CHAPTER

# Housing market expectations☆

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The 2008 Global Financial Crisis was the culmination of a large boom–bust cycle in U.S. house prices. Observers quickly proposed overly optimistic house price expectations as a key factor in explaining the run-up and subsequent fall of house prices.[1] Expectations are a natural candidate as a key determinant of aggregate market outcomes since they are an important factor in intertemporal decision making in the presence of uncertainty. Many decisions in housing and mortgage markets—for example, whether to buy or sell a home and whether to default on a mortgage—are in part determined by individual expectations about future market conditions. Individual beliefs therefore have the potential to influence market-level outcomes and the aggregate economy. Following the Global Financial Crisis, researchers have focused on better understanding how individuals form housing market expectations, how these expectations determine individual decisions, and, ultimately, how those decisions influence aggregate outcomes. In this chapter, we review the existing literature on each step of the way from individual expectation formation to aggregate outcomes and propose promising avenues for future work.

To empirically study the determinants and effects of housing market expectations, researchers first need to be able to credibly measure expectations. Since people's expectations are not directly observable, researchers mostly rely on survey elicitation. We start by providing an overview of existing surveys of U.S. households' expectations of national or local housing markets as well as planned housing investments. We also highlight surveys of U.S. housing market expectations of professionals and industry experts. We conclude our overview of existing surveys by describing a number of surveys from outside the United States. We also briefly discuss alternative non-survey-based measures of expectations used by researchers, and end with a "wish list" of key elements that we would like to see included in future housing market expectation surveys.

We next use data from the Michigan Surveys of Consumers and the New York Fed Survey of Consumer Expectations to document a number of salient facts about the time-series and cross-sectional

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[1] For instance, Shiller (2007) described house price growth fueled by "public observations of price increases and public expectations of future price increases."

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variation in U.S. house price expectations. We show that house price beliefs vary substantially over time and in the cross-section. We also document that only a small part of the cross-sectional variation in house price beliefs at any given point in time can be explained by basic demographic characteristics.

We then review a large literature that has used survey data to study how individuals form housing market expectations. Prior work has found that, across a range of settings such as the stock market, individuals rely on recently observed price changes when forming expectations about future prices. Similar forces appear to be at work in the housing market. We summarize work that has documented that recent house price changes affect house price expectations.[2] Since house price changes are known to be autocorrelated, it is a quantitative question whether the observed extrapolation by individuals when forming beliefs represents an optimal use of past information. Recent work suggests that individuals appear to underextrapolate from recent price changes when forming short-run expectations and overextrapolate when forming long-run expectations.

The observed extrapolation from past price changes suggests that households rely on information from recent episodes of price change when forming their expectations. We also summarize work that documents that people forming housing market expectations disproportionately rely on information from their recent personal experiences, their geographically local experiences, and the experiences of those in their social networks. Since individuals differ in terms of their experiences, locations, and social networks, their reliance on these factors when forming local and aggregate housing market expectations helps explain the very heterogeneous expectations observed in the data.

The same factors that influence individuals' average expected house price changes—own experiences, local experiences, and friend experiences—also influence higher moments of individuals' belief distributions. For example, we describe evidence that the dispersion of house price changes experienced within an individual's social network affects the variance of that individuals belief distribution.

Current ownership of housing also matters for the formation of house price expectations. In particular, a key difference between housing and other assets is that nonowners in the housing market (i.e., renters) have good information about the dividend stream of the asset, because they pay rent each month. This information may provide useful signals about the value of the asset itself, which owner-occupiers do not receive. We discuss evidence that suggests that, on average, renters indeed make better forecasts of future house prices during a housing boom than owners, but also that renter forecasts are more dispersed. While evidence from other asset markets suggests the presence of endowment effects, whereby owners become more optimistic than non-owners when they receive positive signals about their assets, the existing evidence on housing markets suggests the opposite effect.

Having explored some of the determinants of individuals' housing market expectations, we next summarize work that analyzes the effects of these beliefs on individuals' housing decisions. Identifying the effect of expectations on actual decisions is challenging, since few data sets contain information linking housing expectations to housing market decisions. Even if available, concerns about unobservable factors influencing both expectations and housing market decisions make it difficult to identify a causal effect. Using a variety of empirical approaches—including lab and field experiments—researchers have documented that housing market expectations indeed affect individual's housing investments, such as whether or not to buy or sell a home, how large of a home to buy,

[2] Throughout this chapter, we use the term house price expectations to refer to expected price changes for residential real estate more broadly, instead of referring more narrowly to expectations relating to houses or single-family residences.

and how much to pay or charge for a given home. In addition, expectations about future house prices, inflation, and interest rates affect individuals' decisions about how to finance their homes, such as how much leverage to take on and whether to choose fixed or variable rate mortgages.

In our final section, we describe work that analyzes the effects of individuals' housing market expectations on market-level and aggregate economic outcomes. Specifically, we explore the role of various expectations in explaining different housing market episodes, including the U.S. housing cycles of the 1970s and the 2000s, as well as the more recent house price increases during the 2010s. Some of the theoretical frameworks assume rational expectations and introduce preference shocks for housing that persistently increase the weight on housing consumption in the utility function. The dynamics of the preference shocks are then disciplined using survey evidence. More recent work abandons the rational expectations assumption and adopts models of belief formation that more directly aim to match the survey evidence, including the heterogeneity of beliefs observed in the survey responses.

## 6.1 Measuring expectations

To study the determinants and effects of housing market expectations, researchers need to be able to measure people's expectations. Unlike many other variables of interests (e.g., housing transactions, house prices, or mortgage decisions), these expectations are not easily observable.

Faced with the challenge of being unable to directly observe expectations, economists have traditionally focused on inferring expectations from individuals' observable actions. In most settings, however, observed choices are consistent with many possible combinations of preferences and expectations, requiring researchers to make strong assumptions on the structure of preferences or the exact process of forming expectations (see Manski, 2004, for a review). Over the past decades, researchers have therefore increasingly turned to surveys to directly elicit expectations. Indeed, we believe that if we want to learn what different agents are expecting house prices to look like in the future, the natural approach is to go and ask them.

### 6.1.1 Surveys about housing market expectations

We next describe a number of existing surveys of housing market expectations (see Chapter 1 in this Handbook for a detailed discussion of household surveys more generally). Table 6.2 summarizes the questions, sample periods, frequencies, and access modalities of these surveys.

The longest-running survey eliciting housing market expectations is the Michigan Surveys of Consumers. Founded in 1946 and fielded monthly to at least 500 households in the contiguous U.S., the core survey includes questions on current perceptions and expectations for the housing market: for instance, whether it is a good or bad time for buying and selling a house (and why), and whether (and by how much) prices of local homes will increase or decrease.[3] Another early survey effort focusing explicitly on housing market expectations was undertaken by Case and Shiller (1988), who surveyed a random sample of recent homebuyers in four U.S. metropolitan areas in 1988. The survey was fielded annually from 2003 to 2014 to a wider geographic area (Case et al., 2012).

[3] The questions on sentiments regarding current conditions for buying and selling go back to 1960, but those asking for point estimates of house price changes were added later in 2007.

As interest in better understanding housing market expectations grew during the housing boom and bust of the 2000s, more housing surveys emerged, many of them incorporating new knowledge about how to elicit various aspects of expectations in surveys. For example, the RAND American Life Panel (ALP) was one of the first surveys to elicit expectations in probabilistic form when, in 2009, it added questions about respondents' expectations about the price development of their own homes into its Financial Crisis Surveys (these surveys were fielded until 2016). From 2011 to 2013, the RAND ALP Asset Price Expectations Surveys also included questions about local house price expectations.

In 2013, the Federal Reserve Bank of New York launched the Survey of Consumer Expectations (SCE), fielded monthly to a rotating panel of about 1300 households. The main monthly module includes questions about respondents' expectations of aggregate house prices, eliciting both point estimates and probabilistic estimates via density forecasts. In addition to the main monthly module, the SCE fields an annual submodule on housing—the SCE Housing Survey—which includes questions on perceived past, present, and future conditions in the local housing market (see Zafar et al., 2014).[4] Researchers using SCE data have conducted several studies showing that participants' expressed expectations correlate with their incentivized choices across a range of settings (Armantier et al., 2015, 2016; Armona et al., 2019). These findings contribute to alleviating potential concerns about the reliability of unincentivized survey data of beliefs.

Fannie Mae's National Housing Survey (NHS) has surveyed U.S. households since 2010 on current conditions and expectations about housing markets "in general," as well as respondents' plans for purchasing a home. Based on the survey, key indicators such as the Home Purchase Sentiment Indicator are made publicly available. Similarly, since 2014, Pulsenomics has constructed and published various indicators for different local housing markets based on its U.S. Housing Confidence Survey (HCS), which asks about current local housing market conditions, expectations about future local housing market conditions, and plans for purchasing a home.

With the exception of the early Case–Shiller surveys focusing on recent homebuyers, all surveys described above aim to obtain responses from a representative sample of U.S. households. But housing market expectations are also elicited in surveys focusing on specific subsets of the population. The University of Michigan's Health and Retirement Survey (HRS) focuses on respondents aged 50 and above, and has included questions about housing market expectations since 2010. The National Survey of Mortgage Originations (NSMO) surveys households who hold a recently originated mortgage contained in the National Mortgage Database (a 5% sample of U.S. residential mortgages), and elicits perceived past housing market conditions, local house price expectations, and the respondents' perceived likelihood of selling and moving in the future.

