Household Ratio Guidelines for the Amount of Investments

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Abstract

Some textbooks suggest using financial ratios to provide simple indicators of whether households are making appropriate decisions. However, ratios related to the appropriate level of investment assets are not common, and not standardized. We investigate three investment ratios mentioned in textbooks: the Capital Accumulation Ratio, the ratio of investments to annual income, and the ratio of investments to total assets. We conduct a regression on respondent evaluation of the adequacy of retirement income, among households in the 2013 Survey of Consumer Finances. The ratio of investments to total assets has the strongest relationship to adequacy, controlling for household characteristics.

1. Introduction

Household financial ratios are used to help provide simple rules for financial decisions, since many consumers have trouble with more complex analyses (Harness, Chatterjee, & Finke, 2008). One topic covered by a few proposed ratio guidelines is the appropriate amount of investments that should be held by households. The most frequently mentioned such ratio is the Capital Accumulation Ratio, which has been analyzed in a number of empirical analyses (Harness, Finke, & Chatterjee, 2009; Letkiewicz & Hanna, 2013; Yao, Hanna & Montalto, 2002, 2003). The Capital Accumulation Ratio, defined as the proportion of net worth held in investment assets was proposed by Lytton, Garman, and Porter (1991). It has been used in two personal finance textbooks, in editions of the Garman and Forgue (2003) from about 2000 to 2010, and in DeVaney (1997). These authors propose that having a Capital Accumulation Ratio of at least 25% is a good indicator of the ability to accumulate capital for future goals, as it shows that net worth is not being devoted to vehicles and one's personal residence. In the Greninger, Hampton, Kitt and Achacoso (1996) article reporting a Delphi survey of financial planners and educators, a level of 50% for the ratio is suggested.

However, as Letkiewicz and Hanna (2013) note, the Capital Accumulation Ratio guideline advocated by Garman and Forgue (2003) in previous versions of their textbook before 2012 is not commonly suggested in financial planning textbooks. Garman and Forgue (2015, p. 78) suggest using the ratio of investments to total assets to answer the question of whether one is investing enough. They state guidelines of having the ratio be at least 10% for those in their 20's, 11% to 30% for those in their 30's, and over 30% for those aged 40 and over. Yao et al. (2002)

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mention the alternative of using the Investment to Assets ratio instead of the Capital Accumulation Ratio because of the problem of households having negative net worth.

Dalton, Dalton, Cangelosi, Guttery, and Wasserman (2005, p. 124) suggest using the ratio of investment assets to annual income, with a goal of having sufficient investments to generate the amount of income needed in retirement. They suggest having a ratio of 10 at retirement, with ratios of 3 to 4 about 10 years before retirement and a ratio of at least 1 about 20 years before retirement. This ratio is similar to the normative analysis presented in Ibbotson (2008, p. 199). Figure 1 shows graphically the pattern implied by the results in Ibbotson. As shown, the needed ratio depends not only on age, but also on income, because of the progressive nature of Social Security pension benefits and taxes on current earnings.

[Insert Figure 1 about here]

While a number of empirical studies have been conducted using the Capital Accumulation Ratio (see review by Letkiewicz & Hanna, 2013), there are no empirical studies of one of the newer ratios, the ratio of investment assets to annual income (Dalton, et al., 2005). There is one brief abstract related to the other newer ratio used by Garman and Forgue (2015), the ratio of investment assets to total assets. Yao and Hanna (2002) report comparisons how well the 25% Capital Accumulation Ratio guideline is related to retirement adequacy to how well the 25% Investments to Assets guideline is related to retirement adequacy, and note that neither guideline is a very good indicator of retirement adequacy. Much of the previous empirical research on investment ratios focuses on meeting simple thresholds, and therefore, has not provided much insight into what levels might be best for households.

