# Supplement to the paper "Double-question Survey Measures for the Analysis of Financial Bubbles and Crashes" by

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January 2, 2017

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# S1 Introduction

This supplement is organized as follows. Section S2 provides further details of the RAND American Life Panel (ALP) surveys discussed in Section 3 of the paper. Section S3 provides the random effect estimates of of the model specifications discussed in Section 4 of the paper. Sections S4 and S5 describe the FE-TE and the FE-TE filtered estimators, respectively. Section S5.1 summarizes the FE-TE filtered estimates. Section S6 provides a comparison of the estimates of $\beta^{(h)}$ (defined in Section 4 of the paper) obtained for different model specifications, as well as the corresponding interest rate estimates. Section S7 describes the estimator used in the dynamic panel regressions of realized house price changes across MSAs reported in Section 6 of the paper. Section S8 provides summary statistics for selected MSA level variables. Finally, Section S9 contains a brief description of the Data Sources as well as the files that replicate the results reported in paper and this supplement.

# S2 American Life Panel Surveys

The American Life Panel (ALP) consists of over 6,000 panel members aged 18 and older. Detailed information about the panel can be found at https://alpdata.rand.org/index.php?page=panel. In what follows we provide selected information about the ALP surveys that we deem relevant to the double-questions surveys.

## S2.1 Recruitment

ALP participants are recruited through a number of sources, including the University of Michigan Monthly Surveys, both internet-panel cohort and phone-panel (CATI) cohort, the National Survey Project cohort, Snowball cohort, phone and mailing experiment cohort, vulnerable population cohort, and ALP Intergenerational Cohort. The origin of each household in the survey is indicated by the "recruitment_type" variable in the excel sheet survey result files.

The ALP invites adult members of participating households to join the panel. Members of the same household can be identified in the panel, which allows for intra-household comparisons. Currently, approximately 17 percent of surveyed households have more than one panel member.

## S2.2 Demographics

Each ALP survey contains a “Demographics” module, which by default contains information on "gender, date of birth, place of birth, US citizenship, household income, household members, employment, state of residence, ethnicity. and education#.

## S2.3 Response Rates and Attrition

The attrition rate of ALP participants is relatively low. Between 2006 and 2013 the annual attrition rate has been between 6 and 13 percent. Since panel members do not always give formal notification about their decision to leave the panel, in order to avoid retention of non-responding panel members, RAND contacts members who have not been active for at least one year and asks them about their continued interest in participating. The ALP removes all those for whom such contact attempts fail, as well as all those who were not active in the previous year.

Response rates for ALP surveys are calculated by dividing the number of completed interviews by the size of the associated underlying sample. Most selected panel members who complete the interview respond within one week of the fielding of the survey, and almost all do so within two weeks. Response rates for the ALP survey typically average around 70 percent, but can vary significantly by subgroups, how long the survey is kept in the field, and the number of reminders sent.

# S3 Random Effects Estimates

In what follows, we provide estimates of the panel data model

$$\hat{\pi}^{e}_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \beta^{(h)} x_{it} + \delta_t^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}, \tag{S1}$$

which corresponds to equation (28) in the paper. We provide estimates both with and without time effects, and with and without MSA dummies. For the elements of $\mathbf{z}_i =$

$(z_{i1}, z_{i2}, ..., z_{i7})'$, we consider $z_{i1} = \ln \text{age}_i$, $z_{i2} = \ln \text{income}_i$, $z_{i3}$ to $z_{i6}$ are dummy variables that take the value of 1 if the respondent $i$ identifies her/himself as female, Asian, Black and Hispanic/Latino, respectively. Finally, $z_{i7}$ measures the education level of the respondent. For a detailed description of how the time-invariant variables are constructed see Appendix A.2 of the paper. We allow $\varepsilon_{i,t+h} + \psi_i^{(h)}$ to be serially correlated and heteroskedastic. Random effects estimates of model (S1) are presented in Tables S1-S3.

We also consider the following model

$$\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \delta_t^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}, \tag{S2}$$

which we estimate with and without time effects and MSA dummies. These estimates are presented in Tables S4-S6.

Table S1: **Random Effect Estimates of Price Expectation Equations for Equity**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $x_{it}$ | -0.124 | -0.146 | -0.133 | -0.156 | -0.118* | -0.126* | -0.120* | -0.128* | -0.138*** | -0.140*** | -0.139*** | -0.140*** |
| | (0.116) | (0.116) | (0.116) | (0.117) | (0.0700) | (0.0700) | (0.0703) | (0.0704) | (0.0337) | (0.0337) | (0.0339) | (0.0339) |
| Female | 0.654** | 0.649** | 0.684*** | 0.680*** | 0.825*** | 0.822*** | 0.829*** | 0.826*** | 0.553*** | 0.551*** | 0.553*** | 0.551*** |
| | (0.261) | (0.261) | (0.264) | (0.264) | (0.155) | (0.155) | (0.156) | (0.156) | (0.0778) | (0.0779) | (0.0783) | (0.0783) |
| ln age | -2.464*** | -2.465*** | -2.345*** | -2.344*** | -2.417*** | -2.426*** | -2.358*** | -2.361*** | -1.580*** | -1.588*** | -1.545*** | -1.549*** |
| | (0.441) | (0.441) | (0.441) | (0.442) | (0.264) | (0.264) | (0.265) | (0.265) | (0.130) | (0.131) | (0.133) | (0.133) |
| Education | -0.305 | -0.309 | -0.416 | -0.420 | -0.597*** | -0.602*** | -0.680*** | -0.684*** | -0.454*** | -0.457*** | -0.494*** | -0.497*** |
| | (0.272) | (0.272) | (0.280) | (0.280) | (0.163) | (0.163) | (0.166) | (0.166) | (0.0800) | (0.0802) | (0.0819) | (0.0820) |
| ln income | -0.686*** | -0.688*** | -0.657*** | -0.659*** | -0.793*** | -0.794*** | -0.777*** | -0.777*** | -0.468*** | -0.470*** | -0.455*** | -0.455*** |
| | (0.207) | (0.207) | (0.213) | (0.214) | (0.133) | (0.133) | (0.135) | (0.136) | (0.0646) | (0.0647) | (0.0657) | (0.0657) |
| Asian | -1.254 | -1.270 | -1.191 | -1.207 | -0.133 | -0.153 | -0.0571 | -0.0821 | -0.137 | -0.148 | -0.115 | -0.131 |
| | (0.931) | (0.931) | (0.948) | (0.948) | (0.552) | (0.552) | (0.568) | (0.569) | (0.248) | (0.249) | (0.258) | (0.258) |
| Black | 0.998* | 1.006* | 0.772 | 0.779 | 1.523*** | 1.533*** | 1.369*** | 1.375*** | 1.149*** | 1.155*** | 1.051*** | 1.053*** |
| | (0.586) | (0.586) | (0.599) | (0.599) | (0.335) | (0.335) | (0.343) | (0.343) | (0.162) | (0.162) | (0.168) | (0.168) |
| Hispanic/Latino | 0.280 | 0.273 | -0.234 | -0.245 | 1.284*** | 1.281*** | 1.006*** | 0.995*** | 0.916*** | 0.915*** | 0.781*** | 0.774*** |
| | (0.505) | (0.505) | (0.559) | (0.559) | (0.282) | (0.282) | (0.311) | (0.311) | (0.133) | (0.133) | (0.146) | (0.146) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^{e}_{i,t+h|t} = \beta^{(h)} x_{it} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.

$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$

Random effect estimates with standard errors clustered at individual level.

Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table S2: **Random Effect Estimates of Price Expectation Equations for Gold**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $x_{it}$ | 0.581*** | 0.562*** | 0.591*** | 0.572*** | 0.208** | 0.190* | 0.213** | 0.195* | -0.0565 | -0.0646 | -0.0524 | -0.0606 |
| | (0.177) | (0.177) | (0.178) | (0.178) | (0.0993) | (0.0994) | (0.0997) | (0.0998) | (0.0455) | (0.0456) | (0.0457) | (0.0458) |
| Female | 1.143*** | 1.136*** | 1.131*** | 1.125*** | 1.047*** | 1.041*** | 1.056*** | 1.051*** | 0.626*** | 0.623*** | 0.639*** | 0.637*** |
| | (0.321) | (0.321) | (0.323) | (0.323) | (0.190) | (0.190) | (0.190) | (0.190) | (0.0943) | (0.0944) | (0.0942) | (0.0943) |
| ln age | -3.925*** | -3.936*** | -3.840*** | -3.842*** | -3.072*** | -3.082*** | -3.052*** | -3.055*** | -1.707*** | -1.712*** | -1.708*** | -1.710*** |
| | (0.539) | (0.539) | (0.542) | (0.542) | (0.313) | (0.314) | (0.314) | (0.314) | (0.152) | (0.152) | (0.152) | (0.152) |
| Education | -1.294*** | -1.299*** | -1.266*** | -1.273*** | -1.269*** | -1.274*** | -1.226*** | -1.231*** | -0.783*** | -0.785*** | -0.768*** | -0.770*** |
| | (0.319) | (0.318) | (0.330) | (0.330) | (0.198) | (0.198) | (0.200) | (0.200) | (0.0965) | (0.0965) | (0.0979) | (0.0979) |
| ln income | -1.381*** | -1.385*** | -1.325*** | -1.326*** | -1.140*** | -1.142*** | -1.092*** | -1.092*** | -0.663*** | -0.665*** | -0.632*** | -0.633*** |
| | (0.265) | (0.265) | (0.271) | (0.271) | (0.158) | (0.158) | (0.161) | (0.161) | (0.0750) | (0.0750) | (0.0751) | (0.0752) |
| Asian | 0.758 | 0.736 | 0.833 | 0.801 | 0.492 | 0.475 | 0.590 | 0.563 | 0.274 | 0.265 | 0.365 | 0.352 |
| | (1.212) | (1.208) | (1.232) | (1.228) | (0.651) | (0.648) | (0.666) | (0.662) | (0.318) | (0.317) | (0.327) | (0.327) |
| Black | 2.071*** | 2.078*** | 1.742** | 1.742** | 1.898*** | 1.904*** | 1.768*** | 1.767*** | 1.297*** | 1.300*** | 1.240*** | 1.240*** |
| | (0.695) | (0.695) | (0.711) | (0.710) | (0.388) | (0.388) | (0.394) | (0.393) | (0.189) | (0.189) | (0.193) | (0.193) |
| Hispanic/Latino | 1.452** | 1.449** | 0.856 | 0.840 | 1.674*** | 1.673*** | 1.355*** | 1.341*** | 0.954*** | 0.953*** | 0.800*** | 0.794*** |
| | (0.573) | (0.573) | (0.645) | (0.645) | (0.327) | (0.327) | (0.367) | (0.367) | (0.153) | (0.153) | (0.170) | (0.170) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \beta^{(h)} x_{it} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Random effect estimates with standard errors clustered at individual level.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table S3: **Random Effect Estimates of Price Expectation Equations for Housing**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $x_{it}$ | -0.363*** | -0.374*** | -0.382*** | -0.389*** | -0.144*** | -0.147*** | -0.149*** | -0.151*** | -0.0638*** | -0.0637*** | -0.0634*** | -0.0632*** |
| | (0.0604) | (0.0602) | (0.0547) | (0.0546) | (0.0254) | (0.0254) | (0.0242) | (0.0242) | (0.00945) | (0.00947) | (0.00940) | (0.00942) |
| Female | 0.123 | 0.119 | -0.0138 | -0.0169 | 0.0236 | 0.0226 | -0.0240 | -0.0246 | 0.0356 | 0.0355 | 0.0216 | 0.0215 |
| | (0.180) | (0.180) | (0.0920) | (0.0919) | (0.0666) | (0.0665) | (0.0426) | (0.0426) | (0.0250) | (0.0250) | (0.0216) | (0.0216) |
| $\ln age$ | 2.007*** | 1.993*** | -0.0146 | -0.0207 | 0.663*** | 0.659*** | -0.00791 | -0.00980 | 0.187*** | 0.187*** | 0.0227 | 0.0226 |
| | (0.280) | (0.279) | (0.134) | (0.134) | (0.103) | (0.103) | (0.0632) | (0.0632) | (0.0380) | (0.0380) | (0.0334) | (0.0334) |
| Education | 0.384** | 0.382** | 0.114 | 0.113 | 0.166** | 0.165** | 0.0610 | 0.0607 | 0.0428* | 0.0428* | 0.00841 | 0.00852 |
| | (0.181) | (0.180) | (0.102) | (0.102) | (0.0652) | (0.0651) | (0.0439) | (0.0439) | (0.0237) | (0.0237) | (0.0211) | (0.0211) |
| $\ln income$ | 0.546*** | 0.547*** | 0.247*** | 0.249*** | 0.145*** | 0.145*** | 0.0497 | 0.0502 | 0.0137 | 0.0139 | -0.00911 | -0.00894 |
| | (0.132) | (0.131) | (0.0733) | (0.0731) | (0.0502) | (0.0501) | (0.0353) | (0.0352) | (0.0196) | (0.0196) | (0.0179) | (0.0179) |
| Asian | -1.332* | -1.343* | -0.233 | -0.247 | -0.443* | -0.446* | -0.0547 | -0.0584 | -0.00995 | -0.0103 | 0.0673 | 0.0668 |
| | (0.716) | (0.713) | (0.393) | (0.390) | (0.242) | (0.242) | (0.154) | (0.154) | (0.0879) | (0.0878) | (0.0753) | (0.0752) |
| Black | -1.429*** | -1.418*** | -0.210 | -0.204 | -0.414*** | -0.411*** | -0.0211 | -0.0193 | -0.0362 | -0.0358 | 0.0548 | 0.0550 |
| | (0.345) | (0.344) | (0.192) | (0.192) | (0.128) | (0.128) | (0.0889) | (0.0889) | (0.0500) | (0.0500) | (0.0456) | (0.0457) |
| Hispanic/Latino | -2.074*** | -2.076*** | -0.196 | -0.202 | -0.521*** | -0.522*** | 0.100 | 0.0987 | -0.0114 | -0.0115 | 0.130*** | 0.129*** |
| | (0.290) | (0.289) | (0.159) | (0.159) | (0.111) | (0.111) | (0.0783) | (0.0783) | (0.0412) | (0.0412) | (0.0390) | (0.0390) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \beta^{(h)} x_{it} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Random effect estimates with standard errors clustered at individual level.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table S4: **Random Effect Estimates of Price Expectations and Individual Time-Invariant Characteristics for Equity**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Female | 0.665** | 0.663** | 0.696*** | 0.693*** | 0.836*** | 0.834*** | 0.839*** | 0.837*** | 0.566*** | 0.565*** | 0.565*** | 0.563*** |
| | (0.260) | (0.260) | (0.263) | (0.263) | (0.154) | (0.155) | (0.156) | (0.156) | (0.0778) | (0.0779) | (0.0783) | (0.0784) |
| ln *age* | -2.467*** | -2.469*** | -2.350*** | -2.349*** | -2.420*** | -2.430*** | -2.362*** | -2.366*** | -1.584*** | -1.592*** | -1.550*** | -1.554*** |
| | (0.441) | (0.441) | (0.441) | (0.442) | (0.263) | (0.264) | (0.265) | (0.265) | (0.130) | (0.131) | (0.133) | (0.133) |
| Education | -0.304 | -0.308 | -0.414 | -0.418 | -0.596*** | -0.600*** | -0.678*** | -0.683*** | -0.453*** | -0.455*** | -0.492*** | -0.495*** |
| | (0.272) | (0.272) | (0.280) | (0.280) | (0.163) | (0.163) | (0.166) | (0.166) | (0.0802) | (0.0803) | (0.0821) | (0.0822) |
| ln *income* | -0.670*** | -0.670*** | -0.642*** | -0.641*** | -0.778*** | -0.778*** | -0.763*** | -0.762*** | -0.451*** | -0.452*** | -0.439*** | -0.439*** |
| | (0.207) | (0.207) | (0.214) | (0.214) | (0.133) | (0.133) | (0.136) | (0.136) | (0.0647) | (0.0648) | (0.0657) | (0.0658) |
| Asian | -1.256 | -1.272 | -1.189 | -1.205 | -0.135 | -0.155 | -0.0555 | -0.0805 | -0.139 | -0.150 | -0.114 | -0.129 |
| | (0.931) | (0.932) | (0.948) | (0.948) | (0.552) | (0.552) | (0.569) | (0.569) | (0.249) | (0.249) | (0.258) | (0.259) |
| Black | 0.983* | 0.988* | 0.757 | 0.762 | 1.509*** | 1.517*** | 1.356*** | 1.361*** | 1.133*** | 1.138*** | 1.036*** | 1.038*** |
| | (0.585) | (0.585) | (0.598) | (0.598) | (0.335) | (0.335) | (0.343) | (0.343) | (0.162) | (0.162) | (0.168) | (0.168) |
| Hispanic/Latino | 0.274 | 0.266 | -0.233 | -0.243 | 1.279*** | 1.275*** | 1.007*** | 0.996*** | 0.909*** | 0.908*** | 0.782*** | 0.775*** |
| | (0.505) | (0.505) | (0.559) | (0.559) | (0.282) | (0.282) | (0.311) | (0.311) | (0.133) | (0.133) | (0.146) | (0.147) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Random effect estimates with standard errors clustered at individual level.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table S5: **Random Effect Estimates of Price Expectations and Individual Time-Invariant Characteristics for Gold**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Female | 1.118*** | 1.111*** | 1.105*** | 1.099*** | 1.038*** | 1.033*** | 1.047*** | 1.043*** | 0.629*** | 0.626*** | 0.641*** | 0.639*** |
| | (0.320) | (0.320) | (0.323) | (0.323) | (0.190) | (0.190) | (0.190) | (0.190) | (0.0942) | (0.0943) | (0.0941) | (0.0942) |
| $\ln age$ | -3.781*** | -3.798*** | -3.696*** | -3.703*** | -3.021*** | -3.036*** | -3.001*** | -3.007*** | -1.721*** | -1.728*** | -1.721*** | -1.724*** |
| | (0.536) | (0.536) | (0.538) | (0.538) | (0.311) | (0.312) | (0.312) | (0.312) | (0.151) | (0.151) | (0.151) | (0.152) |
| Education | -1.264*** | -1.270*** | -1.239*** | -1.247*** | -1.259*** | -1.264*** | -1.216*** | -1.222*** | -0.786*** | -0.788*** | -0.770*** | -0.773*** |
| | (0.319) | (0.319) | (0.331) | (0.330) | (0.198) | (0.198) | (0.201) | (0.201) | (0.0965) | (0.0966) | (0.0979) | (0.0980) |
| $\ln income$ | -1.356*** | -1.360*** | -1.301*** | -1.303*** | -1.131*** | -1.134*** | -1.083*** | -1.084*** | -0.666*** | -0.668*** | -0.634*** | -0.635*** |
| | (0.264) | (0.264) | (0.270) | (0.270) | (0.158) | (0.158) | (0.160) | (0.160) | (0.0750) | (0.0750) | (0.0751) | (0.0752) |
| Asian | 0.781 | 0.758 | 0.852 | 0.819 | 0.500 | 0.482 | 0.597 | 0.570 | 0.272 | 0.263 | 0.363 | 0.350 |
| | (1.211) | (1.207) | (1.231) | (1.226) | (0.650) | (0.647) | (0.665) | (0.662) | (0.318) | (0.317) | (0.328) | (0.327) |
| Black | 2.033*** | 2.042*** | 1.705** | 1.706** | 1.885*** | 1.892*** | 1.754*** | 1.755*** | 1.301*** | 1.304*** | 1.243*** | 1.244*** |
| | (0.696) | (0.695) | (0.711) | (0.711) | (0.388) | (0.388) | (0.394) | (0.394) | (0.189) | (0.189) | (0.193) | (0.193) |
| Hispanic/Latino | 1.434** | 1.432** | 0.842 | 0.826 | 1.667*** | 1.667*** | 1.350*** | 1.337*** | 0.956*** | 0.955*** | 0.801*** | 0.795*** |
| | (0.574) | (0.573) | (0.645) | (0.645) | (0.327) | (0.327) | (0.367) | (0.367) | (0.153) | (0.153) | (0.170) | (0.170) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Random effect estimates with standard errors clustered at individual level.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table S6: **Random Effect Estimates of Price Expectations and Individual Time-Invariant Characteristics for Housing**