In addition to these household surveys, several surveys focus on the expectations of industry professionals and experts. The National Association of Home Builders (NAHB) together with Wells Fargo has surveyed its members since 1985 about housing market demand conditions (e.g., the interests of prospective buyers). Fannie Mae's Mortgage Lender Sentiment Survey (MLSS) has surveyed lenders since 2014 about their expectations for home prices and mortgage demand. Since 2010, Zillow and Pulsenomics have asked around 100 industry professionals and economists each quarter to predict house price growth. Similarly, the Wall Street Journal has been asking around 70 academic, business, and financial economists to predict house prices twice a year since 1980 and monthly since 2003.

[4] The NY Fed's internal version of the SCE includes the zip codes of respondents, allowing researchers to match SCE expectations data with external data on actual local outcomes (see Kuchler and Zafar, 2019).

Outside the U.S., surveys about housing market expectations have mainly been conducted by central banks. In Europe, the following surveys include questions about housing market expectations: the European Central Bank's Household Finance and Consumption Survey (HFCS) and its Consumer Expectation Survey (CES); the Deutsche Bundesbank's Survey on Consumer Expectations; the Bank of Spain's Survey of Household Finances; the Bank of Italy's Survey of Household Income and Wealth; Tilburg University's DNB Household Survey; and the English Longitudinal Study on Ageing (ELSA). Beyond Europe, the Reserve Bank of New Zealand's Household Expectations Survey and the Bank of Canada's Survey of Consumer Expectations ask participants about housing market expectations.

**Dimensions for the Development of Future Surveys.** We close this section by compiling a "wish list" of features to be included in future surveys that would further advance our understanding of the determinants and effects of housing market beliefs. As with most "wish lists," not all of these will be feasible within the scope and constraints of every survey, but each of the elements would expand the set of insights that can be generated. With this in mind, we recommend that future surveys:

- Include a panel dimension to the survey population to better understand the variation in individual beliefs over time.
- Include both qualitative questions (e.g., "Do you think buying a house is a good investment?") and quantitative questions (e.g., "By how much do you think house prices will grow over the coming year?"). While qualitative questions may be easier to understand for some people, quantitative questions are more useful to discipline economic models, and have been shown to be predictive of behavior in economically meaningful ways (Giglio et al., 2021a,b).
- Include questions that elicit beliefs over different horizons, and questions that elicit higher moments of the belief distribution (for example, by asking individuals to assign subjective probabilities to different possible house price realizations).
- Elicit expectations about both house price growth and rent growth. Understanding cross-sectional and time-series variation in beliefs about both prices and rents ("dividends") can be helpful to distinguish between different explanations for house price movements.
- Elicit expectations about other macroeconomic quantities that are relevant determinants of home purchasing and financing decisions in quantitative models (e.g., inflation, interest rates, stock returns, and GDP growth).
- Collect households' expectations about their future housing consumption needs, such as "How long do you plan to stay in your current residence?" and "What is your target family size?". Unlike buying stocks or other financial assets, purchasing a house is both an investment and a consumption decision, and such questions will allow researchers to better understand the interactions between those two factors.
- Collect information (either in the survey, or from matched administrative data) on individuals' housing and mortgage market choices that would allow researchers to better understand how expressed beliefs align with actual behavior.
- Collect information on individuals' other investments to allow researchers to consider housing investments as part of a portfolio choice problem.
- Exploit the potential of information experiments that allow for a more causal exploration of the determinants of housing market beliefs (see Chapter 4 in this Handbook).
- Exploit the potential of incentivized investment games within surveys that allow for a more detailed exploration of the effects of housing market beliefs on real decisions.

- Exploit the potential for "free-text" questions to allow respondents to communicate how they are thinking about specific housing market trade-offs (see Bailey et al., 2019a), or to provide details such as their key sources of information on housing markets (see Kindermann et al., 2021).
- Consider surveying a population that oversamples housing market investors and landlords. These individuals play an important role in the housing market, yet their behavior is not well understood.

### 6.1.2 Nonsurvey measures of housing market expectations

While surveys have been the most widely used tool to measure housing market expectations, researchers have also proposed alternative ways of capturing housing expectations or sentiment.

Soo (2018) constructs indicators of sentiment in 34 urban housing markets using textual analysis of the tone of local newspaper articles about housing. This housing sentiment index, validated against data from the Michigan and Case–Shiller surveys, is strongly predictive of future growth in house prices. Ben-David et al. (2019) use a structural VAR model with sign restrictions to infer price expectation shocks from vacancy data. They argue that analyzing vacancy data can help distinguish whether prices are high due to an underlying increase in demand for housing (associated with low vacancy rates as people are eager to live in the purchased homes), or whether prices are high due to shocks to expectations (leading to high vacancies as agents amass empty homes in the anticipation of future price increases). Using this approach, the paper argues that expectations shocks are the most important factor explaining the boom in house prices in the early 2000s.

Landvoigt (2017) uses predictions from a consumption-portfolio choice model with housing to estimate belief parameters. In the model, the extensive margin—the decision whether to rent or own a house—is largely driven by households' expected house price appreciation. Meanwhile, the intensive margin—how much housing to buy—is mostly determined by downpayment constraints. Landvoigt (2017) finds that the mean expected house price appreciation was only slightly elevated at the beginning of the boom, an estimate that is within reasonable confidence bounds of the survey evidence in Case and Shiller (2003). Thus, many households chose to buy during the boom years mostly because mortgage rates and the perceived house price volatility were low; these factors also explain the higher loan-to-value ratios during these years. Landvoigt (2017) also concludes that households did not foresee the bust in housing markets: at the peak of the boom, households' inferred expectations of future house price growth were in line with long-run average house price appreciation.

## 6.2 Determinants of expectations and expectations heterogeneity

Using data from the surveys described in the previous section, a large literature tries to understand how housing market beliefs vary both over time and across individuals. To highlight some representative patterns that have motivated this research, Panel A of Fig. 6.1 shows the time series of expected house price increases over the coming year, as collected by the Michigan Surveys of Consumers; it also plots annual changes in the Zillow Home Value Index as a representative measure of house price movements.

There is substantial time-series variation in house price expectations, a pattern that is replicated across most expectation surveys. The particular expectation series from the Michigan Survey starts in January 2007, near the peak of the 2000s housing boom, with individuals expecting house prices to increase by 2%, on average, going forward. Over the following months and years, as house prices fell

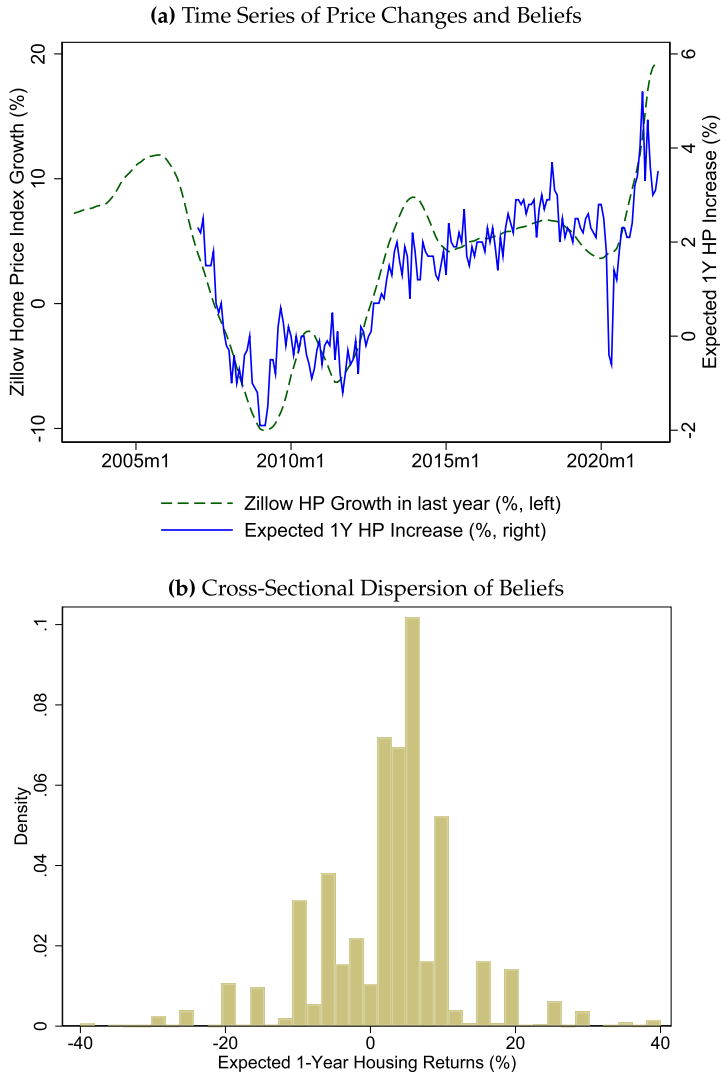


**FIGURE 6.1 Patterns of Expectations**

**Note:** Figure presents representative patterns of U.S. housing market expectations. Panel A shows monthly data on the average expected 1-year house price increase, as reported by the Michigan Surveys of Consumers (solid line). The exact question is "By about what percent do you expect prices of homes like yours in your community to go (up/down), on average, over the next 12 months?". Panel A also plots 1-year changes of the Zillow Home Value Index (dashed line). Panel B shows a histogram of 1-year expected house price increases, as reported by the New York Fed Survey of Consumer Expectations, pooling across all responses from survey waves in 2020, excluding responses with absolute values in excess of 40% ($N = 14,794$). The exact question is "Over the next 12 months, what do you expect will happen to the average home price nationwide? By about what percent do you expect the average home price to increase/decrease? Please give your best guess."

