2012-June 2013 versus 2013 net supply, and so on
 - We make adjustments for the COVID-19 pandemic, where market expectations for Fed activity was not known six months prior. For years 2020 and 2021, we look at spread changes from June 2019 – December 2020, and from December 2020-December 2021
- Spread changes thus far suggest the market is pricing something close to a Fed runoff scenario. Our model suggests that OAS needs to widen another 10bps through June 2023. The model would expect 17bps further widening through June 2024
- If the Fed was to sell MBS, we would expect spreads to widen 20bps through June 2023 in OAS terms. We would expect a further 27bps widening through June 2024
- It is possible the market could frontload some of the expected spread moves in June 2023-June 2024 when the Fed provides more clarity on MBS portfolio reduction



Source: Bloomberg, Amherst estimates





DATA DETAILS

The **Amherst Home Price Index (HPI)** tracks home price changes in 50 states and over 200 Core-Based Statistical Areas (CBSA). The U.S. level index is the weighted average of state-level indices. The index is published on a monthly basis and is based on the S&P CoreLogic Case-Shiller repeat-sales methodology. Unlike the indices published by S&P CoreLogic Case-Shiller and the Federal Housing Finance Agency, the Amherst HPI is a distressed-free index which does not include price changes due to foreclosures, short-sales, bank repossession, and REO resale. The use of Multiple Listing Services (MLS) data that are supplemented by CoreLogic off-market data allow the HPI to have a timelier look at monthly shifts in the housing market than some other leading market indices.

The **Amherst Rent Growth Index** follows single-family detached home rent price changes in 50 states and over 150 CBSAs. The U.S. level is the weighted average statistic of state-level indices. The index is published every month and uses a repeat-rent methodology similar to the one employed for the Amherst HPI. The index incorporates both MLS and Altos rental data to produce a timely rent index.

Due to the early nature of our estimates, our indexes for prior months can change.



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The comments provided herein are a general market overview and do not constitute investment advice, are not predictive of any future market performance, are not provided as a sales or advertising communication, and do not represent an offer to sell or a solicitation of an offer to buy any security. Similarly, this information is not intended to provide specific advice, recommendations or projected returns of any particular product of The Amherst Group, LLC ("Amherst") or its subsidiaries. These views are current as of the date of this communication and are subject to rapid change as economic and market conditions dictate. Though these views may be informed by information from sources that we believe to be accurate and reliable, we can make no representation as to the accuracy of such sources nor the completeness of such information. Past performance is no indication of future performance. Investments in real estate and mortgage related assets are speculative and involve special risks, and there can be no assurance that investment objectives will be realized or that suitable investments may be identified. Many factors affect performance including changes in market conditions and interest rates and in response to other economic, political, or financial developments. An investor could lose all or a substantial portion of his or her investment. No investment process is free of risk and there is no guarantee that the investment process described herein will be profitable. No investment strategy or risk management technique can guarantee returns or eliminate risk in any market environment. Certain information contained herein is based upon Amherst models. No representation is made as to the accuracy, completeness or effectiveness of Amherst models, nor the results of running such models.

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