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Abstract:

This paper estimates threshold (S,s) models of household securities purchases, allowing for transactions costs. Purchases are related to excess market returns, the ratio of securities holdings to total wealth, and other variables capturing labor market and demographic transitions. Purchases are also related to various summary measures of households' hedging motives. In contrast to previous focus on income risk, the measures here include consumption-risk, which is more consistent with theoretical models of portfolio choice. The Consumer Expenditure Survey is used to calculate the standard deviation of household consumption growth and the correlation of consumption growth with market returns. A second, higher frequency set of measures is taken from the monthly Michigan consumer sentiment surveys. The survey questions have households themselves identify the financial risks they believe they will face in the future, and so provide more informative and forward-looking measures of their hedging motives.

Securities purchases are found to increase with excess market returns and decrease with the securities-to-total-wealth ratio. Even controlling for these variables, securities purchases vary significantly with the measures of hedging motives. Households with more volatile consumption, or a larger consumption-return correlation, buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also buy fewer securities. The marginal effects of the hedging motives are greater than the marginal effect of returns. However, the sensitivity of investors to returns has increased in recent years, even controlling for changes in the composition of investors.

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In October 1987 the S&P stock index plunged over 20%, wiping out about $1 trillion dollars of financial wealth. Yet household consumption and so GDP slowed only modestly and temporarily, and net outflows out of equity mutual funds were only about 3% of fund assets.[1] One possible explanation for the moderate response to the crash can be found in the behavior of the Michigan Index of Consumer Sentiment [ICS] at the time. Although the index dropped by about 11% between September and November of 1987, it subsequently quickly recovered, surpassing its pre-crash level by March 1988. Its performance suggests that individual investors perceived the crash to be a temporary problem, not posing a longer-term risk to their financial position [Abel and Bernanke (1998)].[2] The implication is that, in order to predict how individual investors will respond to a given decline in stock prices, one needs to control for their expectations about the future; and that one can use sentiment surveys to gauge those expectations.

This paper estimates threshold (S,s) models of household securities purchases, allowing for transactions costs. Purchases are related to excess market returns, the ratio of securities holdings to total wealth, and other variables capturing labor market and demographic transitions. Purchases are also related to various summary measures of households' hedging motives. Suppose for example returns again drop to -20%. How will investors respond, as a function of their hedging motives and expectations about the future? Which investors will respond more? Are they more sensitive now than they were in 1987?

In previous empirical studies of hedging motives the focus has been on labor-income risk, usually measured by the standard deviation of household earnings. Households with a larger

[1] Rea and Marcis (1996). According to surveys by the Investment Company Institute, only 5% of households owning mutual funds redeemed shares in the month following the crash, and only 11% redeemed shares up through May 1988.

"background" level of income risk are expected to invest less in risky financial assets [Kimball(1993)].[3,4] The income risk generates a hedging motive. However, the standard deviation of income might not be a good measure of the risks that households actually face. To begin with, it does not even summarize the riskiness of a household's income process. For instance an income process whose innovations have a smaller standard deviation but greater persistence can impose greater risk than another process whose innovations have a larger standard deviation but less persistence. A household might invest less in risky assets under the first income process than under the second [Constantinides and Duffie (1996); Storesletten, Telmer, and Yaron (1997)]. Second, the shocks that households face are quite heterogeneous, including medical expenses, divorce, etc., not just shocks to earnings. Third, different households can have differential access to credit and other insurance mechanisms, like family gifts in case of need. As a result some households are better able to smooth their consumption past the very same income fluctuations than others [Dynarski and Gruber (1997)]. The general point is that households should not care about their income risk per se, but only about its implications for their consumption. Unfortunately the econometrician does not observe the full array of shocks and consumption-smoothing mechanisms for each household.

In contrast this paper examines two alternative sets of measures of households' hedging motives. First, the Consumer Expenditure Survey [CEX] is used to directly compute

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[2]By contrast, after Iraq invaded Kuwait in 1990, the ICS dropped by about 28% between July and October, and did not permanently recover until late 1992. Over that period real consumption dropped by over 2%, pushing the economy into recession.

[3] The term background risk is often used to refer to risks uncorrelated with returns. The empirical analysis below will also consider non-zero correlations.

[4] These results are proven in a two-period setting. There are no general closed form solutions for dynamic portfolio choice in the presence of undiversifiable background risks and transactions costs. For simulations, see Heaton and Lucas (1996), Koo (1995), and Storesletten, Telmer, and Yaron (1997). Viceira (1999) presents an "approximate" analytic solution for the hedging motive resulting from risky labor income that can be correlated with returns. The insight that investors will hedge their financial portfolios in response to background risks is an old one, see e.g. Merton

consumption-risk, measured as the standard deviation of household consumption growth and the covariance of consumption growth with stock returns. Consumption risk is a summary statistic for all the risks the household faces, not only those observable by the econometrician. *Ceteris paribus*, a household with greater consumption risk should be less likely to make additional investments into risky financial assets. Although it measures hedging motives in a way that is consistent with theoretical models of portfolio choice, to the author's knowledge no one has previously used consumption risk to empirically explain portfolio choice. For a given household the standard deviation and covariance are computed over long horizons, five and twelve years. As a result these measures cannot capture high frequency changes in risk. A second, more dynamic set of measures of hedging motives is taken from the micro data sets underlying the Michigan ICS. Although this micro data has not been much exploited in the past, it has a number of unique advantages. It is collected monthly and so allows high frequency analysis of portfolio choice. Also, it reveals households' expectations about their overall financial position in the future. This again provides a summary of household information sets that is not usually available to the econometrician. The result is likely to be more informative measures of hedging motives than the standard deviation of income, or perhaps the ex post covariance of consumption and stock returns. Souleles (1999) applied the same Michigan micro data to the consumption-savings decision in an Euler-equation framework. The questions successfully captured precautionary motives. Households that are pessimistic about the future have steeper consumption profiles; i.e., they spend less and save more, allowing them to increase their precautionary buffer stocks. The focus here is instead on the composition of savings, in particular on allocations to risky financial securities.

(1971) and Mayers (1972). For a general analysis of transactions costs and (S,s) dynamics, see Davis and Norman

To preview the results, securities purchases are found to increase with excess market returns and decrease with the securities-to-total-wealth ratio. Even controlling for these variables, securities purchases vary significantly with the measures of hedging motives. Households with more volatile consumption, or a larger consumption-return correlation, buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also buy fewer securities. The marginal effects of the hedging motives are greater than the marginal effect of returns. However, the sensitivity of investors to returns has increased in recent years, even controlling for changes in the composition of investors.

The paper begins by surveying related studies in Section I. Section II describes the data and Section III the econometrics. The results are in Section IV. Section V concludes, and is followed by a data appendix in Section VI.

I. Related Studies

There have been a number of empirical studies of household equity holdings. Using the 1983 Survey of Consumer Finances, Haliassos and Bertaut (1995) find that people in apparently risky occupations have lower shares of equity to total financial wealth. Gakidis (1998) and Vissing-Jorgensen (1999) use the Panel Study of Income Dynamics [PSID] to analyze the effect of the income process on equity shares. (While the PSID records asset holdings only every five years, starting in 1984, it records income annually.) Vissing-Jorgensen finds that a larger standard deviation of income depresses shares, but the covariance of income and stock returns has no

(1990) and the simulations in Lynch and Balduzzi (1999).

significant effect in her sample. Heaton and Lucas (1997) perform a similar study using the IRS Tax Panel. They too find that the income-return covariance is insignificant, but shares increase with the standard deviation of income. However when they decompose income into wages versus business income, the standard deviation of business income again depresses shares. Gakidis finds that the probability of low income due to unemployment is the most important feature of the income process in depressing shares. Guiso, Jappelli, and Terlizzese (1996) use instead a self-reported measure of the expected probability distribution for income one-year ahead, taken from a Bank of Italy survey. They find that in the cross-section shares decrease with the variance of income as computed from this subjective distribution.

This paper differs from previous studies in a number of important ways. First, it measures hedging motives in a more theoretically consistent way, using consumption-risk. It also uses the high frequency and forward-looking subjective information in the Michigan sentiment surveys. Second, the CEX data on securities purchases has been collected monthly since the early 1980's, and so provides a long series of cross-sections, unlike the small number of cross-sections used in most previous studies. This allows for a dynamic analysis of investor response to returns and hedging motives over time. It also accommodates aggregate shocks, which can complicate inference in a small number of cross-sections [Souleles (1999)]. Third, this paper uses the CEX variables on active purchases and sales of securities, which to the author's knowledge have not been exploited before. Unlike previous studies which have focused on the level (the stock) of equity holdings, the focus here is on the flows. This avoids complications from passive changes in asset levels due to unrealized capital gains. Like a first difference, it also avoids much of the substantial heterogeneity in asset levels that complicates empirical analysis. Fourth, while previous studies have recognized the potential importance of transactions costs, they have not generally taken them into account in their estimation. In particular, in an (S,s) framework the level of equity holdings, normalized say by total wealth, need not vary monotonically with background risk and other variables. In this framework standard OLS and tobit specifications would be misspecified. The analysis here will explicitly accommodate transactions costs and (S,s) dynamics by estimating threshold models of securities purchases. Lam (1991) and Eberly (1994) have undertaken related studies of automobile purchases, where transactions costs are again important.