precipitously, expected 1-year house price increases declined to about 0%. From mid-2012, as house prices began to recover and increase steadily for the rest of the decade, expected 1-year house price gains also increased, at first rapidly to about 1.5% by mid-2013, and then gradually further to 2% by about late 2016. Expected house price increases have stayed relatively flat since, with the salient exception of the period at the start of the COVID-19 pandemic, when they fell to below 0% before recovering almost immediately to above 3%.[5] Overall, two salient patterns emerge: house price expectations are more optimistic following recent price increases, and the time-series variation in expectations is smaller than the time-series variation in price changes. In the following sections—and in particular in Section 6.2.1—we review research that explores some of the determinants of this time-series variation in house price beliefs, and its relationship with house prices.

Panel B of Fig. 6.1 shows the heterogeneity of house price expectations across individuals from the 2020 waves of the New York Fed SCE. There is a wide dispersion of house price beliefs across individuals. While some individuals expected house prices to decrease by 20% over the coming year, others expected them to increase by 20%. Similar to beliefs about other asset returns, such as beliefs about expected stock returns (see Giglio et al., 2021a), the observed cross-sectional dispersion is much larger than the observed time-series variation in average expected house price increases.

Why do people disagree so much about expected house price changes? In Table 6.1, we show results from a regression of house price expectations on a number of explanatory variables. (Again, the sample consists of respondents in the 2020 waves of the New York Fed SCE.) In columns 1–3 of Table 6.1, we assess national house price expectations over the coming year. In column 1, we only control for month-of-wave fixed effects. This is to ensure that the dispersion in beliefs is not primarily driven by common time-series variation during 2020, a year of unprecedented time-series variation in house price beliefs, with expected average expectations of 1-year house price growth ranging from 5.8% in February 2020 to −2.7% in April 2020 (see Panel A of Fig. 6.1). This time-series variation, although large, only accounts for 6.4% of the variation in beliefs across responses collected in 2020.

In column 2 of Table 6.1, we include controls for a range of demographic characteristics. In 2020, older respondents were more optimistic about future house price growth, while more-educated and higher-numeracy respondents were more pessimistic. These differences are statistically significant and economically large: for example, individuals above the age of 60 had a 2 percentage point higher house price expectation than those below the age of 40. Conditional on the other controls, we find no large differences in house price expectations across individuals with different incomes.

In column 3 of Table 6.1, we add fixed effects for the state of residence of individuals. The R-squared of the regression—the share of variation in our data that is explained by the control variables—increases somewhat, suggesting that there are systematic geographic differences in beliefs about national house price movements.

Despite these systematic and statistically significant patterns, controls for time, location, and demographics jointly explain only about 10% of the cross-sectional dispersion in house price expectations

[5] The Michigan Survey also reports average 5-year expected house price increases, which are significantly less volatile, and, for example, do not parallel the substantial drop in 1-year expectations during the initial months of the COVID-19 pandemic. Since the start of the NY Fed Survey of Consumer Expectations in June 2013, the expectations measured by the NY Fed survey have shown similar patterns to those in the Michigan Survey. In terms of levels, average expected 1-year returns are usually around 2 percentage points higher in the NY Fed SCE, though differences in the question and object elicited complicate any direct comparison.

**Table 6.1 Correlates of Individual-Level House Price Beliefs.**

| | 1Y Expected HP Growth (Now) | | | 1Y Expected HP Growth (In 2 Years) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Age: 40-60 Years | | 0.261 | 0.233 | | 0.191 | 0.174 |
| | | (0.187) | (0.189) | | (0.176) | (0.178) |
| Age: 60+ Years | | 1.918*** | 2.023*** | | 1.278*** | 1.281*** |
| | | (0.194) | (0.196) | | (0.182) | (0.185) |
| | | . | . | | . | . |
| Some College | | −1.271*** | −1.145*** | | −0.723** | −0.701** |
| | | (0.272) | (0.275) | | (0.256) | (0.260) |
| College | | −2.177*** | −2.058*** | | −1.453*** | −1.423*** |
| | | (0.270) | (0.273) | | (0.254) | (0.258) |
| | | . | . | | . | . |
| Income $50k–$100k | | −0.005 | 0.008 | | −0.348* | −0.384* |
| | | (0.185) | (0.185) | | (0.173) | (0.174) |
| Income >$100k | | −0.037 | 0.189 | | −0.176 | −0.084 |
| | | (0.205) | (0.207) | | (0.192) | (0.195) |
| | | . | . | | . | . |
| High Numeracy | | −1.399*** | −1.370*** | | −1.339*** | −1.302*** |
| | | (0.175) | (0.176) | | −(0.165) | −(0.166) |
| Survey Month FE | Y | Y | Y | Y | Y | Y |
| State FE | | | Y | | | Y |
| N | 14,794 | 14,794 | 14,794 | 12,862 | 12,862 | 12,862 |
| R-Squared | 0.064 | 0.087 | 0.101 | 0.006 | 0.025 | 0.037 |

***Note:*** *Table shows results from a regression of 1-year expected house price changes on various respondent characteristics. We pool all responses to 2020 waves from the NY Fed Survey of Consumer Expectations, pooling across all responses from survey waves in 2020, but dropping responses with absolute values in excess of 40%. The exact question in columns 1–3 is "Over the next 12 months, what do you expect will happen to the average home price nationwide? By about what percent do you expect the average home price to increase/decrease? Please give your best guess." The exact question in columns 4–6 is "Over the 12-month period between [24 months from survey date] and [36 months from survey date], what do you expect will happen to the average home price nationwide? By about what percent do you expect the average home price to increase/decrease over that period?" All columns include month-of-survey fixed effects; columns 3 and 6 also include fixed effects for the state in which the respondent is located. Standard errors in parentheses:* ***, $p < 0.001$; **, $p < 0.01$; *, $p < 0.05$.

visible in Panel B of Fig. 6.1. (Giglio et al., 2021a, show a similarly low predictive power of demographics for stock market expectations).

Columns 4–6 of Table 6.1 assess expectations about house price changes over the 1-year period that starts two years into the future. Directionally, demographics affect these expectations the same way as we saw in columns 1–3 for more immediate expectations, though the overall explanatory power of the various observable characteristics is even smaller.

We have documented substantial variation in house price expectations over time and across individuals, much of which is not explained by individual demographics. What drives this observed variation in house price expectations? More generally, how do individuals form expectations about the housing

market? In the following sections, we review recent research efforts attempting to understand belief formation.

### 6.2.1 Extrapolation

A large literature studying expectation formation across a variety of settings has found that individuals extrapolate from recent information when forming expectations (e.g., Fuster et al., 2010; Greenwood and Shleifer, 2014; Barberis et al., 2015; Liu and Palmer, 2021; Giglio et al., 2021a,b). Several papers, including early work by Case and Shiller (1988) and follow-up work by Case et al. (2012), show that measured housing market expectations are also strongly related to recent house price developments (see also Panel A of Fig. 6.1).

To explore the causal relationship between past realized house prices and expected future house prices, Armona et al. (2019) conduct an information experiment in which housing market expectations are elicited before and after a random subset of individuals receive information about actual past house price changes (see Chapter 4 in this Handbook for a detailed discussion of such information experiments in surveys). The authors find that both short- and long-term expectations are revised based on this information, highlighting that individuals do indeed extrapolate from information about the recent past when forming house price forecasts.

To what extent does the observed extrapolation represent an optimal use of information? Early work studying stock market expectations argued that any extrapolation from recent price changes would correspond to a deviation from rational expectations, since stock prices are serially uncorrelated. In housing markets, evaluating whether extrapolation from recent price changes is a violation of rational expectations is more complicated, since house prices are serially correlated in the short-run, but exhibit mean reversion in the long-run (e.g., Case and Shiller, 1989; Cutler et al., 1991; Guren, 2018). A rational forecaster therefore should "extrapolate" from recent house price changes when forming expectations about near-term price changes, but not when forming medium- to long-term expectations. To assess whether the extent of extrapolation from past prices observed is consistent with rational expectation formation therefore requires comparing the extent of extrapolation to the extent of serial correlation in the underlying data.

Case et al. (2012) and Armona et al. (2019) show that, in the short-run, individuals underreact to recent house prices changes, while in the long-run they overreact relative to the actual predictiveness of past house price changes in the data. Similarly, De Stefani (2020) shows that recent local house price developments systematically affect the house price expectations of respondents in the Michigan Survey, and that individuals systematically underestimate the extent of both short-run momentum and long-term mean reversion in housing markets.

