Why Do Households Concentrate Their Wealth in Housing?

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Abstract   An apparent paradox in household wealth accumulation in the
                 United States is the relatively small holding of financial assets
                 and the large holding of housing wealth. To explain the high
                 concentration of household wealth in housing, this paper
                 estimates the marginal propensity to consume from housing and
                 from financial assets. A higher marginal propensity to consume
                 from housing rather than from financial assets would lead
                 households to concentrate their wealth in real estate. For
                 aggregate U.S. quarterly data from 1952:1 to 2002:2, the
                 marginal propensity to consume from housing is higher than that
                 from financial wealth. These conditions provide a rationale for
                 the concentration of household assets in housing.

Introduction

An empirical observation about households in the United States is that they
concentrate their wealth holding in housing and hold relatively limited financial
assets. The Federal Reserve's 2001 *Survey of Consumer Finances* reveals that
65.6% of net wealth of the median household is in single-family residential
housing. By comparison, outside of retirement and insurance accounts, average
U.S. household financial wealth in cash, bonds and mutual funds was 22.5% of
household wealth in 2001. Further, homeowners hold most financial wealth, with
renters relatively liquidity-constrained.

This paper develops a model of consumption to determine why households hold
relatively so much of their wealth in housing. Households have a choice between
holding illiquid assets such as housing and financial assets in restricted pension
accounts or in unrestricted liquid accounts. If households have a relatively high
marginal propensity to consume from housing as compared with financial assets,
they will accumulate housing assets. The marginal propensity to consume depends
on risk preferences, time horizons and long-term interest rates. For aggregate U.S.
quarterly data from 1952:1 to 2002:2, the marginal propensity to consume from
housing is higher than that from financial wealth. These conditions provide a
rationale for the concentration of household assets in housing.

Households choose between physical assets such as housing or other real estate and financial assets such as stocks and bonds. Fratantoni (1998) and Kullmann and Siegel (2002) note the concentration of household portfolios in housing. Henderson and Ioannides (1983) explain the choice as one between selecting the housing asset that is optimal in the household investment portfolio and the housing asset that provides the optimal amount of housing services. For younger households, this choice leads to an over-allocation in housing. A portfolio with real estate completes the household's utility-maximization given Euler equations for the consumption capital asset pricing model (CCAPM). Flavin and Yamashita (2002) examine the portfolio composition of the household in a life-cycle context argue that the indivisibility of housing causes its overweighting in portfolios of younger households.

The following section presents the model and theoretical structure for the representative household. The model's parameters are consistent with the consumption model of Hall (1988) and Hansen and Singleton (1983) adjusted for a representative household with the typical portfolio of housing and a retirement account. Since these assets are not identical, there are corresponding potentially different marginal propensities to consume from either real estate or financial wealth. Each marginal propensity depends on the household's optimization of consumption from wealth and on parameters that represent the economic environment. The environment includes the long-term rate of interest, the coefficient of relative risk aversion and the planning horizon.

A subsequent section presents the data and estimating equation, while the final section discusses the empirical results for the U.S. using aggregate quarterly consumption data for 1952:1–2002:2. These estimates show a marginal propensity to consume from an additional dollar of housing wealth to range between 0.15 and 0.2. The marginal propensity to consume from housing wealth is between 15 and 20 cents on the dollar in a year. These results are consistent with Case, Quigley and Shiller (2001) and other researchers who use comparable measures, namely time series and aggregate consumption data as opposed to retail sales as a measure of consumption.[1] Using international data, they utilize aggregate consumption as the dependent variable and find that the added consumption from $1 more of real estate wealth ranges between 11 and 17 cents in a year. The second finding in the current study is that the marginal propensity to consume from financial wealth falls between 2 and 3 cents on the dollar per year. By comparison, Case, Quigley and Shiller find for their international sample a marginal propensity to consume from financial wealth of between zero and 2 cents on the dollar per year. In other words, the data and results using U.S. aggregate consumption in the current study are very similar to Case, Quigley and Shilller's international results for fourteen countries. Those results are also for aggregate consumption and with time series data.