| | One Month Ahead | | | | Three Months Ahead | | | | One Year Ahead | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Female | 0.144 | 0.140 | 0.00295 | 0.000163 | 0.0320 | 0.0311 | -0.0175 | -0.0180 | 0.0393 | 0.0391 | 0.0243 | 0.0243 |
| | (0.180) | (0.180) | (0.0926) | (0.0925) | (0.0669) | (0.0667) | (0.0429) | (0.0429) | (0.0251) | (0.0251) | (0.0217) | (0.0217) |
| ln *age* | 2.085*** | 2.072*** | 0.0594 | 0.0546 | 0.694*** | 0.690*** | 0.0207 | 0.0192 | 0.201*** | 0.200*** | 0.0348 | 0.0346 |
| | (0.280) | (0.280) | (0.134) | (0.134) | (0.103) | (0.103) | (0.0631) | (0.0631) | (0.0381) | (0.0381) | (0.0336) | (0.0335) |
| Education | 0.406** | 0.405** | 0.145 | 0.144 | 0.175*** | 0.175*** | 0.0729* | 0.0728* | 0.0467** | 0.0467** | 0.0134 | 0.0135 |
| | (0.182) | (0.181) | (0.102) | (0.102) | (0.0654) | (0.0653) | (0.0441) | (0.0441) | (0.0238) | (0.0238) | (0.0211) | (0.0212) |
| ln *income* | 0.607*** | 0.609*** | 0.307*** | 0.309*** | 0.169*** | 0.170*** | 0.0727** | 0.0736** | 0.0244 | 0.0245 | 0.000657 | 0.000778 |
| | (0.131) | (0.131) | (0.0731) | (0.0729) | (0.0502) | (0.0501) | (0.0353) | (0.0352) | (0.0197) | (0.0197) | (0.0180) | (0.0180) |
| Asian | -1.370* | -1.383* | -0.241 | -0.256 | -0.459* | -0.462* | -0.0579 | -0.0617 | -0.0171 | -0.0174 | 0.0663 | 0.0658 |
| | (0.716) | (0.713) | (0.395) | (0.392) | (0.242) | (0.242) | (0.155) | (0.155) | (0.0883) | (0.0882) | (0.0758) | (0.0758) |
| Black | -1.531*** | -1.523*** | -0.298 | -0.294 | -0.455*** | -0.452*** | -0.0553 | -0.0541 | -0.0542 | -0.0537 | 0.0403 | 0.0405 |
| | (0.345) | (0.345) | (0.194) | (0.194) | (0.128) | (0.128) | (0.0894) | (0.0894) | (0.0500) | (0.0500) | (0.0458) | (0.0458) |
| Hispanic/Latino | -2.143*** | -2.148*** | -0.224 | -0.230 | -0.549*** | -0.550*** | 0.0896 | 0.0879 | -0.0237 | -0.0238 | 0.125*** | 0.125*** |
| | (0.290) | (0.290) | (0.160) | (0.160) | (0.111) | (0.111) | (0.0786) | (0.0786) | (0.0413) | (0.0413) | (0.0392) | (0.0391) |
| Time Dummies | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | No | No | Yes | Yes | No | No | Yes | Yes | No | No | Yes | Yes |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \alpha_i^{(h)} + \varepsilon_{i,t+h}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Random effect estimates with standard errors clustered at individual level.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

## S4 Fixed Effects-Time Effects (FE-TE) Estimators

Consider the panel data model

$$y_{it} = \alpha_i + \gamma_t + \theta x_{it} + u_{it}, \tag{S3}$$

where $i = 1, 2, \ldots, H$ and $t = 1, 2, \ldots, T_i$ for respondent $i$, and let $T = \max_i T_i$. Let $N_t$ be the number of respondents observed in period $t$ and let $\mathbb{N}_t$ be the set of respondents observed in period $t$. Let $s_{it}$ be a binary variable which takes the value of 1 if a response is recorded for respondent $i$ at time period $t$, and equal to 0, otherwise. Finally, let $N = \sum_t N_t$.[S1]

Denote the available observations by respondents at time $t$ by the $N_t \times 1$ vector, $\mathbf{y}_{.t,N_t}$, whose elements are members of the set $\mathbb{N}_t$. Specifically, $N_t = \#\mathbb{N}_t$. $\mathbf{x}_{.t,N_t}$ is defined analogously. Stack $\mathbf{y}_{.t,N_t}$ and $\mathbf{x}_{.t,N_t}$ over $t = 1, 2, ..., T$ to obtain

$$\mathbf{y} = \begin{Bmatrix} \mathbf{y}_{.1,N_1} \\ \mathbf{y}_{.2,N_2} \\ \vdots \\ \mathbf{y}_{.T,N_T} \end{Bmatrix}, \text{ and } \mathbf{x} = \begin{Bmatrix} \mathbf{x}_{.1,N_1} \\ \mathbf{x}_{.2,N_2} \\ \vdots \\ \mathbf{x}_{.T,N_T} \end{Bmatrix}.$$

Next, following the procedure described in Wansbeek and Kapteyn (1989), let $\mathbf{D}_t$ be the $N_t \times H$ matrix obtained from the $H \times H$ identity matrix from which the rows corresponding to the respondents not observed in period $t$ have been omitted, and let $\boldsymbol{\iota}_H$ be the $H \times 1$ vector of ones. Define

$$\mathbf{Z}_1 = \begin{Bmatrix} \mathbf{D}_1 & \mathbf{D}_1\boldsymbol{\iota}_H & & & \\ \mathbf{D}_2 & & \mathbf{D}_2\boldsymbol{\iota}_H & & \\ \vdots & & & \ddots & \\ \mathbf{D}_T & & & & \mathbf{D}_T\boldsymbol{\iota}_H \end{Bmatrix},$$

[S1] In terms of paper's notation, $y_{it}$ corresponds to $\hat{\pi}^e_{i,t+h|t}$ and $v_{it}$ corresponds to $x_{it}$ in equation (26) of the paper.

and

$$\mathbf{Z}_2 = \begin{Bmatrix} \mathbf{D}_1\boldsymbol{\iota}_H & & & \\ & \mathbf{D}_2\boldsymbol{\iota}_H & & \\ & & \ddots & \\ & & & \mathbf{D}_T\boldsymbol{\iota}_H \end{Bmatrix},$$

and set $\mathbf{Z} = (\mathbf{Z}_1, \mathbf{Z}_2)$. Also let

$$\bar{\mathbf{Z}} = \mathbf{Z}_2 - \mathbf{Z}_1 \left(\mathbf{Z}_1'\mathbf{Z}_1\right)^{-1} \mathbf{Z}_1'\mathbf{Z}_2,$$

$$\mathbf{Q} = \mathbf{Z}_2'\mathbf{Z}_2 - \mathbf{Z}_2'\mathbf{Z}_1 \left(\mathbf{Z}_1'\mathbf{Z}_1\right)^{-1} \mathbf{Z}_1'\mathbf{Z}_2',$$

and

$$\mathbf{P} = \mathbf{I}_N - \mathbf{Z}_1 \left(\mathbf{Z}_1'\mathbf{Z}_1\right)^{-1} \mathbf{Z}_1' - \bar{\mathbf{Z}}\mathbf{Q}^{-}\bar{\mathbf{Z}}',$$

where $\mathbf{I}_N$ denotes the $N \times N$ identity matrix, and $\mathbf{Q}^{-}$ is any generalized inverse of $\mathbf{Q}$. The resultant $\mathbf{P}$ matrix does not depend on the choiceof the generalized inverse. See (Wansbeek and Kapteyn (1989). Now define transformed variables $\tilde{\mathbf{y}} = \mathbf{P}\mathbf{y}$ and $\tilde{\mathbf{v}} = \mathbf{P}\mathbf{x}$ and consider the transformed panel regression

$$\tilde{y}_{it} = \theta\tilde{x}_{it} + \varepsilon_{it}.$$

We estimate $\theta$ by

$$\hat{\theta}_{FE-TE} = \left[\sum_{i=1}^{H}\sum_{t=1}^{T} s_{it}(\tilde{x}_{it} - \bar{\tilde{x}})^2\right]^{-1} \left[\sum_{h=1}^{H}\sum_{t=1}^{T} s_{it}(\tilde{x}_{it} - \bar{\tilde{x}})(\tilde{y}_{it} - \bar{\tilde{y}})\right], \tag{S4}$$

where $\bar{\tilde{x}} = \frac{1}{N}\sum_{i=1}^{H}\sum_{t=1}^{T} s_{it}\tilde{x}_{it}$, and $\bar{\tilde{y}}$ is defined analogously.