Overall, these findings are consistent with individuals naively extrapolating from recent local house price changes when forming expectations about future price changes. This extrapolation underestimates the serial correlation in house prices in the short-run and overestimates it in the long-run.

Additional evidence that households rely on information from past house price changes when forming expectations about the future comes from Fuster et al. (2018). In this work, the authors show that when individuals are given the opportunity to pick among different sources of information to help predict future house price changes, about half pick forward-looking information (45.5% chose the forecast of housing experts), while the other half pick backward-looking information (28% chose the past one-year home price change, 22% chose the past ten-year home price change). This finding suggest that

many individuals perceive past price changes as informative of future price changes, explaining why their forecasts appear to vary with this information in the data.

Glaeser and Nathanson (2017) specify a micro-foundation for extrapolative house price expectations. In their model, buyers assume that past prices reflect only contemporaneous demand and neglect that they are also influenced by market participants' beliefs. Buyers also do not take into account that prior buyers may have made similar simplifying assumptions when inferring demand from prices. This leads individuals to extrapolate from recent price changes when forming their house price expectations. Consistent with the empirical evidence described above, individuals in the model underextrapolate in the short-run and overextrapolate in the long-run since they underestimate the long-term mean reversion relative to a rational benchmark. Glaeser and Nathanson (2017) show that their model leads house prices to display three features present in the data but usually missing from rational expectations models: momentum at one-year horizons, mean reversion at five-year horizons, and excess longer-term volatility relative to fundamentals.

Other authors have proposed alternative micro-foundations of belief formation that also generate belief dynamics consistent with the evidence that households become more optimistic about future price changes after observing recent price increases. For example, Chodorow-Reich et al. (2021) show how diagnostic expectations in the spirit of Bordalo et al. (2019) can lead to temporary overoptimism during a housing boom: when dividends increase unexpectedly, diagnostic agents overweight the likelihood of high trend growth going forward, thereby making them excessively optimistic. Chodorow-Reich et al. (2021) highlight that this model of belief formation fits a number of features of the 2000s housing cycle, including the overshooting of expectations during the housing boom and the absence of substantial overshooting of expectations during the housing bust. (The model in Chodorow-Reich et al., 2021, instead generates an overshooting of prices during the housing bust as the result of a price-default spiral and foreclosure externalities).

### 6.2.2 Personal experiences

In addition to the evidence above that recent information plays an important role when households form expectations, a related literature suggests that individuals put substantial weight on *personal* experiences in belief formation. For instance, Malmendier and Nagel (2016) argue that individuals overweight information about events that happened during their lifetimes compared to information about events that occurred before they were born. But the overweighting of personal experiences is not unique to the time dimension. Rather, this can also include experiences that happened to the individual personally (such as returns earned on a prior housing investment) or events that are closer geographically (local versus national house price movements).[6] A number of papers provide evidence for a range of such forces in determining expectations about the housing market.

Kuchler and Zafar (2019) analyze data from the New York Fed SCE to show that when individuals form expectations about aggregate housing market outcomes, they overweight recent information that is geographically local to them. Specifically, larger recent local house price gains lead respondents to

[6] Extrapolation and the overweighting of personal experiences are not mutually exclusive forces: individuals might overweight local relative to aggregate house price changes (personal experiences) and at the same time, overweight recent local house prices compared to local house price changes further in the past (extrapolation).

expect larger increases in national house prices.[7] The authors also find that the expectations of less educated and less numerate respondents are more heavily influenced by personal local experiences.

Both extrapolation from the recent past and the overweighting of personal experiences involve focusing on some information that is close—either in time or personally—when forming expectations. Extrapolation alone, however, does not lead to heterogeneous expectations among individuals who share the same information set and form expectations in the same extrapolative way (unless people differ in the extent to which they extrapolate, as suggested by Armona et al., 2019). On the other hand, since personal experiences differ across individuals, the overweighting of personal experiences naturally leads to heterogeneous expectations across individuals at any given point in time, even when the process of belief formation is the same among them. The extrapolation from person experiences thus contributes to the large differences in expectations across individuals at the same point in time (which we documented in Panel B of Fig. 6.1).

As with extrapolation from the recent past, judging whether the overweighting of personal experiences is consistent with rational expectations is challenging. Under the assumption of full information—i.e., that all individuals share the same information set—it would violate rationality to overweight personal experiences in forming beliefs about a common object such as national house prices. However, without the assumption of full information, the observed behavior could arise from a variety of underlying factors, some of which do not constitute a violation of rational expectations. For instance, it could be that the availability and cost (monetary or cognitive) of accessing different information varies across individuals, perhaps because it is cheaper to learn about past local house prices than about prices in other parts of the country. This would naturally lead different information to receive varying weights in the expectation formation process of different individuals. Whether the implied information acquisition costs are plausible is an open question.

### 6.2.3 Social interactions

So far, we have described research that documents how individuals overweight recent information and personal experience. We next discuss the growing evidence that housing market expectations are also affected by information from their *social network*.

Robert Shiller has long argued that house prices are driven largely by belief fluctuations resulting from social interactions. For example, Shiller (2007) wrote that "many people seem to be accepting that the recent home price experience is at least in part the result of a social epidemic of optimism for real estate." In this narrative, some individuals become more optimistic about national house price growth (for example, because they observe substantial recent local house price increases). Borrowing language from the epidemiology literature, these individuals then "infect" their friends and acquaintances with their optimism, allowing the optimism to spread across society.

We agree with Shiller that in settings such as the housing market, where there are substantial information and search frictions and individuals transact only infrequently (Piazzesi and Schneider, 2009;

[7] Similar to the work on extrapolation described above, Kuchler and Zafar (2019) also find that expectations of future *local* house price changes underreact to past local price changes in the short-run and overreact in the long-run. The authors also find evidence for the overweighting of geographically close information in other domains. In particular, personal transitions to (and from) unemployment lead respondents to be more (or less) pessimistic about national unemployment rates. See also the discussion of labor market expectations in Chapter 22 in this Handbook.

Kurlat and Stroebel, 2015; Stroebel, 2016; Piazzesi et al., 2020), it is indeed natural to expect individuals to rely on their social networks when forming beliefs.[8] However, while the idea of social dynamics in housing markets has a long history, it is only recently that researchers have been able to document that house price beliefs are truly socially "contagious" in the way proposed by Shiller and others.

Bailey et al. (2018b) were the first to provide direct empirical evidence for belief contagion in the housing market. Specifically, they document that individuals whose geographically distant friends experienced higher recent house price growth are indeed more optimistic about future local house price growth. To measure social networks, Bailey et al. (2018b) collaborate with Facebook, the world's largest online social networking service. The authors begin their empirical analysis by documenting that, at any point in time, different people in the same local housing market have friends who have experienced vastly different recent house price movements. This variation is driven by heterogeneity in the locations of peoples' friends and heterogeneity in regional house price changes.

Bailey et al. (2018b) then provide evidence for an important effect of social interactions on an individual's assessment of the attractiveness of local property investments. To conduct this analysis, they field a housing expectations survey among Los Angeles-based Facebook users. Over half of the survey respondents report that they regularly talk to their friends about investing in the housing market, providing strong evidence that social dynamics could end up being important.[9] The survey in Bailey et al. (2018b) also asked respondents to assess the attractiveness of property investments in their own zip codes. The authors find a strong positive relationship between the recent house price experiences of a respondent's friends and whether that respondent believes that local real estate is a good investment. Importantly, this relationship is stronger for individuals who report that they regularly talk with their friends about investing in real estate. For individuals who report to never talk to their friends about investing in the housing market, there is no relationship between friends' house price experiences and their own evaluations of the attractiveness of local housing investments.

These results suggest that social interactions provide a natural link between friends' house price experiences and an individual's own housing market expectations (and indeed, as we discuss below, their housing investment behavior). Since social networks differ across individuals, the overweighting of the experiences in a person's social network also generates heterogeneity in expectations, even among individuals living in the same location, contributing to the large observed belief dispersion.

Much exciting research remains to be done in our quest to better understand the role of social dynamics in the belief formation process, both in general and specifically with respect to housing market beliefs. For example, it would be interesting to explore whether some types of friends—work friends, college friends, better-educated friends, or closer friends—have particularly strong effects on individuals' beliefs, as suggested by Bailey et al. (2019b) in other settings. Readers interested in this question should make sure to read Chapter 25 in this Handbook, which provides detailed discussion of various epidemiological models of belief formation. We believe that many of these models have the potential

[8] Kuchler and Stroebel (2021) provide a survey of the role of social interactions in determining household financial decisions more broadly. Social interactions have also been shown to affect beliefs and behaviors across a wide range of other settings, from labor markets (Topa, 2001, 2011; Gee et al., 2017), to trade flows (Rauch, 2001; Bailey et al., 2021), to investment behaviors (Ouimet and Tate, 2020; Kuchler et al., 2020), to social distancing behavior during the COVID-19 pandemic (Bailey et al., 2020).