There is also a related literature on the relationship between equity mutual-fund flows and stock returns, using aggregate time-series data. Warther (1995) and Edelen and Warner (1999) find that the relationship is mostly contemporaneous, and positive. Since both investment flows and returns are endogenous, however, it is difficult to identify the extent to which returns are driving flows or vice-versa. Or, both flows and returns can be responding to some third variable, for instance the arrival of macroeconomic data like the employment report. Household-level data brings additional information to bear on these issues. First, in micro data investment flows are unlikely to be causing returns, since no individual sample household's investments are large enough to drive aggregate returns. Second, time dummies can be used to control for any possible macroeconomic third variable. Even though such dummy variables will also partial out the effects of aggregate returns, one can still examine the remaining cross-sectional effect of household-specific measures of hedging motives on household securities purchases. Third, changes in the composition of investors complicates time-series analysis. For instance, some analysts claim that recent entrants into the stock market might be more skittish than investors in 1987. Demographic variables help control for such compositional changes.

II. Data

A. The Consumer Expenditure Survey

The bulk of the data is drawn from the CEX surveys from 1982-1993.[5] The CEX interviews households four times, three months apart, though starting in different months for different households. Each interview records household spending over the preceding three months. Household assets are recorded in a special module in only the final interview. This module includes questions eliciting the combined market value of stocks, bonds, and other securities (i.e., asset stocks) as of the first and final interviews. There are separate questions on the total value of stock, bond, and mutual fund purchases over the past 12 months, and on the total value of sales over the past 12 months (i.e., asset flows). The difference between these two values gives net purchases of securities, which deflated by the average CPI over the same 12 month period ($1982-84) yields the main variable of interest, real net purchases NETPUR of securities.

Even though the CEX specializes in recording spending, it is the only traditional household data set containing the required asset information monthly over the 1980s and 1990s. It also differs from other data sets in distinguishing active purchases of securities from changes in financial wealth. Unfortunately NETPUR does not distinguish purchases of stocks and risky bonds.[6] To limit the amount of heterogeneity, NETPUR is normalized by initial household income (from the year preceding the first interview). Following Brav and Geczy (1996), the main sample used below focuses on households making either purchases, or sales, of real value greater than $1000 per year, comparing them to households making no sales or purchases. This focus makes it more likely that NETPUR is picking up trades of equity and also helps guard against measurement

[5] The first wave of the CEX, 1980-81, is not used because its data are generally considered to be of lesser quality than the data from the following waves. In particular there appear to be inconsistencies in the first wave's flagging of the assets data.

error.[7] The average real purchase of securities is then about $9000 and the average sale about $8000; though there are almost three times as many households with net purchases than net sales. Alternative samples are also considered. The Appendix and Souleles (1999a) provide further details about the data.

Reliable estimates of the standard deviation of consumption growth and its correlation with stock returns need to be based on many years of data. However the CEX follows individual households for only one year. To circumvent this limitation, longer time-series for real, nondurable consumption will be imputed for each CEX household on the basis of demographically similar CEX households, as explained below.[8] The CEX sample is accordingly selected in standard ways to improve the measurement of consumption. A household is dropped from the sample if: there are multiple "consumer units" in the household, the household lives in student housing, or the head of household is a farmer; or if food-expenditure is missing in any quarter, or any food is received as pay.

B. Survey of Consumer Attitudes and Behavior

Because the CEX does not include data on household sentiment, it is matched with the Michigan Survey of Consumer Attitudes and Behavior [CAB], the survey underlying the well-known aggregate ICS consumer sentiment index. The CAB is a nationally representative survey that has been undertaken monthly since 1978. In recent years about 500 households are sampled each month, in the earlier years two to three times as many were sampled. The aggregate ICS

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[6] The PSID also fails to distinguish between stock and bond mutual funds.

[7] Cross-tabulations show a large number of households whose securities holdings, or purchases or sales of securities, are small in magnitude, including values less than $10. According to the BLS staff, some of these values are probably spurious but for unknown reasons unflagged.

[8] The imputation procedure is analogous to the creation of "synthetic cohorts," which are based on sample averages within a few demographic cells (like education crossed with age). Here instead consumption will be imputed via a prior regression on a large number of demographic variables. This will retain more of the idiosyncratic variation in consumption.

index is an average of the responses to five of the questions in the CAB survey, month-by-month. Two of these questions are used here, the two which specifically elicit expectations about future financial conditions. (These two questions comprise the Expectations Sub-index of the ICS, which in turn is a component of the Index of Leading Economic Indicators. The other three ICS questions refer to current or past economic conditions, and comprise the Coincident Sub-index.) Because of the importance of unemployment risk, a third question from the CAB on unemployment expectations is also used, even though it is not part of the ICS.[9] The wording of the three questions is as follows. (The allowed responses are in brackets. Underlining is original.)

Q2. Now looking ahead—do you think that a year from now you (and your family living there) will be better off financially or worse off, or just about the same as now? [will be better off, the same, will be worse off]

Q3. Now turning to business conditions in the country as a whole—do you think that during the next twelve months we'll have good times financially, or bad times, or what? [good times, good times with qualifications, pro-con, bad times with qualifications, bad times]

QU. How about people out of work during the coming 12 months—do you think that there will be more unemployment than now, about the same, or less? [more, about the same, less]

These questions capture various aspects of households' hedging motives, just as the covariance of consumption and returns summarizes these motives. They also have the advantage of being forward-looking. Q2 elicits the household's own view of its overall financial position over the next 12 months. It can provide information not available in the other risk measures that have previously been investigated. For instance, two households with the same standard deviation of income (or covariance of consumption and returns) in the past can have different expectations about the future and so invest differently. Q3 provides similar information about aggregate financial conditions and QU about unemployment risk. Instead of offering a literary analysis of

[9] Carroll et. al. [1996] examine the effects of cross-sectional differences in actual (ex post) unemployment rates on

these questions, Souleles (1999) formally investigated the time-series and cross-sectional properties of the responses to them. In particular he found that they help predict precautionary savings. Whether they help predict portfolio allocation in risky assets is examined below using both time series and micro data.[10]

The answers to all three questions are constrained to be discrete yet ordered, which will require special estimation techniques below. For convenience, the better states ("financially better off", "good times", "good times with qualifications" and "less unemployment") are coded as +1, the intermediate states as 0, and the worse states as -1. Figure 1 shows the average response to each question, month-by-month. All three variables are highly procyclical. Q2 especially seems to be leading. It recovers in advance of the ends of the 1980-81 and 1990-91 recessions (and can be shown to lead the corresponding coincident question in the ICS). All three variables decline in response to the stock market crash in 1987, but as already noted, only modestly and temporarily.

The CAB also includes a number of demographic variables. Since some of these changed across CAB surveys, great care was taken to create a dataset consistent across the entire sample period, and consistent with the corresponding variables in the CEX. These variables will be used to impute the sentiment of the households in the CEX on the basis of demographically similar CAB households. Since both surveys ran monthly over the 1980's and 1990's and contain a rich and overlapping set of demographic variables, the imputation can be very fine. In both the CAB and the CEX, the demographic variables were switched to refer to the head of household (i.e., for a couple, the male), unless specifically indicating the spouse. Table 1 shows the means of the

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balance sheets in the SCF.

[10] Q2 and Q3 could pick up, among other things, consumers' expectations about future asset returns or their variability, as in the literature on time-varying investment opportunities. See Merton (1971) and more recently Barberis (1999), Brandt (1999), and Lynch and Balduzzi (1999). However the questions will also pick up other, non-return risks, like unemployment risk. All such risks, whether pertaining to returns or not, can generate hedging motives that are

variables common to both datasets. The CAB sample is somewhat more highly educated and more likely to live in the South. But generally the means are rather similar, as one would expect from two nationally representative samples.

The main sample exclusion in the CAB concerns the survey respondent. The sample used here drops an observation when there is a married couple in the household but the respondent is neither the husband nor spouse. (Most such respondents appear to be children of the couple.) This should help make the respondent's answers more representative of the views of the entire household. The Appendix contains additional details about the data.

III. Econometric Specifications

The main dependent variable is $NETPUR_{i,t}$, net securities purchases of household i over a 12 month reference period, denoted by t. Net purchases are related to excess market returns r_t (returns to the S&P 500 net of the 3-month treasury rate) over the same period, as well as a vector **W** of state variables and the explicit measures of hedging motives, HEDGE:

$$NETPUR_{i,t} = b_0 r_t + \mathbf{b_1}'\mathbf{W_{i,t}} + b_2 HEDGE_{i,t-1} + e_{i,t}. \qquad (1)$$

When using consumption risk for HEDGE, b_2 should be negative. *Ceteris paribus*, a household whose consumption process is more volatile, or more correlated with returns, should be less likely to make additional risky securities purchases. Since NETPUR is on average positive, in practice this means that the household's net purchases will grow at a slower pace than average. When using instead consumer sentiment for HEDGE, b_2 is expected to be positive. A household that

summarized for each household by sentiment. For comparison, to avoid the effects of income risk in particular, Lynch expects its financial position to deteriorate over period t is less likely to purchase additional securities, *ceteris paribus.* **W** will be discussed below.

The estimation must take into account the special structure of the dependent variable. NETPUR is 0 for households that do not trade any securities, a positive number for households whose net purchases are positive, and a negative number for households whose net purchases are negative. NETPUR is 0 for over 85% of the sample. This reflects the participation puzzle, the fact that over the sample period a surprisingly small fraction of households held any equity, less than 30% of households in the mid 1980s [Mankiw and Zeldes (1991)]. Since NETPUR is positive almost three times as often as negative, as a starting point the households with NETPUR <0 are temporarily deleted from the sample so that Equation (1) can be estimated via the familiar tobit estimator. This deletion can lead to biased estimates, however. By contrast the ordered probit estimator -- with NETPUR is redefined to be -1 for households with negative net purchases, +1 for those with positive net purchases, and 0 otherwise -- will give consistent estimates.