Let $\hat{\varepsilon}_{it,FE-TE} = \tilde{y}_{it} - \bar{\tilde{y}} - (\tilde{x}_{it} - \bar{\tilde{x}})\hat{\theta}_{FE-TE}$ and $\hat{\boldsymbol{\varepsilon}}_{i,FE-TE} = (\hat{\varepsilon}_{it_{1,i},FE-TE}, \hat{\varepsilon}_{it_{2,i},FE-TE}, \ldots, \hat{\varepsilon}_{iT_i,FE-TE})'$, where $t_{1,i}$ is the first time period in which respondent $i$ is observed. Also, define

$$\mathbf{x}_{i.}^{*} = \begin{Bmatrix} \tilde{x}_{it_{1,i}} - \bar{\tilde{x}} \\ \tilde{x}_{it_{2,i}} - \bar{\tilde{x}} \\ \vdots \\ \tilde{x}_{iT_i} - \bar{\tilde{x}}, \end{Bmatrix}.$$

The variance of $\hat{\theta}_{FE-TE}$ is computed as

$$\widehat{Var}(\hat{\theta}_{FE-TE}) = \left(\sum_{i=1}^{H} \mathbf{x}_{i.}^{*'}\mathbf{x}_{i.}^{*}\right)^{-1} \left(\sum_{i=1}^{H} \mathbf{x}_{i.}^{*'}\hat{\boldsymbol{\varepsilon}}_{h,OLS}\hat{\boldsymbol{\varepsilon}}_{i,OLS}'\mathbf{x}_{i.}^{*}\right) \left(\sum_{i=1}^{H} \mathbf{x}_{i.}^{*'}\mathbf{x}_{i.}^{*}\right)^{-1} \quad \text{(S5)}$$

# S5 Fixed Effects-Time Effects Filtered Estimators of the time- invariant effects

The parameters of interest are the $k \times 1$ vector of time-invaraint effects, $\boldsymbol{\gamma}$,

$$y_{it} = a + \boldsymbol{\gamma}'\mathbf{z}_i + \gamma_t + \theta x_{it} + u_{it} + \varepsilon_i,$$

obtained from (S3), by replacing $\alpha_i$ with $a + \boldsymbol{\gamma}'\mathbf{z}_i + \varepsilon_i$, where $\mathbf{z}_i$ is the $k \times 1$ vector of time-invaraint characteristics of respondent $i$. To estimate $\boldsymbol{\gamma}$, we assume that $\mathbf{z}_i$ is distributed independently of $\varepsilon_i$ and $\bar{u}_i = \sum_{t=1}^{T} s_{it}u_{it} / \sum_{t=1}^{T} s_{it}$, where $s_{it} = 1$ if respondent $i$ is in the sample and 0, otherwise. note that $\sum_{t=1}^{T} s_{it} = T_i$, where $T_i$ denotes the number of time periods that respondent $i$ is observed in the data. To estimate $\boldsymbol{\gamma}$ we extend the method proposed in Pesaran and Zhou (2016) to unbalanced panels with time effects, and adopt a two-stage procedure where in the first-step the effects of $x_{it}$ are filtered out, by considering the individual specific residuals after estimation of $\theta$ by FE-TE applied to (S3). In this way we allow $x_{it}$ and $v_i$ to be correlated for each $i$. Let

$$\hat{u}_{it} = y_{it} - \hat{\theta}_{FE-TE}x_{it},$$

and note that for a fixed $T$ and $N$ large

$$\hat{u}_{it} = a + \boldsymbol{\gamma}'\mathbf{z}_i + \gamma_t + \varepsilon_i + O_p(N^{-1/2}).$$

Then for each respondent averaging $\hat{u}_{it}$ over $t$, taking into account of the unbalanced nature of the panel, we have

$$\bar{\hat{u}}_i = a + \boldsymbol{\gamma}'\mathbf{z}_i + \bar{s}_{\gamma i} + \varepsilon_i + O_p(N^{-1/2}), \quad \text{(S6)}$$

where

$$\bar{s}_{\gamma i} = \left( \frac{\sum_{t=1}^{T} s_{it}\gamma_t}{\sum_{t=1}^{T} s_{it}} \right),$$

and

$$\bar{\hat{u}}_i = \left( \sum_{t=1}^{T} s_{it}\hat{u}_{it} \right) / \left( \sum_{t=1}^{T} s_{it} \right).$$

We note that $\bar{s}_{\gamma i} = \bar{s}_{\gamma i'}$, if respondents $i$ and $i'$ have the same participation pattern, as represented by $\mathbf{s}_i = (s_{i1}, s_{i2}, \dots, s_{iT})'$. As Table 2 in the paper shows the frequency of participation across the survey waves has been quite high, and there is a high probability that many respondents have the same participation pattern, $\mathbf{s}_i$. Accordingly, we use a dummy variable to identify the set of respondents with the same participation patter. Specifically, let $\mathcal{S}$ be the set of unique response patterns in the data,

$$\mathcal{S} = \{\xi \in \{0,1\}^T | \xi = \mathbf{s}_i \text{ for at least one } i = 1, 2, \dots, H\}.$$

Denote the cardinality of $\mathcal{S}$ by $|\mathcal{S}| = m$ and assume that the elements of $\mathcal{S}$ are ordered, with $\xi_l$ denoting the $l^{th}$ element of $\mathcal{S}$. Note that $m \leq 2^T - 1$. Let

$$\mathbf{d}_i = (d_{i1}, d_{i2}, \dots, d_{i,m}) \tag{S7}$$

be the vector of time effects of respondent $i$, with $d_{il} = 1$ if $s_i = \xi_l$, and $d_{il}$ equal to zero, otherwise. In effects respondents with the same participation pattern are grouped together and assigned a dummy variable which takes the value of unit if a respondent belong to the group and zero otherwise. With these additional dummy variabkes, (S6) can be written as

$$\bar{\hat{u}}_i = a + \boldsymbol{\gamma}'\mathbf{z}_i + \boldsymbol{\lambda}'\mathbf{d}_i + \varepsilon_i + O_p(N^{-1/2}), \tag{S8}$$

or more compactly as

$$\bar{\hat{u}}_i = \boldsymbol{\phi}'\mathbf{q}_i + \varepsilon_i + O_p(N^{-1/2}),$$

where $\boldsymbol{\phi} = (a, \boldsymbol{\gamma}', \boldsymbol{\lambda}')'$ and $\mathbf{q}_i = (1, \mathbf{z}_i', \mathbf{d}_i')'$. Then the FE-TE filtered (FE-TE-F) estimator of $\boldsymbol{\phi}$ is computed as

$$\hat{\boldsymbol{\phi}}_{FE-TE-F} = \left[\sum_{i=1}^{H}(\mathbf{q}_i - \bar{\mathbf{q}})(\mathbf{q}_i - \bar{\mathbf{q}})'\right]^{-1} \sum_{i=1}^{H}(\mathbf{q}_i - \bar{\mathbf{q}})(\bar{\hat{u}}_i - \bar{\hat{u}}), \tag{S9}$$

where $\bar{\hat{u}} = H^{-1}\sum_{i=1}^{H}\bar{\hat{u}}_i$, and $H$ is the total number of respondents in the sample
The variance of $\hat{\boldsymbol{\phi}}_{FE-TE-F}$ is estimated by (see also Proposition 2 of Pesaran and Zhou (2016)),

$$\widehat{Var}(\hat{\boldsymbol{\phi}}_{FE-TE-F}) = H^{-1}\mathbf{Q}_{qq,H}^{-1}\left[\hat{\mathbf{V}}_{qq,H} + \mathbf{Q}_{q\bar{x},H}\left(H\,\widehat{Var}(\hat{\theta}_{FE-TE})\right)\mathbf{Q}_{q\bar{x},H}'\right]\mathbf{Q}_{qq,H}^{-1}, \tag{S10}$$

where $\widehat{Var}(\hat{\theta}_{FE-TE})$ is given by (S5), and

$$\mathbf{Q}_{qq,H} = \frac{1}{H}\sum_{i=1}^{H}(\mathbf{q}_i - \bar{\mathbf{q}})(\mathbf{q}_i - \bar{\mathbf{q}})',$$

$$\mathbf{Q}_{q\bar{v},H} = \frac{1}{H}\sum_{i=1}^{H}(\mathbf{q}_i - \bar{\mathbf{q}})(x_i - \bar{x})',\ \bar{x} = \sum_{i=1}^{H}\bar{x}_i/H,$$

$$\hat{\mathbf{V}}_{qq,H} = \frac{1}{H}\sum_{i=1}^{H}(\hat{\varsigma}_i - \bar{\hat{\varsigma}})^2(\mathbf{q}_i - \bar{\mathbf{q}})(\mathbf{q}_i - \bar{\mathbf{q}})',$$

and

$$\hat{\varsigma}_i - \bar{\hat{\varsigma}} = \bar{y}_i - \bar{y} - (x_i - \bar{x})\hat{\theta}_{FE-TE} - (\mathbf{q}_i - \bar{\mathbf{q}})'\hat{\boldsymbol{\phi}}_{FE-TE-F}.$$

## S5.1 FE-TE Filtered estimates for the double-question surveys

We consider the following model.

$$\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \beta^{(h)}x_{it} + \mathbf{d}_i'\xi^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}, \tag{S11}$$

with $\mathbf{d}_i$ as specified in equation (S7). There are $m = 943$ unique response patterns in our data, 456 of which pertain to at least two respondents. We estimate two specifications of the model. In the first one we introduce dummies for each response pattern, i.e. $\mathbf{d}_i \in \mathbb{R}^{942}$

(we leave out one dummy). Second, we estimate a model with time dummies for response patterns shared by at least two respondents, $\mathbf{d}_i \in \mathbb{R}^{456}$. Finally, as a benchmark, we estimate a model with no response pattern effects. The estimates are presented in Tables S7, S8 and S9.

