Consumption, Real Estate and Financial Wealth

John D. Benjamin
Department of Finance and Real Estate
Kogod School of Business, American University
4400 Massachusetts Avenue NW
Washington DC 20016
(202) 885-1892

Peter Chinloy
Department of Finance and Real Estate
Kogod School of Business, American University
4400 Massachusetts Avenue NW
Washington DC 20016
(202) 885-1951

G. Donald Jud
Department of Finance, School of Business
University of North Carolina, Greensboro
Greensboro, North Carolina 27412
(910) 334-3091

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Abstract

The consumption function for the U.S. economy is estimated with real estate and financial wealth for quarterly data for 1952:1-2001:4. An additional dollar of real estate wealth increases consumption by 8 cents in the current year, as compared with 2 cents for financial wealth. The results are consistent with theoretical bounds on the marginal propensity to consume from aggregate wealth. The decline in the stock market had a limited impact on aggregate demand in 2000-2001 because of an offsetting real estate wealth effect.

Keywords: consumption and savings, marginal propensity to consume, financial assets, real estate assets.

JEL: N2

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1. Introduction

Consumers may react differently to capital gains depending on whether they are generated by rising stock prices or increasing house prices. This differential reaction is a possible explanation for the robustness of consumption and aggregate demand when securities markets decline. Federal Reserve Chairman Alan Greenspan (2001) speculates that families offset declines in spending from falling stock prices by increased spending from real estate wealth.

With the availability of home equity loans and low-cost tax-deductible refinancing, homeowners can tap their houses to finance consumption. Similarly, stock owners can sell stock and realize gains at preferential tax rates, or borrow against these assets on margin. Muellbauer (1994) suggests that differences between assets in liquidity and the distribution of ownership could imply different aggregate propensities to consume.

Estimates of the marginal propensity to consume have been constructed for financial and physical wealth separately. Brayton and Tinsley (1996)) use a marginal propensity to consume from financial wealth of between 3 and 5 cents per dollar for macroeconomic forecasting. At the individual level, Poterba and Samwick (1995) examine markets for luxury goods when stock prices increase. Only automobile demand is relatively sensitive to stock prices, leading Shleifer (1995) to conclude that the marginal propensity to consume from stock market wealth is negligible. Part of the accumulation of financial wealth comes as a response to uncertainty (Carroll and Samwick (1998)). On the other hand, for individual data from the *Panel Survey of Income Dynamics(PSID)*, Juster, Lupton, Smith and Stafford (1999) find a marginal propensity to consume from a dollar of stock gains of 17 cents.

For housing wealth, Elliott (1980) and Hoynes and McFadden (1997) using aggregate data reported that changes in housing wealth have only a limited impact on consumption. Using the *PSID* Engelhardt (1996) shows that the marginal propensity to consume is as high as 30 cents from a dollar of declining housing wealth. Increases in housing wealth have little or no effect on consumption. Case, Shiller and Quigley (2001) estimate the marginal propensity to consume from wealth using both physical and financial assets, using state retail sales data. The elasticity of consumption with respect to housing wealth is 0.06. The corresponding elasticity to financial wealth is about half that for housing.

This paper estimates the marginal propensities to consume from both physical and financial assets at the aggregate level. Wealth is divided between real estate and financial equity. Real estate equity includes for principal residences, vacation homes and rental

property. Financial equity includes liquid deposits as well as stocks, bonds and mutual funds. The series is for the United States quarterly 1952:1-2001:4.

The marginal propensity to consume is 8 cents in the current year from another dollar of real estate equity. By comparison, the marginal propensity to consume from a dollar of financial wealth is about 2 cents. Both estimates are within the Poterba (2000) bounds for aggregate wealth of between 2 and 10 cents.

