The Effects of the Capital Accumulation Ratio on Wealth

Nathaniel J. Harness, Michael S. Finke, and Swarn Chatterjee

The capital accumulation ratio (CAR) is commonly used in academic research as a measure of household portfolio quality. This study tested whether a higher initial CAR impacts change in wealth over a decade among households in the accumulation life cycle stage. Meeting the 25% CAR guideline resulted in a 28.1% increase in net worth between 1994 and 2004. When broken into quartiles, the relationship between CAR and wealth was monotonic and statistically significant. However, this increase comes at a cost; those who met the 25% threshold CAR increased their standard deviation of net worth from 1994 to 2004 by 8.1%, and those in the highest CAR quartile saw their wealth dispersion increase by 36%. Results from this study suggest that meeting the 25% CAR threshold leads to greater wealth over time at the tradeoff of higher variation in future wealth.

Key Words: capital accumulation ratio, net worth, personal financial ratio analysis

Introduction

The capital accumulation ratio (CAR) is traditionally defined as the proportion of net worth held in investment assets and is intended to reflect the share of assets held primarily for future consumption. Many financial planning texts and articles today use the CAR to assess financial strength over time (Garman & Forgue, 2000), relative household financial well-being (DeVaney, 1993), and retirement adequacy (DeVaney, 1995; Yao, Hanna & Montalto, 2003).

The CAR has also been used as an indicator of how well a household is achieving the goal of wealth accumulation (Garman & Forgue, 2000; Yao et al., 2003) and as a reflection of proper asset allocation (Moon, Yuh, & Hanna, 2002). However, ratios are only useful if they accurately reflect the financial characteristic they were created to capture.

Although the CAR is frequently used in financial planning research and practice, the limited availability of detailed longitudinal wealth data has discouraged studies that test the implications of these recommended practices on households across time. The lack of empirical support has not affected reliance on the CAR by practitioners and in the popular financial press. One financial news television program noted that "the recommended [CAR] ratio is at least 50% and should get higher as retirement approaches" (Jung & Ng, 2007). Others recommend the CAR "ratio should increase over time" (Marcinko, 2002) and that "as one approaches retirement, this ratio should increase and should approach 70% to 90% (lower for homeowners)" (Burns & Forgue, 2003). While greater investment in financial assets, rather than tangible and liquid asset categories, will lead to greater expected wealth in later years, these specific recommendations are empirically unfounded.

While empirical support of a relation between higher CAR and household wealth accumulation over time has not been established in the extant personal finance literature, there is overwhelming empirical evidence that investment assets have yielded a higher return over time than have liquid or tangible assets in the U.S. This paper explores how variation in CAR leads to changes in wealth among a sample of households within a similar life cycle stage over a 10-year period.

Nathan Harness, Ph.D. Assistant Professor of Finance, CFP® Program Director, P.O. Box 3011, Texas A&M-Commerce University, Commerce, TX 75429-3011, nathan_harness@tamu-commerce.edu, (903) 886-5673

Michael Finke, Ph.D., Associate Professor of Personal Financial Planning, Box 41162, Texas Tech University, Lubbock, TX 779409-1162, michael.finke@ttu.edu, (806) 742-5050, Ext. 259

Swarn Chatterjee, Ph.D., Assistant Professor, Housing & Consumer Economics, 213 Dawson Hall, University of Georgia, Athens, GA 30602, swarn@uga.edu, (770) 467-6092

Literature Review

Most CAR analyses are cross-sectional due to the lack of detailed, nationally representative panel data sets (Campbell, 2006). While cross-sectional analysis can provide insight into variation in CAR across households (Yee & Niemeier, 1996), panel data provide the ability to estimate the effect of a ratio on a household's financial well being over time.

Griffith (1985) was one of the first to use financial ratios as assessment tools to measure household financial health. He developed case scenarios that analyzed a proposed set of 16 ratios to interpret a household's financial situation. Although the CAR was not one of these original ratios, Griffith concluded that scaling ratios by net worth is critical in determining progression toward goal attainment. Lytton, Garman, and Porter (1991) identified the ratio of investment assets within a portfolio as a benchmark of a successful household portfolio and recommended that the CAR be 25% or greater (although it should vary across the life cycle).

Yao and Hanna (2001) empirically tested the effect of the CAR on retirement adequacy using a sample of 110 financial planning clients and found that only 34% of households meeting the 25% CAR guideline were adequately prepared for retirement. Of those who failed to meet the 25% guideline, a similar proportion (30%) was adequately prepared for retirement. Moon, Yuh, and Hanna (2002) analyzed the usefulness and limitations of financial ratio guidelines in a sample of Korean households. They found that just 15% of Korean households met the CAR guideline (25%), and that CAR increased up to age 39, but then decreased for the rest of the life cycle--suggesting possible cultural and generational differences in preference for investment assets.

Yao, Hanna, and Montalto (2003) found that 63% of households that met the 25% CAR guideline were adequately prepared for retirement. Contrary to some recommendations of academics and practitioners, a very high CAR (50% or above) was found to be a weaker predictor of retirement adequacy than a lower CAR (25-50%) threshold.

DeVaney (1995) studied the CAR to determine retirement adequacy in young and older baby boomers. The researcher found that being white and expecting an inheritance was positively associated with having a CAR of greater than 25%. Older baby boomers who were in good health, male, and had a pension were more likely to meet the 25% guideline. These findings indicated that the CAR is a good indicator of retirement adequacy, but that a panel data set would improve the power of the study.