Table S7: **FE-TE Filtered Estimates of Price Expectation Equations with 942 Response Pattern Dummies**

| | One Month Ahead | | | Three Months Ahead | | | One Year Ahead | | |
|---|---|---|---|---|---|---|---|---|---|
| | Equity | Gold | Housing | Equity | Gold | Housing | Equity | Gold | Housing |
| Female | 0.817*** | 1.067*** | -0.018 | 0.951*** | 1.016*** | -0.009 | 0.582*** | 0.610*** | 0.025 |
| | (0.310) | (0.377) | (0.192) | (0.178) | (0.215) | (0.071) | (0.087) | (0.103) | (0.028) |
| ln age | -2.880*** | -3.586*** | 1.386*** | -2.536*** | -2.737*** | 0.489*** | -1.536*** | -1.492*** | 0.180*** |
| | (0.597) | (0.658) | (0.302) | (0.337) | (0.369) | (0.114) | (0.157) | (0.171) | (0.044) |
| ln income | -0.595** | -1.145*** | 0.430*** | -0.771*** | -0.892*** | 0.109* | -0.422*** | -0.536*** | 0.010 |
| | (0.272) | (0.328) | (0.145) | (0.161) | (0.188) | (0.056) | (0.076) | (0.087) | (0.022) |
| Education | -0.220 | -1.161*** | 0.044 | -0.410** | -1.051*** | 0.041 | -0.328*** | -0.643*** | 0.024 |
| | (0.346) | (0.397) | (0.194) | (0.191) | (0.234) | (0.070) | (0.090) | (0.107) | (0.025) |
| Asian | -1.637 | 2.232 | -1.575** | -0.008 | 1.379** | -0.550** | -0.199 | 0.578* | -0.065 |
| | (1.054) | (1.445) | (0.764) | (0.641) | (0.686) | (0.251) | (0.312) | (0.334) | (0.089) |
| Black | 1.217* | 1.948** | -1.355*** | 1.333*** | 1.507*** | -0.403*** | 0.963*** | 1.043*** | -0.071 |
| | (0.727) | (0.795) | (0.390) | (0.401) | (0.436) | (0.146) | (0.188) | (0.210) | (0.057) |
| Hispanic/Latino | -0.330 | 0.883 | -1.706*** | 0.912*** | 1.380*** | -0.415*** | 0.693*** | 0.818*** | -0.002 |
| | (0.621) | (0.680) | (0.321) | (0.330) | (0.376) | (0.123) | (0.152) | (0.171) | (0.047) |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \beta^{(h)}x_{it} + \mathbf{d}_i'\xi^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
FE-TE Filtered estimates with standard errors robust to heteroskedasticity and serial correlation.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.
Filtered estimates are computed using the estimator of Pesaran and Zhou (2016).

Table S8: **FE-TE Filtered Estimates of Price Expectation Equations with 456 Response Pattern Dummies**

| | One Month Ahead | | | Three Months Ahead | | | One Year Ahead | | |
|---|---|---|---|---|---|---|---|---|---|
| | Equity | Gold | Housing | Equity | Gold | Housing | Equity | Gold | Housing |
| Female | 0.792*** | 1.181*** | 0.071 | 0.888*** | 1.075*** | 0.003 | 0.567*** | 0.646*** | 0.029 |
| | (0.297) | (0.363) | (0.181) | (0.171) | (0.208) | (0.068) | (0.084) | (0.099) | (0.026) |
| ln age | -2.895*** | -3.781*** | 1.297*** | -2.506*** | -2.871*** | 0.458*** | -1.523*** | -1.513*** | 0.172*** |
| | (0.550) | (0.616) | (0.283) | (0.314) | (0.349) | (0.107) | (0.146) | (0.160) | (0.041) |
| ln income | -0.695*** | -1.292*** | 0.417*** | -0.773*** | -0.980*** | 0.105** | -0.426*** | -0.565*** | 0.006 |
| | (0.257) | (0.310) | (0.135) | (0.154) | (0.178) | (0.053) | (0.072) | (0.082) | (0.021) |
| Education | -0.171 | -1.144*** | 0.137 | -0.463** | -1.084*** | 0.089 | -0.360*** | -0.676*** | 0.042* |
| | (0.327) | (0.375) | (0.182) | (0.181) | (0.223) | (0.066) | (0.085) | (0.102) | (0.024) |
| Asian | -2.073* | 1.029 | -1.653** | -0.121 | 0.808 | -0.535** | -0.200 | 0.412 | -0.035 |
| | (1.181) | (1.523) | (0.761) | (0.647) | (0.704) | (0.246) | (0.295) | (0.330) | (0.084) |
| Black | 1.107 | 1.664** | -1.214*** | 1.387*** | 1.630*** | -0.341*** | 1.019*** | 1.117*** | -0.032 |
| | (0.679) | (0.747) | (0.352) | (0.376) | (0.414) | (0.132) | (0.176) | (0.198) | (0.054) |
| Hispanic/Latino | -0.139 | 1.161* | -1.750*** | 1.027*** | 1.559*** | -0.402*** | 0.786*** | 0.902*** | 0.019 |
| | (0.564) | (0.628) | (0.298) | (0.308) | (0.352) | (0.114) | (0.142) | (0.161) | (0.044) |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \beta^{(h)}x_{it} + \mathbf{d}_i'\xi^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.

$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$

FE-TE Filtered estimates with standard errors robust to heteroskedasticity and serial correlation.

Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Filtered estimates are computed using the estimator of Pesaran and Zhou (2016).

Table S9: **FE-TE Filtered Estimates of Price Expectation Equations with 0 Response Pattern Dummies**

| | One Month Ahead | | | Three Months Ahead | | | One Year Ahead | | |
|---|---|---|---|---|---|---|---|---|---|
| | Equity | Gold | Housing | Equity | Gold | Housing | Equity | Gold | Housing |
| Female | 0.764** | 1.173*** | 0.139 | 0.898*** | 1.061*** | 0.031 | 0.570*** | 0.622*** | 0.037 |
| | (0.301) | (0.356) | (0.185) | (0.171) | (0.203) | (0.069) | (0.084) | (0.098) | (0.026) |
| ln age | -2.844*** | -4.127*** | 2.039*** | -2.633*** | -3.135*** | 0.672*** | -1.668*** | -1.723*** | 0.189*** |
| | (0.511) | (0.591) | (0.287) | (0.296) | (0.332) | (0.107) | (0.142) | (0.158) | (0.040) |
| ln income | -0.666*** | -1.361*** | 0.547*** | -0.817*** | -1.118*** | 0.144*** | -0.479*** | -0.656*** | 0.011 |
| | (0.241) | (0.302) | (0.135) | (0.148) | (0.172) | (0.052) | (0.070) | (0.080) | (0.021) |
| Education | -0.343 | -1.311*** | 0.389** | -0.622*** | -1.279*** | 0.165** | -0.467*** | -0.797*** | 0.042* |
| | (0.329) | (0.370) | (0.187) | (0.184) | (0.220) | (0.068) | (0.087) | (0.103) | (0.025) |
| Asian | -1.577 | 0.982 | -1.299* | -0.210 | 0.557 | -0.448* | -0.170 | 0.299 | -0.016 |
| | (1.056) | (1.407) | (0.738) | (0.619) | (0.687) | (0.246) | (0.274) | (0.325) | (0.089) |
| Black | 0.959 | 1.976*** | -1.487*** | 1.502*** | 1.885*** | -0.433*** | 1.136*** | 1.308*** | -0.040 |
| | (0.665) | (0.751) | (0.354) | (0.368) | (0.409) | (0.133) | (0.173) | (0.198) | (0.053) |
| Hispanic/Latino | -0.097 | 1.279** | -2.031*** | 1.206*** | 1.681*** | -0.499*** | 0.895*** | 0.966*** | -0.004 |
| | (0.586) | (0.640) | (0.295) | (0.310) | (0.353) | (0.114) | (0.142) | (0.161) | (0.043) |

The estimates reported refer to the panel regressions $\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i'\boldsymbol{\gamma}^{(h)} + \beta^{(h)}x_{it} + \mathbf{d}_i'\xi^{(h)} + \varepsilon_{i,t+h} + \psi_i^{(h)}$ using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
FE-TE Filtered estimates with standard errors robust to heteroskedasticity and serial correlation.
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.
Filtered estimates are computed using the estimator of Pesaran and Zhou (2016).

# S6 Comparison of estimates of the expectation-valuation equation for different model specifications

In Table S11 we present a comparison of the estimates of $\beta^{(h)}$ in the equation

$$\hat{\pi}^e_{i,t+h|t} = \alpha^{(h)} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \beta^{(h)} x_{it} + \varepsilon_{i,t+h} + \psi_i^{(h)} \tag{S12}$$

for different model specifications. We consider FE and FE-TE estimates of $\beta^{(h)}$. We also consider a model where $\psi_i^{(h)}$ is treated as random. We estimate the RE model with and without the time-invariant characteristics $\mathbf{z}_i$, and with/without time and MSA dummies.

Then, using the estimates of $\beta^{(h)}$ for the housing market, we calculate the estimated interest rate, $\hat{r}$. Given the estimates $\hat{\beta}^{(h_1)}$ and $\hat{\beta}^{(h_2)}$, compute the interest rate estimates as follows:

$$\hat{r}_{h_1,h_2} = \left( \frac{h_1}{h_2} \frac{\beta^{(h_1)}}{\beta^{(h_2)}} \right)^{\frac{1}{h_1 - h_2}} - 1,$$

for cases where $|\hat{\beta}^{(h_1)}| < |\hat{\beta}^{(h_2)}|$. The interest rate estimates are presented in Table S10.