The higher marginal propensity to consume from housing is linked to a lower required return given risk preferences, household time horizon and long-term interest rates. Consequently, households have an incentive to concentrate on

housing despite its illiquidity and apart from any tax benefits capitalized in housing prices.

A Model of Wealth and Consumption for the Household

In the model, a representative household behaves according to the intertemporal CCAPM in that it maximizes utility of consumption in each period over a planning horizon. Utility of consumption is intertemporally separable, but aggregated with a real discount rate over the planning horizon. Each period's consumption is constrained by wealth plus income, including a return to the wealth. Wealth is held in housing and financial forms, and representative data for the U.S. are in Exhibit 1. Income is generated from the household's human capital as wages and salaries. Once the utility function is specified with constant relative risk aversion,

Exhibit 1 | Average Household Assets, 2001 from the *Survey of Consumer Finances* (in $'000)

Asset Type	All Households		Homeowners		Renters	
	Amount	%	Amount	%	Amount	%
Vehicles	15.5	3.4	19.6	3.1	6.8	10.8
Primary residence	122.4	27.2	180.8	28.5	0.0	0.0
Mortgage loan	−62.1	n.a.	−91.7	n.a.	0.0	n.a.
Equity in primary residence	60.3	n.a.	89.1	n.a.	0.0	n.a.
Other residential	21.1	4.7	28.6	4.5	5.3	8.4
Nonresidential real estate	21.4	4.8	30.7	4.8	2.0	3.2
Bus. equity	76.5	17.0	108.4	17.1	9.7	15.2
Other	4.3	1.0	5.5	0.9	1.7	2.7
Total nonfinancial assets	261.2	58.0	373.6	58.9	25.6	40.3
Cash	28.8	6.4	38.7	6.1	8.1	12.8
Bonds	8.6	1.9	12.5	2.0	0.5	0.7
Stocks	40.9	9.1	56.6	8.9	8.1	12.7
Mutual funds	23.1	5.1	32.5	5.1	3.5	5.5
Retirement accts.	53.6	11.9	74.7	11.8	9.3	14.6
Life insurance	10.1	2.2	13.2	2.1	3.7	5.7
Other managed	20.1	4.5	28.4	4.5	2.7	4.2
Other	3.6	0.8	4.3	0.7	2.1	3.4
Total financial assets	188.8	42.0	260.8	41.1	37.9	59.7
Total assets	450.0	100.0	634.4	100.0	63.5	100.0
Percentage of all households	n.a.	100.0	n.a.	67.7	n.a.	32.3
Ave. household income	68.0	n.a.	85.1	n.a.	32.2	n.a.
Ave. household net worth	433.4	n.a.	558.2	n.a.	171.7	n.a.

Note: Data tabulated by the authors from data presented in Aizcorbe, Kennickell and Moore (2003).

the resulting consumption function depends on financial and housing wealth and a series of parameters that are exogenously determined by the economic environment.

That environment generates a long-term interest rate, a planning horizon and the specification of a representative household's preferences including attitude toward risk. These three environmental parameters, together with the estimated marginal propensities to consume from housing and financial assets, yield implicit returns and discount rates to holding each type of asset.

The household holds its total wealth W_t in three categories: human capital, physical assets principally in single-family housing, and financial assets. While human capital is not observable, its return is earned labor income. Labor income is included in observable personal disposable income Y_t. The other source of income for the household outside of physical or financial assets is from transfer payments G_t, also included in personal disposable income. Labor income is $Y_t - G_t$. The value of human capital is $b(Y_t - G_t)$, where b is the inverse of the rate of return. This value of human capital is part of the household's wealth.

The household has physical wealth in housing and other consumer durable equity of: $H_t = A_t - M_t$. Here A_t is the value of the house and other assets, and M_t is the market value of the mortgage and other debt. Holding of financial assets such as stocks, bonds and mutual funds is S_t.

