Household Portfolio Choice, Transactions Costs, and Hedging Motives

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January, 2003

For helpful comments I thank Andy Abel, Michael Brandt, George Constantinides, Steve Davis, John Heaton, Urban Jermann, Leonid Kogan, Todd Sinai, Annette Vissing-Jorgensen, Paul Willen, Amir Yaron, and seminar participants at the NBER summer institute, the University of Chicago, Boston College, the New York Area Macro conference at the Stern School, and various Wharton workshops. I am grateful to Richard Curtin for providing data, and to Hoon Ping Teo for excellent research assistance. Of course, none of these people is responsible for any errors herein.

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Abstract:

This paper extends the empirical literature on portfolio choice in three ways. First, consistent with theoretical models of portfolio choice, it estimates tobit models of the ratio of risky securities to *total* wealth, proxied by consumption, not just *financial* wealth. Second, in response to evidence that transactions costs are important, (S,s)-type models of securities purchases (asset flows) are also estimated. Third, alternative measures of household risk, both hedging motives and background risks, are considered. In addition to previously studied income risk, whose drawbacks are discussed, the measures include "consumption risk". The Consumer Expenditure Survey is used to calculate the standard deviation of household consumption growth and the correlation of consumption growth with market returns, both instrumented to avoid endogeneity. Another set of measures is taken from the monthly Michigan consumer sentiment surveys, which have households themselves identify the risks they believe they will face in the future.

Both securities holdings and securities purchases are found to vary significantly with the alternative measures of household risk. Households with exogenously more volatile consumption, or a larger consumption-return covariance, hold and buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also hold and buy fewer securities. By contrast, income risk is generally less significant. Securities purchases are also found to increase with excess market returns and decrease with the initial securities-to-wealth ratio. This latter result is consistent with the rebalancing motive generated by (S,s)-type dynamics. The marginal effects of the household risks are greater than the marginal effect of past returns. However, the sensitivity of securities purchases to returns has increased in recent years, even controlling for changes in the composition of investors.

JEL classification: G11

Keywords: Portfolio choice; Transactions costs; Hedging motives, Background risk; Consumer sentiment, Consumption risk.

There is a tremendous amount of cross-sectional heterogeneity in households' portfolio choices, especially in their equity holdings. Most of the empirical literature on equity holding has estimated tobit models of the share of household financial wealth invested in equities, as a function of household demographic characteristics. Recent attention has focused on hedging motives induced by undiversifiable labor income risk. This risk is usually measured by the standard deviation of a household's income changes (background risk) or their covariance with equity returns.[1] If this standard deviation or covariance is large, the household is expected to invest less in risky financial assets, *ceteris paribus.*[2] However, the empirical results on labor income risk have been mixed. (For a recent review, see Heaton and Lucas (2000).) In tobit models of equity shares, labor income risk is often insignificant; and even when significant its effect on shares has usually been relatively small in magnitude.

This paper considers a number of possible explanations for these mixed results. First, theoretical models of portfolio choice do not generally provide crisp implications for the share of equities in just *financial* wealth; rather, their implications apply to the share in *total* wealth [Merton (1971), Bodie, Merton, and Samuelson (1992)]. Unfortunately total wealth, which includes human capital, real estate, pensions, etc., is not available in standard household data sets and is difficult to estimate. However, by using the Consumer Expenditure Survey [CEX] this paper is able to proxy for total wealth with nondurable consumption. Under the Permanent-

[1] The term background risk generally refers to risks uncorrelated with returns. The empirical analysis below will also consider non-zero correlations, for convenience using the term “hedging motive” for both cases.

[2] The analytic results for background risk are generally proven in a static setting, for "proper" preferences [Pratt and Zeckhauser (1987), Kimball(1993)]. There are no general closed-form solutions for dynamic portfolio choice in the presence of both transactions costs and undiversifiable income or other risks, which are the context of this paper. For simulations, see Heaton and Lucas (1996), Koo (1995), and Storesletten, Telmer, and Yaron (1997). Viceira (2001) 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 adjust their financial portfolios in response to other risks is an old one, see e.g. Merton (1971) and Mayers (1972). For a general analysis of transactions costs and (S,s) dynamics, see Davis and Norman (1990) and the simulations in Lynch and Balduzzi (2000).

Income Hypothesis [PIH] nondurable consumption should be proportional to total wealth. Even outside the PIH, consumption is likely to be a better proxy for total wealth than is financial wealth, considering the disproportionate importance of nonfinancial wealth for most households [e.g., Heaton and Lucas (2000b), Davis and Willen (1998)]. As far as the author is aware, this is the first paper to estimate tobit models of the ratio of risky asset holdings to such a proxy for total wealth.[3]

Second, financial transactions occur discretely, not continuously, which suggests that transactions costs or other frictions might be important.[4] In the presence of such frictions, equity shares, even if properly measured, need not vary linearly with hedging motives and other variables. In this case tobit models, which assume linearity conditional on holding any equity, would be misspecified. In response this paper also estimates (S,s)-type threshold models of households' purchases of risky assets. Such models analyze asset flows, not asset stocks, explicitly allowing for transactions costs. Although previous empirical studies of portfolio choice have recognized the potential importance of transactions costs, they have not generally taken them into account in their estimation. Lam (1991) and Eberly (1994) have undertaken related studies of automobile purchases, where transactions costs are again important. Here purchases of risky securities will be related to excess market returns, various variables capturing hedging motives, and the initial ratio of risky securities to wealth (proxied by consumption). The latter variable captures the "rebalancing motive" that will be generated if (S,s)-type dynamics are important.

Third, the volatility of labor income might not adequately capture the undiversifiable

[3] Heaton and Lucas (2000b) estimate the present discounted value of labor and pension income under certain assumptions about their growth rates and discount rates.

risks that households actually face. To begin with, households face a multitude of non-earnings risks, including illness, divorce, automobile and college costs that can turn out larger than expected, stochastic house prices and rents, etc. As for earnings risk, the commonly measured standard deviation of income changes does not 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)]. Further, an observed change in income might not represent an unexpected, undiversifiable shock from the point of the view of the household. Without access to the household's information set, it is difficult for the econometrician to identify the extent to which the income change was predictable.[5] It is also difficult to identify whether the household has sufficient assets, or access to credit and other, sometimes informal, insurance mechanisms (e.g., family gifts) in order to buffer income shocks.[6] As a result some households are better able to smooth their consumption past a given income shock than others [Dynarski and Gruber (1997)]. The general point is that households should not care about their income volatility per se, but only about its implications for their consumption. Unfortunately the econometrician cannot hope to observe the full array of shocks and consumption-smoothing mechanisms for each

[4] In addition to the evidence on transactions costs below, Ameriks and Zeldes (2000) find that, in TIAA-CREF retirement accounts, most people make very few transactions. See also Vissing-Jorgenson (1999).

[5] Consider e.g. an academic receiving guaranteed summer support. The econometrician would see a large rise in income at the beginning of the summer and then a large decline at the end of summer, and wrongly conclude this income process is risky. More generally, one of the greatest difficulties in testing the permanent-income hypothesis and other consumption models is identifying changes in income that are predictable or transitory [Souleles (1999)].

[6] There is a large literature documenting the pervasiveness of liquidity constraints. *E.g*., Jappelli (1990) and Gross and Souleles (2002) show that liquidity constraints vary cross-sectionally and over time. Zeldes (1989) and Jappelli, Pischke, and Souleles (1998) show that they interfere with households' ability to smooth consumption past income

household.[7]

This paper examines alternative measures of households' hedging motives, in addition to income risk. For convenience, the term hedging motives will be applied to both risks correlated with returns and uncorrelated with returns (background risk). First, demographic and labor market transitions are directly examined, including but not limited to transitions like unemployment spells that induce volatility in income. Second, the CEX is used to compute "consumption risk", measured as the standard deviation of household consumption growth and the covariance of consumption growth with equity returns. Unlike income changes, consumption changes should reflect only innovations from the household's point of view, taking into account their persistence. Indeed, consumption risk is a summary statistic for all the risks a household faces, not only those induced by income shocks or those observable by the econometrician. Consumption risk also takes into account (*i.e.*, is measured net of) all the consumption-smoothing mechanisms available to the household. For instance, consumption is likely to be more volatile in the presence of liquidity constraints than otherwise. To avoid the endogeneity of consumption risk with respect to portfolio choice in particular, it will be instrumented for using regional variation and other instruments. To the author's knowledge this is the first paper to use consumption risk to explain portfolio choice in the context of tobit and (S,s)-type models.

A third set of measures of hedging motives is taken from the monthly Michigan surveys of Consumer Attitudes and Behavior [CAB], which underlie the well known Michigan Index of Consumer Sentiment [ICS] (or "consumer confidence"). The CAB surveys ask households about

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fluctuations. There is also a large literature on the importance of intergenerational gifts, including gifts given to insure against adverse shocks. See *e.g.* McGarry (1999).

[7] Dynarski and Gruber examine, among other income shocks, unemployment spells. Souleles (2000) looks at college tuition payments, which also induce large fluctuations in disposable income (net of tuition). He stresses the difficulty of measuring the full array of resources available to households to handle these fluctuations, including savings,

expected changes in salient variables like their financial security, the probability of unemployment, and aggregate business and financial conditions. Such sentiment variables provide direct access to household information sets that is not usually available to the econometrician, for more than just income risk. The same variables have been shown to be quite useful in forecasting household consumption and precautionary savings motives [Carroll, Fuhrer, Wilcox (1999), Souleles (1999)]. Because they reflect households' expectations of upcoming risks, they capture household hedging motives and hence should also help explain portfolio choices.

To preview the results, both holdings and purchases of risky securities are found to vary significantly with the measures of hedging motives. Households with exogenously more volatile consumption, or a larger consumption-return correlation, hold and buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also hold and buy fewer securities. By contrast, income risk is less significant in explaining portfolio choice. Securities purchases are also found to increase with excess market returns and decrease with the initial securities-to-consumption ratio. The latter result is consistent with the rebalancing motive generated by (S,s)-type dynamics. The marginal effects of the hedging motives are greater than the marginal effect of returns. However, the sensitivity of securities purchases to returns has increased in recent years, even controlling for changes in the composition of investors.

Section I begins by discussing the measures of consumption risk and sentiment. Section II surveys related studies. Section III describes the data, the CEX supplemented by the CAB

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moonlighting, financial aid and loans, and contributions from relatives. To gauge the adequacy of total household resources, he instead looks directly at the stability of consumption as households pay for college.

survey, and Section IV describes the econometrics. The results are in Section V. Section VI concludes, and is followed by a Data Appendix.