Table S10: **Alternative estimates of the discount rate $r$, using FE, FE-TE and RE estimates of $\beta^{(h)}$ for house prices**

| | FE | FE-TE | RE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $\hat{r}_{3,1}$ | 0.044 | 0.039 | 0.082 | 0.082 | 0.055 | 0.057 | 0.091 | 0.086 | 0.082 | 0.079 |
| $\hat{r}_{12,1}$ | 0.064 | 0.060 | 0.058 | 0.055 | 0.055 | 0.053 | 0.070 | 0.067 | 0.065 | 0.063 |
| $\hat{r}_{12,3}$ | 0.069 | 0.065 | 0.053 | 0.049 | 0.055 | 0.052 | 0.066 | 0.063 | 0.061 | 0.059 |
| Time Dummies | | | No | Yes | No | Yes | No | Yes | No | Yes |
| MSA Dummies | | | No | No | Yes | Yes | No | No | Yes | Yes |
| Demographics | | | No | No | No | No | Yes | Yes | Yes | Yes |

Table S11: **Estimates of $\beta^{(h)}$ in equation (26) for different model specifications**

| | horizon | FE | FE-TE | RE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| equity | One Month Ahead | -0.0991 | -0.126 | -0.0849 | -0.107 | -0.108 | -0.131 | -0.124 | -0.146 | -0.133 | -0.156 |
| | | (0.127) | (0.128) | (0.116) | (0.116) | (0.116) | (0.117) | (0.116) | (0.116) | (0.116) | (0.117) |
| | Three Months Ahead | -0.0905 | -0.0995 | -0.0719 | -0.0798 | -0.0908 | -0.0988 | -0.118* | -0.126* | -0.120* | -0.128* |
| | | (0.0760) | (0.0760) | (0.0703) | (0.0703) | (0.0705) | (0.0705) | (0.0700) | (0.0700) | (0.0703) | (0.0704) |
| | One Year Ahead | -0.115*** | -0.117*** | -0.111*** | -0.112*** | -0.121*** | -0.122*** | -0.138*** | -0.140*** | -0.139*** | -0.140*** |
| | | (0.0365) | (0.0364) | (0.0339) | (0.0339) | (0.0340) | (0.0340) | (0.0337) | (0.0337) | (0.0339) | (0.0339) |
| gold | One Month Ahead | 0.602*** | 0.581*** | 0.409 ** | 0.389 ** | 0.455 *** | 0.435 ** | 0.581 *** | 0.562 *** | 0.591 *** | 0.572 *** |
| | | (0.197) | (0.198) | (0.175) | (0.176) | (0.176) | (0.177) | (0.177) | (0.177) | (0.178) | (0.178) |
| | Three Months Ahead | 0.222** | 0.203* | 0.0850 | 0.0678 | 0.113 | 0.0960 | 0.208 ** | 0.190 * | 0.213 ** | 0.195 * |
| | | (0.108) | (0.109) | (0.0986) | (0.0987) | (0.0990) | (0.0992) | (0.0993) | (0.0994) | (0.0997) | (0.0998) |
| | One Year Ahead | -0.0226 | -0.0316 | -0.114 ** | -0.122 *** | -0.0996 ** | -0.108 ** | -0.0565 | -0.0646 | -0.0524 | -0.0606 |
| | | (0.0488) | (0.0489) | (0.0453) | (0.0454) | (0.0455) | (0.0456) | (0.0455) | (0.0456) | (0.0457) | (0.0458) |
| housing | One Month Ahead | -0.292*** | -0.303*** | -0.443 *** | -0.456 *** | -0.412 *** | -0.419 *** | -0.363 *** | -0.374 *** | -0.382 *** | -0.389 *** |
| | | (0.0643) | (0.0642) | (0.0602) | (0.0601) | (0.0545) | (0.0544) | (0.0604) | (0.0602) | (0.0547) | (0.0546) |
| | Three Months Ahead | -0.106*** | -0.109*** | -0.173 *** | -0.178 *** | -0.153 *** | -0.156 *** | -0.144 *** | -0.147 *** | -0.149 *** | -0.151 *** |
| | | (0.0273) | (0.0274) | (0.0252) | (0.0252) | (0.0239) | (0.0239) | (0.0254) | (0.0254) | (0.0242) | (0.0242) |
| | One Year Ahead | -0.0481*** | -0.0479*** | -0.0687 *** | -0.0686 *** | -0.0618 *** | -0.0616 *** | -0.0638 *** | -0.0637 *** | -0.0634 *** | -0.0632 *** |
| | | (0.0102) | (0.0102) | (0.00941) | (0.00943) | (0.00937) | (0.00939) | (0.00945) | (0.00947) | (0.00940) | (0.00942) |
| | Time Dummies | | | No | Yes | No | Yes | No | Yes | No | Yes |
| | MSA Dummies | | | No | No | Yes | Yes | No | No | Yes | Yes |
| | Demographics | | | No | No | No | No | Yes | Yes | Yes | Yes |

The equation $\hat{\pi}^{e}_{i,t+h|t} = \beta^{(h)} x_{it} + \mathbf{z}_i' \boldsymbol{\gamma}^{(h)} + \alpha_i + \delta_t + \varepsilon_{i,t+h}$ is estimated using an unbalanced panel of 4,971 respondents over 11 months, March 2012 to January 2013.
$N = 35,961$, $T_{min} = 1$, $T_{p25} = 4$, $T_{p50} = 6$, $\bar{T} = 7.23$, $T_{p75} = 9$, $T_{max} = 11$
Standard errors are in parentheses, *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.
Standard errors are robust to heteroskedasticity and serial correlation.
† Female= 1

## S7 Two-Step General Method of Moments Estimator

In this section we provide additional information on estimation of the dynamic panel regressions of realized house price changes. We follow the procedure described by Arellano and Bond (1991) with some modifications. Consider the model

$$\pi_{s,t+1} = \alpha_s + \lambda \pi_{st} + \boldsymbol{\beta}' \mathbf{x}_{st} + u_{s,t+1} \tag{S13}$$

with $s = 1, 2, \ldots, N\ (= 48)$, and $t = 3, 4, \ldots, T\ (= 11)$ (May 2012-January 2013). Depending on the model specification, $\mathbf{x}_{st}$ corresponds to $\hat{\pi}^e_{s,t+h|t}$, $(\hat{\pi}^e_{s,t+h|t}, B_{s,t+h|t}, C_{s,t+h|t})$ or $(\hat{\pi}^e_{s,t+h|t}, B_{s,t+h|t}, C_{s,t+h|t}, B^*_{s,t+h|t}, C^*_{s,t+h|t})$. See equations (35) and (36) of the paper. First differencing equation (S13) to eliminate the MSA fixed effects, $\alpha_s$, we obtain

$$\Delta \pi_{s,t+1} = \lambda \Delta \pi_{st} + \beta' \Delta x_{st} + \Delta u_{s,t+1}$$

Denote the stacked observations by $\Delta \boldsymbol{\pi}_{s,+1} = (\Delta \pi_{s,4}, \Delta \pi_{s,5}, \ldots, \Delta \pi_{s,12})'$, $\Delta \boldsymbol{\pi}_{s,} = (\Delta \pi_{s,3}, \Delta \pi_{s,4}, \ldots, \Delta \pi_{s,11})'$, $\Delta \mathbf{u}_{s,+1} = (\Delta u_{s,4}, \Delta u_{s,5}, \ldots, \Delta u_{s,12})'$ and $\Delta \mathbf{X}_s = (\Delta \mathbf{x}'_{s,3}, \Delta \mathbf{x}'_{s,4}, , \ldots, \Delta \mathbf{x}'_{s,11})'$.

We treat $x_{st}$ as predetermined and use the instrument matrix

$$\mathbf{W}_s = \begin{pmatrix} (\pi_{s1}, \pi_{s2}, \mathbf{x}_{s1}, \mathbf{x}_{s2}) & 0 & \cdots & \cdots & 0 \\ 0 & (\pi_{s2}, \pi_{s3}, \mathbf{x}_{s2}, \mathbf{x}_{s3}) & \cdots & \cdots & 0 \\ \vdots & \ddots & \ddots & \ddots & 0 \\ 0 & \cdots & \cdots & \cdots & (\pi_{s9}, \pi_{s10}, \mathbf{x}_{s9}, \mathbf{x}_{s,10}) \end{pmatrix}.$$

The moment conditions can be expressed as

$$E[\mathbf{W}'_s \Delta \mathbf{u}_{s,+1}] = 0.$$

We can write

$$\Delta \boldsymbol{\pi}_{+1} = \lambda \Delta \boldsymbol{\pi} + \Delta \mathbf{X} \beta + \Delta \mathbf{u}_{+1},$$

where

$$\Delta\boldsymbol{\pi}_{+1} = \begin{pmatrix} \Delta\pi_{1,+1} \\ \Delta\pi_{2,+1} \\ \vdots \\ \Delta\pi_{N,+1} \end{pmatrix}, \ \Delta\boldsymbol{\pi} = \begin{pmatrix} \Delta\pi_{1} \\ \Delta\pi_{2} \\ \vdots \\ \Delta\pi_{N} \end{pmatrix}, \quad \Delta\mathbf{X} = \begin{pmatrix} \Delta\mathbf{X}_{1} \\ \Delta\mathbf{X}_{2} \\ \vdots \\ \Delta\mathbf{X}_{N} \end{pmatrix}.$$

Let

$$\mathbf{W} = \left(\mathbf{W}_1, \mathbf{W}_2, \ldots, \mathbf{W}_N\right)'$$

The two-step Arellano-Bond estimator is defined as

$$\hat{\gamma}_{AB,2step} = \left(\mathbf{G}'\mathbf{Z}\mathbf{S}_N\mathbf{Z}'\mathbf{G}\right)^{-1}\mathbf{G}'\mathbf{Z}\mathbf{S}_N\mathbf{Z}'\Delta\boldsymbol{\pi}$$

where $\hat{\boldsymbol{\gamma}}_{AB,2step} = (\hat{\lambda}_{AB,2step}, \hat{\boldsymbol{\beta}}'_{AB,2step})$, $\mathbf{G} = (\Delta\boldsymbol{\pi}, \Delta\mathbf{X})$, $\mathbf{Z} = (\mathbf{W}, \Delta\mathbf{X})$,

$$\mathbf{S}_N = \left(\sum_{s=1}^{N} \mathbf{Z}_s'\hat{\mathbf{u}}_s\hat{\mathbf{u}}_s'\mathbf{Z}_s\right)^{-1},$$

where $\mathbf{Z}_s = (\mathbf{W}_s, \Delta\mathbf{x}_s)$ and $\hat{\mathbf{u}}_s = \Delta\boldsymbol{\pi} - \mathbf{G}\hat{\boldsymbol{\gamma}}_{AB,1step}$, are the residuals using the preliminary estimates

$$\hat{\gamma}_{AB,1step} = \left[\mathbf{G}'\mathbf{Z}\left(\mathbf{Z}'\boldsymbol{\Omega}\mathbf{Z}\right)^{-1}\mathbf{Z}'\mathbf{G}\right]^{-1}\mathbf{G}'\mathbf{Z}\left(\mathbf{Z}'\boldsymbol{\Omega}\mathbf{Z}\right)^{-1}\mathbf{Z}'\Delta\boldsymbol{\pi}, \tag{S14}$$

with $\boldsymbol{\Omega} = (\mathbf{I}_N \otimes \mathbf{A})$.

$$\mathbf{A} = \begin{pmatrix} 2 & -1 & \ldots & 0 & 0 \\ -1 & 2 & \ldots & 0 & 0 \\ \vdots & \ddots & \ddots & \ddots & \vdots \\ 0 & 0 & \vdots & 2 & -1 \\ 0 & 0 & \vdots & -1 & 2 \end{pmatrix}.$$

See also Section 27.4.2 in Pesaran (2015).