[9] Consistent with the findings by Bailey et al. (2018b), Kindermann et al. (2021) document that more than 50% of survey respondents in Germany report that talking to family members and friends is an important source of information when forming expectations about the housing market.

to provide accurate description of beliefs dynamics, and expect the associated models to become more prominent over time.

A related area for future research is to better understand the economic mechanisms that explain why individuals rely on their social networks when forming expectations. One possible reason is that it is cheaper to acquire information through friends than through other channels. A second possible explanation is that individuals are more likely to trust information obtained through their social networks, perhaps because friends—unlike, for example, real estate agents or mortgage brokers—are not perceived to have potential conflicts of interest (see Bailey et al., 2020, for evidence of such a "trust"-based channel) Third, it is possible that information obtained through friends is more likely to "resonate" with individuals. This mechanism is described in a recent paper by Malmendier and Veldkamp (2022): *"[Information resonance] is not a question of 'limited attention' or cognitive limitations, as frequently modeled in economics. Recipients did not 'miss' the information in question, and might be able to reproduce and recite it even it does not resonate with them. Instead, they simply do not identify with the person conveying the information and, as a result, put less weight on it in terms of its relevance to their own decision-making."*

### 6.2.4 Ownership status

The process of forming beliefs about future housing market outcomes also depends on individuals' current ownership status. One reason is that a key difference between housing and other assets is that nonowners of the asset who almost always rent can more easily observe the cash flows of the asset—they are, after all, paying rent every month—while owner-occupiers simply consume housing services and do not need to pay attention to the value of their consumption (see Kindermann et al., 2021).

Kindermann et al. (2021) find that survey data during the recent German house price boom reveal sizable differences in house price forecasts between renters and owners that are consistent with such an information environment. While all households were, on average, underpredicting the strength of the house price boom, the average renter had higher house price growth forecasts than owners, especially in areas where house prices grew the most.[10] However, while renters had more accurate house price expectations on average, their forecasts were also more dispersed than those of owners. Combining these two effects, renters had forecasts with higher average mean squared errors than owners.

An explanation based purely on common experiences of renters may account for their higher average forecast, but cannot account for their worse overall forecasting performance. Instead, Kindermann et al. (2021) show that Bayesian learning with ownership status-dependent information can quantitatively account for these stylized facts (see Chapter 23 in this Handbook for a discussion of learning models). More specifically, agents learn about the determinants of house price growth from signals that differ in their precision depending on whether they rent or own. Renters receive signals about rent that are more precise, while they get noisier signals about house prices than owners. The noisier signals about house prices generate the larger dispersion of renter forecasts.

[10] Some households own their primary residence but also other houses that they rent out to other households. These landlord households should have forecasts that are more similar to those of renters, because they receive more precise signals about rents—after all, they charge rent to their tenants. The survey data shows that this is indeed the case. Demographics such as age, income, wealth, risk aversion, other economic forecasts (growth), and financial literacy play minor roles.

Another mechanism through which ownership status could affect belief formation is through an endowment effect. For example, Hatzmark et al. (2021) argue that stock owners overreact to signals about stock prices: owners overpredict future stock prices in response to positive signals about their stocks compared to nonowners (see also Anagol et al., 2018, 2021). In contrast, the evidence in Kindermann et al. (2021) point to a period with positive signals about house prices, in which owners of houses make *lower* house price forecasts than nonowners (renters). This is the opposite from what an endowment effect would predict. An interesting question for future research is to understand these differences in belief formation across asset markets.

### 6.2.5 Determinants of higher moments of belief distribution

The research described above has focused on the determinants of the expectations of average future house prices. But recent information and personal experiences can also affect other moments of their belief distributions, such as variance and skewness, which have important implications for households' housing and mortgage choices.

To explore the determinants of higher moments of individuals' belief distributions, Kuchler and Zafar (2019) exploit that the New York Fed SCE not only elicits a point estimate for beliefs, but also asks respondents to assign probabilities to different ranges of possible future house price changes. The authors relate the volatility of recent local house prices changes to the variance of each respondents' expected house price distribution. More volatile local house price changes are associated with a wider distribution of expected national house price changes. This finding highlights that the effect of recent local experiences on aggregate expectations works through both the first and second moments of the locally experienced price changes.

Ben-David et al. (2018) also use the New York Fed SCE to measure uncertainty in respondents' expectations. They first show that uncertainty about inflation, own income growth, and U.S. house price growth is correlated within individuals. They also show that uncertainty about these outcomes is higher for respondents with lower incomes, lower educations, and more precarious finances, as well as those living in counties with higher unemployment rates. These results suggest that individuals facing more economic adversity are more uncertain in their economic forecasts, potentially due to their experienced uncertainty affecting the uncertainty in their expectations in what the authors call "an effect akin to extrapolation in the second moment of beliefs."

Adelino et al. (2018) use data from the Fannie Mae National Housing Survey, which includes a question about how risky individuals perceive an investment in housing to be. The authors first document that 66% of respondents perceive housing as a relatively safe investment, while only 18% feel similarly about stock investments. Renters are more likely to perceive housing as a risky investment compared to owners. In addition, the share of households who perceive housing as risky correlates with past local house price changes and, importantly, measures of the volatility of local house price changes. As such, the authors interpret their findings as showing that "beliefs about house price risk extrapolate from recent experience."

Bailey et al. (2019a) show that individuals with friends from counties with a wider variety of house price experiences—that is, individuals with a higher second moment of house price experiences across individuals in their social network—report wider distributions of expected house price changes. This result suggests that social dynamics do not only affect the first moment of individuals' beliefs, as documented in Bailey et al. (2018b) and described above, but also higher moments of the belief distribution.

## 6.3 The effects of expectations on individual housing market behavior

There are a number of reasons why it is challenging to explore how differences in housing expectations translate into differences in housing market behaviors. First, there are few data sets that contain information on both individuals' house price beliefs and their actual behaviors in the housing market. Second, even when such data sets exist, one needs to worry about the ability to cleanly identify a causal link from expectations to behavior, since factors that lead individuals to be more optimistic about house price growth may also affect their housing market behavior through channels other than their expectations. For instance, a large past increase in local house prices could make individuals more optimistic about future house prices, but could also directly affect their housing market behaviors by increasing the equity of current homeowners. A local housing boom may also coincide with a general local economic boom, leaving prospective home buyers with higher incomes and more money to invest in the housing market. Hence, causally estimating the effect of housing market expectations on housing market investments requires plausibly exogenous variation in expectations.

### 6.3.1 Homeownership decisions

We begin this discussion by reviewing several research papers that study the effects of housing market expectations on the decision of whether to buy and rent, as well as related decisions in the home purchasing process, such as how large of a home to buy and how much to pay for a house.

After showing that friends' house price experiences affect an individual's housing market expectations (see Section 6.2.3), Bailey et al. (2018b) document that friends' house price experiences also affect that individual's actual housing market investments. The authors argue that this effect occurs through friends influencing the individual's expectations. To do so, the authors combine de-identified social network data from Facebook with anonymized information on individuals' housing transactions from public deeds data. Friends' house price experiences affect both the intensive and extensive margins of individuals' housing market investments: renters with friends who have experienced more positive local house price growth are more likely to become homeowners, while homeowners with social networks that experienced more positive local house price growth are less likely to sell their homes. Conditional on buying a home, those with more positive friend experiences buy larger homes and pay more for a given home. The economic magnitudes of these effects are substantial. Bailey et al. (2018b) then provide evidence that the relationships between the house price experiences in an individual's social network and that individual's housing market behavior are explained by the effect of friends' house price experiences on the individual's own housing market expectations.

Bottan and Perez-Truglia (2020) estimate the role of house price expectations on homeowners' decisions to sell their homes. To causally identify the effect of differences in expectations, homeowners who recently listed their homes for sale were mailed information about past local home price changes. The authors randomize the horizon, time frame, and source of this information across homeowners, leading some respondents to randomly receive more positive, albeit non-deceptive, signals about local house prices. A supplemental survey exposing subjects to the same information that was mailed to potential home sellers shows that receiving more positive information about past local house price changes indeed leads individuals to be more optimistic about future house price growth, consistent with the evidence in Section 6.2. The authors then use administrative data to observe subsequent home sales. Receiving more positive information about past local house price changes caused potential sellers

to delay selling their homes, suggesting that differences in expected future house prices (induced by differences in the information received) are reflected in differences in selling behaviors.

There is also evidence that house price beliefs affect the housing search process. Gargano et al. (2020) focus on the effects of home buyers' expectations on their housing search. The authors show that individuals experiencing higher past house price growth in their postcode of residence search more broadly across locations and house characteristics, without changing attention devoted to individual sales listings. They also have shorter search durations. The authors argue that at least part of this effect comes from individuals extrapolating from their locally experienced house price growth when forming housing market expectations. In particular for renters, higher experienced house price growth increases future expected house price growth and thus the returns to finding a matching house quickly, before ownership becomes less affordable. Using the model of Piazzesi et al. (2020), Gargano et al. (2020) show that the expansion of search breadth in response to locally experienced house price growth translates into spillovers onto house sales prices and inventories of listings across postcodes within a metropolitan area.