A number of studies have tested the impact of household variables on meeting the CAR guideline. Yao, Hanna, and Montalto (2002) found that education, income, number of years until retirement, overspending, and financial risk tolerance were all predictors of meeting the CAR guideline. Moon et al. (2002) found that income, a small household size (< 3), having a child younger than six, and being married were all positive predictors of meeting the CAR guideline. Older age, larger household size, being male, and being a dual earner were all negative predictors of meeting the CAR guideline.

Baek and DeVaney (2004) found that being college educated, earning a higher income, having an above average tolerance for risk, always paying off credit card balances, saving regularly, and spending less than one's income were all positively associated with meeting a CAR guideline of 25%, while risk aversion decreased the chance of meeting the CAR guideline.

Using a panel study of the Survey of Consumer Finances, DeVaney (1993) found that the average household CAR increased from 0.39 to 0.41 between 1983 and 1986 (a period of economic expansion). Bae, Hanna, and Baek (2005) analyzed financial ratios before and after the Korean economic crisis (between 1997 and 1998) and found that the percentage meeting a 20% CAR guideline decreased by 5.7%. They attributed the decrease in the CAR to the decline of the stock market after the economic crisis.

Investment Asset Holdings

It has been well documented that households vary in their preference for different asset classes (Xiao, 1995). Investment asset holdings were greater among households with more financial resources, a longer planning horizon, a growth-oriented savings motive, a higher education, and those who are white (Zhong & Xiao, 1995). Other indicators of households with greater investment asset holdings included those who have a higher levels of income, own credit cards, own a home, and hold other financial assets (Xiao, 1995); who are older (Ameriks & Zeldes, 2000; Poterba & Samwick, 1997); who are in higher marginal tax brackets (Poterba & Samwick, 1999); and who have higher non-tradable income (human capital) (Campbell & Viceira, 2002; Klos & Weber, 2006) and higher cognitive ability (Benjamin & Shapiro, 2005). Guiso, Haliassos, and

Jappelli (2002) found that in the United States the fraction of investors with direct or indirect stockholdings rises from 4.4% in the lowest quartile of wealth to 86.7% in the highest quartile of wealth.

Tradeoffs Among Asset Categories

Meeting the CAR guidelines is in part a decision to defer consumption. According to life cycle savings theory (Ando & Modigliani, 1963), individuals make a decision to defer consumption from periods of relatively low marginal utility to periods of higher marginal utility by borrowing and saving. Household preferences determine portfolio allocation. Monetary assets provide liquidity or insurance against a sharp decline in consumption. Tangible assets provide a service flow of utility both in the present and the future and may either rise or fall in value depending on rate of depreciation. Investment assets are held primarily for future consumption, and allocation within this category is a function of time horizon and risk tolerance.

Modern Portfolio Theory (Markowitz, 1952) differentiates two basic categories of assets held for investment purposes – the market portfolio, consisting of all capital assets available, and a risk-free asset. In reality, the allocation problem faced by households is further complicated by the multi-period consumption streams that can be drawn from durable goods and the demand for asset liquidity. At equilibrium, the household equalizes discounted expected marginal utility from monetary, tangible, and investment assets. Monetary and tangible assets provide utility in the current period that investment assets do not, but holding these assets involve tradeoffs. The tradeoff to holding monetary assets is the price of liquidity, which can be roughly measured by return differences between cash assets and safe illiquid assets (for example between certificates of deposit (CDs) and money market accounts). The other opportunity cost of holding monetary assets is the inability to take advantage of the risk premium available through investment vehicles that have an uncertain future payout. Households that, in the absence of demand for liquidity, would have placed a portion of monetary assets into a market portfolio will experience reduced expected investment returns from holding monetary assets. The opportunity cost of holding tangible assets, such as residential real estate, a vehicle, or a sofa, is the difference in expected risk-adjusted returns between the optimal investment asset portfolio and the return (or depreciation) on a tangible asset[1]. In addition to the possibility of lower returns from tangible assets, households trade off the ability to attain diversification benefits available through an investment portfolio. Residential real estate investment, for example, involves a significant amount of unrewarded nonsystematic risk. Both lower returns and reduced diversification are tradeoffs that households accept when the expected discounted utility from consuming the durable asset over time exceeds the opportunity costs.

Among the most notable tradeoffs of liquid and tangible assets is that they generally do not allow investors to accept additional systematic investment risk in order to earn greater expected returns. Investment assets allow a household to choose an appropriate level of risk in order to maximize expected utility from consumption in future periods. Because investments are risky, returns over the short- and long-run will vary among households. It is possible that shifting assets from less volatile monetary or tangible assets into investment assets that may be invested in riskier instruments will lead to increased variation in subsequent wealth.

Hypotheses and Methods

Researchers have stated that "the capital accumulation ratio defined as investment assets to net worth, is an indicator of the household's wealth accumulation" (Yao et al., 2003, p. 6). We hypothesized that households with sufficient investment assets to meet the CAR guideline of 25% in 1994 will have a greater net worth in 2004 when controlling for selected variables. We also hypothesized that households in higher CAR categories will see a greater increase in wealth between 1994 and 2004. This is represented in equation (1).

(1) $$\ln(\Delta Wealth_{04i\text{-}94i}) = \alpha_i + \beta_1 (CAR94_i) + \beta_2 \ln(\sum income_{94i}) + \beta_3 \ln(Wealth\ 94_i) + \beta_4 (D_i) + \epsilon_i$$

Where;

Di = vector of household characteristics affecting preference for current consumption

Means of sample and frequencies by quartile changes in wealth are calculated in Table 1. An ordinary least squares (OLS) regression is used to test this hypothesis as shown in the first and second regressions in Tables 2 and 3.