# S8 Selected MSA Summary Statistics

Table S12: **Summary statistics of variables used in the realized house price change regressions**

| Variable | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|
| $\pi$ | 1.726 | 2.565 | $-3.408$ | 10.084 |
| $\hat{\pi}^e_{s,t+1\|t}$ | $-2.181$ | 5.462 | $-55.552$ | 6.543 |
| $\hat{\pi}^e_{s,t+3\|t}$ | $-0.678$ | 1.991 | $-18.744$ | 5.391 |
| $\hat{\pi}^e_{s,t+12\|t}$ | 0.063 | 0.682 | $-5.041$ | 2.525 |
| $B_{s,t+1\|t}$ | 0.273 | 0.134 | 0.000 | 0.682 |
| $C_{s,t+1\|t}$ | 0.267 | 0.138 | 0.000 | 0.812 |
| $B^*_{s,t+1\|t}$ | 0.261 | 0.112 | 0.000 | 0.646 |
| $C^*_{s,t+1\|t}$ | 0.281 | 0.114 | 0.020 | 0.808 |
| $B_{s,t+3\|t}$ | 0.356 | 0.147 | 0.000 | 0.737 |
| $C_{s,t+3\|t}$ | 0.229 | 0.133 | 0.000 | 0.812 |
| $B^*_{s,t+3\|t}$ | 0.341 | 0.122 | 0.000 | 0.653 |
| $C^*_{s,t+3\|t}$ | 0.249 | 0.111 | 0.012 | 0.808 |
| $B_{s,t+12\|t}$ | 0.487 | 0.142 | 0.000 | 0.755 |
| $C_{s,t+12\|t}$ | 0.157 | 0.111 | 0.000 | 0.808 |
| $B^*_{s,t+12\|t}$ | 0.476 | 0.120 | 0.000 | 0.755 |
| $C^*_{s,t+12\|t}$ | 0.171 | 0.089 | 0.000 | 0.808 |

The statistics are based on the sample of 48 MSAs and 11 months: March 2012 to January 2013.
$\pi$ and $\hat{\pi}^e_{s,t+h|t}$ for $h = 1, 3, 12$ are expressed in percent per quarter.
The indicators $B_{s,t+h|t}, C_{s,t+h|t}, B^*_{s,t+h|t}, C^*_{s,t+h|t}$ for $h = 1, 3, 12$ are fractions between 0 and 1.

Table S13: **Summary statistics of selected variables by MSA for 48 MSAs**

| | Average value during the period March 2012-January 2013 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $N_{st}$ | $\pi_{st}$ | $B_{s,t+1\|t}$ | $C_{s,t+1\|t}$ | $B_{s,t+3\|t}$ | $C_{s,t+3\|t}$ | $B_{s,t+12\|t}$ | $C_{s,t+12\|t}$ |
| Albuquerque, NM | 27.82 | 0.55 | 0.33 | 0.22 | 0.41 | 0.18 | 0.56 | 0.14 |
| Amarillo, TX | 20.18 | 0.40 | 0.35 | 0.15 | 0.41 | 0.15 | 0.59 | 0.14 |
| Atlanta-Sandy Springs-Roswell, GA | 49.36 | 3.17 | 0.13 | 0.42 | 0.20 | 0.38 | 0.31 | 0.25 |
| Austin-Round Rock, TX | 45.27 | 2.12 | 0.47 | 0.07 | 0.55 | 0.07 | 0.70 | 0.05 |
| Boise City, ID | 22.64 | 4.02 | 0.20 | 0.31 | 0.31 | 0.27 | 0.41 | 0.16 |
| Chattanooga, TN-GA | 29.45 | 0.89 | 0.20 | 0.30 | 0.38 | 0.26 | 0.53 | 0.14 |
| Chicago-Naperville-Elgin, IL-IN-WI | 68 | 0.43 | 0.19 | 0.47 | 0.25 | 0.37 | 0.32 | 0.19 |
| Cleveland-Elyria, OH | 41.55 | 0.26 | 0.13 | 0.44 | 0.18 | 0.41 | 0.29 | 0.32 |
| Columbus, OH | 22.36 | 0.67 | 0.19 | 0.35 | 0.30 | 0.27 | 0.45 | 0.13 |
| Corpus Christi, TX | 59.09 | 1.54 | 0.44 | 0.11 | 0.53 | 0.11 | 0.65 | 0.09 |
| Cumberland, MD-WV | 29.55 | 0.07 | 0.22 | 0.24 | 0.28 | 0.20 | 0.49 | 0.15 |
| Dallas-Fort Worth-Arlington, TX | 63.64 | 1.48 | 0.26 | 0.23 | 0.36 | 0.18 | 0.52 | 0.13 |
| Denver-Aurora-Lakewood, CO | 27.64 | 2.82 | 0.42 | 0.15 | 0.54 | 0.08 | 0.63 | 0.05 |
| Detroit-Warren-Dearborn, MI | 54.91 | 3.74 | 0.07 | 0.49 | 0.12 | 0.47 | 0.18 | 0.34 |
| Dover, DE | 20.45 | 0.33 | 0.17 | 0.40 | 0.22 | 0.39 | 0.41 | 0.24 |
| El Paso, TX | 51.09 | 0.13 | 0.38 | 0.14 | 0.46 | 0.15 | 0.57 | 0.14 |
| Fort Wayne, IN | 36.27 | 0.67 | 0.19 | 0.39 | 0.17 | 0.44 | 0.22 | 0.43 |
| Grand Rapids-Wyoming, MI | 34 | 2.11 | 0.12 | 0.39 | 0.21 | 0.36 | 0.39 | 0.24 |
| Green Bay, WI | 26.73 | 0.13 | 0.33 | 0.22 | 0.48 | 0.15 | 0.54 | 0.12 |
| Greensboro-High Point, NC | 30.82 | 0.56 | 0.17 | 0.31 | 0.26 | 0.24 | 0.51 | 0.15 |
| Houston-The Woodlands-Sugar Land, TX | 46.82 | 1.83 | 0.26 | 0.17 | 0.37 | 0.18 | 0.55 | 0.15 |
| Indianapolis-Carmel-Anderson, IN | 27.45 | 0.85 | 0.21 | 0.34 | 0.27 | 0.30 | 0.43 | 0.20 |
| Kansas City, MO-KS | 26.55 | 0.93 | 0.31 | 0.24 | 0.39 | 0.20 | 0.54 | 0.13 |
| Lansing-East Lansing, MI | 21.82 | 1.79 | 0.15 | 0.30 | 0.25 | 0.21 | 0.38 | 0.15 |
| Los Angeles-Long Beach-Anaheim, CA | 176.18 | 3.22 | 0.47 | 0.13 | 0.52 | 0.12 | 0.56 | 0.09 |
| Miami-Fort Lauderdale-West Palm Beach, FL | 43.09 | 3.18 | 0.23 | 0.19 | 0.35 | 0.11 | 0.46 | 0.06 |
| Milwaukee-Waukesha-West Allis, WI | 24.91 | 0.15 | 0.35 | 0.28 | 0.40 | 0.26 | 0.52 | 0.21 |
| Minneapolis-St. Paul-Bloomington, MN-WI | 36.91 | 2.32 | 0.20 | 0.31 | 0.31 | 0.21 | 0.42 | 0.16 |
| New York-Newark-Jersey City, NY-NJ-PA | 136.36 | 0.26 | 0.43 | 0.15 | 0.49 | 0.13 | 0.59 | 0.10 |
| Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 35.55 | 0.44 | 0.28 | 0.22 | 0.40 | 0.19 | 0.57 | 0.10 |
| Phoenix-Mesa-Scottsdale, AZ | 42.55 | 5.77 | 0.21 | 0.24 | 0.30 | 0.21 | 0.43 | 0.13 |
| Raleigh, NC | 24.82 | 0.72 | 0.28 | 0.28 | 0.38 | 0.25 | 0.52 | 0.22 |
| Reading, PA | 21.27 | 0.46 | 0.18 | 0.43 | 0.30 | 0.38 | 0.50 | 0.22 |
| Riverside-San Bernardino-Ontario, CA | 44.82 | 3.98 | 0.37 | 0.24 | 0.45 | 0.19 | 0.55 | 0.12 |
| Sacramento–Roseville–Arden-Arcade, CA | 64.18 | 4.83 | 0.29 | 0.30 | 0.36 | 0.24 | 0.48 | 0.15 |
| Salt Lake City, UT | 61.64 | 2.51 | 0.30 | 0.36 | 0.36 | 0.29 | 0.44 | 0.26 |
| San Antonio-New Braunfels, TX | 45.09 | 1.03 | 0.35 | 0.19 | 0.46 | 0.22 | 0.62 | 0.18 |
| San Diego-Carlsbad, CA | 36.27 | 3.55 | 0.42 | 0.07 | 0.52 | 0.06 | 0.57 | 0.05 |
| San Francisco-Oakland-Hayward, CA | 21.45 | 4.52 | 0.48 | 0.12 | 0.55 | 0.06 | 0.61 | 0.02 |
| San Jose-Sunnyvale-Santa Clara, CA | 39.64 | 4.18 | 0.45 | 0.08 | 0.40 | 0.08 | 0.52 | 0.06 |
| Seattle-Tacoma-Bellevue, WA | 43.55 | 3.16 | 0.35 | 0.21 | 0.46 | 0.17 | 0.56 | 0.13 |
| Spartanburg, SC | 24.27 | 0.40 | 0.08 | 0.45 | 0.15 | 0.36 | 0.39 | 0.19 |
| St. Louis, MO-IL | 21.36 | 0.45 | 0.17 | 0.38 | 0.22 | 0.27 | 0.39 | 0.11 |
| Tallahassee, FL | 20.45 | 0.62 | 0.34 | 0.20 | 0.50 | 0.18 | 0.63 | 0.10 |
| Tucson, AZ | 26.09 | 2.44 | 0.19 | 0.36 | 0.26 | 0.30 | 0.41 | 0.17 |
| Tulsa, OK | 33 | 0.65 | 0.32 | 0.18 | 0.38 | 0.17 | 0.52 | 0.09 |
| Washington-Arlington-Alexandria, DC-VA-MD-WV | 43.27 | 1.76 | 0.42 | 0.17 | 0.55 | 0.11 | 0.64 | 0.06 |
| Youngstown-Warren-Boardman, OH-PA | 24.91 | 0.75 | 0.07 | 0.42 | 0.14 | 0.41 | 0.32 | 0.31 |