Housing investment decisions are also affected by individuals' uncertainty about future house price movements. Ben-David et al. (2018) argue that individuals with more uncertain expectations about income growth, inflation and home price changes are more cautious in their consumption and investment behaviors. Similarly, Adelino et al. (2018) point to the role of beliefs about house price risk in explaining homeownership decisions. They find that individuals who perceive housing as risky are about 12% more likely to be renters than homeowners. Similarly, individuals perceiving housing as risky are much more likely to say they would rent rather than buy the next time they move to a new home. There are no differences in renters and owners in risk perceptions of the stock market, suggesting that housing decisions are driven specifically by perceived house price risk.

Malmendier and Steiny (2017) argue that macroeconomic conditions beyond the housing market can also affect homeownership decisions. In particular, they show that individuals who have experienced higher inflation during their lifetimes expect higher inflation going forward, making owning a home—traditionally seen as an inflation hedge—more attractive. The authors argue that, through this channel, differences in lifetime macroeconomic experiences can help explain the vastly different rates of homeownership across European countries.

### 6.3.2 Mortgage choice

In addition to affecting housing market investments, house price expectations also influence how a home purchase is financed, including choices about the type of mortgage and the overall leverage.

Bailey et al. (2019a) study the effect of home buyers' house price expectations on their mortgage leverage choices, asking whether households that are more concerned about large house price drops make larger or smaller downpayments. The authors highlight that, from a theoretical perspective, the relationship is ambiguous and depends on the ability of households to directly adjust their exposure to the housing market by renting or purchasing a smaller home. Intuitively, if such an adjustment is comparably easy, relatively pessimistic households will choose to purchase smaller homes with less leverage. However, households' ability to rent or buy a smaller home might be restricted by a variety of constraints, such as the desire for a certain amount of space due to family size. In the extreme case, households' home sizes are completely determined by their consumption preferences. In this case, the only way for relatively pessimistic homeowners to reduce their exposure to future house price declines

is by levering up more and investing fewer own resources into the purchase, allowing them to limit their losses through defaulting in the case of large prices decline. This ability to "insure" against house price drops by making smaller downpayments and defaulting on the loan in case of large house price declines ("risk shifting") is higher when default is less costly, for example, when there is no recourse to the nonhousing assets of defaulting borrowers. Importantly, both the first and second moment of the belief distribution affect leverage choices through this channel, since both lower expected house price increases and higher expected house price volatilities are associated with larger probabilities of the very large house price drops that might induce a household to default.

In addition to highlighting these novel insights into the relationship between beliefs and leverage choices, Bailey et al. (2019a) explore which force dominates in the U.S. housing market. Their identification relies on the finding that geographically-distant friends' house price experiences affect individuals' expectations, but should not directly affect their behaviors (see above). The authors then show empirically that individuals choose higher leverage when their friends have recently seen house price declines and have experienced more dispersed housing market outcomes, both of which increase individuals' subjective expectations of a large house price drop. Consistent with the theoretical framework, the overall effect is driven by households living in U.S. states where default costs are relatively low; the effect of beliefs on leverage is also larger in housing markets with few rental options, where even relatively pessimistic households may be forced to owner-occupy to live there.

De Stefani (2020) similarly links home price expectations to the mortgage choices of housing investors. While Bailey et al. (2019a) find that optimistic house price beliefs are associated with *lower* leverage for owner-occupied homes, De Stefani (2020) finds that when buying investment properties, more optimistic borrowers take on more leverage. This difference between owner-occupied properties and investment properties is consistent with the model in Bailey et al. (2019a). As described above, the sign of the relationship depends on the ability of pessimistic households to reduce their exposures to the housing market by means other than reducing their downpayment. While owner-occupiers often have consumption motives for buying a specific home, this is not the case for buyers of investment properties. Investors who are pessimistic about housing as an asset can choose other asset classes and abstain from owning investment property altogether (see also Geanakoplos, 2010; Simsek, 2013). As such, more optimistic investment property buyers will choose higher leverage to finance larger purchases, while more pessimistic investors will abstain from housing market investments altogether.

Other important determinants of mortgage choice are a household's expectations of future inflation and interest rates. Malmendier and Nagel (2016) argue that the inflation experienced during an individual's lifetime disproportionately affects her inflation expectations.[11] They also show that differences in inflation expectations due to variation in experienced inflation affect household borrowing and lending behaviors, including the choice between fixed-rate and variable-rate mortgages. Botsch and Malmendier (2020) build on this earlier work and incorporate inflation expectations shaped by lifetime inflation experiences into a structural model of mortgage choice, focusing on the decision between fixed-rate and adjustable-rate mortgages. They find that for every percentage point increase in experienced inflation, households are willing to pay between 6 and 14 basis points more in interest for a fixed-rate mortgage.

[11] See Chapter 5 in this Handbook for a discussion of the literature studying the determinants of inflation expectations.

## 6.4 House price expectations and aggregate economic outcomes

Households' expectations of future house prices can be important drivers of aggregate trends and volatility in house prices. If households expect to sell their homes at higher prices in the future, they will be willing to pay higher prices for those homes today. Although households generally hold their homes for a long time after purchase—in the U.S., more than a decade, on average—the expected resale value remains important in determining the expected overall return on the investment. Survey evidence of house price expectations allows researchers to quantify the importance of changes in those expectations in driving boom–bust episodes in housing markets and, thus, in driving house price volatility. In this section, we review some of the work in this direction.

During the postwar period, the U.S. experienced two national boom–bust episodes in house prices. These episodes stand out because house prices climbed to historically high levels relative to rents not only in the U.S., but also in many other countries (for the international evidence, see Piazzesi and Schneider, 2008). The first postwar housing boom occurred during the Great Inflation of the 1970s: many countries experienced extraordinary inflation in consumption good prices following the oil price shocks. During this high-inflation episode, many households considered housing to be a particularly attractive real asset that hedges against inflation. The second boom was in the early 2000s (see Fig. 6.1), a period when banks in many countries relaxed their mortgage lending standards.

As we are writing this chapter, we are in the middle of the COVID-19 pandemic. At the start of the pandemic, U.S. housing market activity came to a screeching halt, as uncertainty spiked and emergency measures made it difficult for real estate agents to organize open houses. As highlighted in Fig. 6.1, while house prices remained relatively steady, housing market expectations collapsed during the early months of the pandemic. Later, the desire for social distancing combined with the rising feasibility of remote work increased the demand for housing, including in cheaper areas outside of crowded cities like San Francisco and New York. As a result, the pandemic ignited a third national house price boom (again paralleled in many other countries); very quickly, house price expectations recovered, and data from the February 2021 Survey of Consumer Expectations indicates that households were expecting house prices to appreciate by more than 5% over the subsequent year.

There is a vibrant debate in the research community about the relative importance of different potential causes of these national house price boom and bust episodes. Some researchers believe that exuberant house price expectations are important for explaining house price booms, while others emphasize the relevance of inflation expectations (especially in the 1970s, but also now again in the 2020s), changing credit conditions (particularly in the early 2000s), as well as other fundamental demand-side factors, such as a stronger preference for housing during the pandemic. Naturally, these different mechanisms can interact and are therefore hard to disentangle. For example, higher inflation expectations may convince households that real borrowing rates are lower and thus that credit is cheaper; alternatively, more optimistic house price expectations by loan officers could lead to a reduction in downpayment requirements and other easing of access to credit. These forces increase housing demand and drive up house prices today. If they are expected to persist, or if households extrapolate from recent price changes, households may also form higher expectations of future house prices.

To argue that high house price expectations cause a house price boom today, researchers would ideally like to identify an exogenous shift in house price expectations. But while some of the research described above has been able to isolate exogenous shifts in individual-level beliefs to explore their effects on individual housing market decisions (Bailey et al., 2018b, 2019a; Bottan and Perez-Truglia, 2020), identifying exogenous shifts in beliefs held by many households is a daunting challenge.

Researchers have therefore focused on other testable implications of their preferred explanations of boom–bust episodes. For example, many models of aggregate price movements also make important predictions for the cross-section of house prices and capital gains, both across space and segments within a location. In the language of empirical asset pricing, the cross-section of house prices is thus a useful set of "test assets" for these models and their alternative explanations of aggregate patterns.

In the following, we describe some of the progress in the housing literature to understand the quantitative importance of house price expectations as well as expectations of other variables such as inflation, nominal interest rates, earnings growth, and credit conditions. A key feature of the past booms and busts in housing markets is that they do not look alike. In some booms, houses in lower-quality segments appreciate much more than houses in higher-quality segments, while in other booms the opposite is true. Moreover, some booms witness a large increase in mortgage debt by households, while other booms do not. Some booms affect the entire country, while others are more concentrated in some geographies. Finally, disagreement among households about the future path of inflation or house prices is strong in some booms, while other booms are characterized by broad agreement about future economic conditions. These differences across boom–bust episodes are helpful to understand the quantitative importance of various channels. Survey evidence on household expectations is therefore an important piece of data that models in this literature should want to match.

### 6.4.1 The housing boom of the late 1970s

The Great Inflation of the 1970s witnessed a huge shift in U.S. household portfolios out of equity into housing (Leombroni et al., 2020). House prices and price–rent ratios increased nationwide in the U.S. and many other countries during this time (Piazzesi and Schneider, 2008). In the U.S., expensive homes appreciated more than cheaper homes (Poterba, 1991).