The second hypothesis was that a greater share of assets held in investment assets in period A will lead to greater variance of wealth in period B. More specifically, it was hypothesized that meeting the CAR guideline in 1994 (and being in higher CAR categories) will lead to a greater variance in net worth in 2004 when controlling for selected

variables. If the CAR is unrelated to variation in wealth then the parameter estimate of the CAR variable should be insignificant. This analysis is represented in equation (2).

$$(2) \quad \log(\sigma Wealth_{04i\text{-}94i}) = \alpha_i + \beta_1 (CAR94_i) + \beta_2 \ln(\sum income_{04i\text{-}94i}) + \beta_3 \ln(Wealth94_i) + \beta_4 (D_i) + \epsilon_i$$

Where;

Di = vector of household characteristics affecting preference for current consumption

An ordinary least squares (OLS) regression was used to test this hypothesis as shown in the third and fourth regression in Tables 4 and 5.

Data Description

This research used the National Longitudinal Survey of Youth 1979 cohort (NLSY79), a nationally representative panel data set comprised of youth who were between the ages of 14 and 21 on December 31, 1979. The NLSY79 has surveyed the same households between 1979 and 2004 comprising of 21 waves of this panel, with a 90% retention rate in subsequent years. This cohort of individuals are considered part of the young baby boom generation (Galizzi & Zagorsky, 2005).

Not all participants were used in this research. The data were limited to those who were willing or able to estimate their net worth in both 1994 and 2004. The years 1994 to 2004 were chosen due to availability of wealth data in the earliest and most recent NLSY surveys. It should also be noted that the time period represents a period in which households have entered the accumulation stage of their life cycle (early 30s in 1994 and early 40s in 2004).

Dependent Variable

The dependent variable was change in net worth from 1994 to 2004. Net worth was measured using an identical self-reported net worth question asked in each sample year. The respondent was asked: "How much would you have left over after all debts are paid from selling all assets?" Net worth was a measure of total family net worth including both spouses. Wealth in 1994 and 2004 was transformed using a natural log. These two logged wealth variables were then subtracted from each other to create a change in log from 1994 to 2004.[2] This log transformation eliminated distortions caused by large values and the non-normal distribution of wealth.[3]

Independent Variables

The independent variables included measures of demographics, financial variables, socioeconomic characteristics, myopic behavior, and health. The CAR was calculated by dividing investment assets by net worth. Investment assets were calculated using the actual reported value of all investment assets reported by the participants. These assets included the value of IRA, Keogh, 401(k), 403(b), pre-tax annuities, stocks, bonds, mutual funds, CDs, other non-residential real estate, business and professional interests, value of farming operation, and personal loans to others.

Although age is limited by the nature of the sample, it was included as a variable because of the slight (7 year) age difference in the panel. Age has been found to be a significant predictor of wealth across time (Haurin, Wachter, & Hendershott, 1996). Race was also included as an independent variable. Prior research has found whites to be more likely than blacks to hold high-risk and high-return assets (Keister, 2000). Education, marital status, and gender were included because of their relationship to wealth. Education was measured using years of education and was broken into high school, some college (2 years or less), college graduate, or those who have attended graduate school. Marital status was broken into a binary variable of married or those not married. Gender was also binary coded into male and female. Households with higher levels of education are more inclined to invest in higher-return assets, and may be less myopic (Peress, 2004; Wolff, 1998). Yamokoski and Keister (2006) found that married couples have $7^1/_2$ times the median net worth of single adults, and females are often financially penalized due to childbirth and rearing responsibilities--causing a reduction in lifetime wealth.

Region of residence was included to proxy possible regional differences in asset price changes (for example residential real estate) (Haurin et al., 1996). Number of children was included to proxy preference for present consumption. Keister (2003) also found that having a larger number of children is negatively associated with ownership of risky assets.

Socioeconomic variables included log sum of total income from 1994 to 2004, inheritance, and log net worth in 1994. The share of wealth generated by inheritance has been estimated to be as small as 10% (Morgan, David, Cohen, & Brazer, 1962) and as large as 18.5% (Menchik & David, 1983). Inheritance was measured as a binary variable showing whether or not the household had received any form of monetary bequeath from the year 1994 to 2004.

Both income and net worth were used as controls for change in net worth given the effect of income and current net worth on changes in net worth.

Other financial variables included were bankruptcy between 1979 and 2004 and homeownership. Households that declared bankruptcy at any time from 1979 to 2004 were dummy coded to control for shocks that could affect net worth. Homeownership, a binary variable, was included because of its positive impact on savings and ultimately net worth of households (Haurin & Rosenthal, 2005).