I. Consumption Risk and Sentiment

Reliable estimates of the standard deviation of consumption growth and its covariance 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 interviewed in other years, as explained in Section IV.[8] The consumption standard-deviation and return-covariance are then estimated over five year and twelve year horizons. Given the available sample, these measures will partly depend on ex post data, as does the income risk usually studied.

The sentiment variables, by contrast, are available monthly and are explicitly forward-looking. They allow for the possibility that expectations of future risks do not coincide with past realizations of risk. For instance a household whose employment is expected to become less secure in the near future, or that faces the possibility of a large medical expense, might chose a different portfolio going forward than that held in the past. Because the CEX does not record household sentiment, Souleles [2002] imputed the sentiment of CEX households from the sentiment of demographically similar households in the CAB surveys. He applied the results to the consumption-savings decision in an Euler-equation framework. The sentiment variables captured households' precautionary motives in the expected manner: households that are

[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 of consumption on a large number of demographic variables. Although both procedures are consistent, this procedure will retain more of the idiosyncratic variation in consumption.

pessimistic about the future have steeper consumption profiles; i.e., they spend less and save more.

Sentiment should also help explain the composition of savings, in particular portfolio allocations to risky financial securities. The behavior of the aggregate ICS index, which combines numerous sentiment variables, provides supporting evidence. For instance, the ICS is known to be correlated with stock returns [Friend and Adams (1964); Ludvigson (1996)]. As for asset flows, consider the October 1987 stock market crash, which wiped out about $1 trillion dollars of wealth. Afterwards, 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.[9] Although the ICS dropped by about 11% between September and November of 1987, it subsequently quickly recovered, surpassing its pre-crash level by March 1988. This suggests that individual investors expected the crash to be a temporary phenomenon, not posing a longer-term risk to their financial position [Abel and Bernanke (1998)].[10] The more general implication is that the sentiment variables capture household expectations of risk and so affect portfolio choices, even controlling for past returns. This implication will be tested below using both the CEX and aggregate data on mutual fund flows.

Of course consumption risk and sentiment are partly endogenous with respect to portfolio choice. For instance a household with a larger equity share will tend to have more volatile consumption, inducing a positive correlation between these variables. In response this paper instruments for consumption and sentiment, using regional variation and other instruments.

[9]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.

[10]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.

Assuming that risk-aversion does not systematically vary across geographic regions, regional variation in consumption risk is assumed to reflect underlying exogenous differences in the undiversifiable shocks hitting each region, such as regional business cycles. *Ceteris paribus*, a household living in a region with more volatile consumption is expected to invest less in risky assets. This would induce a negative correlation between instrumented consumption volatility and equity holding.

As for the covariance of consumption with equity returns, in the canonical model of Merton (1971) it should be constant across all equity holders. This follows directly from the first-order condition relating the covariance to excess equity returns, which are the same for all households. However, the consumption-return covariance is shown below to vary significantly across equity holders. Strictly speaking the first-order condition depends on the covariance of returns with marginal utility, so even under the canonical model the observed variation could reflect differences in risk aversion. Yet the variation exists even for instrumented consumption, which is assumed not to reflect risk aversion.

This apparent violation of the first-order condition for portfolio choice is consistent with the literature on the "participation puzzle" [e.g., Mankiw and Zeldes (1991), Brav, Constantinides, and Geczy (2002), Vissing-Jorgenson (1999b)]. Given the estimated consumption-return covariance, the equity premium, and reasonable values for risk aversion, too few households are holding equity, and even conditional on holding some equity, most households are holding too little equity. That is, it appears that households are not choosing their equity holdings to fully equalize their consumption-return covariances. There are many possible explanations for this failure of the first-order condition, including liquidity constraints, short-sale constraints, transactions costs, or other frictions. Whatever the explanation, the failure calls for

empirical research on the heterogeneity in the consumption-return covariance. In particular, do households facing an exogenously higher covariance invest less in equity? For example, short-sale constraints can induce a negative cross-sectional correlation between equity holding and the consumption-return covariance.[11] More generally, if households with an exogenously small (large) covariance increase (reduce) their equity holdings incompletely, for whatever reason, the cross-sectional correlation can again be negative. This paper will estimate the cross-sectional correlation in the data, allowing for the possibility of a positive correlation, if e.g. people over-adjust their equity holdings.

An extension will distinguish the binary participation decision (using probit models) from the magnitude of equity holdings conditional on participation. Another extension will consider the part of consumption changes uncorrelated with equity returns, which is not hedgeable using equity and so is exogenous to equity holdings. Finally, some of the sentiment variables are a priori exogenous. For instance, the probability of unemployment and bad aggregate business conditions does not depend on individual equity holdings. Nonetheless, all the sentiment variables will be instrumented for, in the process of imputing sentiment from the CAB surveys into the CEX surveys.

II. Related Studies

There have been a number of empirical studies of household equity holdings. Using the 1983 Survey of Consumer Finances [SCF], Haliassos and Bertaut (1995) find that people in apparently risky occupations have lower shares of equity to financial wealth. Gakidis (1998) and

[11] To illustrate, consider someone whose covariance is large for exogenous reasons, even with no equity holdings. (Perhaps he works in a industry highly correlated with the stock market.) To meet the first-order condition he would like to short stocks, which would reduce his covariance. But since he cannot short, his optimal equity holdings are

Vissing-Jorgensen (1999) use the Panel Study of Income Dynamics [PSID] to analyze the effect of the income process on equity shares. Vissing-Jorgensen finds that a larger standard deviation of income depresses shares, but the covariance of income and stock returns has no significant effect in her sample. Heaton and Lucas (2000b) perform a similar study using an IRS Tax Panel. However they find that the standard deviation of income is insignificant, but shares decrease with the income-return covariance. They also highlight the importance of business-income risk. When they decompose income into wages versus business income, the standard deviation of business income again depresses shares, but its covariance with returns is insignificant. Gakidis finds that the probability of low income due to unemployment is a particularly 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 complements these previous studies in a number of ways. First, as already noted it models the share of risky securities in total wealth, proxied by consumption. It also considers alternative, arguably superior, measures of hedging motives. Second, in addition to tobit models of securities shares, it also estimates (S,s)-type models of securities purchases. Third, the CEX has some advantages compared to the data sets previously employed. It has been collected monthly since the early 1980's, unlike the small number of cross-sections available in the SCFs and the PSID.[12] This allows for a dynamic analysis of investor response to hedging motives and returns over time. It also accommodates aggregate shocks, which can lead to false

zero. Because his observed covariance remains too large, this induces a negative cross-sectional correlation. The same analysis applies more generally to other frictions.

[12] Recent SCF surveys, conducted every three years, contain single, independent cross-sections. While the PSID panel records income annually, it records asset holdings only every five years, starting in 1984.

inferences in a small number of cross-sections [Chamberlain (1984), Mariger and Shaw (1993), Souleles (2002)]. The CEX records both nondurable consumption and risky securities holdings. It also separately records active purchases and sales of risky securities, which variables have not been much exploited before. Using active transactions, as opposed to the change in asset balances, avoids complications due to passive changes in asset balances from capital gains. Like a first difference, using transactions also avoids some of the substantial heterogeneity in asset levels that complicates empirical analysis. Further, the reference period for the transactions questions is one year. This is a reasonable horizon over which to study household financial decision-making.

There is a related literature on the relationship between stock returns and equity mutual-fund flows, 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. Alternatively, both flows and returns might be responding to some third variable, for instance the release of macroeconomic data. Household-level data brings additional information to bear on these issues. First, in micro data investment flows are less likely to be driving aggregate returns. Second, time dummies can be used to control for any possible aggregate 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 hedging motives on household portfolio choice. 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. In micro data demographic variables can be used to control for such compositional changes.

III. Data

A. The Consumer Expenditure Survey

The bulk of the data is drawn from the CEX surveys from 1982-1993.[13] 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. The fourth interview also contains a wealth module, which includes a question eliciting the combined market value of risky securities, grouping together stocks, bonds, and mutual funds, as of the first and fourth interviews. Relative to the cash and other savings held by most households, the CEX recognizes that bonds should be considered risky assets. Hence the focus here is on the portfolio allocation between risky securities and riskless securities (e.g., cash, savings accounts, savings bonds, CD's, money market funds, etc.), but not the allocation *within* risky securities between stocks and bonds.[14] To proxy for the share of risky securities in total wealth, the value of securities is divided by nondurable consumption from the same interview. This yields the main dependent variable for the tobit models of securities shares, SEC/C.[15]

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. Deflated by

[13] 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.

[14] Hence the results below will pick up only part of the effect of hedging motives on portfolio choice, and so can be considered a lower bound. However, since the typical household holds relatively few bonds, the bound should not be too loose. The PSID used in previous studies also fails to distinguish between stock and bond mutual funds.

[15] To control for family size and seasonality the results below that use SEC/C (either as a dependent or independent variable) will include as controls 11 month dummies and family size dummies (distinguishing the number of adults and the number of children). In preliminary work these dummies were instead partialled out of consumption before

the average CPI over the same 12 month period ($1982-84), this yields real net purchases of securities, NETPUR, the dependent variable in the (S,s)-type models of transactions. To limit the amount of heterogeneity, NETPUR is normalized by initial household income (from the year preceding the first interview).

The CEX contains the best micro data on consumption in the U.S. It is also the only traditional household data set containing the required asset information monthly over the 1980s and 1990s. To minimize measurement error the main sample for NETPUR 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.[16] 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 CEX sample is 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. The Appendix and Souleles (1999) provide further details about the CEX data.

B. Survey of Consumer Attitudes and Behavior

The CAB is a nationally representative survey that since 1978 has been undertaken monthly. In recent years about 500 households are sampled each month, in the earlier years two

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forming SEC/C. The results were qualitatively similar but even more significant than those reported below. However, it is harder to interpret the ratio of securities to this residual consumption, which can be negative.

[16] Cross-tabulations show a number of households whose gross purchases or sales of securities are small in magnitude, including values less than $10. According to the BLS staff, many of these values are probably spurious but for unknown reasons unflagged. Brav, Constantinides, and Geczy (2002) and Heaton and Lucas (2000b) impose analogous restrictions on their assets data.

to three times as many households were sampled. The well-known aggregate ICS consumer sentiment 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 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 survey on unemployment expectations is also used, even though it is not part of the main ICS.[17] The wording of the three sentiment questions used below is as follows. (The allowed responses are in brackets. Underlining is original.)