One measure of the household's total wealth W_t is to add the human capital, housing and physical assets as well as financial assets together as a simple sum. These three assets, however, differ in liquidity and other characteristics.[2] The inverse rate of return b reflects the inability of households to sell their human capital. Second, houses have transaction costs of brokerage, escrow and taxes that limit sale. Real estate comes in large indivisible sizes, at least for home ownership. Third, financial assets held in pension or retirement accounts have prohibitions and tax penalties on withdrawal. There are restrictions on borrowing against or collateralizing such accounts. Consequently, there are liquidity adjustments $\lambda_H \leq 1$ and $\lambda_S \leq 1$ on the holdings of housing and on financial assets that create cash-equivalent values: $\lambda_H H_t$ and $\lambda_S S_t$. These adjustments lead to the household's total wealth of

$$W_t = b[Y_t - G_t] + \lambda_H H_t + \lambda_S S_t. \tag{1}$$

Wealth is a liquidity-adjusted sum of human capital, physical assets in housing and financial assets. That wealth enters the maximization decision of the household, representative of the economy. The household obeys the consumption capital asset pricing model. Consumption of the household at time t is C_t. Utility for the representative household U_t exhibits constant relative risk aversion in consumption with parameter γ or:

$$U_t = \frac{C_t^{1-\gamma}}{1 - \gamma} \quad \gamma < 0. \tag{2}$$

The household consumes from its wealth W_t, which includes its labor income valued as human capital equity, its housing equity and its financial equity. The household maximizes intertemporal utility of consumption as $E_0 \sum_{t=0}^{\rho} \delta^t U(C_t)$, $0 \le \delta \le 1$, where δ is the discount rate and ρ is the time horizon.

Consumption is linear in wealth with marginal propensity to consume β, or:

$$C_t = \beta W_t. \tag{3}$$

From iterated expectations on the utility function, the marginal propensity to consume from wealth is:

$$\beta = \frac{1 - \theta}{1 - \theta^{\rho-t}}, \tag{4}$$

where $\rho - t$ is the planning horizon and with weighting factor:

$$\theta \equiv \frac{1}{1 + \omega} \left[\frac{1 + \omega}{1 + \delta} \right]^{\frac{1}{\gamma}}. \tag{5}$$

The marginal propensity to consume from the three types of wealth is $\beta(\omega, \delta, \gamma, \rho - t)$. Here ω is the real rate of interest, δ the risk premium, γ the coefficient of relative risk aversion and $\rho - t$ the planning horizon. The aggregate environment provides the real rate of interest ω, the coefficient of relative risk aversion γ and its inverse, the intertemporal marginal rate of substitution and the planning horizon $\rho - t$. Given this environment $(\omega, \gamma, \rho - t)$ common to all assets, there is a unique risk premium δ that corresponds to the β for each asset.

For housing wealth, the marginal propensity to consume adjusted for its lack of liquidity is $\beta \lambda_H$. This marginal propensity can be tested as being equal to the analogous marginal propensity to consume from financial equity $\beta \lambda_S$.

Substituting Equation (4) into Equation (3) and using the wealth definition gives:

$$C_t = \left[\frac{1 - \theta}{1 - \theta^{\tau-t}}\right]W_t = \beta[b(Y_t - G_t) + \lambda_S S_t + \lambda_H H_t]$$

$$= \beta[Y_t^* + \lambda_S S_t + \lambda_H H_t], \tag{6}$$

and $Y_t^* \equiv b(Y_t - G_t)$. The consumption and savings ratios are $c_t \equiv \dfrac{C_t}{Y_t^*}$, $s_t \equiv \dfrac{S_t}{Y_t^*}$ as proportions of income. The ratio of the house asset to income is $h_t \equiv \dfrac{H_t}{Y_t^*}$. Then

$$c_t = \beta + \beta_S s_t + \beta_H h_t$$

$$\beta_s \equiv \beta\lambda_S = \left[\frac{1 - \theta}{1 - \theta^{\rho-t}}\right]\lambda_S \quad \beta_H \equiv \beta\lambda_S = \left[\frac{1 - \theta}{1 - \theta^{\rho-t}}\right]\lambda_H \tag{7}$$

is the nonlinear estimating equation. Given the invariance property of maximum likelihood estimates of $\hat{\beta}\hat{\lambda}_i$, for a given environment of $(\overline{\omega}, \overline{\rho} - t, \overline{\gamma})$ on the long rate, horizon and coefficient of relative risk aversion, the risk premium for a given asset is solved from a rearrangement of Equations (4), (5) and (7). This structure yields:

$$\delta_i = \frac{1}{\theta_i^\gamma(1 + \overline{\omega})^{\gamma-1}} - 1 \quad -\hat{\beta}\hat{\lambda}_i\theta_i^{\overline{\rho}-t} + \theta_i = 1 - \hat{\beta}\hat{\lambda}_i \quad i = S,H \tag{8}$$

The equation on the right is a quadratic that solves for the weighting factor θ_i as in Equation (5) for each asset.