Table 1. Mean of Sample and Frequencies by Quartile Changes in Wealth

	Frequency by Change in Wealth Quartiles			
Variable	**Quartile one**	**Quartile two**	**Quartile three**	**Quartile four**
Guideline CAR (25%)	19.16	24.13	26.74	29.97
Age 39 to 40	25.90	28.38	23.05	22.67
Age 41 to 42	24.67	27.58	25.15	22.60
Age 43 to 44	24.80	26.24	23.76	25.20
Age 45 to 47	26.11	20.76	25.35	27.77
Black	35.09	25.73	26.90	12.28
White	24.12	25.67	24.62	25.59
Hispanic	35.90	26.92	16.67	20.51
High school education and below	31.96	28.55	23.99	15.50
Some College	26.40	26.40	25.23	21.98
College	14.22	19.78	24.00	42.00
Graduate school	12.89	17.27	26.29	43.56
Married	20.19	23.74	26.46	29.62
Widow/Divorced between 94 to 04	32.65	28.92	19.96	18.47
North East	20.00	20.94	23.06	36.00
North Central	24.79	25.28	28.10	21.84
South	29.36	28.98	23.48	18.18
West	22.90	23.06	22.08	31.96
Male	24.78	24.45	25.92	24.85
Female	25.91	26.70	22.84	24.55
Inheritance	18.35	20.85	24.65	36.16
Bankruptcy anytime 94 - 04	40.89	30.35	17.89	10.86
Homeowner	21.86	22.33	26.28	29.53
Heavy smoker	33.20	30.43	22.13	14.23
Health effected employment	39.89	31.69	13.11	15.30
		Mean by Quartile		
Number of children	1.98	1.89	1.76	1.86
Log of wealth 1994	9.72	9.24	10.00	10.86
Log of total income 94 - 04	12.15	12.29	12.62	13.03

Myopic behavior was tested using an index of behaviors that included alcohol abuse, smoking, and drug use as a proxy for a high rate of time preference. This index was coded so that a higher score indicated a higher rate of time preference. This was similar to Lusardi's (2000) proxy for rate of time preference which can have an effect on preference for assets held to defer consumption. Entrepreneurship was included as a dummy variable. Hurst and Lusardi (2004) found that when subtracting business equity, entrepreneurial households have a significantly larger level of wealth. Research by Galizzi and Zagorsky (2005) suggested that a worker who is never injured is more likely to have a higher level of wealth and wealth growth rates. A variable was included to test whether a worker had been injured (affecting the respondent's ability to work) any time between 1994 and 2004. This variable asked respondents whether or not they had been unable to work because of their current health situation.

Results

Table 1 provides descriptive statistics for the overall sample and frequencies by quartiles of changes in net worth. This table was designed to show the frequency of each variable across wealth change quartiles. For continuous variables such as number of children, the means of each quartile change in wealth are shown instead of the frequency within each quartile. This table shows the percentage (out of 100%) of individuals who fall within each quartile change in wealth based on each of the independent variables.

The frequency of those meeting the CAR guideline of 25% increased from 19.16% to 29.97% across each quartile of wealth. The median CAR for the sample was 19.01%. This percentage is smaller than previous studies (Yao et al., 2002, 2003) and can be attributed to differences in definitions of variables and restrictions on sample age. Age appeared roughly equal across all quartiles of changes in wealth. Within the age group of 39 to 40, 25.9% had the lowest change in wealth from 1994 to 2004, while a similar 22.6% within this age group were in the highest change in wealth quartile. The similarity between groups could be attributed to the homogeneity of ages, with only an 8 year age gap throughout the sample period. Those with higher education appeared to have the largest changes in wealth, peaking with those who had completed graduate school (43.56%) in the highest quartile change in wealth. Married households saw slightly greater changes in wealth, while divorce appeared unsurprisingly to have the opposite effect. Those in the north central and southern parts of the United States appeared to have the lowest changes in net worth compared to those in the Northeast and West. Inheritance and homeownership appeared to have a positive relationship with changes in wealth, while bankruptcy, smoking and health affecting jobs had a negative relationship. For the continuous variables, the mean for each quartile change in wealth is shown at the bottom of Table 1. Those in the lowest quartile change in wealth had the largest mean number of children (1.98). There was a direct relationship between greater changes in wealth and both initial wealth and total income.

Regression Results

The first regression results testing hypothesis one estimated the impact of meeting the CAR guideline of 25% on the log change of net worth from 1994 to 2004 using OLS regression. The results in Table 2 are consistent with the hypothesis that meeting the recommended CAR guideline of 25% in 1994 led to an increase in the wealth in 2004. Meeting the CAR guideline resulted in a 28.1% increase in the change of net worth between1994 and 2004.[4]

Compared to those aged 39 or 40, 41 and 42 year-old respondents had a significantly lower change in net worth. Race had a significant impact on net worth. Black (-.407) and Hispanic (-.124) households had smaller changes in net worth than whites. Education had a significantly positive relationship with changes in net worth. Those who completed graduate school (.351), college (.354) or some college (0.177) saw a greater positive change of net worth compared to those who only attained a high school education. Marriage (.134) had a significant and positive impact on change in net worth. Those who lived in the southern and north-central U.S. had a significantly lower CAR than those who live in the West. Both having declared bankruptcy and having a greater number of children had a negative effect on change in net worth. Log net worth in 1994 had a negative relationship to changes in net worth. A 10% increase in net worth in 1994 reduced changes in net worth by 5.2%.[5] Log income in 1994 had a positive impact on changes in wealth.