QFP. 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]

QBC. 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 sentiment questions capture various aspects of households' hedging motives in choosing their portfolios. They also have the advantage of being forward-looking, unlike ex post calculations of income or consumption risk. QFP elicits the household's own view of its overall financial position over the next 12 months. Like consumption risk this question summarizes the risks households face, more completely than just income risk. For instance, two households with the same standard deviation of income in the past can have different

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

expectations about their future financial position and so invest differently. QBC provides similar information about aggregate business/financial conditions and QU about unemployment risk.[18] Instead of offering a literary analysis of these questions, Souleles (2002) formally investigated their time-series and cross-sectional properties. He found that they help predict precautionary saving.

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. QFP in particular appears to be a leading indicator. 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 declined in response to the stock market crash in 1987, but as already noted, only modestly and temporarily.

The CAB survey also includes a number of demographic questions. Since some of these changed across surveys waves, great care was taken to create a set of demographic variables 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 CEX households on the basis of similar households in the CAB data at the same time. Since both surveys ran monthly over the 1980's and 1990's and contain a rich and overlapping set of demographic variables, the

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in the SCF. The results are consistent with precautionary motives.

[18] QFP and QBC 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 (2000), Brandt (1999), and Lynch and Balduzzi (2000). However the questions will also pick up other, non-asset risks, like unemployment risk. The analysis below groups together all such risks, whether pertaining to

imputation can be very fine. In both the CAB and the CEX data, the demographic variables regarding the respondent were switched to refer to the head of household (for a couple, assumed to be the male), unless noted otherwise. Table 1 shows the means of the 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 CAB sample used below drops an observation when there is a married couple in the household but the respondent is neither the husband nor spouse. (Most such respondents are children of the couple.) This should help make the respondent's answers more representative of the views of the entire household. The Appendix and Souleles (2002) contain additional details about the CAB data.

IV. Econometric Specifications

This section begins by setting out the (S,s)-type models of securities purchases, and then turns to the more familiar tobit models of securities shares. In the (S,s)-type models the dependent variable is $NETPUR_{i,t}$, net securities purchases of household i over the 12 month reference period, denoted by t. Net purchases are related to excess market returns r_t over the same period (for convenience, returns to the S&P 500 net of the 3-month treasury rate), as well as a vector $\mathbf{W}$ of state variables and the various measures of hedging motives, HEDGE:

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

HEDGE is taken from the start of the reference period, denoted by t-1. When using consumption

asset returns or not, and tests whether they affect portfolio choice. Some extensions will include time dummies as controls, and hence capture only cross-sectional variation in the risks.

risk for HEDGE, b_2 is expected to be negative. *Ceteris paribus*, a household whose consumption process is exogenously more volatile, or more correlated with returns, should be less likely to make additional purchases of risky securities. Since NETPUR is on average positive, in practice this means that the household's securities holdings will grow at a slower pace than average. When using instead consumer sentiment for HEDGE, b_2 is expected to be positive. *Ceteris paribus,* a household that expects its financial position to deteriorate over period t is less likely to purchase additional securities. **W** and the instruments for consumption and sentiment will be discussed shortly.

The estimation must take into account the special structure of the dependent variable. NETPUR is 0 for households that do not trade any securities within period t, 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 suggests that transactions costs or other frictions are important. It also implicitly reflects the participation puzzle, *i.e.*, 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 redefined to be +1 for households with positive net purchases, -1 for those with negative net purchases, and 0 otherwise -- will give consistent estimates.

Ordered probits are also consistent with (S,s)-type dynamics 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:

$$Y_{i,t}^{*} = \boldsymbol{\gamma}'\mathbf{X_{i,t}} + \varepsilon_{i,t}. \qquad (2)$$

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 $\mathbf{X_{i,t}}$. Consequently, a natural specification for $Y_{i,t}$ is

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

for two unobserved thresholds k_u, $k_l > 0$.[19] 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 the lower threshold (minus) k_l. Otherwise, when the index is between the two thresholds net purchases will be zero, $Y_{i,t} = 0$.[20]

Although consistent, ordered probit models do not use the information available on the magnitudes of purchases and sales, conditional on transacting. The Rosett estimator takes this information into account [Maddala (1983)]:

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

Again, if Y* rises above the upper threshold k_u – i.e., if actual holdings fall far enough below desired holdings -- then it is optimal to incur the transactions cost and purchase more securities,

[19] The estimated coefficients k_u and k_l are not interpretable as the dollar value of transactions costs, and so are not reported. First, Y* can include a constant. Second, in general Y* and k_u and k_l will be denominated in utils.

in order to return below the threshold. Such behavior is consistent with state-dependent (S,s) dynamics.[21] However Equations (3) and (3a) should be interpreted more generally as accommodating any portfolio policies that are "lumpy". For example, many households transact at regular, fixed frequencies, e.g. investing part of each month's paycheck (time dependence). In this case Y* would reflect the desired magnitude of transactions, but not their timing.[22]

As already noted, the sentiment of the CEX households has to be imputed. The imputation takes place in two steps, starting in the CAB data. 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 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**:

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

$\mathbf{a_{0t}}$ 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.[23] Equation (4) is estimated over 1982-1993, for each sentiment question QFP, QBC, and QU. The second step takes place in the CEX. The estimated coefficients from the first step, $\hat{\mathbf{a}}_{0t}$ and $\hat{\mathbf{a}}_1$, are used to impute the (index value) level of sentiment $\hat{Q}$ of the CEX households with

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[20] See Abel and Eberly (1994) for a related model of firms' real investment with transactions costs.

[21] Unlike Equation (3), Equation (3a) assumes that the two thresholds are reflecting barriers. Equation (3a) was also generalized to allow for jumps inside the barriers, sometimes called the "uUDd" model, using $Y_{i,t} = Y_{i,t}^* - k_u + j_u$ 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, this estimator appears to find it difficult to identify both pairs k_u and k_l, and j_u and j_l. 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 the reported specifications.

[22] Recall that NETPUR does not record individual transactions, but only net transactions over the year. Nonetheless NETPUR is lumpy, and so can be modeled by Equations (3) and (3a).

[23] 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.

the same demographic characteristics **Z** at time t:

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

Lagged $\hat{Q}_{i,t-1}$ is then used as $HEDGE_{i,t-1}$ in Equation (1)[24], 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. Let $C_{i,t}$ represent real nondurable consumption of household i in the first three months of investment period t, for households in the CEX sample at t. For consistency $C_{i,t}$ is assumed to depend on the same set of variables **Z** used above to impute sentiment[25]:

$$C_{i,t} = \mathbf{a}_{0t} + \mathbf{a}_1'\mathbf{Z}_{i,t} + u_{i,t}. \quad (6)$$

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 across years y. Equation (6) is estimated by OLS over 1982-93. The resulting coefficients $\hat{\mathbf{a}}_{0y}$ and $\hat{\mathbf{a}}_{1y}$ 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 ≠ t in which the household is not in the sample:[26]

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[24] 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 that took place 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.

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

[26] $\mathbf{Z}_{it}$ 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 $\hat{\mathbf{a}}_{0y}$ also vary with the interview month during year y. For instance, consider a household that is in the sample from t = February 1990 to January 1991. Its estimated

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

From the resulting annual time-series for consumption for each household, the standard deviation of year-on-year consumption growth $SD(g_c)$ was computed over two different horizons. First, $SD^5(g_c)_{i,t-1}$ depends on consumption growth in the five years preceding the period t in which a household is in the CEX sample. However this significantly reduces the sample size, because Equation (1) can then be estimated starting only in 1987. To retain the entire 1982-1993 sample, $SD^{12}(g_c)_{i,t-1}$ instead depends on consumption growth in all 12 years of the sample period, even years after the interview year t. The covariance of consumption growth with excess market returns (for convenience, again using the S&P 500) was computed using the same time series for consumption. To normalize for differences in scale across households, the reported results use the correlation of consumption growth with returns, $CORR(g_c)$. However the results using the covariance were qualitatively similar. $CORR^5(g_c)_{i,t-1}$ and $CORR^{12}(g_c)_{i,t-1}$ denote the correlation using the preceding five years of data, and the entire sample period, respectively.

Income risk is computed analogously. Let $Y_{i,t}$ represent household i's real after-tax income recorded in the first interview. Using this as the dependent variable in Equation (6) allows one to impute income in other years and then calculate the standard deviation of income growth $SD(g_y)$ and its correlation with returns $CORR(g_y)$.

Because consumption is endogenous, even if the CEX contained long consumption time-series for each household, one would have to instrument for consumption anyway with suitably chosen variables **Z**. That is, one advantage of the above procedure using predicted consumption

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consumption in February to April of year y=1993 is based on the sample average level of consumption in February to April 1993 (via $\hat{\mathbf{a}}_{\mathbf{0y}}$), plus the average consumption of households with the same demographic characteristics $\mathbf{Z}_{\mathbf{it}}$ (via $\hat{\mathbf{a}}_{\mathbf{1y}}$). For the year-interacted variables in $\mathbf{Z}_{\mathbf{it}}$, what counts is the consumption of similar households that are in the sample in 1993.

is that it purges consumption risk of its endogeneity.[27] Another advantage is that it reduces the measurement error that could dominate changes in consumption as measured in the original data. (See also Brav, Constantinides, and Geczy (2002).)

Returning to Equation (1), the remaining question is which variables belong in the vector **W** of state variables and which in **Z**. In the absence of a closed form solution for portfolio choice in the presence of transactions costs and undiversifiable risks like stochastic labor income, the answer is not obvious. Net purchases within period t should be affected by changes in a household's state variables within period t, innovations that cause Y_t^* to hit one of the thresholds. Therefore 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 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 *d(adults)* and in the number of kids *d(kids)*, e.g. due to births, deaths, divorce, etc.) might affect 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, *i.e.* between the beginning and the end of the 12 month investment period t.

Some variables that are predetermined by the start of period t (denoted as t-1), that is variables taken from the household's first interview, might also belong in Equation (1). For instance, they might represent differences in households' optimal (or target) securities holdings in the absence of transactions costs, or differences in households' starting positions, on average, relative to the thresholds. With a finite horizon the age of the investor might affect net purchases,

[27] In particular **Z** does not include variables indicating whether household i owns or trades securities. Hence $\hat{C}$

so age_{t-1} in particular is included in **W**. For households that buy securities at regular frequencies (*e.g.* monthly), the predetermined variables can be interpreted as affecting the average size of each transaction, and hence the growth rate of securities holdings.