Objective

Harness, et al. (2008) suggest that ratio guidelines should be research based. The objective of this paper is to provide insights into three household investment ratios and whether one is better than the others. We present distributions of the two newer ratios, along with the Capital Accumulation Ratio, based on analyses of the 2013 Survey of Consumer Finances. Also, for an exploratory attempt to derive normative results for levels of the three ratios, three Ordinary Least Squares regressions are run, with respondent assessment of the adequacy of future retirement income, as a function of age, homeownership status, having a defined benefit plan, along with linear and quadratic variables for each investment ratio.

2. Methods

2.1. Mathematical Considerations for Financial Ratios

Harness, et al. (2009) suggest note that many financial ratios have a non-normal distribution. The component variables of the three ratios related to investments are income, investments, net worth, and total assets. All have skewed distributions, especially the asset and net worth variables, with very long tails of the distribution. Many households have zero or negative net worth, making interpretation of the Capital Accumulation Ratio problematic, since net worth is in the denominator of the ratio.

If an investment ratio is to provide some guidance for financial planning, presumably the level of the ratio should be related to projected retirement adequacy. This is the approach used by Yao, Montalto, and Hanna (2003), although they use arbitrary levels of the Capital Accumulation Ratio and analyze the effect on an objective measure of retirement adequacy. For convenience in this exploratory study, we use as a dependent variable the household's subjective assessment of retirement adequacy. The SCF variable (X3023) has 5 levels:

X3023 Using any number from one to five, where one equals totally inadequate and five equals very satisfactory, how would you rate the retirement income you receive (or expect to receive) from Social Security and job pensions? Include 401(k) accounts and all other types of pensions.

1. *TOTALLY INADEQUATE
2.
3. *ENOUGH TO MAINTAIN LIVING STANDARDS
4.
5. *VERY SATISFACTORY

Kim and Hanna (2015) show that this variable is related to an objective estimate of retirement adequacy, although not perfectly. If we want to include households of all ages, and not make arbitrary assumptions about the retirement ages of those who did not list a specific retirement age, the subjective measure has advantages over the objective measure. Three Ordinary Least Squares regressions on subjective retirement adequacy are run, controlling for age of head, age squared, homeownership status, having a defined benefit pension, and one of the ratio variables. To allow for non-linear effects of the ratios on subjective retirement adequacy, a quadratic term for the ratio is also included.

2.2. Data and Sample

The 2013 Survey of Consumer Finances (SCF) released by Federal Reserve Board (Bricker, et al., 2014) is used. The total sample size of the 2013 SCF is 6,015 and for our main analyses, households with heads employed full-time (N=3,747) are analyzed. The suggestions in Lindamood, Hanna, and Bi (2007) are followed in analyzing the data.

2.3. Key Variables: Three Investment Ratios

The Capital Accumulation Ratio is defined as investment assets-to-net worth and is calculated from information on investment assets and net worth. If net worth is zero or negative, then the ratio is defined as equal to the value of investments, in other words, the denominator will be assumed to be equal to one (c.f., Letkiewicz & Hanna, 2013). Investment assets consist of all financial assets other than monetary assets such as checking and saving accounts, plus non-financial assets such as art work, antiques, net business assets, and real estate other than the personal residence. Monetary (liquid) assets include checking, savings, money market, and call accounts, and are not counted as part of investment assets, although certificates of deposit are included as investment assets. Net worth is the sum of monetary assets, investment assets, and nonfinancial assets minus consumer debt and property debt. As showed in the descriptive results

below, there are some extreme values of the ratio, so some adjustments are made for the regression analysis.

The ratio of investments to annual income (Dalton, et al., 2005) is calculated at the ratio of investments to annual pretax household income. If the denominator is zero, the ratio is defined at the value of investments. As with the Capital Accumulation Ratio, there are some extreme values of the ratio, so adjustments are made for the regression analysis. Dalton, Dalton, and Oakley (2014) discuss the ratio of investments plus monetary assets to gross earnings, although this ratio does not address the idea of needing investments that will grow. However, as a worker approaches retirement, it is plausible that those that are risk averse will shift some investments to monetary assets such as money market accounts.