Ordered probits are also consistent with the (S,s) model for transactions generated by transactions costs [Davis and Norman (1990)]. To see this, let $Y^*_{i,t}$ be the underlying latent index function representing household i's *desired* net purchases in period t:

$$Y_{i,t}^{*} = \beta' \mathbf{X}_{\mathbf{i,t}} + \varepsilon_{i,t}. \qquad (2)$$

X represents the vector of state variables determining desired purchases, including hedging motives. Because of transactions costs household i will not adjust its actual purchases $Y_{i,t}$ (later $NETPUR_{i,t}$) in response to every small change in state $\mathbf{X}_{\mathbf{i,t}}$. Consequently, a natural specification for $Y_{i,t}$ is

and Balduzzi simulate their model only for retired investors of age 65 and above.

$$Y_{i,t} = \begin{cases} +1 & \text{if } Y_{i,t}^* > k_u \\ 0 & \text{if } -k_l <= Y_{i,t}^* <= k_u \\ -1 & \text{if } Y_{i,t}^* < -k_l, \end{cases} \quad (3)$$

for two unobserved thresholds k_u, $k_l > 0$. Observed net purchases will be positive, with $Y_{i,t} = 1$, only if desired purchases are large enough; that is, if the latent index Y* rises above the upper threshold k_u. Net purchases will be negative, $Y_{i,t} = -1$, only if the index falls below some lower threshold (minus) k_l. Otherwise, when the index is between the thresholds (the range of inaction) net purchases will be zero, $Y_{i,t} = 0$.

Although consistent, ordered probit does not use the information available on the magnitudes of purchases and sales. A two-sided generalization of the tobit model, here simply called the "threshold model", takes this information into account [Maddala (1983)]: [11,12]

$$Y_{i,t} = \begin{cases} Y_{i,t}^* - k_u & \text{if } Y_{i,t}^* > k_u \\ 0 & \text{if } -k_l <= Y_{i,t}^* <= k_u \\ Y_{i,t}^* + k_l & \text{if } Y_{i,t}^* < -k_l, \end{cases} \quad (3a)$$

Lam (1991) has used such an estimator in his study of automobile purchases and sales. Equation (3a) is estimated by maximum-likelihood.

As already explained, the sentiment of the CEX households is imputed using the sentiment of demographically similar households in the CAB at that time. The imputation takes place in two steps, starting in the CAB. Since the sentiment variables $Q \in \{-1, 0, +1\}$ are discrete and ordered, the estimation is by ordered probit. Let $Q_{i,t}^*$ be the corresponding latent index function

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[11] In Equation (3a) Y* can be interpreted as the difference between optimal holdings of securities before taking the transactions costs into account, and actual holdings of securities. If actual holdings fall far enough below optimal holdings -- i.e., if Y* rises above some upper threshold -- then it is optimal to incur the transactions cost and purchase more securities. See Abel and Eberly (1994) for a related model of firms' real investment with transactions costs.

for household i, representing its underlying sentiment or confidence at time t. $Q_{i,t}^*$ is assumed to depend on a vector of demographic variables **Z**:

$$Q_{i,t}^* = \mathbf{a_{0t}} + \mathbf{a_1}'\mathbf{Z_{i,t}} + v_{i,t}. \quad (4)$$

$\mathbf{a_{0t}}$ represents a full set of month dummies (a different dummy for each month of each year in the sample period). These variables allow for changes in the average level of sentiment from month to month. Since the cross-sectional distribution of sentiment around the average can also change over time, as discussed below some of the demographic variables are interacted with year dummies.[13] Equation (4) is estimated over 1982-1993, for each sentiment question Q2, Q3, and QU. The second step takes place in the CEX. The estimated coefficients from the first step, $\mathbf{\hat{a}_{0t}}$ and $\mathbf{\hat{a}_1}$, are used to impute the (index value) level of sentiment $\hat{Q}$ of the CEX households with the same demographic characteristics **Z** at time t:

$$\hat{Q}_{i,t} = \mathbf{\hat{a}_{0t}} + \mathbf{\hat{a}_1}'\,\mathbf{Z_{i,t}}\,. \quad (5)$$

Lagged $\hat{Q}_{i,t-1}$ is then used as $HEDGE_{i,t-1}$ in Equation (1)[14], for each of the three sentiment questions.

An analogous procedure is used to compute the two measures of consumption-risk. They require longer time-series for household consumption than just the four quarters recorded in the CEX. The out-of-sample consumption of each CEX household is first imputed using the consumption of demographically similar, in-sample households at that time. Let $C_{i,t}$ represent real nondurable consumption of household i in the first quarter of period t, when it is in the CEX

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[12] Equation (3a) was also generalized to $Y_{i,t} = Y_{i,t}^* - k_u + j_u$ if $Y_{i,t}^* > k_u$, and $Y_{i,t} = Y_{i,t}^* + k_l - j_l$ if $Y_{i,t}^* < k_l$, for positive j_u and j_l, and $Y_{i,t} = 0$ otherwise. However, unlike k_u and k_l, j_u and j_l were never significant and greatly slowed down the estimation, so they are not included in Equation (3a).

[13] Year dummies are used instead of month dummies for the interaction terms in order to keep the computational requirements tolerable and the corresponding demographic cells from getting too small.

sample. For consistency $C_{i,t}$ is assumed to depend on the same set of variables **Z** used above to impute sentiment[15]:

$$C_{i,t} = \mathbf{a_{0t}} + \mathbf{a_1}'\mathbf{Z_{i,t}} + u_{i,t}. \qquad (6)$$

Z includes the same year-interactions as in Equation (4), to allow for changes in the cross-sectional distribution of consumption across years, denoted by y. For notational simplicity, denote the corresponding coefficients $\mathbf{a_{0y}}$ and $\mathbf{a_{1y}}$ to signify the time-variation. Equation (6) is estimated by OLS over 1982-93. The resulting coefficients $\mathbf{\hat{a}_{0y}}$ and $\mathbf{\hat{a}_{1y}}$ are then used to impute the consumption $C_{i,t}^{y}$ of each CEX household in <u>every</u> year y = 1982 through 1993, including the years $y \neq t$ in which the household is not in the sample:[16]

$$\hat{C}_{i,t}^{\,y} = \mathbf{\hat{a}_{0y}} + \mathbf{\hat{a}_{1y}}'\mathbf{Z_{i,t}}. \qquad (7)$$

From the resulting time-series for consumption, the standard deviation of year-on-year consumption growth SD was computed over two different horizons. First, $SD^{5}_{i,t-1}$ depends on consumption growth in the five years preceding the period t in which a household is in the CEX sample. However this wastes almost half of the data, because Equation (1) can then be estimated starting only in 1987. To retain the entire 1982-1993 sample, $SD^{12}_{i,t-1}$ instead depends on consumption growth in all 12 years of the sample period, even years after the interview year t. The correlation of consumption growth with excess market returns was similarly computed over

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[14] To allow the sentiment data to remain relatively timely, the time-varying components of $\hat{Q}_{i,t-1}$ are estimated from the CAB survey in the first month of the 12 month period covered by $NETPUR_{i,t}$. This is also consistent with the wording of the sentiment questions, which refer to the ensuing 12 months.

[15] One difference is that Equation (6) uses the relative income of household i, relative to average CEX income that year, instead of the level of income used in Equation (4). This allows for changes in the average consumption to income ratio over time.

[16] $\mathbf{Z_{it}}$ contains the household's demographic characteristics as reported (in its first interview) in the period t it is in the sample; although the notation is simplified, the month dummies $\mathbf{\hat{a}_{0y}}$ also vary with the interview month during year y. For instance, consider a household in the sample from t = February 1990 to January 1991. Its estimated consumption in February to April of y=1993 is based on the sample average level of consumption in February to April 1993 (via $\mathbf{\hat{a}_{0y}}$),

the preceding 5 years, $CORR^5_{i,t-1}$, and the entire sample period, $CORR^{12}_{i,t-1}$.

Returning to the main equation (1), the remaining question is which variables belong in the vector **W** of state variables. In the absence of a closed form solution for portfolio choice in the presence of transactions costs and background risks like risky labor income, the answer is not obvious. Net purchases during period t should be driven primarily by changes in a household's state variables within period t, innovations that cause Y_t* to hit one of the thresholds. In theoretical models the key state variable would usually be the ratio of securities holdings to total wealth. If this ratio grows large enough, the household is "top-heavy" in securities and so would eventually sell some securities. However since total wealth includes human capital, real estate, pensions, etc., this ratio is hard to actually measure with accuracy. As a result, the main specification of Equation (1) will include in $\mathbf{W_{it}}$ variables directly reflecting labor market and demographic transitions. For instance, if a person is employed in t-1 and then unexpectedly becomes unemployed in t, this innovation might drive Y* down to the lower threshold during period t, triggering a sale of stock. Similarly, changes in family composition within t (changes in the number of adults *dadults* and in the number of kids *dkids*, e.g. due to births, deaths, divorce, etc.) might change household preferences or resources and so securities purchases. Since the CEX collects many of the relevant variables only in the first and fourth household interviews, the changes refer to changes between these two interviews, between the beginning and the end of the 12 month investment period t. By contrast, variables that are predetermined by the start of period t (denoted as t-1), that is variables taken from the household's first interview, do not represent innovations that would push Y* to hit a threshold during period t. Nonetheless, some

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plus the average consumption of households with the same demographics $\mathbf{Z_{it}}$. For the year-interacted variables in $\mathbf{Z_{it}}$, what counts is the consumption of demographically similar households that are in the sample in 1993 (via $\mathbf{\hat{a}_{1y}}$).

predetermined variables might belong in Equation (1). With a finite horizon, for example, the age of the investor will affect net purchases, and so age_{t-1} is included in **W**.