Another key state variable should be the ratio of initial securities holdings to total wealth. This ratio governs the rebalancing motive that would be generated by (S,s)-type dynamics. If the ratio grows large enough, the household is "top-heavy" in securities and so would eventually sell some securities, and vice-versa. Various extensions will use SEC/C_{t-1} from the first interview to proxy for this state ratio. Under the rebalancing motive it is expected to have a negative coefficient in Equations (3) and (3a).

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 information costs. 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 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). $\mathbf{Z_{t-1}}$ will not include $\mathbf{Z_1}$ directly, only interacted with region. Hence the results will exploit only cross-regional differences in the hedging motives for each demographic group. Do people (of given demographic characteristics) that live in riskier regions buy fewer risky securities as a result? To also allow for time variation, $\mathbf{Z_{t-1}}$ will also include month dummies; plus year dummies interacted with the demographic

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reflects group-level variation in consumption, automatically reducing endogeneity.

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.[28] Assuming that risk aversion does not vary with region or over time, the regional and temporal variation in $\mathbf{Z_{t-1}}$ is assumed to be exogenous. To give $\mathbf{Z_{t-1}}$ power to identify the role of the hedging motives, $\mathbf{W_{it}}$ will not initially include the variables in $\mathbf{Z_1}$, apart from age, but some of these variables will be added to $\mathbf{W_{it}}$ in extensions.

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 variables 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 resulting estimates $\hat{Q}$. (See Souleles (2002) for an analysis.) Ordered logits were also estimated, but since the results were quite similar they are not reported. As for consumption and income in columns (4) and (5), where the estimation of Equation (6) is by OLS, the R^2's are relatively large at 0.41 and 0.36. Even though $\mathbf{Z_{t-1}}$ is limited to region, time, and their interactions with demographic characteristics, it still captures much of the idiosyncratic variation in household consumption and income.[29]

The average of the resulting standard deviation $SD^{12}(g_c)$ is about 0.048. There is a good amount of cross-sectional variation in $SD^{12}(g_c)$, with interquartile range extending from 0.032 to 0.053. $SD^5(g_c)$ has a similar mean, but rises slightly during the early 1990's, perhaps due to the

[28] In estimating income $Y_{i,t}^{y}$, income is not used in $\mathbf{Z_{t-1}}$.

recession. The average consumption-return correlation $CORR^{12}(g_c)$ is positive at about 0.17, with interquartile range -0.04 to 0.37. The average five-year correlation $CORR^{5}(g_c)$ is slightly smaller. As for income, the average $SD^{12}(g_y)$ is about 0.27, and the average $CORR^{12}(g_y)$ about 0.08.

Returning 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 and **W** to explain the cross-sectional variation in NETPUR.

The tobit models of securities shares will use the same specification as in Equation (1), replacing the dependent variable with $SEC/C_{i,t}$ from the final interview:

$$SEC/C_{i,t} = b_0 r_t + \mathbf{b_1}'\mathbf{W_{i,t}} + b_2 HEDGE_{i,t-1} + e_{i,t}. \qquad (8)$$

For consistency with the (S,s)-type models, the variables in $\mathbf{W_{it}}$ dated t-1 are again taken from the first interview, but the results are similar on taking these variables from the final interview. Using predetermined variables, especially for $HEDGE_{t-1}$, also helps control for endogeneity. To isolate the participation decision, in extensions the indicator dummy $I(SEC/C_{i,t}>0)$ will be used as the dependent variable in probit models of Equation (8). Additional extensions will also be considered.

V. Results.

A. Securities Holdings

[29] The remaining idiosyncratic variation u in Equations (4) and (6) should not affect the consistency of the results below, because by construction it is orthogonal to imputed $\hat{Q}$ and $\hat{C}$. Indeed a good part of u is likely to reflect

For comparison to the previous literature, Table 3 begins with the traditional tobit models of securities shares (Equation (8)), with SEC/C_t from the final interview as the dependent variable. Column (1) begins without the measures of hedging motives. The independent variables include excess returns, some trend variables, the demographic variables dated t-1 (from the first interview), and the demographic variables dated t (capturing the effects of transitions between the first and final interviews).

The trend variables allow for the fact that securities holdings have grown over time, even relative to consumption. A cubic trend turns out to be significant, with the growth in SEC/C accelerating in the last third of the sample period. This trend is consistent with declines in transactions or other costs, pecuniary or non-pecuniary.

The predetermined variables in the basic specification include age, and initial employment, occupation, and housing status. (Additional variables will be considered below.) Most of these variables are quite significant. The effect of age is significant and hump-shaped, with securities shares rising until around age 65, then declining. This pattern can reflect life-cycle considerations [Ameriks and Zeldes (2000)]. People who are not working, the unemployed, retirees, and students/houseworkers, have significantly smaller shares than others. Amongst workers, shares 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* hold significantly smaller shares. The self-employed also have smaller shares. As emphasized by Heaton and Lucas (2000b), this could be the result of the risk and illiquidity they face from their businesses. As for housing, the omitted category is for households that own their house without a

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measurement error.

mortgage. Relative to them, renters, and to a less significant extent homeowners with a mortgage, hold smaller shares. This result 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. It could also reflect the risk that renters face from fluctuations in their rents from year to year (Sinai and Souleles [2003]).

Many of the transition variables are also significant.[30] The negative coefficient on *newunemp* indicates that people who recently became unemployed have a smaller ratio of securities to consumption, even smaller than that of people already unemployed as of t-1. Since consumption in the dependent variable incorporates the effect of the unemployment spell on total wealth, this represents a relative portfolio reallocation away from risky financial securities. People who changed occupations (*d(occ)*, not including self-employment) have smaller shares, however people who move from non-self-employment to self-employment (*newselfemp*) have larger shares. This might reflect the fact that larger securities holdings can help relieve liquidity constraints that otherwise hamper to creation of a business.

The remaining columns of Table 3 add the various measures of households' hedging motives, HEDGE, starting with income risk. In column (2) the standard deviation of income growth is insignificant. However in column (3) its correlation with returns is significantly negative, consistent with hedging motives. That is, households whose income is more correlated with returns hold smaller shares in risky assets. By contrast, both measures of consumption risk in columns (4) and (5) are negative and quite significant. Consumption risk appears to induce hedging motives that reduce equity shares. If instead the results were due to endogeneity,

[30] The reported specification does not include changes in housing status, because few sample households underwent such changes. This reflects the design of the CEX, which samples based on address and so does not follow households that move.

positive coefficients would have been expected. Columns (6) to (8) use instead the sentiment variables. All three have significantly positive coefficients, again consistent with hedging motives. Households that are confident about their future financial position, business conditions, or the probability of employment hold larger shares. Excess returns r_t are now significantly positively correlated with securities holdings. However this effect might reflect capital gains, not increased securities purchases. The (S,s)-type models below will distinguish these two possibilities. As for the other regressors, adding HEDGE does not materially affect most of them.

Table 4 decomposes the two margins of securities holdings: the participation decision vs. the magnitude of shares conditional on participating. Column (1) estimates a probit model of the participation decision, with the dependent variable an indicator for whether SEC/C_t is positive. The reported coefficients give the marginal effects of the independent variables on the probability of participating, evaluated at sample means. Column (2) instead estimates Equation (8) by OLS, given that SEC/C_t is positive.[31] The specifications reported in the upper panel include $SD^{12}(g_c)$. The results for the other hedging variables appear in abbreviated format in rows (2) to (7). In the upper panel, most of the coefficients have the same signs across the two columns. Nonetheless there are a few differences. For example, the trend variables imply that most of the acceleration in shares at the end of the sample (Table 3) was due to increased participation. People self-employed in the first interview are about 5 percent less likely to hold securities (column (1)). But conditional on owning securities, their holdings are larger (column (2)). In row (1), the standard deviation of consumption growth has a significantly negative coefficient in both columns. Hence hedging motives affect both the participation decision and conditional magnitudes. The coefficients are also economically significant. A one standard deviation increase in $SD(g_c)$

[31] Selection models are not estimated, for lack of omitted instruments.

decreases the probability of holding securities by about 9%, and reduces the securities-to-consumption ratio by about 15 percent. In row (2) the consumption-return correlation is also significantly negative in both columns, and in rows (3)-(5) the sentiment variables are significantly positive in both columns. The economic significance of these effects is generally similar in magnitude to that for $SD(g_c)$ in row (1), though QU has a somewhat smaller effect on the conditional magnitudes in column (2).

As for income risk, the negative effect of the income-return correlation on shares appears to operate primarily through the participation decision; $CORR(g_y)$ is significant only in column (1). Also, its marginal effect is smaller than that for consumption risk: a one standard deviation increase in $CORR(g_y)$ decreases the probability of participating by only 1%. $SD(g_y)$ is insignificant in column (1), but significantly positive in column (2), inconsistent with hedging motives. Overall, consumption risk and sentiment appear to do a better job than income risk in capturing hedging motives. Hence the remainder of the analysis will highlight the former variables.[32]

Table 5 shows the results of various extensions. To save space, the reported results focus on the coefficients for HEDGE, and emphasize QFP over the other sentiment variables. In rows (1) and (2) consumption risk is measured using the 5 year rolling horizons, on the latter part of the sample. The coefficients on $CORR^5(g_c)$ and $SD^5(g_c)$ are again negative and significant. Rows (3) to (5) replace excess returns r_t with a full set of month dummies. These control for all possible aggregate variables that might correlate HEDGE and portfolio choice, leaving only purely cross-sectional correlation. Nonetheless all the HEDGE variables remain significant. Row (6) includes three of the hedging variables in the specification simultaneously, $SD^{12}(g_c)$,

$CORR^{12}(g_c)$, and QFP. All three retain their original signs and significance. Even though they are imputed using the same variables **Z**, the particular combinations of **Z** that they reflect contain different information about hedging motives. This specification also helps confirm that endogeneity is not driving the results. Even if the instruments are imperfect, $CORR(g_c)$ should control for the endogenous effect of securities holding on consumption. Given this control, $SD(g_c)$ captures volatility in consumption that is uncorrelated with returns, and hence exogenous. (QBC and QU also remain significant in conjunction with consumption risk.)

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. Rows (7) - (9) control for the education of the household head, with the omitted category being a high school degree. Investors with less education than this have smaller shares, whereas college graduates have larger shares. This result is consistent with informational transactions costs. The HEDGE variables however are still significant. In rows (10) - (12), household income has a significantly positive effect on shares. This could reflect decreasing risk aversion. Nonetheless the HEDGE variables again remain significant.[33] The other variables in Equation (8) generally retain the original patterns of coefficients in Table 3.