The ratio of investments to total assets (Garman & Forgue, 2015) is calculated as the ratio of investment assets to total assets. Total assets include both financial assets and non-financial assets. For the small number of cases with zero assets, the ratio is defined as the value of investments.

3. Results

3.1. Descriptive Results

For all 6,015 households in the 2013 SCF, the maximum level of net worth is $1,324,417,600, with 11.59% of households having negative net worth, and 1.33% of households having zero net worth. (The SCF includes vehicles, housing, and financial assets, but does not include the value of personal possessions such as furniture.) The maximum value of investment assets is over one billion dollars, $1,320,813,200. However, 30.57% of households have zero investment assets, and one household is coded as having negative investments, presumably due to debt not recorded elsewhere. The maximum value of assets is $1,324,540,600, and there is also a case with a negative value for total assets.

Table 1 shows the distribution of the three ratios for all households and for households with the head employed full-time. For all households, the maximum value of the investments to net worth ratio is almost 59,000,000, partly due to the almost 13% of households with zero or negative net worth. For instance, a young recent college graduate with $1,000 in a mutual fund and $30,000 in student debt would have an investments to net worth ratio of 1,000. The maximum value of the investments to annual income ratio is over 125,000,000, whereas the maximum value of the investments to total assets ratio is only 1.00. For all households, the median level of the investments to net worth ratio is 0.35, the median for the investments to income ratio is 0.33, and the median for the investments to total assets ratio is 0.17. For all households, the skewness of the investments to net worth and the investments to income ratios are very high (74 and 38, respectively) but the skewness of the investments to total assets ratio is only 0.7.

[Insert Table 1 about here]

The columns for the ratio with the head employed full-time correspond to the sample used for the regression analyses. In addition, for these columns and for the regression, extreme values of the investments to net worth ratio and of the investments to income ratio are recoded.

The 95th percentile of the investments to net worth ratio is 130, so for households with values of the ratio above 130, the ratio is recoded to 130 to avoid having overly influential values in the regression analysis. The 95th percentile of the investments to income ratio is 11.87 for all households and 8.84 for households with the head employed full-time. That level is not extreme in terms of the Ibbotson (2008) normative analysis (see Figure 1), so we instead use the approximate level of the 99th percentile in the full sample, 35, as the point of recoding. Values of the investments to income ratio above 35 are recoded to 35. The rationale for both of these recoding rules is to limit the effect of a few extreme values on the dependent variable.

3.2. Regression Results

Table 2 shows the results for three Ordinary Least Squares (OLS) regressions, with the dependent variable being the respondent's subjective assessment of the adequacy of retirement income. The effects of the ratio of investments to net worth, and the square of that ratio, are not significant at the conventional level of .05. The combined effect of the linear and the quadratic term imply that the subjective assessment of retirement adequacy increases with the ratio up to a level of 61, then decreases as the ratio increases above that level. (We also ran the same regression without the quadratic term, and the linear term is also not significant.) Age and age squared are significant, and the combined effect implies that subjective assessment of retirement adequacy decreases with age up to age 40, then then increases as age increases above age 40. Homeownership does not have a significant effect on perceived retirement adequacy. Those with a defined benefit pension have significantly higher assessments of adequacy than those without one.

[Insert Table 2 about here]

For the second OLS regression shown in Table 2, the effects of the ratio of investments to income and the square of that ratio have significant effects on perceived retirement adequacy. The combined effects imply a positive effect of the ratio on the subjective assessment as the ratio increases from zero to 14, then a negative effect as the ratio increases above that level. Given the distribution of the ratio (Table 1), for almost all households, the ratio has a positive effect on perceived adequacy. Age and age squared are significant, and the combined effect implies that subjective assessment of retirement adequacy decreases with age up to age 42, then then increases as age increases above age 42. Homeownership does not have a significant effect on perceived retirement adequacy. Those with a defined benefit pension have significantly higher assessments of adequacy than those without one.