The first regression tested the CAR based on the current guideline of 25%. This guideline percentage was originally set at 25% based on scenario studies by Lytton et al. (1991). This guideline was later tested against retirement adequacy (Yao et al., 2003) and was found to be better predictor than the 50% guideline suggested by some practitioners (Greninger, Hampton, Kitt, & Achacoso,

Table 2. CAR Guidelines Using Log (Δ Net Worth) as Dependent Variable

Variables	Estimate	Std. Error	Significance
Intercept	3.8967	0.5371	***
CAR guideline	0.2478	0.0653	***
Age (Reference: Age 39 to 40)			
41 to 42	-0.2099	0.0894	**
43 to 44	-0.1491	0.0922	
45 to 47	-0.1040	0.0935	
Race (Reference: White)			
Black	-0.4071	0.0988	***
Hispanic	-0.1237	0.0970	*
Native	0.0318	0.1336	
Asian	0.5817	0.2973	*
Education (Reference: High school)			
Some college	0.1770	0.0756	**
College	0.3538	0.0845	***
Graduate school	0.3510	0.0979	***
Married	0.1335	0.0829	*
Region (Reference: West)			
North East	-0.0525	0.0976	
North Central	-0.2149	0.0857	***
South	-0.2363	0.0843	***
Number of children	-0.0478	0.0273	*
Gender (Reference category: Male)			
Female	-0.0928	0.0603	
Log income 94	0.3318	0.0545	***
Inheritance	0.1505	0.0626	**
Log net worth 1994	-0.5634	0.0262	***
Bankruptcy ever	-0.3892	0.1130	***
Homeowner	-0.4370	0.0286	
Business owner	-0.4805	0.0224	
Composite	-0.5240	0.0163	
Health effected employment	-0.5675	0.0102	

*$p < .10$. ** $p < .05$. ***$p < .01$.

Adj $R^2 = 0.2937$.

Table 3. CAR Quartile Regression Using Log (Δ Net worth) as Dependent Variable

Variables	Estimate	Std. Error	Significance
Intercept	3.9077	0.5409	***
CAR Quartiles (Reference: Quartile one)			
CAR Quartile two	-0.0035	0.0827	
CAR Quartile three	0.1360	0.0872	*
CAR Quartile four	0.2608	0.0768	***
Age (Reference: Age 39 to 40)			
41 to 42	-0.2071	0.0895	**
43 to 44	-0.1511	0.0923	
45 to 47	-0.1054	0.0936	
Race (Reference: White)	-0.0002	0.0732	
Black	-0.4128	0.0989	***
Hispanic	-0.1287	0.0971	
Native	0.0338	0.1338	
Asian	0.5968	0.2976	**
Education (Reference: High school)			
Some college	0.1781	0.0758	**
College	0.3571	0.0848	***
Graduate school	0.3529	0.0980	***
Married	0.1571	0.0803	**
Region (Reference: West)			
North East	-0.0508	0.0977	
North Central	-0.2166	0.0859	**
South	-0.2335	0.0844	***
Number of children	-0.0457	0.0273	*
Gender (Reference: Male)			
Female	-0.0884	0.0604	
Log income 94	0.3311	0.0548	***
Inheritance	0.1462	0.0627	**
Log net worth 1994	-0.5623	0.0265	***
Bankruptcy ever	-0.3876	0.1132	***
Homeowner	0.0407	0.0782	
Business owner	0.0763	0.1232	
Composite	0.0093	0.0102	
Health effected employment	-0.1625	0.1502	

*$p < .10$. ** $p < .05$. ***$p < .01$.

Table 4. CAR Guideline Regression Using Standard Deviation of Net Worth as Dependent Variable

Variables	Estimate	Std. Error	Significance
Intercept	1.4533	0.6296	**
CAR guideline	0.0776	0.0145	***
Age (Reference: Age 39 to 40)			
41 to 42	-0.2232	0.0941	**
43 to 44	-0.1780	0.0978	*
45 to 47	-0.1853	0.0989	*
Race (Reference: White)			
Black	-0.2364	0.1133	**
Hispanic	-0.1674	0.1048	
Native	-0.0166	0.1443	
Asian	0.6344	0.3302	*
Education (Reference: High school)			
Some college	0.1095	0.0813	
College	0.2390	0.0842	***
Graduate school	0.4062	0.0963	***
Married	0.3182	0.0876	***
Region (Reference: West)			
North East	-0.1245	0.0985	
North Central	-0.2167	0.0877	**
South	-0.1561	0.0893	*
Number of children	-0.0452	0.0291	
Gender (Reference: Male)			
Female	0.0825	0.0623	
Log income 94	0.4922	0.0634	***
Inheritance	0.0860	0.0627	
Log net worth 1994	0.4598	0.0290	***
Bankruptcy ever	-0.1339	0.1345	
Homeowner	-0.1244	0.0851	
Business owner	0.0512	0.1307	
Composite	0.0154	0.0106	
Health effected employment	-0.0551	0.1689	

*$p < .10$. ** $p < .05$. ***$p < .01$.

Adj $R^2 = 0.3829$.

Table 5. CAR Quartiles Regression Using Standard Deviation of Net Worth as Dependent Variable

Variables	Estimate	Std. Error	Significance
Intercept	2.9172	0.4677	***
CAR Quartiles (Reference: Quartile one)			
CAR Quartile two	0.0104	0.0732	
CAR Quartile three	0.1004	0.0756	*
CAR Quartile four	0.3646	0.0760	***
Age (Reference: Age 39 to 40)			
41 to 42	-0.2364	0.0773	***
43 to 44	-0.2079	0.0798	***
45 to 47	-0.1900	0.0809	**
Race (Reference: White)			
Black	-0.1057	0.0856	
Hispanic	-0.1573	0.0840	*
Native	-0.0192	0.1157	
Asian	0.5205	0.2571	*
Education (Reference: High school)			
Some college	0.0904	0.0655	
College	0.2219	0.0734	***
Graduate school	0.3247	0.0849	***
Married	0.2173	0.0695	***
Region (Reference: West)			
North East	-0.0939	0.0847	
North Central	-0.1655	0.0743	**
South	-0.1632	0.0730	**
Number of children	-0.0108	0.0236	
Gender (Reference: Male)			
Female	0.0284	0.0522	
Log income 94	0.3790	0.0476	***
Inheritance	0.1436	0.0542	***
Log net worth 1994	0.4163	0.0230	***
Bankruptcy ever	-0.1923	0.0978	**
Homeowner	-0.0944	0.0676	
Business owner	0.1659	0.1065	
Composite	0.0223	0.0088	**
Health effected employment	-0.0878	0.1299	

*$p < .10$. ** $p < .05$. ***$p < .01$.