The results are applied to two empirical observations, the decline in the savings rate during the 1990s and the robustness of the economy to the sharp drop in stock returns after 2000. About half the decline in the savings rate from 6.5% in 1995 to 1% by 2001 is attributable to increases in real estate and financial wealth. Virtually all the decline in consumption occurring from the stock market decline of 2000-2001 is offset by rising consumption from real estate wealth.

2. Wealth and Consumption

Summary statistics on family wealth for both financial and physical sources are in Table 1 from the 1998 *Survey of Consumer Finances (SCF)*. The typical family holds more than 75% of its financial wealth in restricted-access pension, retirement and insurance accounts. Median financial wealth in unrestricted accounts, including cash, certificates of deposit, bonds, stocks and mutual funds was less than $5,000 in 1998. More than one-third of families have virtually no unrestricted financial assets. Moreover, financial wealth is concentrated even among the wealthy. Bertaut (1998) notes that among those families in the 1992 *SCF* with over $60,000 in liquid assets, almost half owned no stocks or mutual funds.

Table 1. Median Housing and Stock Market Wealth, U.S. Families $'000 1998

	% of Families	% Owning Homes	Financial Wealth	Restricted Financial	Unrestricted Financial	Stocks, Mutual Funds	House Equity
All Families		64.7%	20.8	16.0	4.8	7.5	43.7
< $10,000	12.6%	36.1%	0.8	1.0	-0.2	0.6	15.9
$10,000-24,999	24.8%	54.9%	4.3	4.6	-0.3	4.0	30.1
$25,000-49,999	28.8%	67.0%	17.1	9.2	7.9	2.9	37.5
$50,000-99,999	25.2%	84.5%	57.1	29.6	27.5	10.7	63.7
>=$100,000	8.6%	91.1%	244.3	110.4	133.9	60.2	147.4

Source: *1998 Survey of Consumer Finances* from Kennickell, Shack-Marquez and Surette (2000)

In the life-cycle hypothesis of Ando and Modigliani (1963), consumption is based on the stocks of human and other financial and physical assets, or total wealth. Wealth W_t is an aggregate of personal disposable income Y_t produced partially by human capital,

together with financial equity S_t and real estate equity H_t. Personal disposable income is divided between transfer payments G_t and labor compensation, the latter the return to human capital. Consumption at time t is C_t. The utility function with level U_t exhibits constant relative risk aversion in consumption with parameter g or

$$U_t = \frac{1}{1-g} C_t^{1-g}. \tag{1}$$

Wealth is composed of human capital, financial and physical assets. These assets differ in liquidity, their locked-in nature in pensions or retirement accounts that prevent consumption, and restrictions of capital markets that prevent borrowing against them. Fluctuations in prices in stocks and houses, as well as wages can be interpreted differently as having transitory or permanent effects. There are differing liquidity discounts to be used in constructing wealth. Therefore wealth has the form

$$W_t = b_Y Y_t + b_G G_t + l_S S_t + l_H H_t \tag{2}$$

The coefficients b are the unobservable conversion ratios of income from human capital and transfer payments Y_t and G_t to their corresponding wealth levels. Liquidity parameters l_S and l_H potentially correspond to separate marginal propensities to consume from financial and physical wealth.

The marginal propensity to consume β from aggregate wealth is

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

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

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

where $t-t$ is the planning horizon and

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

The marginal propensity to consume from wealth is $\beta(\omega, \delta, \gamma, t-t)$. Here ω is the real rate of interest, δ the rate of time preference, γ the coefficient of relative risk aversion and $t-t$ the planning horizon. From (4) and (5), for a given real rate of interest, risk aversion coefficient and planning horizon, any

marginal propensity to consume corresponds to a given rate of time preference. For different assets and marginal propensities to consume, there is a unique rate of time preference for each asset. Poterba (2000) imposes plausible values for the long-term real rate, the rate of time preference, the relative risk aversion parameter and the planning horizon. These bound the marginal propensity to consume from aggregate wealth at between 2 and 10 cents per dollar.