In sum, the results so far suggest that hedging motives have significant effects on the level of securities holdings. Consumption risk and sentiment have stronger effects than the income risk emphasized in the literature. However, these tobit results assume that the

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[32] The HEDGE variables vary significantly even across non-participators, which cannot reflect differences in risk aversion affecting conditional shares.

[33] One could similarly control with consumption, but using income avoids spurious interaction with consumption (which is inevitably measured with error) in the denominator of the dependent variable. The results are similar on using permanent income, computed as the fitted value from a prior regression of actual income on the same household characteristics in **Z**. This further bolsters the identification assumption, showing that using the same variables **Z** to impute HEDGE and permanent income does not necessarily tip the results in favor of one variable over the other.

independent variables in Equation (8) have linear effects on the ratio of securities to consumption, conditional on participating. But with transactions costs this assumption need not hold. In an (S,s) framework the ratio would drift around and eventually hit one of the thresholds, triggering a purchase or sale of securities that would cause the ratio to jump in the opposite direction. For instance, the greater the securities-to-consumption ratio, the more likely the household sells securities, decreasing the ratio. This is the rebalancing motive. To illustrate its importance one can simply compute the change in the SEC/C over the course of 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)]. Conditional on starting with positive securities holdings, the securities-to-consumption ratio on average increases by 51% and decreases by 16% in these cases, respectively. These are large changes, suggesting that transactions costs or other frictions are in fact important. As a result, the usual tobit specification is not appropriate. By contrast, ordered probit models (Equation (3)) and Rosett models (Equation (3a)) of securities purchases allow for such frictions.

B. Securities Purchases

As a starting point, one can use mutual fund data to test whether sentiment affects asset flows in the aggregate. Table 6 regresses net cash flows into equity mutual funds on 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. The sample frequency is monthly, covering a 12 year period mostly overlapping the CEX sample period.[34] 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, there is independent information in the sentiment questions that is helpful in forecasting aggregate investment flows, above and beyond the information in returns. This suggests that sentiment does indeed reflect hedging motives that affect asset flows, not just the level of asset holdings. To bring additional, cross-sectional variation to bear on the relation between sentiment and asset flows, one must turn to the micro data. Micro data is also required to control for transactions costs and changes in the composition of investors.

Table 7 reports the main results for net securities purchases NETPUR (Equation (1)). The independent variables are the same as before, including the variables dated t-1 that are predetermined by the beginning of the 12 month investment period, and the variables dated t that allow for innovations within the investment period. In columns (1) through (3) the results are generally similar across the tobit, ordered probit, and Rosett estimators. In the tobit model the coefficient on returns r_t is significantly positive, again suggesting a 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.

The cubic trend is again 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 1990-91 recession, markets became less liquid and bid-ask spreads rose. From the longer-run point of view, however, the increasing trend in the 1990s is again consistent with a long-run decline in transactions costs.

The predetermined demographic variables are again very significant. Net purchases rise

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

until around age 65, then decline. People who are not working make relatively smaller purchases of securities, or sell-off relatively more securities. Blue-collar workers and the self-employed also purchase fewer securities. So do renters and homeowners with mortgages, again suggestive of liquidity constraints. There is additional evidence for liquidity constraints in the coefficient on *d(vehicles)*. 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, and the possibility that it is harder to estimate asset flows than asset levels. For instance, the negative coefficient on $newunemp_t$ is large in magnitude but insignificant. 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.

Table 8 adds the hedging variables, focusing on the preferred ordered probit and Rosett estimators. Columns (1) to (4) show the results for consumption risk, for both the standard deviation and the consumption-return correlation. In all four cases, the coefficients on HEDGE are significantly negative, as expected. Households facing greater consumption risk buy significantly fewer risky securities. 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 consumption risk, though the occupation variables remain significant. In columns (5)

January 1996.

to (10) the coefficients on the sentiment variables are all positive and significant. More confident households buy more securities, consistent with the aggregate evidence on mutual fund flows in Table 6.

In sum, all the measures of hedging motives have predictive power for securities purchases, above and beyond the information in past returns. If returns drop, net purchases are predicted to 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 models. The results appear in Table 9. Column (3) 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 8.) 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 around 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 $SD^{12}(g_c)$ leads to 10% fewer sellers and 9% more buyers. The effect of $CORR^{12}(g_c)$ is about twice as strong, in row (2). The effect of QFP, the household's expectation of its own financial position, is even stronger. 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 (row (3)). The effects of QBC and QU, which capture expectations about aggregate conditions, are relatively weaker but still economically significant (rows (4) and (5)). In all cases the marginal effect of HEDGE is larger than the marginal effect of past returns r. Therefore

hedging motives are at least as important as ex post returns in understanding portfolio choice. In rows (6) and (7) the marginal effects of $CORR^5(g_c)$ and $SD^5(g_c)$ are again negative, but slightly smaller in magnitude than in rows (1) and (2). In rows (8) and (9), the effects of income risk are insignificant for asset flows.

Table 10 reports the results from various extensions. First, rows (1) to (3) again replace r_t with a full set of month dummies. The coefficients on HEDGE remain significant. These cross-sectional specifications complement the time series specification in Table 6. In row (4), the results persist on including $SD^{12}(g_c)$, $CORR^{12}(g_c)$, and QFP simultaneously. Again this suggests that endogeneity is not driving the results. (QU is less significant in conjunction with consumption risk, however unemployment is not endogenous with respect to securities purchases.) Rows (5)-(7) control for education. Low education households buy significantly fewer securities. Still, the HEDGE variables retain their original signs, though $SD^{12}(g_c)$ is somewhat less significant.

Overall, the qualitative patterns of results for the (S,s)-type models of NETPUR are generally similar to those for the tobit models of SEC/C. Nevertheless, there is new information in the results for NETPUR. For instance, part of the reason that the unemployed were found to have lower security shares in Table 3 is that they recently sold securities, during their time in the sample, as indicated by Table 7. Also, the results in Table 3 do not allow for a rebalancing motive, which leads to nonlinear behavior by SEC/C.

To accommodate the rebalancing motive, row (8) adds to Equation (1) the initial securities-to-consumption ratio SEC/C_{t-1}. This is taken from the first interview, as of the beginning of investment period t. The coefficient on this ratio is significantly negative. This result is consistent with the rebalancing motive expected from (S,s)-type dynamics, and suggests

that transactions costs or other frictions are in fact important. Households that become top-heavy in securities are indeed more likely to sell. Securities purchases also increase with scale, with the level of securities holdings at the beginning of period t. This could reflect decreasing risk aversion, or transactions costs becoming less important with wealth.[35] Even with these covariates, however, in rows (9) to (11) the hedging variables remain negative and usually significant. Most of the demographic variables also remain significant (not reported). Thus the securities-to-consumption ratio is not in practice the only variable governing securities purchases.

Table 11 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 (rows (3)-(5)). 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 over time. By contrast, the interaction terms for HEDGE are never significant. Household response to their hedging motives has been relatively stable.

VI. Conclusion

This paper has extended the previous empirical literature on portfolio choice in three ways. First, it estimated tobit models of the ratio of risky securities to nondurable consumption, a proxy for *total* wealth. Unlike the share of risky assets in *financial* wealth, this is consistent with theoretical models of portfolio choice. Second, the securities-to-consumption ratio was shown to

[35] 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 (8) to (11).

vary discretely, suggesting that transactions costs or other frictions are important. To allow for such frictions, this paper estimated (S,s)-type threshold models of securities purchases.

Third, both securities holdings and securities transactions were related to various summary measures of households' hedging motives. In addition to income risk and variables directly capturing labor market and demographic transitions, the measures included consumption risk. The CEX was used to calculate the standard deviation of household consumption growth and the correlation of consumption growth with market returns. Also, household sentiment was taken from the monthly Michigan consumer surveys, which have households themselves identify the risks they believe they will face in the future. These sentiment variables provided comprehensive and forward-looking measures of household hedging motives. To control for their endogeneity with respect to portfolio choice in particular, the analysis exploited regional variation in consumption risk and sentiment.

Both securities holdings and securities purchases were found to vary significantly with hedging motives. Households with exogenously more volatile consumption, or a larger consumption-return correlation, hold and buy fewer securities. Households that are pessimistic about the future, expecting a deterioration in financial conditions or an increase in unemployment risk, also hold and buy fewer securities. By contrast, income risk is less significant in explaining portfolio choice. Securities purchases were also found to increase with excess market returns and decrease with the initial securities-to-consumption ratio. This latter result is consistent with the rebalancing motive generated by (S,s)-type dynamics, and suggests that transactions costs or other frictions are in fact important. The marginal effects of the hedging motives are greater than the marginal effect of returns. Portfolio choice cannot be described as simply responding to ex

post returns alone. However, the sensitivity of securities purchases to returns has increased in recent years, even controlling for changes in the composition of investors.

VII. 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. NETPUR is not used if either of its components, purchases or sales, 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 holdings in interview four is positive, but the level in interview one is zero and there are no purchases in the interim. (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, over time. 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 Survey.

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. In imputing sentiment from the CAB data into the CEX, 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.

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Figure 1: Monthly Averages of QFP, QBC, and QU

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 data. 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.

Table 2. Variation in Sentiment, Consumption, and Income

	(1)	(2)	(3)	(4)	(5)
	QFP	QBC	QU	C	Y
	p-value	p-value	p-value	p-value	p-value
month	0.000	0.000	0.000	0.000	0.000
region	0.012	0.060	0.433	0.000	0.000
region*Z_1	0.000	0.000	0.000	0.000	0.000
year*Z_2	0.000	0.000	0.000	0.000	0.000
log likelihood	-41608.0	-31553.4	-45455.1		
# obs	45785	42527	46587	170358	167764
R^2	0.06	0.09	0.05	0.41	0.36

Notes:

- This table summarizes the first-stage models of sentiment, consumption, and income, as a function of region, time, and their interactions with household demographic characteristics.
- In columns (1) - (3), estimation of sentiment is by ordered probit in the CAB data, 1982-1993 (Equation (4)). In columns (4) and (5), estimation of consumption and income is by OLS in the CEX, 1982-1993 (Equation (6)). The table shows the significance of the different groups of 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. In column (5), Z_1 and Z_2 omit ln(income) and its square.