The required identification assumption is that at least some of the variables $\mathbf{Z_{t-1}}$ used in imputing $HEDGE_{t-1}$ do not independently belong in Equation (1). In the absence of a closed-form solution this assumption is hard to evaluate, so various sensitivity checks will be performed below. For example, while household risk can vary with education, so might transactions costs or other aspects of portfolio choice. On the other hand, regional business cycles affect household risk, yet with national securities markets region seems less likely to belong in the portfolio problem independently, apart from its effect via risk. Therefore $\mathbf{Z_{t-1}}$ will include region and region interacted with the other available matching demographic variables in Table 1, $\mathbf{Z_1} \equiv$ (age, age^2, ln(income), $\ln(income)^2$, marital status, race, gender, education, number of adults, number of kids), but not $\mathbf{Z_1}$ directly. To allow for time variation, $\mathbf{Z_{t-1}}$ will also include month dummies; plus year dummies interacted with the matching demographic variables, apart from education, again without their main effects. That is, $\mathbf{Z_{t-1}}$ will include year dummies interacted with $\mathbf{Z_2}$, which is $\mathbf{Z_1}$ excluding education.[17]

Table 2 summarizes the first-stage results. For brevity the Table reports only the joint significance of the different groups of regressors: month dummies, region dummies, region interacted with $\mathbf{Z_1}$ and year interacted with $\mathbf{Z_2}$. For the sentiment questions in columns (1) to (3), Equation (4) is estimated by ordered probit. All four groups of regressors are generally quite significant. The main exception is region for QU, but region and region interacted with $\mathbf{Z_1}$ are together highly significant. There is a good deal of cross-sectional and temporal variation in the

[17] One advantage of using consumption predicted using $\mathbf{Z_{t-1}}$ is that this purges consumption risk of the endogeneity emphasized by Mankiw and Zeldes (1991), that people who hold equity can have a larger consumption-return

resulting estimates $\hat{Q}$, though their index value magnitudes are hard to interpret. (See Souleles, 1999, for an analysis.) Ordered logits were also estimated, but since the results were quite similar they are not reported. As for consumption in column (4), where the estimation is by OLS, the R^2 is relatively large at over 0.40. This suggests that even though $\mathbf{Z_{t-1}}$ is limited to region, time, and their interactions, it still captures much of the idiosyncratic variation in household consumption. (A good part of the remaining variation is likely to be due to measurement error.) The average of the resulting market correlations $CORR^{12}$ is positive, though small at about 0.16. There is a good amount of cross-sectional variation in $CORR^{12}$, with the interquartile range extending from about -0.05 to 0.37. The average five-year correlation $CORR^5$ is somewhat smaller, but varies more over time. The average SD^{12} is about 0.15, with interquartile range from about 0.10 to 0.17. The average SD^5 is again slightly smaller, though relatively constant across years.

Turning to Equation (1), excess returns r_t will sometimes be replaced by a full set of month dummy-variables. These variables control for all aggregate factors that might correlate securities purchases and HEDGE. They also partial out the monthly average levels of sentiment and consumption, leaving only cross-sectional variation in HEDGE to explain the cross-sectional variation in NETPUR.

IV. Results.

For comparison, Table 3 begins with related aggregate data on net cash flows into equity mutual funds. The sample covers a 12 year period mostly overlapping the main sample period

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correlation as a result. Another advantage is that it reduces the measurement error that could dominate changes in consumption as measured in the original data.

used below.[18] Column (1) reports the results of an OLS regression of monthly cash flows on monthly stock returns and the aggregate ICS sentiment index, both contemporaneous and with three lags. Since cash flows are rising over time, they and the ICS are first-differenced. Cash flows significantly increase with contemporaneous returns, as in Warther (1995). The new result here is that cash flows also increase with contemporaneous sentiment. Despite the correlation of the ICS and stock returns [Friend and Adams (1964); Ludvigson (1996)], there is independent information in the sentiment questions helpful in forecasting aggregate investment flows, above and beyond the information in returns. This is consistent with the premise that sentiment picks up investors' hedging motives. Column (2) adds an interaction term between returns and sentiment, but it is insignificant.

One limitation of the literature on aggregate investment flows is that it does not usually control for the endogeneity of returns. These OLS results do not distinguish whether returns are causing flows or vice-versa, or whether both variables are responding to some third variable. As for the novel regressor, sentiment, while it seems unlikely that investment flows would directly drive sentiment, again both variables could be responding to a third variable. To control for endogeneity, the regressors are instrumented for with six lags of all the variables in the regression, as well as the Treasury Bill rate and changes in the unemployment rate. The IV results are in column (3). Contemporaneous returns remains significant. This reinforces Warther's results, implying that there is some independent causal link from returns to flows. Contemporaneous sentiment on the other hand has become insignificant, though the instruments might be inadequate. Sentiment still plays a predictive role, however, since the interaction term between sentiment and returns is now significant and positive. To bring additional, cross-sectional variation

[18] The Investment Company Institute's consistently defined "Old Basis" data series run from January 1984 through

to bear on the relation between investment flows and sentiment, one must turn to the micro data. Micro data is also required to control for transactions costs and changes in the composition of investors.

Equation (1) for net securities purchases is first estimated without the measures of hedging motives. The basic results appear in Table 4. The independent variables include excess returns, some trend variables, demographic variables dated t-1 (predetermined by the beginning of the 12 month investment period), and demographic variables dated t (allowing for innovations within the investment period). The results are generally similar across the tobit, ordered probit, and two-sided threshold estimators, in columns (1) through (3) respectively. In the tobit model the coefficient on returns r_t is significantly positive, again suggesting a causal link from returns to investment flows. r_t loses its significance using the other estimators, however, though it will become significant again on adding sentiment, below.

Since net purchases have trended up over time, trend variables were added to Equation (1). A cubic trend turns out to be significant, with net purchases rising in the first half of the 1980's, slowing from 1987 to 1991, and then accelerating in the early 1990s. Even though the estimated trend is not monotonic, it might reflect transactions costs broadly defined. For example, during the financial turmoil in 1987 and in the recession (and more recently in the fall of 1998), markets became less liquid and bid-ask spreads rose. From the longer-run point of view, however, the increasing trend in the 1990s is consistent with a long-run decline in transactions costs, both pecuniary and nonpecuniary.

The predetermined demographic variables in the basic specification include age, initial employment status, occupation, and housing status. (Additional variables will be considered

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January 1996.

below.) Most of these variables are very significant. The effect of age is hump-shaped, with net purchases rising until around age 60, then declining. This pattern is consistent with standard life-cycle theory. People who are not working, the unemployed, retirees, and students/houseworkers, make relatively smaller purchases of securities, or sell-off relatively more securities. Amongst workers, net purchases are larger for those working more hours per week. *occ1* to *occ4* and *self-employed* represent one-digit Census occupation categories. The omitted category is for professionals and managers. Relative to them, the more blue-collar occupations in *occ1* to *occ4* all make smaller net purchases. The self-employed also purchase fewer securities. As emphasized by Heaton and Lucas (1997), this could be the result of the illiquidity and risk they face from their businesses. As for housing, the omitted category is for households that own their house without a mortgage. Relative to them, renters and homeowners with a mortgage buy fewer securities. This could reflect liquidity constraints: such households might find it difficult both to make their monthly rental or mortgage payments and at the same time to invest in financial securities. There is additional evidence for liquidity constraints in the coefficient on *dvehicle*. Households purchasing cars in a given year invest less in securities in that year. (Though this coefficient is significant only in column (1), and then only at the 10% level.)

The contemporaneous demographic variables that allow for innovations within period t are generally less significant. This reflects the small number of households in the sample experiencing such innovations. For instance, the large negative coefficient on $newunemp_t$ implies that on average securities purchases substantially decline when someone becomes unemployed. However, because few household heads in the sample are employed in their first interview and then unemployed in their final interview, the standard error is correspondingly large. On the other hand, when more generally the hours worked by the head decrease net purchases usually decrease, significantly in column (1). In columns (2) and (3), leaving self-employment ($exitselfemp_t$), perhaps in response to a business failure, is associated with a decline in net purchases. The reported specification does not include changes in housing status, because few sample households underwent such changes.

Table 5 adds to the specification the various measures of households' hedging motives, $HEDGE_{i,t-1}$, focusing on the preferred ordered probit and threshold estimators. Columns (1) to (4) show the results for consumption-risk, the 12 year consumption-returns correlation $CORR^{12}$ and standard deviation of consumption SD^{12}. In all four cases, the coefficients on HEDGE are significantly negative, as expected. Households facing greater risk, as measured by a larger correlation and standard deviation, buy significantly fewer risky securities, consistent with theoretical models of portfolio choice. As for the other regressors, adding HEDGE does not much affect most of them. In columns (2) and (4) some of the variables describing the employment status of the head, including self-employment, have become somewhat less significant. One interpretation is that the employment variables were in part picking up the effects of income risk, though the occupation variables remain highly significant. Columns (5) to (10) show the results using instead the sentiment variables. The coefficients on Q2 and Q3, reflecting expected financial conditions for the household and in the aggregate, are all positive and significant, again as expected. More confident households buy more securities. As in the time series, sentiment appears to be picking up their hedging motives. The coefficients on QU, reflecting lower unemployment risk, are also significantly positive. The effect of the sentiment questions on the other regressors is similar to that just described for consumption-risk, although now excess returns r_t are significant.