There is an allocation of personal disposable income to transfer payments G_t received mainly by the elderly and the poor with a potentially different marginal propensity to consume. Substituting (2) in (3), redefining the parameters and dividing by personal disposable income

$$c_t = \beta_Y (y_t - g_t) + \beta_S s_t + \beta_H h_t. \tag{6}$$

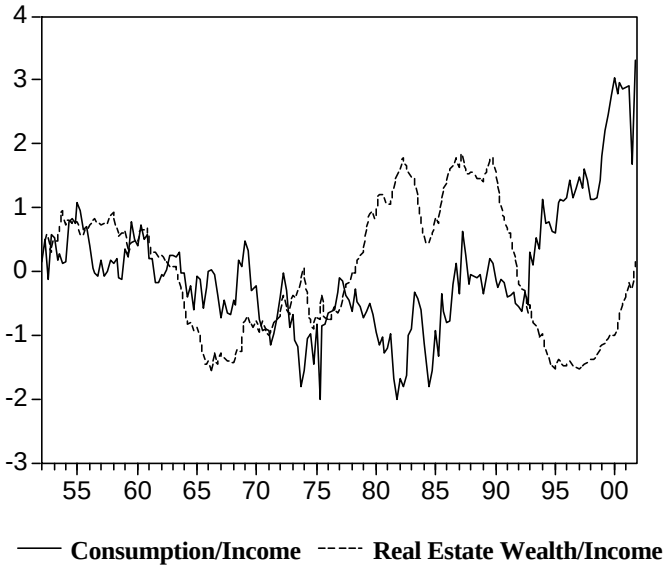
This is the estimating equation for the consumption propensity across financial and real estate assets. The consumption-income ratio depends on the ratio of non-transfer income to income and the ratios financial and real estate wealth to income. The parameterizations (4) and (5) can be substituted in (6) yielding a nonlinear equation where the parameters are different rates of time preferences on each asset. The linear version (6) allows separate marginal propensities to consume out of each type of wealth. Income and wealth are one period lags and viewed as predetermined.

3. Data and Specification

The data are quarterly observations from 1952:1-2001:4 on aggregate consumption, income and wealth for the United States from the Board of Governors of the Federal Reserve System's *Flow of Funds Accounts*. Following Davis and Palumbo (2001), property income for corporate dividends, net interest, rental income, and proprietors' income is subtracted from total disposable income. The reason for adjusting disposable income in this way stems from the life-cycle model. Labor income plus transfer income represents the return to human wealth. Thus, property income should not be included with labor income as proxy for human wealth. Including labor income and property income together can possibly confuse the propensities to consume out of human and property wealth.

Net real estate equity is real estate wealth less mortgage debt. Financial wealth is total net worth minus net real estate wealth. Data on the various components of disposable personal income and consumption are taken from the quarterly *National Income and Product Accounts* of the Bureau of Economic Analysis of the U.S. Department of Commerce. Figure 1 plots the relationship between the consumption-income ratio and the real estate wealth-income ratio.

Figure 1: Consumption Spending and Real Estate Wealth (normalized scale)



To determine the appropriate time series specification, tests for unit roots and co-integration are carried out. For a time series x_t, the estimating equation for a unit root is $\Delta x_t = \alpha + Vt + (\rho - 1)x_{t-1} + \sum_{j=1}^{r} \gamma_j \Delta x_{t-r} + \varepsilon_t$. Here Δ is the first difference operator, r is the number of augmentation lags, (V, ρ, γ) are parameters and ε_t a disturbance. The unit root test is for the null hypothesis of $\rho = 1$ against the alternative of $\rho < 1$. If the time series appear to have a trend, time t is included, and the test statistic is denoted v_1. If there is no apparent trend, time is excluded and the resulting test statistic is v_2. The number of augmentation lags r is large enough to eliminate evidence of serial correlation in the residuals from the estimating equations. In all cases, asymptotic critical values are used, since the residuals from the estimating regressions do not appear to be normally distributed.