The rate of taxation on the return to asset i is τ_i. For housing, imputed rental income is not taxed in the U.S. Capital gains can be deferred by rolling over into a replacement house or cashed out altogether (by mortgage refinancing) for nearly all homeowners without taxation.[3] For financial assets outside of protected accounts, the income return is taxed; but, in contrast, capital gains can be deferred by not selling.[4] In retirement and pension accounts, neither the income nor capital gains are taxed.

Estimation of Equation (7) permits a test for whether the marginal propensity to consume from housing and financial assets is the same and allows estimation of the implicit return to each asset given the economic environment.

Data and Specification of the Estimating Equation

The data are quarterly observations from 1952:1–2002:2 on aggregate consumption, income and wealth for the U.S.[5] There are two alternative definitions of income. One is personal disposable income. The other is human capital income. Following Davis and Palumbo (2001), human capital income is personal disposable income less property income. Property income items representing corporate dividends, net interest, rental income and proprietors' income are subtracted from total disposable income. Data on the various components of disposable personal income and consumption are taken from the quarterly *National Income and Product Accounts* (NIPA) of the Bureau of Economic Analysis of the U.S. Department of Commerce.

Data on real estate equity and financial equity are from the *Flow of Funds Accounts* of the Board of Governors of the Federal Reserve System. Financial wealth is total net worth minus net real estate wealth. Net real estate equity is real estate wealth less mortgage debt. Exhibit 2 plots the relationship between the consumption–income ratio and the real estate wealth-income ratio.

Exhibit 2 | Consumption and Real Estate Wealth (Dual Log Scales)
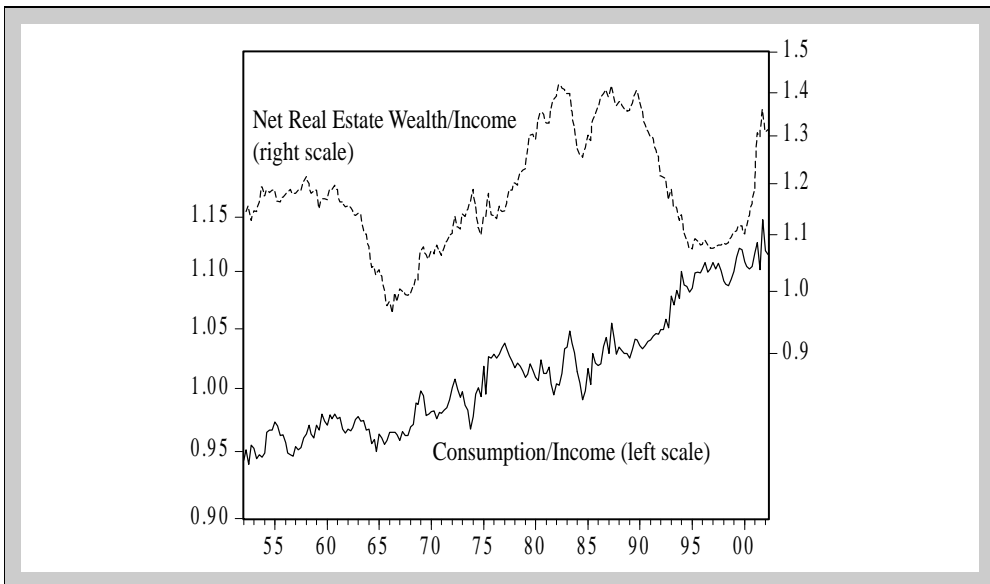
To determine the time-series specification, tests for unit roots and cointegration are carried out. Unit root and cointegration tests are in Exhibit 3. Statistically significant results at the 1% level are in boldface type. The test results with consumption, income and wealth measured relative to personal disposable income are reported on the left, and those relative to human capital income on the right. Test statistics including a time trend are v_1 and without a time trend are v_2. The data for all time series in z_t exhibit unit roots in levels. In the first differences, all time series are stationary. Non-stationary series are cointegrated if there is a stationary linear combination of the variables. Both for the eigenvalue test in Johansen (1995) and for the unit root test of Engle and Granger (1987) there is no cointegration.