For the third OLS regression shown in Table 2, the effects of the ratio of investments to total assets and the square of that ratio have significant effects on retirement adequacy. The combined effects imply a positive effect of the ratio on the subjective assessment of retirement adequacy up to a level of 0.6, then adequacy decreases as the ratio increases above 0.6. Age and age squared are significant, and the combined effect implies that subjective assessment of retirement adequacy decreases with age up to age 43, then increases as age increases above age 43. Those with a defined benefit pension have significantly higher assessments of adequacy than those without one.

4. Discussion and Implications

The investments to net worth ratio (also known as the Capital Accumulation Ratio) is the only household financial ratio related to the amounts of investments for which there has been empirical research, and it is discussed in two personal finance textbooks (Garman & Forgue, 2003; DeVaney, 1997). However, it has problematic mathematical properties (Harness, et al., 2008), and does not seem strongly related to subjective assessment of retirement adequacy among households with a head employed full-time. Another financial ratio, the investments to annual income ratio is also discussed in a textbook (Dalton, et al., 2005). However, it has extreme values for a small proportion of households. It also is not strongly related to subjective assessment of retirement adequacy among households with a head employed full-time.

The investments to asset ratio is discussed in a textbook (Garman & Forgue, 2015), and has better mathematical properties for a financial ratio than the other two ratios. The investments to total assets ratio has advantages in terms of some of the mathematical issues discussed by Harness, et al. (2008). Even though it has a skewed distribution, it is not as skewed as the other two ratios. Also, it is almost always possible to calculate the investments to total assets ratio, as long as the household does not have zero assets, whereas the investments to net worth ratio cannot be directly calculated for almost 13% of the households in the 2013, and the ratio has to be assigned a value of the investments divided by 1.0.

Further, the investments to total assets ratio has a positive effect on subjective retirement adequacy for most households, even though in the OLS regression we might interpret a small decrease in subjective adequacy as the ratio increases above a level of 0.6. By contrast, the investment to net worth ratio does not have a statistically significant effect on subjective retirement adequacy. The investment to income ratio does have a significant positive effect on subjective retirement adequacy, though it has some very extreme values, unlike the investment to assets ratio.

As with any household financial ratio above, the investments to asset ratio can at best be a simplistic guide to initial thinking about financial decisions. Further, the OLS regression with subjective retirement adequacy also has significant effects for homeownership, age, and having a defined benefit pension. So, for instance, if two households are similar in terms of age and homeownership status, and had the same value of the investments to asset ratio, but one had a defined benefit pension but the other had nothing but Social Security, it makes sense that they would have different assessments of retirement adequacy.

To summarize our results: if an author or educators wants to use a financial ratio guideline related to the amount of investments, the investment to total assets ratio is superior to other ratio guidelines that have been proposed. A ratio guideline of 0.5 might be plausible, based on our regression results. As with any financial ratio guideline, one should be cautious in applying such guidelines, as a more complex analysis of a household's situation is always desirable.

References

Bricker, J., Dettling, L.J., Henriques, A., Hsu, J. W., Moore, K.B., Sabelhaus, J., et al. (2014). Changes in U.S. family finances from 2010 to 2013: Evidence from the Survey of Consumer Finances. *Federal Reserve Bulletin*, 100 (4), 1-40.

Dalton, M.A., Dalton, J.F., Cangelosi, R.R., Guttery, R.S., & Wasserman, S.A. (2005). *Personal financial planning theory and practice*. St. Rose, LA: Kaplan Financial.

Dalton, M.A., Dalton, J.F., & Oakley, K.F. (2014). *Cases in financial planning: Analysis and presentation* (2nd ed.). St. Rose, LA: Money Education.