Non-stationary series are cointegrated if there is a stationary linear combination of the variables. The Engle-Granger (1987) cointegration test involves recovering the least squares residuals of (6) as e_t. The test statistic is 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} The augmentation lag order k is large enough to eliminate serial correlation. An additional test takes account of multiple cointegrating vectors. The Johansen (1995) test determines the number of cointegrating relationships as the rank of Γ in $\Delta z_t = \alpha_z + \Gamma z_{t-1} + \sum_{j=1}^{m} \Psi_m \Delta z_{t-m} + \varepsilon_{zt}$.[1] Here $z \equiv (c, y-g, h, s)$ is the variable vector for consumption, income other than from transfer payments, real estate wealth and financial wealth, all relative to income.

Unit root test statistics are in column (4) of the upper panel of Table 2. Statistically significant results at the 1% level are in boldface. The tests 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 ν_1 and without a time trend are ν_2. The data for all time series in z_t exhibit unit roots in levels. In the first differences all time series are stationary.

Cointegration tests are in the lower panel of Table 2. To determine the lag length m, both sequential general-to-specific likelihood ratio tests and the Akaike information criterion are applied. Both these approaches involve setting $m = 5$ including the possibility of a drift in the trend component of z_t There is no cointegration among the variables from the test statistics in column (4). The statistics are for η_{trace} and $\eta_{\max}$ the trace and largest eigenvalue of Γ. The Engle-Granger unit root test reported in the last row also shows no cointegration.

Given the unit roots in levels but stationarity in first differences with no cointegration, the estimating equation is

$$\Delta c_t = \beta_Y \Delta(y_{t-1} - g_{t-1}) + \beta_S \Delta s_{t-1} + \beta_H \Delta h_{t-1}. \qquad (7)$$

[1] This maximum likelihood procedure is based on the existence of a Gaussian vector autoregressive representation of the variables as $z_t = \alpha_z + \chi_1 z_{t-1} + \chi_2 z_{t-2} + \ldots + \chi_m z_{t-m} + \upsilon_{zt}$ which is equivalent to the tested specification. The VAR is of lag length m with parameters (α_z, γ) and error $\upsilon_t \sim NID(0, \Sigma)$ where Σ is the variance-covariance matrix.

Coefficients on the independent variables have the same interpretation as those in (6). They reflect the marginal propensity to consume from income above transfer payments, financial wealth and real estate wealth.

Table 2. Unit Root and Cointegration Tests

1. Unit Root				
(1) Series	(2) Trend	(3) Augmented Lags	(4) Test Statistics	(5) 95% Critical Value
c_t	Yes	4	v_1 = -1.13, -1,18	-3.41
y_t	Yes	4	v_1 = -2.32, -2.33	-3.41
h_t	No	4	v_2 = -1.90, -1.91	-2.86
s_t	Yes	4	v_1 = -1.50, -1.47	-3.41
Δc_t	No	3	v_2 = **-7.51, -7.18**	-2.86
Δy_t	No	3	v_2 = **-5.13, -5.34**	-2.86
Δh_t	No	3	v_2 = **-5.01, -4.99**	-2.86
Δs_t	No	3	v_2 **= -6.90, -6.74**	-2.86
2.Cointegration				
Rank Test				
(1) ΓRank, No Cointegration		(3) ΓRank, Cointegration	(4) Test Statistics	(5) 95% Critical Value
			h_{trace}	
0		1,2,3 or 4	26.19, 31.00	47.18
1		2,3, or 4	7.77, 10.65	29.51
2		3 or 4	2.55, 4.68	15.20
3		4	0.43, 0.71	3.96

			$h_{\max}$	
0		1	18.42, 20.35	27.20
1		2	5.22, 5.97	20.78
2		3	2.13, 3.98	14.04
3		4	0.43, 0.71	3.96
Unit Root Test		1	-3.21,-3.65	-4.16

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 c_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.