Given the unit roots in levels but stationarity in first differences with no cointegration and following Equation (7), the estimating equation lagging the independent variables is:

$$\Delta c_t = \beta + \beta_H \Delta h_{t-1} + \beta_s \Delta s_{t-1}. \tag{9}$$

Initial estimates of Equation (7) reveal the possible presence of autocorrelation. To correct for the autocorrelation of residuals, ARMA terms AR(L) up to lag L are included in the regression models. Serial correlation is tested using the Breusch-Godfrey Lagrange multiplier (LM) test. The null hypothesis of the LM test is that there is no serial correlation up to a lag order k where k is a pre-specified integer. The LM test statistic is asymptotically distributed as χ_k^2, a chi-squared test statistic with k degrees of freedom. There is no evidence of autocorrelation using orders for k as high as 5.

Empirical Results

Estimates of the consumption wealth effects from Equation (9) are in Exhibit 4. The first two columns report results when variables are normalized by personal disposable income. Columns (3) and (4) are when variables are normalized by human capital income. Parameter estimates are for the marginal propensities to consume from real estate and financial wealth. Estimates significant at the 1% level one-tailed are in boldface type.

In Column (1) of Exhibit 4 are estimates of the marginal propensity to consume from wealth when variables are normalized by personal disposable income. The marginal propensity to consume from housing wealth is 0.150 of an additional dollar of housing wealth, significant at the 1% level. The marginal propensity to consume from this additional dollar of financial wealth is 0.02 and is significant at the 1% level. A Wald test on the difference between the two coefficients

Exhibit 3 | Unit Root and Cointegration Tests

	(2)	(3)	(4)	(5)
Panel A: Unit Root				
Series	Trend	Augmented Lags	Test Statistics	95% Critical Value
c_t	Yes	4	$v_1 = -3.04, -1.85$	-3.43
h_t	No	4	$v_2 = -1.73, -1.43$	-2.88
s_t	Yes	4	$v_1 = -1.54, -1.50$	-3.43
Δc_t	No	3	$v_2 = \mathbf{-8.27, -8.01}$	-2.88
Δh_t	No	3	$v_2 = \mathbf{-5.19, -5.45}$	-2.88
Δs_t	No	3	$v_2 = \mathbf{-6.15, -6.02}$	-2.88
Panel B: Cointegration				
Γ Rank, No Cointegration		Γ Rank, Cointegration	Test Statistics	95% Critical Value
η_{trace} 0		1, 2 or 3	8.06, 7.51	29.75
1		2 or 3	2.36, 4.03	12.53
2		3	0.03, 0.93	3.84
η_{max} 0		1	5.70, 8.47	17.89
1		2	2.33, 4.38	11.44
2		3	0.03, 0.18	3.73
Unit Root Test		1	$-2.26, -2.56$	-3.96

Notes:

Unit Root. The estimating equation is $\Delta x_t = \alpha + \varsigma t + (\rho - 1)x_{t-1} + \sum_{j=1}^{r} \varphi_r \Delta x_{t-r} + \varepsilon_t$. Here Δ is the first difference operator, r is the number of augmentation lags, $(\varsigma, \rho, \varphi)$ are parameters and ε_t is a disturbance. The unit root test is for $\rho = 1$ against $\rho < 1$. If the time series appear to have a trend, time t is included with test statistic v_1. Otherwise, time is excluded with test statistic v_2. The number of augmentation lags r is large enough to eliminate evidence of serial correlation in the residuals from the estimating equations. Asymptotic critical values are used, since the residuals from the estimating regressions do not appear to be normally distributed.