In sum, all the measures of hedging motives have independent predictive power for securities purchases, above and beyond the information in returns. If returns drop, net purchases will likely decline; but they will decline even more if households face more consumption-risk or are pessimistic about the future, ceteris paribus. To quantify these responses, marginal effects were computed from the ordered probit results. Column (3) of Table 6 shows the effect of a one standard deviation decline in each of the return and hedging variables separately. (For convenience, columns (1) and (2) repeat some of the corresponding point estimates from Table 5.) The column labeled "sell" gives the resulting percentage change in the probability that a household on net sells securities; the column labeled "buy" gives the percentage change in the probability of on net buying securities. In rows (1) to (5), a one standard deviation decline in returns increases the fraction of households selling securities by 5-9%, and decreases the fraction of households buying securities by 4-7%. As for the response to consumption risk, in row (1) a one standard deviation decrease in the consumption-return correlation CORR^{12} leads to 19% fewer sellers and 19% more buyers. The effect of SD^{12} is about half as strong. The effect of Q2, the household's expectation of its own financial position, is much stronger by comparison. A one standard deviation decline is estimated to lead to a 50% increase in sellers and a 31% decrease in buyers, albeit starting from a small base of sellers and buyers. The effects of Q3 and QU, which capture expectations about aggregate conditions, are relatively weaker. In all cases the marginal effect of HEDGE is larger than the marginal effect of excess returns r. These results support the implication drawn in the introduction concerning the 1987 crash, that expectations and hedging motives are at least as important as returns in understanding individual investment.

Row (6) of Table 6 shows the results on including three of the hedging variables at the same time, CORR^{12}, SD^{12}, and Q2. All three retain their original signs and significance, implying that they reflect different aspects of households' hedging motives. Even though they are imputed using the same variables **Z**, the particular combinations of these variables they reflect contain different information. The same conclusions hold using Q3 instead of Q2, though QU becomes insignificant in conjunction with the two consumption-risk variables. In rows (7) and (8) consumption-risk is instead measured using the 5 year rolling windows on the latter part of the sample. The coefficients on $CORR^5$ and SD^5 are again negative, but smaller in magnitude than in rows (1) and (2), and only marginally significant for SD^5.

Table 7 tests whether investor behavior has changed in recent years. r_t and $HEDGE_{t-1}$ are each interacted with a dummy variable $I_{t>=1991}$ for being in the last quarter of the sample period, from 1991 on. In all cases the interaction term for returns is positive and large, and significant when using sentiment for HEDGE. The marginal effects are accordingly larger in recent years; that is, investors have become more sensitive to returns. This is so even though Equation (1) controls for changes in the characteristics of investors and trends in transactions costs. By contrast, the interaction terms for HEDGE are never significant. Household response to the measures of their hedging motives has been relatively stable.

Table 8 reports the results from various extensions. To save space, the focus is on $CORR^{12}$ and Q2, which are the theoretically most appealing measures of hedging motives. First, it remains possible that both HEDGE and securities purchases are being driven by a third variable, for instance the release of macroeconomic reports. Replacing r_t with a full set of month dummies controls for all possible macro variables, leaving only purely cross-sectional variation. In rows (1) and (2), the coefficients on HEDGE remain significant. Thus, even in the cross-section households with greater hedging motives purchase fewer securities. This complements the time series results in Table 3.

Second, some of the demographic variables in Table 1 might independently belong in

Equation (1), affecting securities purchases other than through their effect on household risk. The next rows in Table 8 control for education and household income, distinguishing permanent (or normal) income y_{perm} and transitory income y_{trans}. y_{perm} is computed as the fitted value from a prior regression of actual income on household characteristics, for comparison the same variables **Z** used to impute sentiment and consumption-risk. Transitory income y_{trans} is then computed as the difference between actual income and y_{perm}. In rows (3) and (4), y_{trans} is usually significantly positive: securities purchases are larger when income is transitorily high, consistent with a simple life-cycle model. Even controlling for income, CORR[12] and Q2 remain significant. y_{perm} in rows (5) and (6) is also significantly positive: households with higher permanent income buy more securities. Again, both measures of HEDGE remain significant. This further bolsters the identification assumption, showing that using the same variables **Z** to impute HEDGE and y_{perm} does not necessarily tip the results in favor of one variable over the other. In rows (7) and (8) the omitted education category is a high school degree. Investors with less education than this purchase significantly fewer securities, whereas college graduates purchase more securities. This result is consistent with informational transactions costs. The measures of HEDGE again remain significant.

Finally, as already noted a key state variable determining securities purchases would be the ratio of securities holdings to total wealth. Although total wealth, which includes human capital, etc., is hard to measure, nondurable consumption should be roughly proportional to it, as under the permanent income hypothesis. Therefore one can use as the state variable the ratio of securities holdings to nondurable consumption.[19] As a preliminary step, this ratio was used as the *dependent* variable in a tobit model, with the same independent variables as in Table 5. This specification parallels the previous literature on the level of equity holdings, adding the new hedging variables.[20] These variables turn out to be significant with the expected signs. Households with high consumption risk, or that are pessimistic about the future, have on average a significantly smaller securities to consumption ratio. However, with transactions costs this ratio need not stay constant for a given household, nor vary monotonically with its hedging motives. In an (S,s) framework this ratio would drift around and eventually hit one of the thresholds, triggering a purchase or sale of securities that causes the ratio to jump in the opposite direction. For instance, the greater this ratio, the more likely the household sells securities, decreasing the ratio. As a result, the usual tobit specification is not appropriate.

To illustrate, one can simply compute the change in this state ratio over the course of the investment period t, between household interviews one and four. This change is significantly positive for households making net purchases and significantly negative for households with net sales, which is consistent with (S,s) dynamics [Eberly (1994)]. Apart from the households starting at 0, the ratio increases by 41% and decreases by 31% in these cases, respectively. More formally, one can add to Equation (1) the state ratio as of the beginning of investment period t, from the first interview. The results are in the last rows of Table 8. In row (9) the coefficient on the state ratio is significantly negative, as expected. Households that become top-heavy in securities are more likely to sell, again consistent with the (S,s) model. Securities purchases also increase with scale, with the level of securities holdings at the beginning of period t. This could reflect risk

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[19] To control for seasonality in consumption, a set of 12 month dummies was first partialled out. Family size was also partialled out of consumption.

[20] This literature usually looks at equity shares out of financial wealth. As Merton (1971) and Bodie, Merton, and Samuelson (1992) emphasize, this can lead to bias since it is total wealth, including human capital, that comes into the optimal portfolio policy functions, not just financial wealth.

aversion decreasing, or transactions costs becoming less important, with wealth.[21] Even with these variables, in rows (10) and (11) the hedging variables remain significant. Thus the securities-to-total-wealth ratio is not in practice the only variable governing securities purchases -- hedging motives also matter.

V. Conclusion

This paper estimated threshold (S,s) models of household securities purchases, allowing for transactions costs. Purchases were related to excess market returns, the ratio of securities holdings to total wealth, and other variables capturing labor market and demographic transitions. Purchases were also related to various summary measures of households' hedging motives. In contrast to previous focus on income risk, the measures here included consumption-risk, which is more consistent with theoretical models of portfolio choice. The CEX was used to calculate the standard deviation of household consumption growth and the correlation of consumption growth with market returns. A second, higher frequency set of measures was taken from the monthly Michigan consumer sentiment surveys. The survey questions have households themselves identify the financial risks they believe they will face in the future, and so provide more informative and forward-looking measures of their hedging motives.

Securities purchases were found to increase with excess market returns and decrease with the securities-to-total-wealth ratio. Even controlling for these variables, securities purchases vary significantly with the measures of hedging motives. Households with more volatile consumption,

[21] In $\ln(\text{securities})_{t-1}$, securities holdings were augmented by $1 so that the log is defined when no securities are held. To allow for a discontinuity at 0, an indicator $I(\text{securities}_{t-1}=0)$ was also included in the specifications in rows (9) to (11). This indicator is significantly positive in all three cases. However it is unclear whether it is picking up a discontinuity in the effect of (securities/c) or ln(securities). If the indicator is used without these two variables, it is significantly negative: households starting with no securities are less likely to purchase. When it is used in conjunction with

or a larger consumption-return correlation, buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also buy fewer securities. This result holds in both the time series and cross-section. In sum, all the measures of hedging motives have independent predictive power for securities purchases, above and beyond the information in returns. Indeed, the marginal effects of the hedging motives are greater than the marginal effect of returns. Individual investment cannot be described as simply responding to ex post returns. However, the sensitivity of investors to returns has increased in recent years, even controlling for changes in the composition of investors.

ln(securities), the indicator is insignificant. Thus the scale effect is not driven only by households starting with no securities.

VI. Data Appendix

A. The CEX.

The CEX variable for securities purchases records the "Purchase prices of stocks, bonds or mutual funds including broker fees bought by [the] CU [consumer unit] in [the] past 12 months." Securities sales records the "Net amount from sales of stocks, bonds, or mutual funds after subtracting broker fees received by [the] CU in [the] past 12 months." NETPUR is the difference, purchases minus sales. A number of restrictions were adopted in the main sample to improve the measurement of net purchases, in addition to the restrictions described in the text. NETPUR is not used if either of its components is topcoded or otherwise flagged (e.g., "Don't Know"). Sales and purchases are supposed to be recorded only in the fourth interview. There are a few observations for which the variables are populated in previous interviews as well. When these values differ from those in interview four, NETPUR is not used. Also, NETPUR is not used when inconsistent with the corresponding variables on the levels of securities holdings in interviews one or four; e.g. when the level of securities in interview four is positive, but the reported level of securities in interview one is zero and net purchases in the interim are zero. (According to the staff at the BLS, the CEX flags for these variables do not always correctly distinguish a truly zero amount from a non-response, e.g., a "Don't know" or a refusal to answer.)