Adj $R^2 = 0.3833$.

1996). To obtain a better understanding of the relationship between CAR thresholds and changes in wealth, the ratio was broken into quartiles and tested using the same control variables. Table 3 presents the results of the quartile CAR OLS regression. Quartile one contained individuals who had a CAR less than 9.87%. Quartile two was comprised of individuals who had a CAR between 9.87% and 26.00%. Quartile three included those between 26.00% and 59.99%, and quartile four contained those with a CAR greater than 59.99%.

Results from Table 3 suggested that the relation between CAR and change in wealth is monotonic. Those in the third-highest CAR quartile had a significantly greater change in net worth than those in the lowest CAR quartile, and having a CAR in the highest quartile had the largest increase in wealth over time. The results for all the other control variables did not differ meaningfully from the first regression.

The third regression tested hypothesis two, the impact of meeting the CAR guideline of 25% on the log standard deviation of net worth from 1994 to 2004, where standard deviation of net worth was measured using self reported net worth from the years 1994, 1996, 1998, 2000, and 2004.[6] The parameter estimates represented the percentage change each variable had on the standard deviation of net worth. The results in Table 4 are consistent with hypothesis two. Meeting the recommended CAR guideline of 25% in 1994 caused an increase in the dispersion of wealth in 2004. Those who met the CAR threshold had a standard deviation of net worth from 1994 to 2004 that was 8.1% higher than other households.

Compared to 39- and 40-year old respondents, every other group had a significantly lower standard deviation of wealth. Blacks (-.236) had a lower standard deviation of wealth and Asians (.634) had a higher standard deviation of wealth when compared to whites. Education has a significantly positive relationship with standard deviation of net worth. Those who completed graduate school (.406) and college (.239) had a significant increase in standard deviation of net worth compared to those who only attained a high school education. Marriage (.318) had positive effect on standard deviation of net worth. Living in the north central U. S.(-.217) or South (-.156) as compared to the West had a significantly negative impact on standard deviation of net worth. Both log of net worth in 1994 and log of income from 1994 to 2004 had a positive impact on standard deviation of net worth.

A final OLS regression was run to estimate the relationship between CAR quartiles and standard deviation of wealth over time. Results from Table 5 show that while the relation between CAR and accumulated wealth was positive and monotonic, a greater allocation of investment assets to net worth also led to greater wealth variation between 1994 and 2004. Those in quartile three (CAR between 26.00% and 59.99%) had a significantly (10%) higher standard deviation of net worth than those in the lowest CAR quartile. Those in the highest quartile (CAR greater than 59.99%) had a much higher standard deviation (36%) of net worth than other CAR quartiles, suggesting a significant tradeoff between expected wealth growth and wealth variation from high household capital asset investment.

Conclusion

The capital accumulation ratio, which measures investment assets divided by net worth, is commonly used by practitioners and academics to measure household portfolio quality. Despite its frequent use in financial planning, there is little empirical evidence that a greater CAR today will lead to financial success tomorrow. This study fills a gap in the literature by estimating the impact of having a higher CAR, and meeting a common CAR threshold, on growth in net worth among households in the same life cycle stage between 1994 and 2004. Meeting a 25% CAR threshold leads to a statistically significant increase in household wealth between 1994 and 2004. When CAR is measured in quartiles, households within the third and fourth quartiles see a greater increase in wealth between the two sample periods. However, the relation between CAR and standard deviation of wealth is also significant for those in the third and fourth quartiles of CAR. Both total wealth and wealth dispersion increase monotonically among CAR quartiles. These results suggest that younger households can benefit from an increased portfolio allocation toward investment assets when capital assets are experiencing returns that resemble historical investment asset performance in the U.S. The results also suggest that a greater capital asset allocation leads to greater volatility in net worth, a tradeoff that is particularly relevant given asset performance since the most recent NLSY survey. Those who are willing to bear greater short-run volatility are rewarded with significantly greater wealth, and this illustrates the expected long-term benefits of maintaining a balanced household portfolio. Prior research has suggested that practitioners often recommend that capital accumulation ratios for most families should be greater than 50%; however, these results suggest that those with a very high CAR during this decade saw a much greater variation in future wealth. Results from this

study help illustrate the possible tradeoff between risk and expected return that characterize a portfolio of investment assets that take advantage of the risk premium by accepting greater volatility in payout. Practitioners must be careful to explain both the expected benefits from holding riskier assets and the expected costs of uncertainty. Rates of return and standard deviations for stocks and bonds from the years in this study were near the historical average--stocks grew by 11.76% per year, while bonds returned an average of 7.17% per year (CRSP, 2008). In periods where asset returns do not resemble historical averages, for example the decade between 1998 and 2008, we may observe a smaller benefit from maintaining a higher CAR.

Ratios must be broad and easy to use and interpret for common acceptance. Households do not appear to use complex heuristics when determining asset allocation or wealth accumulation (Bernheim, Skinner, & Weinberg, 1997; Hurst, 2004). The main benefit of using the CAR as a guideline is not necessarily to dictate appropriate allocation of assets between broad asset categories, but to induce behavior that is closer to optimal among those that have limited knowledge of investing. Similar to a savings ratio, the main benefit of drawing attention to the CAR may be to induce participation in investment assets among households that would otherwise be investing ineffectively in lower-yielding liquid or tangible assets.