Researchers have argued that these patterns are consistent with an important role of inflation levels and expectations in driving the 1970s housing boom. Since households borrow at the nominal interest rate, beliefs about expected inflation determine beliefs about the prevailing real interest rate (Leombroni et al., 2020). When inflation expectations are high, the perceived real cost of credit is thus low. In addition, several features of the tax code makes housing a more attractive asset during times of high expected inflation. First, mortgage interest is tax deductible, and this homeowner subsidy increased dramatically during the Great Inflation (Poterba, 1984). Second, capital gains on housing are easier to shelter from taxes than capital gains on other assets like stocks. With higher expected inflation, this difference in tax treatment implies larger differences in expected after-tax capital gains across assets (since the tax is on nominal capital gains.) Third, dividends from owner-occupied housing are not taxed (Floetotto et al., 2016), which also matters more when expected inflation is high. Poterba (1991) documents that through these channels, the tax code made housing particularly attractive for households in higher tax brackets. Correspondingly, housing demand increased more in those segments of the housing market in which higher income households buy compared to segments in which lower income households buy. Increasing inflation expectations can therefore explain why house prices appreciated the most in the more expensive segments of the housing market.

Inflation expectations can explain another important cross-sectional feature of the 1970s housing boom. In household surveys, we observe that young households were expecting much higher inflation

rates than older households during this episode.[12] Leombroni et al. (2020) show that this disagreement about expected inflation is important to quantitatively account for the aggregate portfolio shift towards housing in an overlapping-generations model with incomplete markets. In the model, households choose between three broad asset classes: bonds, houses and stocks. A key prediction of this lifecycle model is that younger households build riskier portfolios than older households in the form of a leveraged position in housing, because they own more human wealth which is a relatively safe asset. When inflation expectations of the different generations are chosen to match the Michigan survey data, the model explains the observed overall portfolio shift towards housing and away from stocks. Younger households had higher inflation expectations and therefore perceived housing to be a particularly attractive asset because of the tax code. Moreover, younger households perceived the real (borrowing) rate to be low, which further increased the attractiveness of a leveraged position in housing from their perspective, while older households perceived real rates to be high and were happy to hold bonds. The higher aggregate demand for housing matches the higher price–rent ratios and increased mortgage borrowing that we observe in the data.

### 6.4.2 The housing boom of the early 2000s

The two most prominent explanations of the large increase in house prices during the early 2000s are high house price expectations and easier access to credit. Landvoigt et al. (2015) put both of these channels in an assignment model of the housing market with heterogeneous households. While lower interest rates increased house prices in all segments of the housing market, relaxations of credit constraints are required to account for the higher capital gains observed in low quality segments, since lower downpayments enabled poorer households to borrow more. However, changes in credit constraints cannot fully explain the observed patterns. To quantitatively account for the overall increase in house prices during the 2000s, Landvoigt et al. (2015) show that it is important that homebuyers at the peak of the boom did not expect house prices to decline, which is a key feature of the survey evidence in Case et al. (2012) on recent homebuyers. If instead homebuyers expected house prices to continue growing at historical trend (which is within reasonable confidence bands of the survey evidence), the model can account for the house price increase of the early 2000s. Both forces—optimistic house price expectations and easier access to credit—are thus important to explain the housing boom of the 2000s.

While the Case et al. (2012) evidence shows that recent homebuyers had high house price expectations during the housing boom, the broader population was much less optimistic. Based on the Michigan survey, Piazzesi and Schneider (2009) find that the overall enthusiasm among households about housing purchases cooled early on during the 2000s housing boom. The fraction of enthusiastic households who believed that now is a "good time to buy" was initially high (above 80%). The overwhelming majority of these enthusiastic households justified this belief citing good credit conditions: credit is either perceived to be cheap or easy to get in the very early years of the 2000s. The fraction of enthusiastic households then declined to less than 60%, lower than at any time during the entire previous decade. The paper also identifies a small group of households who believed that now is a good time to buy

[12] Malmendier and Nagel (2016) attribute these differences in inflation expectations to differences in lifetime experiences: older households in the 1970s based their expectations in a long record of low inflation rates, while the early inflation spikes after the oil price shocks received a bigger weight in the shorter record of younger households.

*because house prices will rise further*. This group of "momentum" households made up only 10% of households at the beginning of the boom but had doubled in size by the time the market started to turn.

In a liquid market like the stock market, few optimists or optimism that is not backed by a sufficient amount of wealth to buy the entire market are not enough to support high valuations. But while every stock trades at least once a year, a house trades only once every decade. Market illiquidity amplifies the effect of optimistic beliefs and a few optimists can indeed be sufficient to support high transaction prices. Piazzesi and Schneider (2009) formalize this intuition in a search model of the housing market with heterogeneous households. The housing search process takes time; some houses sit on the market for many weeks and few houses transact. When a small fraction of renters becomes optimistic about house price fundamentals, they look for a house, get matched with a seller after a while, and pay a high transaction price. Over some time, all housing transactions therefore feature high house prices until all optimists are matched with a house.

Building on this model of housing as an illiquid asset, Burnside et al. (2016) introduce waves of optimism and pessimism among households that capture several features of the survey data during the 2000s housing boom–bust cycle. Their approach specifies "social dynamics" of beliefs about housing based on an epidemiological model consistent with the empirical evidence in Bailey et al. (2018b, 2019a). The model's central ingredient is that households change their housing market expectations as a result of social dynamics: they meet randomly, and those with tighter priors are more likely to convert other households. Through this mechanism, optimists can "infect" their peers with their beliefs. The model can generate a "fad": that is, the fraction of the population with a particular view can rise and fall. During a housing boom, these belief dynamics imply a higher difference between the mean and median house price expectation of households, because there are few optimists initially who drive up the mean but not the median. This difference disappears as the boom unfolds and more households are infected, consistent with the Case et al. (2012) survey evidence from the early 2000s.

In an alternative framework in which housing is modeled as a capital stock, Kaplan et al. (2020) introduce news shocks about future housing preferences. News shocks are immediately reflected in house prices, but since current preferences for housing are still the same, the marginal rate of substitution between housing consumption and other consumption is unaffected. Therefore, house prices rise relative to rents. When parameter values for the Markov chain that describes the dynamics of housing preference shocks are matched to (i) data on the length of housing booms and busts, and (ii) expected house price growth by recent homebuyers in the Case et al. (2012) survey assuming that *all* households share the same strong optimism during the boom, the model explains the 2000s housing boom.[13]

Taken together these papers provide robust evidence for the importance of beliefs in driving aggregate behavior. Recent work by Chodorow-Reich et al. (2021) documents that areas with the strongest house price booms in the early 2000s not only experienced the largest busts in the late 2000s but also the strongest rebounds during the 2010s. The authors argue that the cycle was in part due to overoptimism about long-run fundamental growth at the city level. In their model, a single improvement in fundamentals in the early 2000s triggers a boom–bust–rebound that quantitatively matches the experience of the cross-section of cities. Agents who infer long-run growth from observing the dividend to living in a city become overoptimistic due to diagnostic expectations. Eventually, agents realize their

[13] The model implies that all houses experience the same capital gains during a boom. The reason is that, in a model of housing capital, houses only differ by the units of capital that they represent. Unless these units somehow change from one period to the next, the capital gains on all houses are identical.

error, triggering a bust that is exacerbated by a wave of foreclosures that cause prices to overshoot in the bust. Foreclosures then subside and prices converge to a higher-growth path, resulting in a rebound. The authors point out that while a number of different formulations of non-rational expectations could cause initial overoptimism during a boom that subsequently corrects, diagnostic expectations help to quantitatively match several features of the data: expectations do not overshoot in the bust and cities have boom–bust–rebound cycles of different size but similar length.

## 6.5 Conclusion

Housing is the largest asset held by U.S. households, and understanding the determinants of housing market expectations is therefore of central importance. In this chapter, we discussed active research efforts to (i) better measure housing market expectations and understand their determinants, and (ii) better understand the role of housing market expectations in driving individual housing market choices and aggregate housing market outcomes. Along the way, we have highlighted a number of exciting avenues for researchers to further advance our understanding. In this concluding section, we want to expand upon our discussion of these future areas of focus.

On the measurement side, we believe that developing surveys that incorporate more of the elements described in Section 6.1.1 offers a valuable direction for future work, in particular for researchers at central banks and other institutions with the resources to field large-scale surveys over extended periods of time. Expanding the availability of better survey data beyond the U.S. also holds promise for generalizing our understanding of the determinants and effects of housing market expectations.

On the determinants side, it is clear that, despite the advances described in Section 6.2, much of the cross-sectional variation in house price beliefs remains unexplained. This realization generates substantial scope for additional research. We believe that it is unlikely that researchers will eventually discover a single factor that explains a dominant share of the observed cross-sectional dispersion of beliefs. Instead, it is more likely that researchers will continue to discover new factors that might each only explain a relatively small part of the observed belief heterogeneity, and that will thus contribute to an understanding of beliefs as formed through a complex amalgamation of forces. In this light, we expect that the increasing availability of electronic trace data, such as GPS and social network data, will allow researchers to refine the measurement of some of the most plausible factors, including social interactions (see Bailey et al., 2018a; Kuchler and Stroebel, 2022).