In addition to the sample restrictions in the text, an observation is dropped if the age of the head increases by more than one, or decreases, on moving into the next quarter. An observation is also dropped if the age of any other member changes in this way and thereby results in the member's switching between being a kid (less than 16 years old) and an adult (at least 16). In computing changes in the number of kids and adults, the artificial changes in each induced by a kid's moving from age 15 to 16 were suppressed. In aggregating individual expenditures to create nondurable consumption, if any component was topcoded or missing its cost or date, consumption was set to missing.

B. The CAB.

For CAB interviews that took place in more than one installment, if these installments spanned two different calendar months, the second month is used to date the observation. If any required variable is topcoded or flagged the observation is not used. When the continuous measure of total household income was missing, the midpoint of the bracketed income variable was used instead. The reference period for income is the previous calendar year, whereas for the CEX it is the past 12 months. For consistency CAB income was deflated using the CPI for the past 12 months. Since the original CAB income variable is constrained to be positive, for consistency total income in the CEX was used only when positive and not flagged. Additional sample restrictions are discussed in the text.

References

Abel, A., and Bernanke, B., 1998, Macroeconomics, third edition, New York: Addison Wesley.

Abel, A., and Eberly, J., 1994, "A Unified Model of Investment under Uncertainty," American Economic Review, 84(5), pp. 1369-84.

Barberis, N., 1999, "Investing for the Long Run when Returns are Predictable," Journal of Finance, forthcoming.

Bodie, Z., Merton, R., and Samuelson, W., 1992, "Labor Supply Flexibility and Portfolio Choice in a Life Cycle Model," Journal of Economic Dynamics and Control 16, pp. 427-449.

Brandt, M., 1999, "Estimating Portfolio and Consumption Choice: A Conditional Euler Equations Approach," Journal of Finance, LIV(5), October, pp. 1609-1645.

Brav, A., and Geczy, C., 1996, "An Empirical Resurrection of the Simple Consumption CAPM with Power Utility," University of Chicago working paper, January.

Carroll, C., Dynan K., and Krane, S., 1996, “Balance Sheets and Precautionary Saving,” Federal Reserve Board of Governors working paper, January.

Constantinides, G., and Duffie, D., 1996, "Asset Pricing with Heterogeneous Consumers," Journal of Political Economy, 104(2), pp. 219-240.

Davis, M., and Norman, A., 1990, "Portfolio Selection with Transactions Costs," Mathematics of Operations Research, 15(4), pp. 676-713.

Dynarski, S., and Gruber, J., 1997, "Can families smooth variable earnings?" Brookings Papers on Economic Activity, 1, pp. 229-303.

Eberly, J., 1994, "Adjustment of Consumers' Durables Stocks: Evidence from Automobile Purchases," Journal of Political Economy, 102 (3), pp. 403-436.

Edelen, R., and Warner, J., 1999, "Why are Mutual Fund Flow and Market Returns Related? Evidence from High Frequency Data," University of Pennsylvania working paper, February.

Friend, I., and Adams, G., 1964, “The Predictive Ability of Consumer Attitudes, Stock Prices, and Non-Attitudinal Variables,” Journal of the American Statistical Association, 59, December, pp. 987-1005.

Gakidis, H., 1998, "Stocks for the Old? Earnings Uncertainty and Life-Cycle Portfolio Choice," M.I.T. working paper, June.

Haliassos, M., and Bertaut, C., 1995, "Why Do So Few Hold Stocks?" The Economic Journal, 105, pp. 1110-1129, September.

Heaton, J., and Lucas, D., 1996, "Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Pricing," Journal of Political Economy, 104(3), pp. 443-487.

Heaton, J., and Lucas, D., 1997, "Portfolio Choice and Asset Prices; The Importance of Entrepreneurial Risk," Northwestern University working paper, August; forthcoming, Journal of Finance.

Kimball, M., 1993, "Standard Risk Aversion," Econometrica, 61(3), May, pp. 589-611.

Koo, H., 1995, "Consumption and Portfolio Selection with Labor Income I: Evaluation of Human Capital," Washington University working paper.

Lam, P., 1991, "Permanent Income, Liquidity, and Adjustments of Automobile Stocks: Evidence from Panel Data," Quarterly Journal of Economics, February, pp. 203-230.

Ludvigson, S., 1996, “Consumer Sentiment and Household Expenditure: Reevaluating the Forecasting Equations,” Federal Reserve Bank of New York working paper, November.

Lynch, A., and Balduzzi, P., 1999, "Predictability and Transactions Costs: The Impact on Rebalancing Rules and Behavior, " New York University working paper, October; forthcoming, Journal of Finance.

Maddala, G, 1983, Limited-Dependent and Qualitative Variables in Economics, Cambridge: Cambridge University Press.

Mankiw, N., and Zeldes, S., 1991, "The Consumption of Stockholders and Nonstockholders," Journal of Financial Economics, 29, pp. 97-112.

Mayers, D., 1972, "Non-marketable Assets and Capital Market Equilibrium under Uncertainty," in: Jensen, M., ed., Studies in the Theory of Capital Markets, Praeger: New York, pp. 223-248.

Merton, R., 1971, "Optimum Consumption and Portfolio Rules in a Continuous-Time Model," Journal of Economic Theory, 3, pp. 373-413.

Rea, J., and Marcis, R., 1996, "Mutual Fund Shareholder Activity during U.S. Stock Market Cycles, 1944-95," Investment Company Institute Perspective, 2(2), March.

Souleles, N., 1999, "Consumer Sentiment: Its Rationality and Usefulness in Forecasting Expenditure -- Evidence from the Michigan Micro Data," University of Pennsylvania working paper, March.

Souleles, S., 1999a, “The Response of Household Consumption to Income Tax Refunds,” American Economic Review, 89(4), September.

Storesletten, K., Telmer, C., and Yaron, A., 1997, "Consumption and Risk Sharing over the Life Cycle," University of Pennsylvania working paper, July.

Viceira, L., 1990, "Optimal Portfolio Choice for Long-Horizon Investors with Nontradable Labor Income," Harvard University working paper, October.

Vissing-Jorgensen, A., 1999, "Towards an Explanation of Household Portfolio Choice Heterogeneity: Nonfinancial Income and Participation Cost Structures," University of Chicago working paper, February.

Warther, V., 1995, "Aggregate Mutual Fund Flows and Security Returns," Journal of Financial Economics, 39, pp. 209-235.

Table 1: Sample Means

	CEX	CAB
age	49.7	45.4
ln(income)	10.0	9.93
married	0.593	0.563
separated	0.289	0.271
nonwhite	0.114	0.093
female head	0.278	0.253
no high school	0.246	0.167
college	0.239	0.277
# adults	1.82	1.73
# kids	0.691	0.698
midwest	0.262	0.287
south	0.281	0.322
west	0.234	0.198

Notes:

· The omitted categorical variables are: single, white, male head, high school graduate, northeast.

· For comparison the CAB sample period is restricted to the CEX sample period, 1982-93. Averages are based on 28159 observations in the CEX and 47104 observations in the CAB. The actual samples used in the analyses below can differ somewhat due to missing data or additional sample restrictions, as explained in the text and the following tables.

Figure 1: Monthly Averages of Q2, Q3, and QU

Table 2: Variation in Sentiment and Consumption

	(1)		(2)		(3)		(4)	
	Q2		Q3		QU		C	
	chi2	p-value	chi2	p-value	chi2	p-value	F	p-value
month	286.55	0.000	1606.36	0.000	973.59	0.000	3.73	0.000
region	11.01	0.012	7.41	0.060	2.74	0.433	15.17	0.000
region*Z_1	267.46	0.000	132.96	0.000	116.18	0.000	73.02	0.000
year*Z_2	941.69	0.000	535.31	0.000	537.73	0.000	175.72	0.000
log likelihood	-41608.0		-31553.4		-45455.1			
# obs	45785		42527		46587		170358	
R^2	0.06		0.09		0.05		0.41	

Notes:
· In columns (1) - (3), estimation of sentiment is by ordered probit in the CAB, 1982-1993. In column (4), estimation of consumption is by OLS in the CEX, 1982-93. The table shows the significance of different groupings of the regressors.
· The omitted region variable is for the northeast. Z_1 includes age, age^2, ln(income), ln(income)^2, marital status, race, gender, education, number of adults, number of kids. Z_2 is Z_1 excluding education.

Table 3: Net Cash Flow into Equity Mutual Funds
1984:01-1995:12

CASH FLOW	(1) OLS coef.	s.e.		(2) OLS coef.	s.e.		(3) IV coef.	s.e.	
$returns_t$	30.75	3.78	**	31.16	4.08	**	27.68	10.40	**
$returns_{t-1}$	-24.94	3.81	**	-24.75	3.89	**	-22.35	4.68	**
$returns_{t-2}$	4.12	3.82		4.26	3.87		5.89	4.31	
$returns_{t-3}$	3.80	3.83		3.75	3.85		2.57	4.32	
ICS_t	8.44	3.62	**	8.18	3.76	**	5.64	8.08	
ICS_{t-1}	-.59	3.59		-.56	3.61		-.72	3.92	
ICS_{t-2}	-5.17	3.59		-5.06	3.63		-3.68	4.01	
ICS_{t-3}	-1.86	3.56		-1.65	3.65		.06	4.29	
$ICS_t * returns_t$				24.09	89.22		393.38	185.99	**
constant	-.06	.18		-.08	.20		-.21	.26	
# of obs		144			144			144	
adj R2		0.47			0.46			0.37	

* = significant at the 10% level, ** at 5%.