Table 3. Tobit Models of Securities Shares

HEDGE Measure	(1)			(2) $SD^{12}(g_y)$			(3) $CORR^{12}(g_y)$		
SEC/C_t	coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	1.836	1.182		1.845	1.182		1.814	1.182	
trend	0.966	0.882		0.969	0.882		0.965	0.882	
$trend^2$	-13.36	13.04		-13.42	13.04		-13.33	13.04	
$trend^3$	65.97	58.41		66.25	58.43		65.65	58.43	
age_{t-1}	0.534	0.067	**	0.537	0.067	**	0.540	0.067	**
$age_{t-1}^2/100$	-0.386	0.065	**	-0.389	0.065	**	-0.394	0.065	**
employment									
$hours_{t-1}$	0.026	0.010	**	0.026	0.010	**	0.029	0.010	**
$hoursspou_{t-1}$	0.049	0.016	**	0.049	0.016	**	0.049	0.016	**
$unemploye_{t-1}$	-16.45	1.385	**	-16.46	1.385	**	-16.51	1.385	**
$retired_{t-1}$	-3.738	0.879	**	-3.738	0.880	**	-3.794	0.880	**
$student_{t-1}$	-10.09	1.592	**	-10.10	1.593	**	-10.13	1.593	**
occupation									
$occ1_{t-1}$	-2.950	0.471	**	-2.948	0.471	**	-2.958	0.471	**
$occ2_{t-1}$	-11.28	0.829	**	-11.28	0.829	**	-11.29	0.829	**
$occ3_{t-1}$	-6.822	0.661	**	-6.824	0.661	**	-6.840	0.661	**
$occ4_{t-1}$	-9.938	0.595	**	-9.940	0.595	**	-9.982	0.595	**
$selfemploy_{t-1}$	-2.681	0.646	**	-2.680	0.646	**	-2.703	0.646	**
housing									
$mortgage_{t-1}$	-0.547	0.429		-0.560	0.429		-0.548	0.429	
$rent_{t-1}$	-9.152	0.510	**	-9.172	0.511	**	-9.175	0.511	**
$d(adults)_t$	-0.535	0.433		-0.535	0.433		-0.539	0.433	
$d(kids)_t$	-0.854	0.516	*	-0.854	0.516	*	-0.820	0.516	
Δ employment									
$d(hours)_t$	0.042	0.020	**	0.042	0.020	**	0.041	0.020	**
$d(hoursspou)_t$	-0.005	0.016		-0.005	0.016		-0.004	0.016	
$newunemp_t$	-8.071	2.770	**	-8.071	2.770	**	-8.077	2.776	**
$stopwork_t$	1.549	1.302		1.551	1.302		1.523	1.302	
$startwork_t$	-0.261	1.390		-0.259	1.390		-0.266	1.389	
Δ occupation									
$d(occ)_t$	-1.134	0.459	**	-1.135	0.459	**	-1.140	0.459	**
$newselfemp_t$	2.277	1.068	**	2.277	1.068	**	2.282	1.068	**
$exitselfemp_t$	0.397	1.329		0.397	1.329		0.425	1.328	
$d(vehicles)_t$	-0.366	0.506		-0.366	0.506		-0.345	0.506	
$HEDGE_{t-1}$				0.018	0.024		-2.060	0.708	**
# of Obs	23507			23503			23503		
Log Lik	-25521.3			-25516.4			-25512.4		
Pseudo R2	0.043			0.043			0.043		

Table 3. Tobit Models of Securities Shares (ctd)

HEDGE Measure	(4) $SD^{12}(g_c)$			(5) $CORR^{12}(g_c)$		
SEC/C_t	coef.	s.e.		coef.	s.e.	
r_t	1.786	1.176		1.685	1.174	
trend	1.061	0.876		0.719	0.875	
$trend^2$	-15.77	12.96		-11.55	12.94	
$trend^3$	76.71	58.05		60.18	57.96	
age_{t-1}	0.288	0.068	**	0.565	0.067	**
$age_{t-1}^2/100$	-0.096	0.067		-0.405	0.064	**
employment						
$hours_{t-1}$	0.032	0.010	**	0.005	0.010	
$hoursspou_{t-1}$	0.040	0.016	**	0.022	0.016	
$unemploye_{t-1}$	-13.23	1.410	**	-15.64	1.371	**
$retired_{t-1}$	-3.031	0.875	**	-3.341	0.873	**
$student_{t-1}$	-7.340	1.609	**	-9.115	1.578	**
occupation						
$occ1_{t-1}$	-2.805	0.465	**	-2.436	0.468	**
$occ2_{t-1}$	-9.933	0.825	**	-10.34	0.827	**
$occ3_{t-1}$	-6.360	0.654	**	-6.314	0.657	**
$occ4_{t-1}$	-9.246	0.588	**	-8.902	0.591	**
$selfemploy_{t-1}$	-1.727	0.641	**	-2.315	0.641	**
housing						
$mortgage_{t-1}$	-0.635	0.427		-1.278	0.428	**
$rent_{t-1}$	-8.522	0.513	**	-9.097	0.508	**
$d(adults)_t$	-0.559	0.429		-0.659	0.429	
$d(kids)_t$	-0.802	0.511		-0.740	0.511	
Δ employment						
$d(hours)_t$	0.044	0.020	**	0.027	0.020	
$d(hoursspou)_t$	-0.004	0.016		-0.010	0.016	
$newunemp_t$	-5.933	2.773	**	-7.626	2.742	**
$stopwork_t$	2.033	1.295		1.167	1.293	
$startwork_t$	-0.606	1.396		0.120	1.375	
Δ occupation						
$d(occ)_t$	-1.054	0.454	**	-1.142	0.456	**
$newselfemp_t$	2.613	1.056	**	2.342	1.057	**
$exitselfemp_t$	0.266	1.317		0.392	1.318	
$d(vehicles)_t$	-0.294	0.503		-0.329	0.502	
$HEDGE_{t-1}$	-199.8	11.33	**	-11.65	0.654	**
# of Obs	23507			23507		
Log Lik	-25327.3			-25358.1		
Pseudo R2	0.050			0.049		

Table 3. Tobit Models of Securities Shares (ctd)

HEDGE Measure	(6) QFP			(7) QBC			(8) QU		
SEC/C_t	coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	4.055	1.185	**	6.574	1.220	**	8.087	1.283	**
trend	-1.305	0.889		-7.642	1.052	**	-4.685	0.991	**
$trend^2$	19.46	13.12		105.2	15.20	**	84.39	15.15	**
$trend^3$	-69.62	58.62		-400.2	65.76	**	-387.7	68.42	**
age_{t-1}	0.780	0.069	**	0.716	0.068	**	0.677	0.068	**
$age_{t-1}^2/100$	-0.411	0.064	**	-0.532	0.065	**	-0.522	0.066	**
employment									
$hours_{t-1}$	0.014	0.010		0.015	0.010		0.020	0.010	**
$hoursspou_{t-1}$	0.029	0.016	*	0.031	0.016	*	0.036	0.016	**
$unemploye_{t-1}$	-15.09	1.383	**	-15.47	1.382	**	-15.70	1.385	**
$retired_{t-1}$	-3.038	0.875	**	-3.802	0.874	**	-3.631	0.876	**
$student_{t-1}$	-9.620	1.596	**	-9.358	1.596	**	-9.800	1.598	**
occupation									
$occ1_{t-1}$	-2.487	0.469	**	-2.709	0.469	**	-2.693	0.470	**
$occ2_{t-1}$	-10.30	0.827	**	-10.53	0.826	**	-10.66	0.828	**
$occ3_{t-1}$	-5.867	0.659	**	-6.616	0.657	**	-6.415	0.658	**
$occ4_{t-1}$	-8.616	0.594	**	-9.563	0.591	**	-9.482	0.593	**
$selfemploy_{t-1}$	-2.040	0.644	**	-2.485	0.642	**	-2.444	0.644	**
housing									
$mortgage_{t-1}$	-1.108	0.428	**	-0.721	0.427	*	-0.648	0.428	
$rent_{t-1}$	-9.146	0.508	**	-8.769	0.509	**	-8.796	0.510	**
$d(adults)_t$	-0.466	0.431		-0.607	0.432		-0.539	0.433	
$d(kids)_t$	-0.907	0.513	*	-0.863	0.515	*	-0.822	0.516	
Δ employment									
$d(hours)_t$	0.033	0.020	*	0.037	0.020	*	0.035	0.020	*
$d(hoursspou)_t$	-0.006	0.016		-0.008	0.016		-0.007	0.016	
$newunemp_t$	-7.357	2.744	**	-7.491	2.768	**	-7.806	2.781	**
$stopwork_t$	1.469	1.296		1.668	1.297		1.520	1.300	
$startwork_t$	0.002	1.385		-0.277	1.386		-0.164	1.390	
Δ occupation									
$d(occ)_t$	-1.035	0.457	**	-1.179	0.457	**	-1.047	0.457	**
$newselfemp_t$	1.984	1.063	*	2.062	1.061	*	2.273	1.063	**
$exitselfemp_t$	-0.104	1.325		-0.207	1.326		-0.075	1.326	
$d(vehicles)_t$	-0.322	0.504		-0.289	0.504		-0.341	0.505	
$HEDGE_{t-1}$	11.47	0.723	**	6.630	0.451	**	7.184	0.567	**
# of Obs	23507			23507			23507		
Log Lik	-25393.9			-25410.1			-25440		
Pseudo R2	0.048			0.047			0.046		

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

Notes:

- This table shows the results of tobit models of SEC/C, the ratio of risky securities holdings to nondurable consumption, as of interview four (Equation (8)), using the CEX, 1982-93.
- Demographic variables dated t-1 come from household interview one; those dated t represent changes between interviews one and four. 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. *d(occ)* 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 into employment. r_t represents excess market returns (S&P 500 net of the three month treasury rate) over the 12 month reference period.

- HEDGE represents the imputed measures of heding motives (Table 2). In columns (2)-(5), the hedging variables are the standard deviation of income growth and its correlation with market returns, and the standard deviation of consumption growth and its correlation with market returns; both computed over the entire 12 year sample period. In columns (6)-(8) the hedging variables are household expectations about future financial position, business conditions, and unemployment, as imputed from the CAB sentiment surveys. See text for details.
- Constant and controls for family size (# kids, # adults) and seasonality (11 month dummies) in consumption are not shown.