Cointegration. The lag length m involves sequential likelihood ratio tests and the Akaike information criterion. Both involve $m = 5$ including of a drift in the trend component of z_t. The Johansen (1995) test determines the number of cointegrating relationships as the rank of Γ in

$\Delta z_t = \alpha_z + \Gamma z_{t-1} + \sum_{j=1}^{m} \vartheta_m \Delta z_{t-m} + \varepsilon_{zt}$. Test statistics are for η_{trace} and η_{max} the trace and largest

eigenvalue of Γ. An alternative is a unit root test for $\rho_e = 1$ for a unit root against the stationary

alternative $\rho_e < 1$ in $\Delta e_t = (\rho_e - 1)e_{t-1} + \sum_{j=1}^{k} \phi_k \Delta e_{t-k} + \varepsilon_{et}$ with parameters (ρ_e, ϕ) and

disturbance ε_{et}.

Exhibit 4 | Marginal Propensities to Consume From Wealth: 1952:4–2002:2

	(1)	(2)	(3)	(4)
	Personal Disposable Income		Human Capital Income	
	Estimate	t-Statistic	Estimate	t-Statistic
Constant	0.00	1.31	0.001	1.51
Δs_{-1} Financial β_S	**0.020**	3.67	**0.028**	4.76
Δh_{-1} Housing β_H	**0.150**	5.31	**0.209**	7.29
AR(1)	−0.285		−0.303	
Adj. R^2	0.256		0.42	
LM Test	1.26		0.04	

Note: N = 199.

indicates whether or not housing and financial wealth can be aggregated: the resulting computed F-Statistic is 20.15, significant at the 5% level, demonstrating that the marginal propensity to consume from housing exceeds that for financial assets.

The human capital income measure underlying the coefficient estimates appears in Column (3) of Exhibit 4. The marginal propensity to consume from an additional dollar of housing wealth is 0.209, while that from financial wealth is 0.028. Both coefficients are statistically significant at the 1% level. The Wald test indicates that the difference between the two is statistically significant at the 1% level, with a computed F-Statistic of 37.51.

The results can be compared with alternative estimates of the marginal propensity to consume from real estate and financial wealth. Using *PSID* data, Engelhardt (1996) finds that housing wealth can have a large though asymmetric impact on consumption. Households reduce consumption by as much as 30 cents for a one dollar decline in house equity. When house equity increases, the impact on consumption is negligible. For financial assets, the estimate of a low marginal propensity to consume is consistent with Poterba and Samwick (1995).[6] They examine luxury good demand when stock prices rise, and their results find sensitivity only in the automobile market, leading Shleifer (1995) to suggest that the marginal propensity to consume from stock market wealth is negligible.

Case, Quigley and Shiller (2001) present estimates of the marginal propensity to consume from housing wealth from two data sets. One data set for the U.S. involves cross-sectional state retail sales data as the consumption definition. Their measure of housing wealth is based on the repeat-sales price index from the Office of Federal Housing Enterprise Oversight (OFHEO). In their cross-sectional U.S.

state regressions, the elasticity of consumption with respect to housing wealth ranges from 0.05 to 0.09. For housing wealth of $100, a $1 increase in house prices (with mortgage debt constant) results in a consumption increase of 5 cents to 9 cents in the current year.

Their second set of results is for 14 countries for 1975 to 1999. These results are based on time-series regressions of aggregate consumption of housing and financial wealth. The difference for this second set of results is that aggregate consumption is the dependent variable. The elasticity of consumption with respect to housing wealth ranges between 0.11 and 0.17. For an initial $100 in housing wealth, a $1 increase in house value raises consumption in the current year between 11 and 17 cents. As shown in Exhibit 4, our measures of total consumption with time-series data are similar. The estimates in the exhibit show that the marginal propensity to consume is between 15 and 20 cents a year, consistent with the results of the international data used by Case, Quigley and Shiller (2001).