Notes:
- Net cash flow into stock funds comes from the "Old Basis" data set of the Investment Company Institute.
- Cash flows are measured in billions $. They and the ICS have been first-differenced.
-

Table 4: Models of Net Securities Purchases

$NETPUR_t$	(1) tobit			(2) ordered probit			(3) threshold model		
	coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	0.180	0.090	**	0.116	0.088		0.081	0.074	
trend	0.253	0.065	**	0.199	0.064	**	0.168	0.054	**
$trend^2$	-4.126	0.961	**	-3.255	0.955	**	-2.742	0.804	**
$trend^3$	19.368	4.300	**	15.372	4.283	**	12.875	3.610	**
age_{t-1}	0.025	0.005	**	0.004	0.005		0.005	0.004	
$age_{t-1}^2/100$	-0.022	0.005	**	-0.003	0.005		-0.004	0.004	
employment status									
$hours_{t-1}$	0.005	0.001	**	0.003	0.001	**	0.003	0.001	**
$hoursspouse_{t-1}$	0.001	0.001		0.001	0.001	*	0.001	0.001	
$unemployed_{t-1}$	-0.595	0.111	**	-0.205	0.081	**	-0.137	0.069	**
$retired_{t-1}$	-0.165	0.068	**	-0.224	0.068	**	-0.134	0.057	**
$student_{t-1}$	-0.688	0.164	**	-0.222	0.096	**	-0.168	0.081	**
occupation									
$occ1_{t-1}$	-0.197	0.035	**	-0.167	0.037	**	-0.127	0.031	**
$occ2_{t-1}$	-0.496	0.062	**	-0.290	0.051	**	-0.227	0.043	**
$occ3_{t-1}$	-0.494	0.057	**	-0.320	0.049	**	-0.239	0.042	**
$occ4_{t-1}$	-0.605	0.052	**	-0.348	0.041	**	-0.259	0.035	**
$selfemployed_{t-1}$	-0.163	0.045	**	-0.152	0.050	**	-0.086	0.042	**
housing									
$mortgage_{t-1}$	-0.094	0.032	**	-0.112	0.033	**	-0.112	0.028	**
$rent_{t-1}$	-0.355	0.040	**	-0.174	0.035	**	-0.153	0.030	**
$dadult_t$	-0.022	0.033		0.026	0.032		0.024	0.027	
$dkid_t$	0.033	0.038		0.029	0.035		0.022	0.030	
change in employment									
$dhours_t$	0.003	0.001	**	0.001	0.001		0.001	0.001	
$dhoursspouse_t$	0.001	0.001		0.001	0.001		0.001	0.001	
$newunemp_t$	-0.466	0.298		-0.167	0.155		-0.141	0.131	
$stopwork_t$	0.179	0.094	*	-0.024	0.092		0.001	0.077	
$startwork_t$	0.079	0.106		-0.059	0.094		-0.038	0.079	
change in occupation									
$docc_t$	0.003	0.034		0.027	0.033		0.023	0.028	
$newselfemp_t$	0.049	0.078		0.009	0.084		-0.002	0.071	
$exitselfemp_t$	-0.127	0.104		-0.268	0.106	**	-0.239	0.088	**
$dvehicle_t$	-0.066	0.038	*	-0.035	0.036		-0.028	0.030	
# of Obs		28034			28440			28440	
Log Lik		-4062.26			-6642.06			-6338.635	
Pseudo R2		0.08			0.02			0.02	

* = significant at the 10% level, ** at 5%.

Notes:

- The excluded dummy variables are: (occupation) manager/professional, (housing) homeowner without mortgage, (change in occupation) no change. *student* includes students and houseworkers. *occ1* = technical, sales, and administrative support; *occ2* = service, including military; *occ3* = precision production, craft, and repair; *occ4* = operators, fabricators, and laborers. *docc* refers to a change in occupation category, not including movements into or out of self-employment (in *newselfemp* and *exitselfemp*, respectively). *newunemp* refers to a head who is employed in the first interview but unemployed in the final interview. Similarly, *stopwork* refers a transition from employment to out-of-the-labor-force over the same period, and *startwork* to a transtion from out-of-the-labor-force or unemployed back to employment.

- constant in the tobit and threshold models not shown

Table 5: Hedging Motives

HEDGE Measure	(1) CORR[12]			(2)			(3) SD[12]			(4)		
	ordered probit			threshold model			ordered probit			threshold model		
$NETPUR_t$	coef.	s.e.		coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	0.125	0.094		0.090	0.078		0.131	0.094		0.095	0.078	
trend	0.240	0.069	**	0.200	0.058	**	0.234	0.069	**	0.196	0.058	**
$trend^2$	-3.878	1.023	**	-3.224	0.857	**	-3.742	1.021	**	-3.133	0.857	**
$trend^3$	18.188	4.603	**	15.054	3.858	**	17.478	4.594	**	14.565	3.858	**
age_{t-1}	0.009	0.005	*	0.008	0.004	**	0.005	0.005		0.005	0.004	
$age_{t-1}^2/100$	-0.007	0.005		-0.007	0.004		-0.003	0.005		-0.003	0.004	
employment												
$hours_{t-1}$	0.003	0.001	**	0.003	0.001	**	0.004	0.001	**	0.003	0.001	**
$hoursspou_{t-1}$	0.001	0.001	*	0.001	0.001		0.001	0.001	*	0.001	0.001	
$unemploye_{t-1}$	-0.158	0.087	*	-0.093	0.073		-0.152	0.088	*	-0.084	0.074	
$retired_{t-1}$	-0.190	0.073	**	-0.104	0.061	*	-0.205	0.073	**	-0.116	0.061	**
$student_{t-1}$	-0.164	0.101	*	-0.118	0.085		-0.175	0.102	*	-0.123	0.086	
occupation												
$occ1_{t-1}$	-0.146	0.040	**	-0.114	0.033	**	-0.161	0.040	**	-0.126	0.033	**
$occ2_{t-1}$	-0.236	0.056	**	-0.182	0.047	**	-0.255	0.056	**	-0.196	0.047	**
$occ3_{t-1}$	-0.286	0.053	**	-0.206	0.045	**	-0.310	0.053	**	-0.226	0.045	**
$occ4_{t-1}$	-0.288	0.044	**	-0.205	0.038	**	-0.321	0.044	**	-0.233	0.037	**
$selfemploy_{t-1}$	-0.132	0.055	**	-0.061	0.046		-0.139	0.055	**	-0.066	0.046	
housing												
$mortgage_{t-1}$	-0.130	0.036	**	-0.128	0.030	**	-0.117	0.036	**	-0.117	0.030	**
$rent_{t-1}$	-0.188	0.038	**	-0.164	0.032	**	-0.173	0.038	**	-0.150	0.032	**
$dadult_t$	0.041	0.034		0.035	0.028		0.051	0.034		0.044	0.028	
$dkid_t$	0.033	0.038		0.024	0.032		0.039	0.037		0.029	0.031	
D employment												
$dhours_t$	0.002	0.002		0.001	0.001		0.002	0.002		0.001	0.001	
$dhoursspou_t$	0.001	0.001		0.001	0.001		0.001	0.001		0.001	0.001	
$newunemp_t$	-0.126	0.167		-0.109	0.141		-0.124	0.167		-0.105	0.141	
$stopwork_t$	0.013	0.099		0.035	0.082		0.018	0.099		0.039	0.082	
$startwork_t$	-0.010	0.101		0.007	0.084		-0.024	0.100		-0.006	0.084	
D occupation												
$docc_t$	0.037	0.036		0.029	0.030		0.037	0.036		0.029	0.030	
$newselfemp_t$	0.012	0.090		0.001	0.075		0.019	0.090		0.008	0.075	
$exitselfemp_t$	-0.347	0.115	**	-0.301	0.095	**	-0.345	0.115	**	-0.300	0.096	**
$dvehicle_t$	-0.038	0.039		-0.020	0.032		-0.035	0.039		-0.018	0.032	
$HEDGE_{t-1}$	-0.288	0.045	**	-0.238	0.038	**	-0.407	0.162	**	-0.404	0.137	**
# of Obs	23789			23789			23789			23789		
Log Lik	-5821.99			-5563.73			-5839.92			-5579.79		
Pseudo R2	0.02			0.02			0.02			0.02		

Table 5: Hedging Motives (ctd)