DeVaney, S.A. (1997). Using financial ratios. In E. T. Garman, J. J. Xiao & B. G. Brunson (Eds.), *The mathematics of personal finance: Using calculators and computers* (pp. 141-153). Houston, TX: Dame Publications.

Garman, E.T., & Forgue, R. (2003). *Personal finance* (7th ed.). Boston, MA: Houghton Mifflin Company.

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.

Harness, N.J., Chatterjee, S., & Finke, M. (2008). Household financial ratios: A review of literature. *Journal of Personal Finance*, 6(4), 77–97.

Harness, N.J., Finke, M.S., & Chatterjee, S. (2009). The effects of the Capital Accumulation Ratio on wealth. *Journal of Financial Counseling and Planning*, 20(1), 44-57.

Ibbotson Associates. (2008). *Stocks, bonds, bills, and inflation yearbook*. Chicago, IL: Ibbotson Associates.

Kim, K.T. & Hanna, S.D. (2015). Do U.S. households perceive their retirement preparedness realistically? *Financial Services Review,* 24, 139-155.

Lindamood, S., Hanna, S.D., & Bi, L. (2007). Using the Survey of Consumer Finances: Some methodological considerations and issues. *Journal of Consumer Affairs*, 41(2), 195-222.

Letkiewicz, J., & Hanna, S.D. (2013). The impact of stock and real estate returns on the propensity of households to meet the Capital Accumulation Ratio guideline. *Journal of Financial Counseling and Planning,* 24(1), 34-44.

Lytton, R.H., Garman, E.T., & Porter, N.M. (1991). How to use financial ratios when advising clients. *Journal of Financial Counseling and Planning*, 2(1), 3-23.

Yao, R. & Hanna, S. D. (2002). The investment-asset ratio - A plausible replacement for the Capital Accumulation Ratio guideline? *Proceedings of the Association for Financial Counseling and Planning Education*, p. 66.

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. *Journal of Financial Counseling and Planning*, 14(2), 1-12.

Table 1 Distribution of Three Investment Ratios, All Households (Untrimmed) and Households with Full-Time Employed Head, Trimmed Ratios

Distribution	Investment/Net Worth		Investment/Income		Investment/Total Assets	
	All households	Full-time employed*	All households	Full-time employed**	All households	Full-time employed
Mean	1026.43	8.82	4804.58	2.07	0.28	0.31
Maximum	58,580,000	130.00	125,340,000	35.00	1.00	1.00
99th %tile	20,000	130.00	35.31	27.59	0.98	0.97
95th %tile	130.00	130.00	11.87	8.84	0.76	0.88
75th %tile	0.76	0.84	2.19	2.05	0.52	0.54
Median	0.35	0.48	0.33	0.45	0.17	0.23
25 %tile	0.00	0.02	0.00	0.01	0.00	0.01
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Skewness	74.35	4.10	37.86	3.81	0.70	0.58