For the marginal propensity to consume from financial wealth, the cross-sectional aggregate consumption data yields results similar to Case, Quigley, and Shiller (2001). In their international comparisons, they find that the marginal propensity to consume from financial wealth is between zero and 2 cents. That estimate of zero to 2 cents is similar to the estimates in this study of 2 to 3 cents for the marginal propensity to consume from financial wealth obtained in Exhibit 4, with comparable time series data on aggregate consumption.

For the marginal propensity to consume from housing wealth, there is a difference when using U.S. state retail sales as compared with time series and aggregate consumption. Spending at the state retail level amounts to only about 50% of total consumption spending as measured in the *National Income and Product Accounts* (*NIPA*) of the Bureau of Economic Analysis of the U.S. Department of Commerce. For example, in 2001, *NIPA* consumption spending totaled $7.1 trillion on an annualized basis, while state retail sales for 2001 were estimated at $3.5 trillion, slightly less than half of total consumption. Case, Quigley and Shiller (2001) use only state retail sales data in their estimate of U.S. housing and financial wealth consumption (their retail sales data for the 50 states is from 1982:1 to 1999:4). Retail sales include items such as food and clothing with low income and wealth elasticities. If retail sales are less wealth-elastic than all consumption, Case, Quigley and Shiller's (2001) estimate will be understated as a marginal propensity to consume.

Returning to the larger data set, the sample mean among households from the 1998 *SCF* is that 74% of total wealth is held in financial assets and 26% in real estate. Using these weights and the national accounts definition of personal disposable income, the overall marginal propensity to consume from wealth is 5.4 cents per dollar. On the other hand, using the Davis and Palumbo (2001) definition of income from human capital, or personal disposable income less property income, the marginal propensity is 7.5 cents annually per dollar. These estimates

are within the Poterba (2000) bound for the marginal propensity to consume from aggregate wealth. These bounds (for plausible estimates of the long-term rate, time horizon and risk aversion) are between 2 and 10 cents per dollar per year. The estimates of Exhibit 4 have maximum likelihood properties, allowing for the solution of Equation (8) that generate the weighting factor and the required risk premium.

The estimation from the disaggregated consumption function yields marginal propensities to consume for each type of asset, financial wealth and housing. Given a specification of the aggregate utility function, here exhibiting constant relative risk aversion and the economic environment of long rate and horizon, the implicit return to holding housing can be obtained.

The estimation derives estimates of the marginal propensity to consume from financial wealth β_s and housing wealth β_h. The environment provides parameters for the long-term interest rate $\overline{\omega}$, the horizon $\overline{\rho} - t$ and the coefficient of relative risk aversion $\overline{\gamma}$. Once these three parameters are specified, then the discount rate can be derived as δ.

Using hats to denote estimates, the marginal propensity to consume from housing wealth is $\hat{\beta}_h = \hat{\beta}\hat{\lambda}_h$. The marginal propensity to consume from financial wealth is analogous. The marginal propensity to consume from housing wealth is equal to the marginal propensity to consume from all wealth multiplied by a shift factor that may vary across assets. Substituting for the discounted weighting factors from Equations (4) and (5), the marginal propensity to consume from housing wealth is $\hat{\beta}_h = \left[\dfrac{1 - \hat{\theta}}{1 - \hat{\theta}^{\rho - t}} \right] \hat{\lambda}_h$. Here $\hat{\theta}_h \equiv \dfrac{1}{1 + \overline{\omega}} \left[\dfrac{1 + \overline{\omega}}{1 + \hat{\delta}_h} \right]^{\frac{1}{\gamma}}$ is the weighting factor that depends on the long-term interest rate and implicitly on the real discount rate for financial wealth $\hat{\delta}_h$. The weighting factor $\hat{\theta}_h$ solves $-\hat{\beta}\hat{\lambda}_h\hat{\theta}_h^{\rho - t} + \hat{\theta}_h = 1 - \hat{\beta}\hat{\lambda}_h$ where $\hat{\beta}$ is the overall marginal propensity to consume, with liquidity adjustment $\hat{\lambda}_h$ for housing and a specified time horizon, set at 10 years.