HEDGE Measure	(5) Q2			(6)			(7) Q3			(8)		
	ordered probit			threshold model			ordered probit			threshold model		
$NETPUR_t$	coef.	s.e.		coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	0.211	0.095	**	0.154	0.079	**	0.215	0.097	**	0.156	0.081	**
trend	0.148	0.070	**	0.124	0.059	**	0.095	0.080		0.085	0.067	
$trend^2$	-2.575	1.042	**	-2.159	0.873	**	-1.833	1.164		-1.604	0.976	*
$trend^3$	12.855	4.665	**	10.702	3.908	**	10.052	5.074	**	8.616	4.256	**
age_{t-1}	0.016	0.005	**	0.013	0.004	**	0.010	0.005	**	0.009	0.004	**
$age_{t-1}^2/100$	-0.006	0.005		-0.006	0.004		-0.008	0.005		-0.007	0.004	*
employment												
$hours_{t-1}$	0.003	0.001	**	0.003	0.001	**	0.003	0.001	**	0.003	0.001	**
$hoursspou_{t-1}$	0.001	0.001	*	0.001	0.001		0.001	0.001		0.001	0.001	
$unemploye_{t-1}$	-0.132	0.087		-0.077	0.073		-0.163	0.087	*	-0.100	0.073	
$retired_{t-1}$	-0.180	0.073	**	-0.097	0.061		-0.208	0.073	**	-0.119	0.061	**
$student_{t-1}$	-0.164	0.101		-0.122	0.085		-0.177	0.101	*	-0.132	0.085	
occupation												
$occ1_{t-1}$	-0.146	0.040	**	-0.115	0.033	**	-0.156	0.040	**	-0.123	0.033	**
$occ2_{t-1}$	-0.230	0.056	**	-0.181	0.048	**	-0.251	0.056	**	-0.196	0.048	**
$occ3_{t-1}$	-0.275	0.053	**	-0.201	0.045	**	-0.308	0.053	**	-0.225	0.045	**
$occ4_{t-1}$	-0.277	0.045	**	-0.201	0.038	**	-0.317	0.044	**	-0.231	0.037	**
$selfemploy_{t-1}$	-0.124	0.055	**	-0.057	0.046		-0.142	0.055	**	-0.070	0.046	
housing												
$mortgage_{t-1}$	-0.135	0.036	**	-0.131	0.030	**	-0.120	0.036	**	-0.119	0.030	**
$rent_{t-1}$	-0.187	0.038	**	-0.163	0.032	**	-0.173	0.038	**	-0.153	0.032	**
$dadult_t$	0.051	0.034		0.043	0.028		0.050	0.034		0.042	0.028	
$dkid_t$	0.033	0.037		0.025	0.032		0.037	0.037		0.028	0.032	
D employment												
$dhours_t$	0.002	0.002		0.001	0.001		0.002	0.002		0.001	0.001	
$dhoursspou_t$	0.001	0.001		0.001	0.001		0.001	0.001		0.001	0.001	
$newunemp_t$	-0.119	0.167		-0.105	0.141		-0.129	0.167		-0.113	0.141	
$stopwork_t$	0.016	0.099		0.038	0.082		0.020	0.099		0.041	0.082	
$startwork_t$	-0.013	0.101		0.004	0.084		-0.021	0.100		-0.002	0.084	
D occupation												
$docc_t$	0.038	0.036		0.030	0.030		0.035	0.036		0.028	0.030	
$newselfemp_t$	0.007	0.090		-0.002	0.075		0.011	0.090		0.001	0.075	
$exitselfemp_t$	-0.358	0.115	**	-0.309	0.096	**	-0.352	0.115	**	-0.305	0.096	**
$dvehicle_t$	-0.036	0.039		-0.019	0.033		-0.035	0.039		-0.019	0.033	
$HEDGE_{t-1}$	0.384	0.056	**	0.281	0.048	**	0.118	0.034	**	0.086	0.029	**
# of Obs	23789			23789			23789			23789		
Log Lik	-5820.23			-5566.83			-5837.11			-5579.85		
Pseudo R2	0.02			0.02			0.02			0.02		

Notes:
- See Table 4 for definitions of the demographic control variables.
- constant in the threshold models not shown

Table 6: Effects of Returns and Hedging Motives

	NETPUR$_t$	(1) ordered probit coef.	s.e.		(2) threshold model coef.	s.e.		(3) marginal effect sell	buy
(1)	r_t	0.125	0.094		0.090	0.078		0.05	-0.04
	$CORR^{12}_{t-1}$	-0.288	0.045	**	-0.238	0.038	**	-0.19	0.19
(2)	r_t	0.131	0.094		0.095	0.078		0.05	-0.04
	SD^{12}_{t-1}	-0.407	0.162	**	-0.404	0.137	**	-0.10	0.09
(3)	r_t	0.211	0.095	**	0.154	0.079	**	0.08	-0.06
	$Q2_{t-1}$	0.384	0.056	**	0.281	0.048	**	0.50	-0.31
(4)	r_t	0.215	0.097	**	0.156	0.081	**	0.08	-0.06
	$Q3_{t-1}$	0.118	0.034	**	0.086	0.029	**	0.17	-0.13
(5)	r_t	0.238	0.101	**	0.175	0.085	**	0.09	-0.07
	QU_{t-1}	0.127	0.044	**	0.094	0.037	**	0.14	-0.11
(6)	r_t	0.194	0.095	**	0.139	0.079	*		
	$CORR^{12}_{t-1}$	-0.234	0.046	**	-0.200	0.038	**		
	SD^{12}_{t-1}	-0.398	0.163	**	-0.395	0.136	**		
	$Q2_{t-1}$	0.317	0.058	**	0.222	0.049	**		
	# of Obs		23789			23789			
(7)	r_t	0.024	0.168		0.056	0.132		0.01	-0.01
	$CORR^{5}_{t-1}$	-0.086	0.037	**	-0.063	0.029	**	-0.11	0.10
(8)	r_t	0.024	0.168		0.055	0.131		0.01	-0.01
	SD^{5}_{t-1}	-0.334	0.302		-0.392	0.237	*	-0.05	0.05
	# of Obs		13576			13576			

* = significant at the 10% level, ** at 5%.

Notes:

- Demographic and trend variables not shown.
- Column (3) shows the marginal effects in the ordered probit model of a one standard deviation decrease in the corresponding variable in each row. The column labeled sell gives the percentage change in the predicted fraction of households with negative net purchases; the column labeled buy gives the percentage change in the fraction of households with positive net purchases.

Table 7: Recent Changes

$NETPUR_t$		(1) ordered probit			(2) marginal effect	
		coef.	s.e.		sell	buy
(1)	r	0.092	0.097		0.03	-0.03
	$r * I_{t>=1991}$	0.440	0.354		0.21	-0.14
	$CORR^{12}$	-0.309	0.050	**	-0.20	0.21
	$CORR^{12} * I_{t>=1991}$	0.086	0.102		-0.15	0.14
(2)	r	0.101	0.097		0.04	-0.03
	$r * I_{t>=1991}$	0.351	0.382		0.17	-0.13
	SD^{12}	-0.443	0.172	**	-0.10	0.10
	$SD^{12} * I_{t>=1991}$	0.182	0.315		-0.06	0.05
(3)	r	0.164	0.097	*	0.06	-0.05
	$r * I_{t>=1991}$	0.765	0.355	**	0.39	-0.25
	Q2	0.412	0.058	**	0.54	-0.33
	$Q2 * I_{t>=1991}$	-0.081	0.074		0.42	-0.27
(4)	r	0.184	0.099	*	0.06	-0.05
	$r * I_{t>=1991}$	0.783	0.398	**	0.40	-0.26
	Q3	0.163	0.040	**	0.24	-0.17
	$Q3 * I_{t>=1991}$	-0.074	0.077		0.13	-0.10
(5)	r	0.180	0.104	*	0.07	-0.05
	$r * I_{t>=1991}$	1.018	0.420	**	0.52	-0.31
	QU	0.116	0.047	**	0.12	-0.10
	$QU * I_{t>=1991}$	0.165	0.103		0.33	-0.22
	# of Obs		23789			

* = significant at the 10% level, ** at 5%.

Notes:

- Demographic and trend variables not shown.
- Column (2) shows the marginal effects in the ordered probit model of a one standard deviation decrease in the corresponding variable. The column labeled sell gives the percentage change in the fraction of households with negative net purchases; the column labeled buy gives the percentage change in the fraction of households with positive net purchases. For the variables interacted with $I_{t>=1991}$, the marginal effects give the total effects for households in the sample from 1991; for the uninteracted variables, the figures are the effects for households in the sample before 1991.

Table 8: Extensions

NETPUR$_t$		(1) ordered probit			(2) threshold model		
		coef.	s.e.		coef.	s.e.	
(1)	$CORR^{12}$	-0.358	0.051	**	-0.286	0.043	**
	(month dummies)						
(2)	Q2	0.485	0.062	**	0.355	0.052	**
	(month dummies)						
(3)	$CORR^{12}$	-0.289	0.045	**	-0.239	0.038	**
	$\ln y_{trans}$	0.083	0.055		0.102	0.046	**
(4)	Q2	0.417	0.057	**	0.313	0.049	**
	$\ln y_{trans}$	0.158	0.055	**	0.157	0.046	**
(5)	$CORR^{12}$	-0.208	0.046	**	-0.178	0.038	**
	$\ln y_{perm}$	0.188	0.020	**	0.135	0.017	**
(6)	Q2	0.204	0.062	**	0.146	0.052	**
	$\ln y_{perm}$	0.181	0.021	**	0.133	0.018	**
(7)	$CORR^{12}$	-0.252	0.045	**	-0.209	0.038	**
	no high school	-0.107	0.034	**	-0.103	0.029	**
	college	0.161	0.032	**	0.115	0.027	**
(8)	Q2	0.301	0.059	**	0.211	0.049	**
	no high school	-0.091	0.036	**	-0.094	0.029	**
	college	0.150	0.033	**	0.109	0.027	**
	# of Obs		23789			23789	
(9)	$(securities/c)_{t-1}$	-0.102	0.022	**	-0.043	0.015	**
	$\ln(securities)_{t-1}$	0.134	0.017	**	0.081	0.012	**
	# of Obs		26392			26392	
(10)	$(securities/c)_{t-1}$	-0.094	0.023	**	-0.033	0.016	**
	$\ln(securities)_{t-1}$	0.125	0.018	**	0.071	0.012	**
	$CORR^{12}$	-0.140	0.053	**	-0.090	0.037	**
(11)	$(securities/c)_{t-1}$	-0.092	0.023	**	-0.032	0.016	**
	$\ln(securities)_{t-1}$	0.123	0.018	**	0.067	0.013	**
	Q2	0.273	0.067	**	0.160	0.047	**

# of Obs	21986	21986

* = significant at the 10% level, ** at 5%.

Notes:

- Demographic variables and trend variables/time dummies not shown.
- y_{perm} is the predicted level if income, y_{trans} is the residual. In rows (7) and (8) the omitted educational category is high school.
- In rows (9) to (11), ln(securities) is the log of the level of security holdings, plus $1, at the beginning of the investment period t. c_{t-1} is consumption in the first quarter of period t, after partialling out seasonal and family size effects.