$N_{st}$ - number of respondents in month $t$ and MSA $s$.
$\pi_{st}$ - realized price change in MSA $s$ and month $t$, expressed in percent per quarter.
The data on house prices is sourced from the National Association of Realtors.The house prices are disaggregated by 180 MSAs as defined by the US Office of Management and Budget. For further details see http://www.realtor.org/topics/existing-home-sales.

# S9 Data Sources

The survey data can be accessed from the link https://alpdata.rand.org/index.php?page=data. The survey is labeled "Asset Price Expectations" [W01]-[W15]. The house price data used in the MSA level analysis is sourced from the National Association of Realtors. The house prices are disaggregated by 180 MSAs as defined by the US Office of Management and Budget. For further details see http://www.realtor.org/topics/existing-home-sales.

In Section S9.1 we describe the survey data as released by RAND, and in Section S9.2 we describe how to replicate our results.

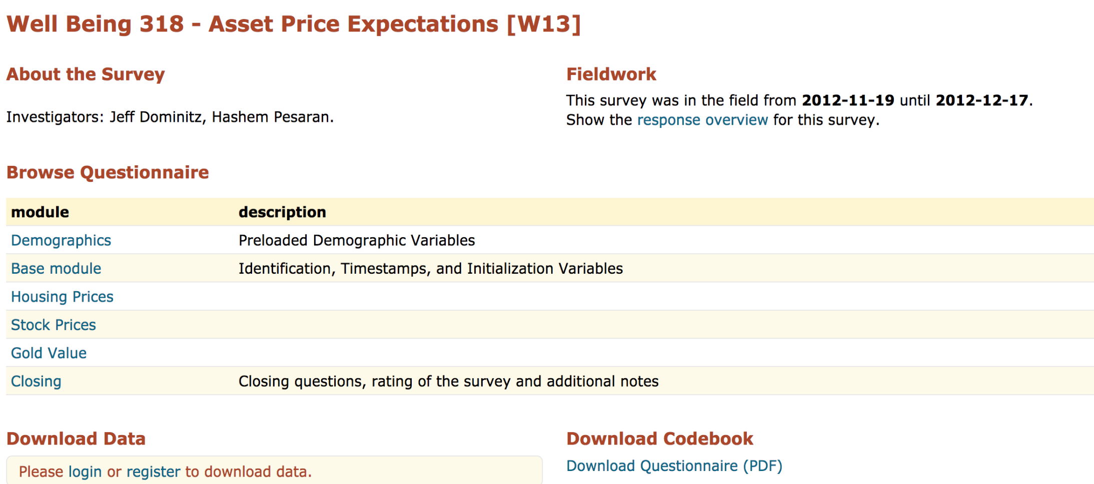
## S9.1 Survey Data Downloaded from the RAND ALP Website

The folder "Double Q survey data Aug 2012-Jan 2013" contains all survey data for the Double Question survey as available on the RAND ALP website. The results of each survey wave is included a separate csv file, and contains the following modules:

- Demographics - demographic information about the respondent, such as age, gender, education, employment etc.
- Base Module - information about the exact time when the respondent filled out the survey.
- Housing Prices - Double Question survey module about house prices.
- Stock Prices - Double Question survey module about stock prices.
- Gold Value - Double Question survey module about gold prices.
- Closing - assessment of the interview experience.

A list of the variables available in each survey wave can be found in the files "List of variables in each survey wave.xlsx". An overview of the modules can be accessed by clicking on the survey name on the RAND website. An example for survey wave 13 is shown in Figure 1. Information about the non-respondents of the survey can also be found on this page. Further information about the questions contained in the module can be accessed by

Figure 1: Screenshot of Asset Price Expectations Survey Wave 13




clicking on the name of the module. See Figure 2 for an example, where some of the variables in the Demographics module are displayed. Finally, more information about a variable can be obtained by clicking on the variable name. Figure 3 shows the information displayed if we click on the variable name, "ms318_gender" in survey wave 13.

## S9.2 Data and codes for replicating results

All data and codes necessary to replicate the results are provided in the zipped file called "Double Q Survey Replication". When this file is unzipped you should see the folder and file structure displayed in Figure 4. This Figure shows the structure of the folders in which the codes are organized. Folders are marked with a blue color. Files that recreate the data sets used in the estimation are marked in yellow, and the numbers next to the yellow boxes indicate the order in which the files should be executed. Finally, green boxes indicate files that replicate the estimation results. These can be executed in an arbitrary order. All files necessary to replicate the estimation results are also provided in the "Data" folder. Hence, it is possible to run the estimation scripts marked with green color without previously re-creating the data sets. All estimates are saved in tex tables, which are automatically placed in the folder called "tex".

The zipped file "Double Q Survey Replication" contains a folder with the same name.

Figure 2: Screenshot of Accessing Demographic Variables

## Well Being 318 - Asset Price Expectations [W13]

### Module - Demographics

Preloaded Demographic Variables

### Questions and Variables (23)

| name | description / question text | variable label |
|---|---|---|
| ms318_gender | What is your gender? | GENDER |
| ms318_calcage | What is your age? | CALCULATED AGE |
| ms318_birthyear | Year | BIRTH YEAR |
| ms318_currentlivingsituation | Could you tell us what your current... | CURRENT LIVING SITUATION |
| ms318_borninus | Were you born in the United States? | BORN IN US |
| ms318_stateborn | In what state were you born? | BORN IN STATE |
| ms318_citizenus | Are you a citizen of the United Sta... | CITIZEN US |

Figure 3: Screenshot of Question about Gender

## Well Being 318 - Asset Price Expectations [W13]

### Module - Demographics

### Question - ms318_gender

| | |
|---|---|
| **Dataset label** | GENDER |
| **Question text** | What is your gender? |
| **Answer type** | **Enumerated**: 1 Male 2 Female |
| **Empty answer allowed** | Yes |
| **Notes** | There are no notes for this question. |

To run the replication files on a PC, place the zipped folder in a directory of your choice and unzip it. Then change the path names in the files accordingly. For example, if the file is unzipped in the root directory “C:\”, add “C:\” directly before the words “Double Q Survey Replication” in the file path, so that the path begins with “C:\Double Q Survey Replication”. Additionally, /” in the path definitions need to be changed to “\”.
Similarly, on a Mac or Linux computer, unzip the folder in a directory of your choice. Suppose the folder “Double Q Survey Replication” is unzipped in the directory “/Users/home/Desktop/”. Then change the path names in the replication files so that they begin with
“/Users/home/Desktop/Double Q Survey Replication”.

The data sets used in the empirical analysis can be found in the folder “Double Q Survey Replication/Data/csv/”. The data files are “panel_ind.csv”, “panel_fef_loc.csv” and “panel_fetef.csv”. These are the data sets containing all individual level variables such as valuation and price expectation as well as demographics. The latter two files also contain location and response pattern dummies, respectively. The panel data of 48 MSAs used in the MSA level analysis is contained in the file “Panel 48 MSAs.xlsx” in the same folder.

For convenience, all the survey data files covering the period August 2012 to January 2013 are also avaialble in the zipped file "Double Q survey data Aug 2012-Jan 2013".

Figure 4: Structure of Replication Directory

- Double Q Survey Replication
  - Data
    - csv
      - original survey data
    - MATLAB
    - R
    - Stata
  - Create Data Sets
    - R
      - 1.Create panel.R
      - 2.Create individual level panel.R (up to line 82)
      - 4.Create individual level panel.R (starting at line 83)
      - 5.Create MSA panel.R (up to line 74)
      - 7.Create MSA panel.R (starting at line 75)
      - extra (contains files called by other scripts)
    - MATLAB
      - 3.WK_transformation.m
      - 6.Generate_B_and_C_neighbor_indicators.m
      - functions (contains functions called by other scripts)
  - Estimation
    - MATLAB
      - FEF_estimation.m (Columns 1, 5, 9 in Tables 8-10)
      - FEF_estimation_with_MSA_FE.m (Columns 2, 6, 10 in Tables 8-10)
      - FE_TE_Filtered_estimation.m (Tables 6, S7, S8 and S9)
      - extra (contains files called by other scripts)
      - functions (contains functions called by other scripts)
    - Stata
      - Replicate Table 6 FE estimates.do
      - Replicate Table 12.do
      - RE Estimates.do (Columns 3-4, 7-8 & 11-12 in Tables 8-10 and Tables S1-S6)
  - tex (tex tables with estimates are stored here)

Figure 5:

# References

Arellano, M. and S. Bond (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *The Review of Economic Studies 58*(2), 277–297.

Pesaran, M. H. (2015). *Time Series and Panel Data Econometrics*. Oxford: Oxford University Press.

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Wansbeek, T. and A. Kapteyn (1989). Estimation of the error-components model with incomplete panels. *Journal of Econometrics 41*(3), 341–361.