The realization that belief formation is neither rational nor easily explained by a few simple factors provides challenges for researchers hoping to create models that accurately capture how beliefs are formed. Indeed, when there are many factors that each explain an important but ultimately small part of the overall dispersion of beliefs, it is complicated to develop canonical models to compete with the rational expectations framework—after all, is it worth moving away from the tractability of rational expectations if the proposed alternative has low explanatory power in the cross-section? We believe that the ideal competing model will depend on the specific question, and expect that not all applications will require researchers to match both the observed time-series and cross-sectional variation in beliefs. In any case, much work remains to be done to translate the growing list of factors that have been shown to influence beliefs into new models of belief formation.

We believe that there is also substantial scope for additional work studying the joint determination of beliefs about different aspects of the economy. House prices are clearly influenced by beliefs about

other economic variables (inflation, interest rates, etc.), and house price beliefs are formed jointly with beliefs about these other outcomes. Therefore, rather than studying beliefs about house prices, inflation, growth, and unemployment in isolation, we believe that much empirical and theoretical progress can be made by exploring their joint determination.

Finally, most work studying the determinants and effects of house price expectations has focused on the first moment of the belief distribution. We believe that expanding on the research efforts described in Section 6.2.5 to better understand the determinants and effects of higher moments of the belief distribution holds much promise. Related to this, it may be worth studying individuals' confidence in their own beliefs, as Giglio et al. (2021a) do in the context of the stock market.

**Table 6.2 Surveys of housing expectations.**

| | Description | History | Access | Relevant Question Topics |
|---|---|---|---|---|
| **Surveys of U.S. consumers** | | | | |
| **University of Michigan Surveys of Consumers** | Rotating panel<br>Fielded monthly<br>>500 U.S. households (excl. AK + HI) | 1946–present[a] | Data available online[b] | Expectations for the local housing market<br>Perceptions of past housing prices, current general market conditions |
| **New York Fed Survey of Consumer Expectations (SCE): Core Questions** | Rotating panel<br>Fielded monthly<br>∼1300 U.S. households | 2013–present | Data available online | Expectations for the general housing market<br>Plans to move |
| **New York Fed SCE Housing Survey** | Cross-sectional<br>Fielded annually as a special module of the NY Fed SCE<br>∼1300 U.S. households | 2014–present | Data available online | Expectations for the price of own home, local housing market<br>Perceptions of past housing prices, current local market conditions<br>Plans to buy, sell, move |
| **Fannie Mae National Housing Survey (NHS)** | Cross-sectional<br>Fielded monthly<br>1000 U.S. households | 2010–present | Data on key indicators is available online | Expectations for the general housing market<br>Perceptions of current market conditions<br>Plans to move |
| **Pulsenomics U.S. Housing Confidence Survey (HCS)** | Cross-sectional<br>Fielded twice a year<br>>15500 U.S. households | 2014–present | Limited time series data available online; microdata must be requested | Expectations for the price of own home, local housing market<br>Perceptions of past housing prices, current general market conditions<br>Plans to buy |
| **Case–Shiller Homebuyer Surveys** | Cross-sectional<br>Fielded annually<br>∼5000 U.S. recent homebuyers in total across all waves | 1988;<br>2003–2012 | Private | Expectations for the price of own home, local housing market<br>Perceptions of past housing prices, current market conditions<br>Plans to buy |
| **RAND American Life Panel (ALP): Financial Crisis Surveys** | Unbalanced panel<br>Fielded monthly (short version) and quarterly (long version)<br>∼3000 U.S. internet users | 2009–2016 | Limited data available online; restricted data available at a cost | Expectations for the price of own home, local housing market, general housing market<br>Perceptions of past housing prices, current market conditions |

*continued on next page*

**Table 6.2** (*continued*)

| | Description | History | Access | Relevant Question Topics |
|---|---|---|---|---|
| **RAND American Life Panel (ALP): Asset Price Expectations Surveys** | Unbalanced panel<br>Fielded monthly<br>~3000 U.S. internet users | 2011–2013 | Limited data available online; restricted data available at a cost | Expectations for the local housing market<br>Perceptions of current market conditions |
| **National Survey of Mortgage Originations (NSMO)** | Cross-sectional<br>Fielded quarterly<br>6000 U.S. borrowers with newly originated mortgages that are part of the NMDB | 2014–present | Data available online | Expectations for the local housing market<br>Perceptions of past housing prices<br>Plans to sell, move |
| **University of Michigan Health and Retirement Survey (HRS)** | Unbalanced panel<br>Fielded once a year (1992–1995) or once every two years (1996–2020)<br>~20,000 U.S. households with $\geq$ 1 individual over age 50 | 1992–present[c] | Limited data available online; restricted data upon request | Expectations for the price of own home |
| **Surveys of U.S. industry professionals and experts** | | | | |
| **National Association of Home Builders (NAHB) / Wells Fargo Housing Market Index (HMI)** | Fielded monthly<br>NAHB members (homebuilders) | 1985–present | Data for the HMI and its component indices is available online | Expectations for the single-family housing market<br>Perceptions of current market conditions |
| **Fannie Mae Mortgage Lender Sentiment Survey (MLSS)** | Cross-sectional<br>Fielded quarterly<br>>200 Fannie Mae partner lenders | 2014–present | Limited data on key indicators is available online | Expectations for the general housing market |
| **Zillow / Pulsenomics Home Price Expectations Survey** | Fielded quarterly<br>>100 industry professionals and economists | 2010–present | Limited data available online | Expectations for the general housing market |
| **The Wall Street Journal Economic Forecasting Survey** | Fielded twice a year (1980s–2002), monthly (2003–2021), and quarterly (2021–present)<br>> 70 academic, business, and financial economists | 1980s–present[d] | Data available online | Expectations for the general housing market |
| **Surveys of non-U.S. consumers** | | | | |
| **European Central Bank Household Finance and Consumption Survey (HFCS)**[e] | Cross-sectional with a panel subset[f]<br>Fielded once every three years<br>60,000–90,000 households in Eurozone countries, as well as Croatia, Hungary and Poland (as of the 2017 wave) | 2010, 2014, 2017 | Data can be requested from the ECB | Expectations for the price of own home, general housing market[g] |

*continued on next page*

**Table 6.2** (*continued*)

| | Description | History | Access | Relevant Question Topics |
|---|---|---|---|---|
| **Deutsche Bundesbank Survey on Consumer Expectations** | Cross-sectional with a panel subset<br>Fielded monthly<br>∼2000 German households | 2019–present | Data can be requested from the Bundesbank | Expectations for the local housing market |
| **Banco de España Survey of Household Finances (EFF)** | Cross-sectional with a panel subset<br>Fielded once every three years<br>∼6000 Spanish households | 2002–present[h] | Data can be requested from the Bank of Spain | Expectations for the price of own home<br>Plans to move |
| **Tilburg University CentERdata Institute DNB Household Survey** | Panel<br>Fielded annually<br>>1500 Dutch households | 1993–present | Data can be requested from CentERdata | Expectations for the price of own home, general housing market<br>Perceptions of past housing prices |
| **Banca d'Italia Survey of Household Income and Wealth** | Cross-sectional with a panel subset (about 50%)<br>Fielded annually (before 1987) or ∼ every two years (since 1987)<br>∼8000 Italian households (most recently) | 1960s–present | Data available online | Expectations for the price of own home |
| **European Central Bank Consumer Expectations Survey** | 10,000 households in Belgium, France, Germany, Italy, the Netherlands, and Spain total (in 2020 pilot) | Piloted in 2020; still under development as of Jan 2022 | As of Jan 2022, available to ECB researchers; external access unclear | Expectations for the price of own home, local housing market<br>Plans to buy |
| **English Longitudinal Study on Ageing (ELSA)** | Unbalanced panel<br>Fielded once every two years<br>>18,000 individuals over age 50 in England | 2002–present | Data can be requested from the UK Data Service | Expectations for the price of own home |
| **Reserve Bank of New Zealand Household Expectations Survey** | Cross-sectional<br>Fielded quarterly<br>∼750–1000 New Zealand households | 1995–present[i] | Limited time series data available online | Expectations for the general housing market |
| **Bank of Canada Survey of Consumer Expectations** | Rotating panel<br>Fielded quarterly<br>∼2000 Canadian households | 2014–present | Data available online | Expectations for the local housing market |

[a] *Questions eliciting point estimates were not introduced until the 2000s.*
[b] *Annual and quarterly data is available for 1960 onward; monthly data is available for 1978 onward.*
[c] *Questions on house price expectations asked since 2010.*
[d] *Question on housing expectations asked since 2006*
[e] *Independently administered by participating countries according to a central blueprint*
[f] *Panel data has been collected in the surveys administered by Belgium, Germany, Spain, Italy, Cyprus, Malta, the Netherlands, Estonia, France, Latvia, Poland, Slovakia and Finland.*
[g] *Own home price expectations was a core variable in the 2017 wave; own and general house prices were non-core variables in the 2014 wave.*
[h] *Question on housing expectations asked since 2011.*
[i] *Questions on house price expectations asked since 2011.*

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