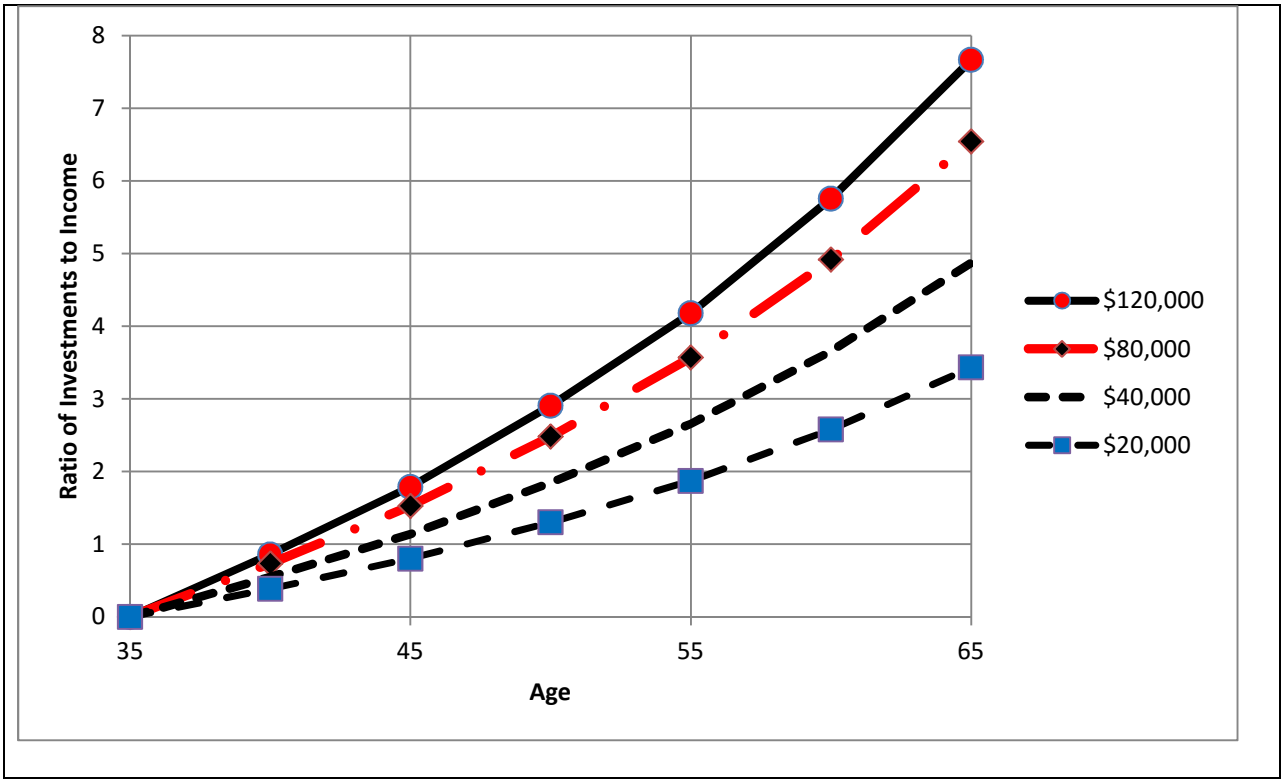
Analysis by authors of 2013 Survey of Consumer Finances, weighted.
Ratios defined as value of investments if denominator = 0. Recoded to 0 if investments<0.
*Values above 130 recoded to 130.
**Values above 35 recoded to 35.

Table 2 Regressions on Subjective Assessment of Retirement Adequacy, Among Households with Head Employed Full-time, by Investment Ratios, Controlling for Age, Homeownership, and Having Defined Benefit Plan

Variable	Investment/Net Worth		Investment/Income		Investment/Assets	
	coefficient	p	coefficient	p	coefficient	p
Ratio	0.0087	.5313	0.0508	<.0001	1.3295	<.0001
Ratio Squared	-7.1E-5	.5104	-0.0018	<.0001	-1.1083	<.0001
Age of head	-.03648	.0003	-0.0368	.0002	-0.0443	<.0001
Age of head/10000	4.5994	<.0001	4.417	<.0001	5.1153	<.0001
Homeowner	0.0747	.0901	0.04607	.2991	0.0526	.2521
Have defined benefit pension	0.3851	<.0001	0.3858	<.0001	0.3752	<.0001
Intercept	2.8971	<.0001	2.9102	<.0001	2.9458	<.0001
Adjusted R squared	0.0223		0.0286		0.0382	

Unweighted analysis by authors of 2013 SCF, households with head employed full-time. Extreme values of ratios recoded. RII technique (Lindamood, et al., 2007) used.

Figure 1 Ratio of Needed Amount of Retirement Investments to Income, Ibbotson Analysis of Amount to Accumulate to Replace 80% of Net Pre-Retirement Income, by Age and Income Level



Calculations by author, based on table in Ibbotson (2008), p. 199.