Table 4. Securities Shares: Participation vs Magnitudes

SEC/C_t	(1) participation			(2) conditional magnitudes		
	coef.	s.e.		coef.	s.e.	
r_t	0.032	0.019	*	0.702	1.240	
trend	0.021	0.014		0.394	0.923	
$trend^2$	-0.319	0.208		-5.167	13.59	
$trend^3$	1.594	0.934	*	14.79	60.64	
age_{t-1}	0.005	0.001	**	0.124	0.075	*
$age_{t-1}^2/100$	-0.003	0.001	**	0.042	0.072	
employment						
$hours_{t-1}$	0.001	0.000	**	-0.006	0.010	
$hoursspou_{t-1}$	0.001	0.000	**	-0.028	0.016	*
$unemploye_{t-1}$	-0.131	0.008	**	-5.159	1.765	**
$retired_{t-1}$	-0.052	0.012	**	0.028	0.888	
$student_{t-1}$	-0.087	0.015	**	-3.097	1.946	
occupation						
$occ1_{t-1}$	-0.050	0.006	**	-0.207	0.470	
$occ2_{t-1}$	-0.124	0.006	**	-0.608	0.994	
$occ3_{t-1}$	-0.090	0.006	**	-1.265	0.706	*
$occ4_{t-1}$	-0.125	0.005	**	-0.950	0.666	
$selfemploy_{t-1}$	-0.048	0.009	**	1.450	0.639	**
housing						
$mortgage_{t-1}$	0.008	0.007		-2.056	0.446	**
$rent_{t-1}$	-0.109	0.007	**	-4.344	0.595	**
$d(adults)_t$	0.000	0.007		-1.242	0.453	**
$d(kids)_t$	-0.015	0.008	*	0.188	0.568	
Δ employment						
$d(hours)_t$	0.001	0.000	**	-0.001	0.021	
$d(hoursspou)_t$	0.000	0.000		-0.019	0.017	
$newunemp_t$	-0.082	0.027	**	-0.232	3.462	
$stopwork_t$	0.035	0.024		0.953	1.372	
$startwork_t$	-0.033	0.020		2.800	1.561	*
Δ occupation						
$d(occ)_t$	-0.019	0.007	**	-0.136	0.483	
$newselfemp_t$	0.039	0.020	**	1.066	1.010	
$exitselfemp_t$	0.016	0.023		-1.004	1.318	
$d(vehicles)_t$	-0.005	0.008		-0.084	0.565	
(1) $SD^{12}(g_c)_{t-1}$	-2.878	0.173	**	-37.01	12.88	**
# of Obs	23507			4706		
Log Lik	-10411.3					
Pseudo/Adj. R2	0.115			0.153		
(2) $CORR^{12}(g_c)_{t-1}$	-0.185	0.011	**	-3.800	0.691	**
(3) QFP_{t-1}	0.186	0.012	**	2.901	0.780	**
(4) QBC_{t-1}	0.101	0.007	**	2.171	0.471	**
(5) QU_{t-1}	0.117	0.009	**	1.137	0.583	**
(6) $SD(g_y)_{t-1}$	-0.000	0.001		0.144	0.045	**
(7) $CORR(g_y)_{t-1}$	-0.034	0.012	**	0.210	0.764	

# of Obs	23507	4706

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

Notes:

- This table decomposes the results of Table 3 into the participation decision and the magnitude of securities holdings conditional on participation. For the probit model in column (1) the dependent variable is the indicator I(SEC/C >0). For the OLS model in column (2) it is SEC/C given that this variable is positive. The coefficients in column (1) give the marginal effects on the probability(SEC/C >0), evaluated at sample means.
- See Table 3 for definitions of the independent variables. Constant in column (2) and controls for family size and seasonality in consumption not shown.
- In rows (2)-(7), each row-column cell represents a separate estimation, showing only the coefficient on HEDGE.

Table 5. Securities Shares: Extensions

	SEC/C_t	coef.	s.e.		N
(1)	$SD^5(g_c)_{t-1}$	-87.03	10.34	**	13504
(2)	$CORR^5(g_c)_{t-1}$	-3.928	0.483	**	13504
(3)	$SD^{12}(g_c)$	-199.6	11.36	**	23507
	(month dummies)			**	
(4)	$CORR^{12}(g_c)$	-11.69	0.654	**	23507
	(month dummies)			**	
(5)	QFP	12.34	0.756	**	23507
	(month dummies)			**	
(6)	$SD^{12}(g_c)_{t-1}$	-164.8	10.75	**	23507
	$CORR^{12}(g_c)_{t-1}$	-8.334	0.672	**	
	QFP_{t-1}	8.740	0.757	**	
(7)	$SD^{12}(g_c)_{t-1}$	-146.8	11.05	**	23507
	no high school	-6.856	0.476	**	
	college	5.676	0.368	**	
(8)	$CORR^{12}(g_c)_{t-1}$	-9.644	0.648	**	23507
	no high school	-7.690	0.469	**	
	college	5.532	0.369	**	
(9)	QFP_{t-1}	7.160	0.737	**	23507
	no high school	-7.448	0.474	**	
	college	5.474	0.375	**	
(10)	$SD^{12}(g_c)_{t-1}$	-57.69	11.69	**	23507
	$\ln(\text{income})_{t-1}$	9.428	0.320	**	
(11)	$CORR^{12}(g_c)_{t-1}$	-3.663	0.693	**	23507
	$\ln(\text{income})_{t-1}$	9.348	0.320	**	
(12)	QFP_{t-1}	1.902	0.804	**	23507
	$\ln(\text{income})_{t-1}$	9.699	0.324	**	

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

Notes:

- Each row represents a separate tobit model of securities shares, extending Table 3. Of the independent variables in Table 3, only the coefficients on HEDGE in Equation (8) are shown.
- In rows (1) and (2) SD^5 and $CORR^5$ use only the previous five years of consumption data in computing HEDGE. Rows (3) to (5) replace excess returns r_t with a full set of month dummies. In rows (7)-(9) the omitted educational category is a high school education.

Table 6. Net Cash Flow into Equity Mutual Funds
1984:01-1995:12

	(1)		
CASH FLOW	coef.	s.e.	
$returns_t$	30.75	3.78	**
$returns_{t-1}$	-24.94	3.81	**
$returns_{t-2}$	4.12	3.82	
$returns_{t-3}$	3.80	3.83	
ICS_t	8.44	3.62	**
ICS_{t-1}	-.59	3.59	
ICS_{t-2}	-5.17	3.59	
ICS_{t-3}	-1.86	3.56	
constant	-.06	.18	
# of obs		144	
adj R2		0.47	

* = 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 7. Models of Net Securities Purchases

	(1) tobit			(2) ordered probit			(3) Rosett model		
$NETPUR_t$	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	**
$trend^3$	19.37	4.300	**	15.37	4.283	**	12.88	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	**
$d(adults)_t$	-0.022	0.033		0.026	0.032		0.024	0.027	
$d(kids)_t$	0.033	0.038		0.029	0.035		0.022	0.030	
change in employment									
$d(hours)_t$	0.003	0.001	**	0.001	0.001		0.001	0.001	
$d(hoursspou)_t$	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									
$d(occ)_t$	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	**
$d(vehicles)_t$	-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:

- This table shows the results of various threshold models of net household purchases of risky securities, NETPUR (Equations (1), (3), and (3a)).
- The dependent variables are defined in Table 3. Constants and thresholds not shown.

Table 8. Securities Purchases: Hedging Motives

HEDGE Measure	(1) $SD^{12}(g_c)$			(2) $SD^{12}(g_c)$			(3) $CORR^{12}(g_c)$			(4) $CORR^{12}(g_c)$		
	ordered probit			Rosett model			ordered probit			Rosett model		
NETPUR$_t$	coef.	s.e.		coef.	s.e.		coef.	s.e.		coef.	s.e.	
r_t	0.131	0.094		0.096	0.078		0.125	0.094		0.090	0.078	
trend	0.234	0.069	**	0.197	0.058	**	0.240	0.069	**	0.200	0.058	**
trend^2	-3.742	1.021	**	-3.136	0.857	**	-3.878	1.023	**	-3.224	0.857	**
trend^3	17.48	4.594	**	14.58	3.857	**	18.19	4.603	**	15.05	3.858	**
age$_{t-1}$	0.005	0.005		0.005	0.004		0.009	0.005	*	0.008	0.004	**
age$_{t-1}^2$/100	-0.003	0.005		-0.003	0.004		-0.007	0.005		-0.007	0.004	
employment												
hours$_{t-1}$	0.001	0.001		0.001	0.001		0.003	0.001	**	0.003	0.001	**
hoursspou$_{t-1}$	0.004	0.001	**	0.003	0.001	**	0.001	0.001	*	0.001	0.001	
unemploye$_{t-1}$	-0.152	0.088	*	-0.084	0.074		-0.158	0.087	*	-0.093	0.073	
retired$_{t-1}$	-0.205	0.073	**	-0.116	0.061	*	-0.190	0.073	**	-0.104	0.061	*
student$_{t-1}$	-0.175	0.102	*	-0.123	0.086		-0.164	0.101	*	-0.118	0.085	
occupation												
occ1$_{t-1}$	-0.161	0.040	**	-0.126	0.033	**	-0.146	0.040	**	-0.114	0.033	**
occ2$_{t-1}$	-0.255	0.056	**	-0.197	0.047	**	-0.236	0.056	**	-0.182	0.047	**
occ3$_{t-1}$	-0.310	0.053	**	-0.226	0.045	**	-0.286	0.053	**	-0.206	0.045	**
occ4$_{t-1}$	-0.321	0.044	**	-0.234	0.037	**	-0.288	0.044	**	-0.205	0.038	**
selfemploy$_{t-1}$	-0.139	0.055	**	-0.066	0.046		-0.132	0.055	**	-0.061	0.046	
housing												
mortgage$_{t-1}$	-0.117	0.036	**	-0.117	0.030	**	-0.130	0.036	**	-0.128	0.030	**
rent$_{t-1}$	-0.173	0.038	**	-0.150	0.032	**	-0.188	0.038	**	-0.164	0.032	**
d(adults)$_t$	0.051	0.034		0.044	0.028		0.041	0.034		0.035	0.028	
d(kids)$_t$	0.039	0.037		0.029	0.031		0.033	0.038		0.024	0.032	
Δ employment												
d(hours)$_t$	0.002	0.002		0.001	0.001		0.002	0.002		0.001	0.001	
d(hoursspou)$_t$	0.001	0.001		0.001	0.001		0.001	0.001		0.001	0.001	
newunemp$_t$	-0.124	0.167		-0.105	0.141		-0.126	0.167		-0.109	0.141	
stopwork$_t$	0.018	0.099		0.039	0.082		0.013	0.099		0.035	0.082	
startwork$_t$	-0.024	0.100		-0.006	0.084		-0.010	0.101		0.007	0.084	
Δ occupation												
d(occ)$_t$	0.037	0.036		0.029	0.030		0.037	0.036		0.029	0.030	
newselfemp$_t$	0.019	0.090		0.008	0.075		0.012	0.090		0.001	0.075	
exitselfemp$_t$	-0.345	0.115	**	-0.300	0.096	**	-0.347	0.115	**	-0.301	0.095	**
d(vehicles)$_t$	-0.035	0.039		-0.018	0.033		-0.038	0.039		-0.020	0.032	
HEDGE$_{t-1}$	-1.287	0.514	**	-1.277	0.433	**	-0.288	0.045	**	-0.238	0.038	**
# of Obs	23789			23789			23789			23789		
Log Lik	-5839.92			-5579.96			-5821.99			-5563.73		
Pseudo R2	0.02			0.02			0.02			0.02		