This is a quadratic equation, and the most feasible solution is $\hat{\theta}_h = 0.996$ for housing. With a long rate of of $\overline{\omega}$ of 10%, and a coefficient of relative risk aversion for γ of 0.4, all the parameters are in place to derive the implied return $\hat{\delta}_h = \dfrac{1}{\hat{\theta}_h^\gamma(1 + \overline{\omega})^{\gamma - 1}} - 1$ Substituting, $\hat{\theta}_h^\gamma = 0.9964$. Also $(1 + \overline{\omega})^{\gamma - 1} = 0.9444$. The product of these two is $\hat{\theta}_h^\gamma(1 + \overline{\omega})^{\gamma - 1} = 0.9429$. The last step is to derive $\hat{\delta}_h$ as the inverse, less one. The calculation results in $\hat{\delta}_h = 0.0606$.

The real rate of discount applied to holding housing is therefore 6.06%. This discount rate is a premium, based on the long-term interest rate, the time horizon of the representative household and its coefficient of relative risk aversion. From estimates of the marginal propensity to consume from housing, the underlying rate of return to housing for the aggregate economy is derived.

Conclusion

Households concentrate their holdings of wealth in housing and show a higher marginal propensity to consume housing wealth. That higher marginal propensity may be because housing provides both consumption and investment. Financial assets do not provide direct consumption; rather, a dominant part of total consumption is from housing wealth.

The marginal propensity to consume from housing ranges between 15 cents and 20 cents per dollar of wealth per additional dollar of wealth. The results are based on time series and aggregate data for the U.S. economy for consumption, financial wealth and housing wealth. Using data from fourteen countries, Case, Quigley and Shiller (2001) find marginal propensity to consume from housing wealth ranges between 11 and 17 cents per dollar (in the current year), consistent with the estimates obtained here.

Part of the difference in marginal propensities to consume between financial and housing wealth is likely to lie in the consumption aspect of each. Housing is consumed and financial wealth is not. The consumption of housing is included in aggregate consumption; its weight in the Consumer Price Index, itself based on cross-sectional data from the Consumer Expenditure Survey for the U.S., is more than 40%. Netting out the consumption of housing from total consumption will determine the extent to which housing wealth funds non-housing consumption. With the ability to borrow and refinance against housing on a non-recourse basis and at rates tied to federal debt, households have used their homes to fund consumption.

The consumption model describes the behavior of a representative household over its planning horizon. Standard assumptions are made about household utility. After applying liquidity adjustments to each asset, comparable cash equivalent values are obtained for each form of wealth. The implied marginal propensities to consume from each form of wealth differ and depend on risk preferences, time horizons and long-term interest rates. Using a non-linear estimating equation, the hypothesis that the marginal propensities to consume from physical and financial wealth are identical is tested. The resulting computed F-Statistic is 20.15, which is significant at the 5% level, demonstrating that the marginal propensity to consume from housing exceeds that for financial assets.

Endnotes

[1] See, for example, Davis and Palumbo (2001).

[2] In the long run over generations, the marginal propensity to consume from all three forms of wealth should be similar, but in the shorter time span of an individual, a household's consumption may be impacted by the constraints associated with consuming a particular form of wealth. The three forms of wealth (human, physical and financial)

are assumed to have different liquidity risks and the marginal propensity to consume from each asset also depends on risk preferences.

[3] Households have increasingly used mortgage equity withdrawals to access housing wealth to fund consumption. Methods households have used include cashing out some equity when refinancing mortgages, home equity lines and withdrawing housing wealth when selling homes and not fully reinvesting the housing wealth in a new home as in Canner, Dynan and Passmore (2002).

[4] Households may also use margin debt to access financial equity without paying taxes, but margin debt is callable unlike most residential mortgages including equity lines of credit.

[5] To estimate the marginal propensities to consume from housing and financial wealth, aggregate U.S. data that more fully measures total consumption spending than micro data such as when state retail is employed. Although aggregation biases exist when grouped household data are used such as potentially exaggerated household consumption elasticities, micro data such, as that from the American Housing Survey is subject to many biases such as self-reporting inaccuracies. Further, use of aggregate data allows for a consistent 50-year time-series allowing for greater analysis of the housing concentration issue.

[6] Ludvigson (1998) shows that credit for automobile loans may act to restrain consumption during periods of tight money supply.

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