For financial planners and counselors, it is important to recognize that most households could benefit from taking advantage of capital market returns by shifting wealth to investment assets. The general guideline of 25% does appear to contribute to increases in wealth. Planners, counselors, and households must also realize that there is likely a threshold at which increased CAR leads to decreased satisfaction by reducing liquidity or consumption from durable goods. There is a significant portion of the population that follows general rules of thumb when faced with complex and intimidating financial choices. If simple financial ratios can help these households, then it is the job of the researcher to test both their usefulness and limitations.

Although the objective of ratio research is to develop a measure that is easily interpretable, it would be naive to suggest that every person maintain a certain ratio guideline throughout their life cycle. Longitudinal research that includes a different sample, for example the Health and Retirement Study, could shed light on the consistency of the risks and rewards of holding a greater share of one's wealth in the form of investment assets. Likewise, estimating the impact of CAR on wealth during a period of low investment returns and high volatility might provide greater insight into the risks of holding a very high CAR. An investment asset portfolio heavily weighted toward equity-based assets will correlate negatively or positively with change in wealth during economic expansions and contractions. The standard deviation of CAR may also have an impact on net worth across time if households attempt to time the market. Net worth could be reduced by a high standard deviation of the CAR through taxes and trading costs as well as by behavioral timing mistakes. Future research should address the impacts of short-term CAR volatility on financial health.

Financial planning practitioners, government policy makers, and households would benefit greatly from appropriate guidelines for all ratios that impact a household's financial health. Results from this study suggest that meeting the 25% CAR threshold leads to greater wealth over time at the tradeoff of higher wealth dispersion. The appropriate CAR guideline for any individual household is a function of their tolerance for risk; however, this study provides some concrete evidence that both the increase in expected wealth from holding investment assets and the increase in risk are significant.

References

Ameriks, J., & Zeldes, S. P. (2000). *How do household portfolio shares vary with age*. Unpublished manuscript, Columbia University.

Ando, A., & Modigliani, F. (1963). The" life cycle" hypothesis of saving: Aggregate implications and tests. *The American Economic Review, 53*(1), 55-84.

Bae, M. K., Hanna, S., & Baek, E. (2005). Before and after the economic crisis: Changes in financial ratios of the self-employed households. *Consumer Interests Annual, 51*.

Baek, E., & DeVaney, S. A. (2004). Assessing the baby boomers' financial wellness using financial ratios and a subjective measure. *Family and Consumer Sciences Research Journal, 32*(4), 321-348.

Benjamin, D. J., & Shapiro, J. M. (2005). *Does cognitive ability reduce psychological bias?* : Retrieved May 16, 2007, from http://elsa.berkeley.edu/users/webfac/dellavigna/e218_sp05/benjamin.pdf

Bernheim, B. D, Skinner, J. S., & Weinberg, S. A. (1997). *What accounts for the variation in retirement wealth among U.S. households?,* Stanford University Working Paper 97-035. Available at SSRN: http://ssrn.com/abstract=48653 or DOI: 10.2139/ssrn.48653

Burbidge, J. B., Magee, L., & Robb, A. L. (1988). Alternative transformations to handle extreme values of the dependent variable. *Journal of the American Statistical Association, 83*(401), 123-127.

Burns, S., & Forgue, R. E. (2003). *How to care for your parents' money while caring for your parents*. New York: McGraw-Hill.

Campbell, J. Y. (2006). Household finance. *Journal of Finance, 61*, 1553-1604.

Campbell, J. Y., & Viceira, L. M. (2002). *Strategic asset allocation: Portfolio choice for long term investors*. Oxford, England: Oxford University Press.

CRSP. (1994-2004). Available: Center For Research in Security Prices. Graduate School of Business. University of Chicago 4/15/2008. Retrieved from Wharton Research Data Service.

DeVaney, S. A. (1993). Changes in household financial ratios between 1983 and 1986: Were American households improving their financial status? *Financial Counseling and Planning, 4*, 31-46.

DeVaney, S. A. (1995). Retirement preparation of older and younger baby boomers. *Financial Counseling and Planning, 6*, 25-33.

Galizzi, M., & Zagorsky, J. L. (2005). How do on-the-job injuries and illnesses impact wealth? (pp. 1-27): National Institute for Occupational Safety and Health.

Garman, E. T., & Forgue, R. E. (2006). *Personal Finance* (9th ed.). Boston: Houghton Mifflin.

Greninger, S. A., Hampton, V. L., Kitt, K. A., & Achacoso, J. A. (1996). Ratios and benchmarks for measuring the financial well-being of families and individuals. *Financial Services Review, 5*(1), 57-70.

Griffith, R. (1985). Personal financial statement analysis: A modest beginning. *Proceedings, Third Annual Conference of the Association of Financial Counseling and Planning Education, 3*, 123-131.

Guiso, L., Haliassos, M., & Jappelli, T. (2002). *Household portfolios: An international comparison*. Cambridge, MA: MIT Press.

Haurin, D. R., & Rosenthal, S. S. (2005). House price appreciation, savings, and consumer expenditures (pp. 1-43): Columbus: Ohio State University Press.

Haurin, D. R., Wachter, S. M., & Hendershott, P. H. (1996). Wealth accumulation and housing choices of young households: An exploratory investigation. *Journal of Housing Research, 7*(1), 33 - 57.