4. Empirical Results

Empirical results are in Table 3. The first two columns report results when variables are normalized by personal disposal 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 indicated in boldface.

The estimated constant terms in Table 3 are zero. The coefficient of $\Delta(y-g)$ reflects the difference between the marginal propensity to consume from transfer payment income and that from personal disposable income. These are not lump-sum income payments, which may have different consumption propensities (Souleles (1999)). Both estimates suggest that the marginal propensity to consume from transfer income is not significantly different from that for personal disposable income.

Table 3. Marginal Propensities to Consume From Wealth, 1952:4-2001:4

	(1)	(2)	(3)	(4)
	Personal Disposable Income		Human Capital Income	
	Estimate	t-statistic	Estimate	t-statistic
Constant	0.00	0.16	0.00	0.43
$\Delta(y-g)$	0.199	1.17	0.166	0.82
Δs	**0.023**	4.81	**0.025**	4.96
Δh	**0.079**	2.80	**0.157**	5.27
AR(1)	-0.223		-0.260	
Adjusted R^2	0.20		0.31	
LM Test	1.46		0.18	
N	197		197	

In column (1) are estimates of the marginal propensity to consume from wealth when variables are normalized by personal disposable income. The marginal propensity to consume from financial wealth is 0.023 and is significant at the 1% level. The marginal propensity to consume from housing wealth is 0.079, also significant at the 1% level. A Wald test on the difference between the two coefficients indicates whether or not financial and physical wealth can be aggregated. The computed F-statistic is 3.76, significant at the 5% level. The coefficients on financial and physical wealth are not identical.

The human capital income measure underlying the coefficient estimates in column (3) is more in accord with the life-cycle hypothesis. The marginal propensity to consume from housing wealth is 0.157, while that from financial wealth is 0.025. 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 18.

At the sample mean, 74% of total wealth is held in financial assets and 26% in real estate. Using these weights, the overall marginal propensity to consume from wealth is 3.8 cents per dollar using the national accounts definition of personal disposable income. Using the Davis and Palumbo (2001) definition of income from human capital, or personal disposable income less property income, the marginal propensity is 5.9 cents. These estimates are within the Poterba bounds of 2 to 10 cents. The financial asset marginal propensity of between 2 and 2.5 cents per dollar is at the lower end of estimates, which have ranged from nearly zero to as high as 17 cents.

The marginal propensities to consume from real estate wealth of between 8 and 15 cents per dollar are within the range of between zero and 30 cents previously obtained.

The elasticity of consumption with respect to real estate wealth is 0.068 and 0.135 for two income definitions at the sample mean. Case, Quigley and Shiller (2001) estimate consumption elasticities for real estate wealth for 14 countries with a range of 0.11 to 0.17, similar to the estimates obtained. For the U.S., the elasticity of state retail sales is 0.06 with respect to housing wealth. The estimates in Table 2 for the aggregate U.S are consistent with state data and with theoretical restrictions.

The marginal propensity to consume from physical assets is several times larger than that from financial assets, with implications for the stabilization of the aggregate economy. They allow consideration of hypotheses such as Alan Greenspan's that the housing market offsets the stock market to stabilize consumption and aggregate demand.

4.1 The Savings Ratio

From Figure 1, the dark line indicates a sharp rise in the consumption-income ratio during the 1990s, with a corresponding fall in the savings ratio toward nearly zero. In the first quarter of 1995, the U.S. savings ratio was 6.5% of personal disposable income. The ratio of real estate wealth to personal disposable income h_t was 0.9176 and the financial wealth-income ratio s_t was 3.7834 in 1995:1. By the first quarter of 2001, six years later, the savings ratio had declined to 1.1%. The physical wealth-income ratio was 1.0457 and the financial wealth-income ratio were 4.3658 in the same quarter. The savings ratio change is $-\Delta c = \hat{b}_S \Delta s + \hat{b}_H \Delta h$, given the same marginal propensity to consume from transfer and non-transfer income, with hats denoting estimates.