Table 8. Securities Purchases: Hedging Motives (ctd)

	(5)			(6)			(7)			(8)		
HEDGE Measure	QFP						QBC					
	ordered probit			Rosett model			ordered probit			Rosett 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	12.86	4.665	**	10.70	3.908	**	10.05	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	**
d(adults)$_t$	0.051	0.034		0.043	0.028		0.050	0.034		0.042	0.028	
d(kids)$_t$	0.033	0.037		0.025	0.032		0.037	0.037		0.028	0.032	
Δ *employment*												
d(hours)$_t$	0.002	0.002		0.001	0.001		0.002	0.002		0.001	0.001	
d(hoursspou)$_t$	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	
Δ *occupation*												
d(occ)$_t$	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	**
d(vehicles)$_t$	-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		

Table 8. Securities Purchases: Hedging Motives (ctd)

	(9)			(10)		
HEDGE Measure	QU					
	ordered probit			Rosett model		
NETPUR$_t$						
	coef.	s.e.		coef.	s.e.	
r_t	0.238	0.101	**	0.175	0.085	**
trend	0.175	0.075	**	0.126	0.063	**
trend^2	-2.722	1.148	**	-1.915	0.971	**
trend^3	12.79	5.190	**	8.953	4.393	**
age$_{t-1}$	0.010	0.005	**	0.009	0.004	**
age$_{t-1}^2$/100	-0.007	0.005		-0.007	0.004	*
employment						
hours$_{t-1}$	0.003	0.001	**	0.001	0.001	
hoursspou$_{t-1}$	0.001	0.001	*	0.003	0.001	**
unemploye$_{t-1}$	-0.169	0.087		-0.104	0.073	
retired$_{t-1}$	-0.205	0.073	**	-0.116	0.061	*
student$_{t-1}$	-0.188	0.101		-0.139	0.085	
occupation						
occ1$_{t-1}$	-0.157	0.040	**	-0.123	0.033	**
occ2$_{t-1}$	-0.255	0.056	**	-0.199	0.048	**
occ3$_{t-1}$	-0.304	0.053	**	-0.223	0.045	**
occ4$_{t-1}$	-0.316	0.044	**	-0.231	0.038	**
selfemploy$_{t-1}$	-0.142	0.055	**	-0.070	0.046	
housing						
mortgage$_{t-1}$	-0.120	0.036	**	-0.119	0.030	**
rent$_{t-1}$	-0.176	0.038	**	-0.155	0.032	**
d(adults)$_t$	0.050	0.034		0.043	0.028	
d(kids)$_t$	0.039	0.037		0.029	0.032	
Δ employment						
d(hours)$_t$	0.002	0.002		0.001	0.001	
d(hoursspou)$_t$	0.001	0.001		0.001	0.001	
newunemp$_t$	-0.133	0.167		-0.116	0.141	
stopwork$_t$	0.016	0.099		0.038	0.082	
startwork$_t$	-0.020	0.100		-0.001	0.084	
Δ occupation						
d(occ)$_t$	0.038	0.036		0.030	0.030	
newselfemp$_t$	0.016	0.090		0.004	0.075	
exitselfemp$_t$	-0.352	0.115	**	-0.305	0.096	**
d(vehicles)$_t$	-0.036	0.039		-0.019	0.033	
HEDGE$_{t-1}$	0.127	0.044	**	0.094	0.037	**
# of Obs	23789			23789		
Log Lik	-5838.83			-5581.01		
Pseudo R2	0.02			0.02		

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

Notes:

- This table adds the hedging variables to the specifications in Table 7. See Tables 3 and 7 for details.

Table 9. Securities Purchases: Effects of Returns and Hedging Motives

	$NETPUR_t$	(1) ordered probit			(2) Rosett model			(3) marginal effect	
		coef.	s.e.		coef.	s.e.		sell	buy
(1)	r_t	0.131	0.094		0.096	0.078		0.05	-0.04
	$SD^{12}(g_c)_{t-1}$	-1.287	0.514	**	-1.277	0.433	**	-0.10	0.09
(2)	r_t	0.125	0.094		0.090	0.078		0.05	-0.04
	$CORR^{12}(g_c)_{t-1}$	-0.288	0.045	**	-0.238	0.038	**	-0.19	0.19
(3)	r_t	0.211	0.095	**	0.154	0.079	**	0.08	-0.06
	QFP_{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
	QBC_{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
	# of Obs		23789			23789			
(6)	r_t	0.024	0.168		0.055	0.131		0.01	-0.01
	$SD^5(g_c)_{t-1}$	-0.668	0.605		-0.783	0.474	*	-0.05	0.05
(7)	r_t	0.024	0.168		0.056	0.132		0.01	-0.01
	$CORR^5(g_c)_{t-1}$	-0.086	0.037	**	-0.063	0.029	**	-0.11	0.10
	# of Obs		13576			13576			
(8)	r_t	0.128	0.094		0.094	0.078		0.05	-0.04
	$SD(g_y)^{12}{}_{t-1}$	-0.001	0.002		-0.001	0.002		-0.02	0.02
(9)	r_t	0.129	0.094		0.094	0.078		0.05	-0.04
	$CORR(g_y)^{12}{}_{t-1}$	0.020	0.038		0.009	0.032		0.02	-0.01
	# of Obs		23785			23785			

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

Notes:

- This table extends the results in Table 7, showing only the coefficients on excess returns r and the hedging variables.
- 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 10. Securities Purchases: Extensions

	$NETPUR_t$	(1) ordered probit			(2) Rosett model		
		coef.	s.e.		coef.	s.e.	
(1)	$SD^{12}(g_c)$	-1.453	0.529	**	-1.416	0.442	**
	(month dummies)						
(2)	$CORR^{12}(g_c)$	-0.358	0.051	**	-0.286	0.043	**
	(month dummies)						
(3)	QFP	0.485	0.062	**	0.355	0.052	**
	(month dummies)						
(4)	$SD^{12}(g_c)_{t-1}$	-1.257	0.516	**	-1.250	0.435	**
	$CORR^{12}(g_c)_{t-1}$	-0.234	0.046	**	-0.200	0.038	**
	QFP_{t-1}	0.317	0.058	**	0.222	0.049	**
(5)	$SD^{12}(g_c)$	-0.784	0.525		-0.846	0.441	*
	no high school	-0.111	0.034	**	-0.105	0.029	**
	college	0.176	0.032	**	0.127	0.027	**
(6)	$CORR^{12}(g_c)$	-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	**
(7)	QFP	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	
(8)	SEC/C_{t-1}	-0.011	0.003	**	-0.005	0.002	**
	$\ln(securities)_{t-1}$	0.116	0.015	**	0.072	0.011	**
	# of Obs		26392			26392	
(9)	SEC/C_{t-1}	-0.010	0.003	**	-0.004	0.002	*
	$\ln(securities)_{t-1}$	0.111	0.016	**	0.065	0.012	**
	$SD^{12}(g_c)$	-0.679	0.646		-0.568	0.452	
(10)	SEC/C_{t-1}	-0.010	0.003	**	-0.004	0.002	**
	$\ln(securities)_{t-1}$	0.108	0.016	**	0.064	0.012	**
	$CORR^{12}(g_c)$	-0.173	0.063	**	-0.102	0.044	**
(11)	SEC/C_{t-1}	-0.010	0.003	**	-0.003	0.002	**
	$\ln(securities)_{t-1}$	0.107	0.016	**	0.063	0.012	**
	QFP	0.270	0.068	**	0.158	0.048	**
	# of Obs		21986			21986	

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

Notes:

- This table extends the results in Table 7. Of the independent variables in Table 7, only the coefficients on HEDGE in Equation (1) are shown.
- Rows (1) to (3) replace excess returns r_t with a full set of month dummies. In rows (5) to (7) the omitted educational category is a high school education.
- In rows (8) to (11), ln(securities) is the log of the level of security holdings, plus $1, from interview one. SEC/C is the ratio of risky household securities holdings to nondurable consumption, from interview one. Controls for family size and seasonality in consumption, and and indicator for whether securities are positive, are not shown. See text for details.

Table 11. Securities Purchases: Recent Changes

	$NETPUR_t$	(1) ordered probit			(2) marginal effect	
		coef.	s.e.		sell	buy
(1)	r	0.101	0.097		0.04	-0.03
	$r * I_{t>=1991}$	0.351	0.382		0.17	-0.13
	$SD^{12}(g_c)$	-1.402	0.545	**	-0.10	0.10
	$SD^{12}(g_c) * I_{t>=1991}$	0.576	0.996		-0.06	0.05
(2)	r	0.092	0.097		0.03	-0.03
	$r * I_{t>=1991}$	0.440	0.354		0.21	-0.14
	$CORR^{12}(g_c)$	-0.309	0.050	**	-0.20	0.21
	$CORR^{12}(g_c) * I_{t>=1991}$	0.086	0.102		-0.15	0.14
(3)	r	0.164	0.097	*	0.06	-0.05
	$r * I_{t>=1991}$	0.765	0.355	**	0.39	-0.25
	QFP	0.412	0.058	**	0.54	-0.33
	$QFP * I_{t>=1991}$	-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
	QBC	0.163	0.040	**	0.24	-0.17
	$QBC * I_{t>=1991}$	-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:

- This table extends the results in Table 8, testing for changes since 1991 in the effects of returns r and hedging motives. Only the coefficients on excess returns r and the hedging variables are 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 <u>total</u> effects for households in the sample from 1991; for the uninteracted variables, the figures are the effects for households in the sample before 1991.