Hurst, E. (2004). *Grasshoppers, ants and pre-retirement wealth: A test of permanent income consumers*, Michigan Retirement Research Center Research Paper No. WP 2004-088 Available at SSRN: http://ssrn.com/abstract=1092963

Hurst, E., & Lusardi, A. (2004). Liquidity constraints, wealth accumulation and entrepreneurship. *Journal of Political Economy, 112*(2), 319-347.

Jung, S., & Ng, J. (2007). Managing your overall budget. Retrieved February 27, 2007, from http://www.channelnewsasia.com/ptm/wealth/episodes.htm.

Keister, L. A. (2000). Race and wealth inequality: The impact of racial differences in asset ownership on the distribution of household wealth. *Social Science Research, 29*(4), 477-502.

Keister, L. A. (2003). Sharing the wealth: The effect of siblings on adults' wealth ownership. *Demography, 40*(3), 521-542.

Klos, A., & Weber, M. (2006). Portfolio choice in the presence of nontradable income: An experimental analysis. *German Economic Review*, *7*(4), 427-448.

Lusardi, A. (2000). Explaining why so many people do not save. JCPR Working Papers 203, Northwestern University/University of Chicago Joint Center for Poverty Research.

Lytton, R. H., Garman, E. T., & Porter, N. M. (1991). How to use financial ratios when advising clients. *Financial Counseling and Planning, 2*, 3-23.

Marcinko, D. E. (2002). Fundamentals of Rx financial planning and plan construction for physicians. Retrieved February, 27 2007, from http://medicalbusinessadvisors.com/financial%20planning1.doc.

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance, 7*(1), 77-91.

Menchik, P. L., & David, M. (1983). Income distribution, lifetime savings, and bequests. *The American Economic Review, 73*(4), 672-690.

Moon, S. J., Yuh, Y., & Hanna, S. D. (2002). Financial ratio analysis of Korean households. *Family and Consumer Sciences Research Journal, 30*(4), 496-525.

Morgan, J. N., David, M. H., Cohen, W. J. & Brazer, H. E. (1962). *Income and welfare in the United States*. New York: McGraw-Hill Book.

Pence, K. M. (2002). *401(k)s and Household Saving: New evidence from the survey of consumer finances*: Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board.

Peress, J. (2004). Wealth, information acquisition, and portfolio choice. *The Review of Financial Studies, 17*(3), 879-914.

Poterba, J. M., & Samwick, A. (1997). Household portfolio allocation over the life cycle: National Bureau of Economic Research.

Poterba, J. M., & Samwick, A. (1999). Taxation and household portfolio composition: US evidence from the 1980s and 1990s: National Bureau of Economic Research.

Wolff, E. N. (1998). Recent trends in the size distribution of household wealth. *The Journal of Economic Perspectives, 12*(3), 131-150.

Xiao, J. J. (1995). Patterns of household financial asset ownership. *Financial Counseling and Planning, 6*, 99-106.

Yamokoski, A., & Keister, L. A. (2006). The wealth of single women: Marital status and parenthood in the asset accumulation of young baby boomers in the United States. *Feminist Economics, 12*(1-2), 167-194.

Yao, R., & Hanna, S. D. (2001). An in-depth examination of the capital accumulation guideline with financial planning client households. *Proceedings of the 2001 Annual Conference of the Association for Financial Counseling and Planning Education*.

Yao, R., Hanna, S. D., & Montalto, C. P. (2002). Factors related to meeting the capital accumulation ratio guideline. *Financial Services Review, 11*(2), 153-171.

Yao, R., Hanna, S. D., & Montalto, C. P. (2003). The capital accumulation ratio as an indicator of retirement adequacy. *Financial Counseling and Planning, 14*(2), 1-11.

Yee, J. L., & Niemeier, D. (1996). Advantages and disadvantages: Longitudinal vs. repeated cross-section surveys. Retrieved February, 27, 2007 from Project Battelle 94-16, FHWA, HPM-40.

Zagorsky, J. L. (2005). Marriage and divorce's impact on wealth. *Journal of Sociology, 41*(4), 406.

Zhong, L. X., & Xiao, J. J. (1995). Determinants of family bond and stock holdings. *Financial Counseling and Planning, 6*, 107-114.

Endnotes

[1] While it is possible that some tangible assets will outperform investment assets, for example when real estate or a Picasso outperforms a bond portfolio, in a competitive market the consumption streams available from these assets will lead to a reduced expected return when compared to an investment asset of the same level of risk.

[2] Using the equation $\log_b W_{04} - \log_b W_{94} = \log_b (W_{04}/ W_{94})$.

[3] As a measure of robustness other transformations were performed. An inverse hyperbolic sine transformation $\theta\text{-}1\sinh^{-1}(\theta y) = \theta^{-1}\ln(\theta y + (\theta^2 y^2 + 1)^{½})$ with a scale parameter (θ) of 0.0001used, producing similar results. For further discussion see (Burbidge, Magee, & Robb, 1988; Pence, 2002). No households reported a negative net worth, which may bias estimates of change in net worth among those who may have had significant debt.

[4] Interpretation of parameter estimates of a log dependent variable requires (ex) -1.

[5] Interpretation of the log dependent and independent relationship requires $(ex^{*\ln(1.1)})$-1.

[6] Statistical analysis software version 9 (SAS) function sdev = Std(1994, 1996, 1998, 2000, 2004) was used to calculate the dependent variable in this regression.