Using the estimates from column (1) of Table 3, for personal disposable income, $-\Delta c_t = 0.0134 + 0.0101 = 0.0235$. The decline in the savings ratio was 5.4 percentage points. During 1995-2001, families' added wealth from the real estate market led to a 1.3 percentage point savings reduction. The rise in financial wealth over the same period led to a 1 percentage point decline in saving. The decline in savings resulting from higher physical and financial wealth is 2.3 percentage points, less than half the total. When the definition is changed from personal disposable income to human capital income, the savings decline is 2.9 percentage points. If the actual changes in real estate and financial wealth were expected, then these account for about half the decline in the savings rate. The remainder of the decline came through unanticipated shocks or from variables not measured by the estimation.

4.2 The Financial Market Decline

A simulation covers a period of sharp declines in the stock market and financial wealth after April 2000. Table 4 summarizes the results. In columns (1) and (2) are the ratios of financial and real estate wealth to personal disposable income, quarterly for 2000:1-2001:2. Financial wealth declined in each quarter

relative to income from 5.2553 in 2000;1 to 4.4377 in 2001:2. Real estate wealth relative to personal disposable income increased from 0.9828 to 1.0501 during the same period.

The wealth effect from the financial market is in column (5). This effect of declining financial wealth is negative throughout 2000. This negative wealth effect is countered by a positive wealth effect from families' holding of real estate in column (6). Column (7) sums the two wealth effects. The overall wealth effect is very slightly negative. In effect. the positive real estate wealth effect offsets the decline in the financial wealth.

Table 4. Wealth and Consumption 2000-2001 After the Stock Market Decline

	(1) s **Financial**	(2) h **Real Estate**	(3) c **Consumption**	(4) $1-c$ **Saving**	(5) $\hat{b}_S \Delta s$	(6) $\hat{b}_H \Delta h$	(7) $\hat{b}_S \Delta s + \hat{b}_H \Delta h$
2000:1	5.2553	0.9828	0.9922	0.0078			
2000:2	5.0380	1.0014	0.9874	0.0126	-0.005	0.001469	-0.00353
2000:3	4.9605	1.0201	0.9923	0.0077	-0.00178	0.001478	-0.0003
2000:4	4.6627	1.0344	0.9896	0.0104	-0.00685	0.001129	-0.00572
2001:1	4.3658	1.0457	0.9892	0.0108	-0.00683	0.000894	-0.00593
2001:2	4.4377	1.0501	0.9889	0.0111	0.001654	0.000345	0.001999

5. Concluding Remarks

There are several possible explanations for restraints on consumption from financial wealth. For most families, the holding of financial wealth is in restricted accounts for pensions and insurance. They cannot easily withdraw these funds for current consumption, nor can they borrow against the collateral. The holding of unrestricted financial wealth is virtually nonexistent among lower-income families, and concentrated even within high-income families. Within these latter families, holdings within specific firms such as controlling or dominant interests may also be restrictive.

Tax policy has favored families concentrating their debt against their housing collateral, and by using larger mortgage balances and home equity lines to finance consumption. With the marginal propensity to consume from real estate wealth larger than from financial wealth, families are more at risk from a decline in the housing market.

In a period of declining financial asset prices but rising real estate prices there are offsetting effects on aggregate demand. The covariance between returns in financial and real estate markets will indicate whether there is a risk of both declining together. How these wealth shifts occur has an impact on aggregate demand. An increase in expected profits shifts demand outward, while a reduction in the discount rate changes the slope of the intertemporal budget constraint.

These are caveats and extensions. The results remain that the marginal propensity to consume from real estate wealth is considerably higher than that for financial assets. This gain has allowed families to use real estate wealth to offset declines in financial wealth when they make consumption and expenditure decisions.

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