

The Capital Accumulation Ratio as an Indicator of Retirement Adequacy

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The relationship between meeting the Capital Accumulation Ratio Guideline and retirement adequacy was investigated. About 63% of the households had a consistent relationship between meeting the 25% ratio guideline and being adequately prepared for retirement, with 46% of households both meeting the 25% ratio guideline and being prepared for retirement and 17% not meeting the guideline and not being adequately prepared for retirement. However, 37% of households did not have a consistent relationship. Meeting the 25% ratio guideline does not appear to be an accurate indicator of retirement adequacy. The 25% guideline was a better indicator than the 50% guideline.

Keywords: Retirement adequacy, Financial ratios, Capital accumulation ratio, Investments, Survey of Consumer Finances

Introduction

How can we assess the retirement readiness of a household? A complete evaluation is complex, but DeVaney (1995) proposed that having at least 25% of net worth in investment assets was a good indicator of being adequately prepared for retirement. Others have proposed that this ratio be at least 50%. This article investigates the relationship between the ratio guidelines and a more complex measure of retirement adequacy. The ratio guidelines were related to retirement adequacy, but had a substantial error rate, suggesting that they are not sufficiently accurate indicators to be useful.

Whether American households are prepared for retirement has become a question of great interest. Yuh, Montalto and Hanna (1998) found that only 52% of American households were adequately prepared for retirement. Based on pessimistic projections of investment returns, Yuh, Hanna and Montalto (1998) concluded that only 42% of American households were adequately prepared. How can we assess the retirement readiness of a household? According to Yuh, Montalto et al. (1998), a household is prepared for retirement if the household could retire at the planned retirement age and maintain the level of preretirement consumption from the accumulated retirement resources. However, a complete analysis of the adequacy of an individual

household's preparation for retirement is time consuming and complex.

Financial ratios can provide an easy way to diagnose the financial situation of households (Greninger, Hampton, Kitt, & Achacoso, 1996). Moon, Yuh and Hanna (2002) reviewed six financial ratios and discussed theoretical foundations for common guidelines proposed in the United States. Moon et al. (2002) concluded that there were no rigorous theoretical foundations for the financial ratio guidelines. One ratio discussed was the Capital Accumulation Ratio, defined as the ratio of investment assets to net worth. Various experts have suggested that this ratio be at least 25% (DeVaney, 1997; Lytton, Garman, & Porter, 1991). There was a consensus in a survey of financial educators and planners that the minimum level of this ratio should be at least 50% (Greninger, et al., 1996). The argument for this ratio guideline is that a substantial portion of net worth should be in assets that over the long run will grow faster than inflation, in order for households to achieve an adequate retirement and reach other goals. Meeting the Capital Accumulation Ratio guideline of 25% has been proposed as an indicator that a household is on track to achieve an adequate retirement (DeVaney, 1995).

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This paper investigates DeVaney's proposition by comparing meeting the Capital Accumulation Ratio guideline to a more complex measure of retirement adequacy based on the methods used by Yuh (1998) and Yuh, Montalto et al. (1998). There are no previous studies that examine the relationship between the Capital Accumulation Ratio and retirement adequacy. Is meeting the 25% guideline really an accurate indicator of being prepared for retirement, as DeVaney (1995) proposed? If this guideline is an accurate indicator of whether households are prepared for retirement, the projection of retirement adequacy would be greatly simplified – by just calculating the Capital Accumulation Ratio on the balance sheet, consumers would be able to judge whether they are on track in terms of retirement preparation. If, however, the ratio guideline is not accurate for many households, then either:

1. Consumers who do not meet the guideline but have sufficient funds for retirement may deprive themselves too much before retirement.
2. Consumers who meet the ratio guideline but are not adequately prepared for retirement may not save enough for retirement.

Therefore, it is important to investigate the appropriateness of applying the ratio guideline to the projection of retirement adequacy. Retirement adequacy was analyzed in detail by Yuh (1998) and Yuh, Montalto et al. (1998). This paper uses their model as a guideline for the retirement adequacy projection and compares retirement adequacy of households to whether they meet each Capital Accumulation Ratio guideline. Meeting the guidelines alone is compared to retirement adequacy estimated based on the method presented by Yuh (1998). The logistic regression (logit) presented in Yuh, Montalto et al. (1998) is replicated to ascertain the variables important in explaining retirement adequacy. Then for the 25% ratio guideline and also for the 50% ratio guideline, the guideline dummy variable is added to the retirement adequacy logit to determine whether the guideline adds to the predictability of retirement adequacy.

Literature Review

Retirement Adequacy

To determine retirement adequacy, most studies on retirement adequacy have compared the available resources for retirement to retirement needs. A number of studies before 1998 were summarized in Yuh, Montalto et al. (1998). A household is regarded as being adequately prepared for retirement if its resources at its planned retirement age are equal to or greater than its needs at retirement. Otherwise, it is

regarded as being inadequately prepared for retirement.

Previous research on retirement savings has focused on specific components of retirement income, including Social Security and employer-provided pensions. These studies generally confirm an inverse relationship between the Social Security share of retirement income and total household income (Feldstein, 1976; Wolff, 1993), and a positive relationship between the pension share of retirement income and total household income (Kennickell & Sunden, 1999). Changes over time in the composition of retirement income have also been examined, documenting the shift from defined-benefit to defined contribution pension plans (Even & Macpherson, 1994; Kotlikoff & Smith, 1983; Poterba, Venti, & Wise, 1998, 2000).

An analysis of the adequacy of retirement income requires that all components of retirement income be considered concurrently. A comprehensive measure of retirement wealth can then be compared to a measure of retirement need in order to assess retirement adequacy. Most of the recent retirement adequacy studies employ data from the Health and Retirement Study (Engen, Gale, & Uccello, 1999; Moore & Mitchell, 2000) or the Survey of Consumer Finances (Yuh, Montalto, & Hanna, 1998; Wolff, 2002). These studies consistently find that a large proportion of U.S. households are financially unprepared for retirement.

The retirement adequacy analysis of Yuh (1998) and Yuh, Montalto et al. (1998) provided the reference point for our analysis of the capital accumulation ratio as an indicator of retirement adequacy. Yuh (1998) focused on the projected retirement wealth accumulated at the respondent's planned age of retirement rather than an arbitrary age. In contrast, Moore and Mitchell (2000) examined the projected retirement wealth accumulated at age 62 and age 65. Yuh (1998) also analyzed a broad age range of the population (householders 35 to 70 years old) facilitating our ability to assess DeVaney's implicit assumption that the Capital Accumulation Ratio guideline could be applied to households of all ages. In contrast, the Retirement and Health Study used by Moore and Mitchell is a sample of households with at least one household member age 51 to 61. Yuh (1998) assessed retirement adequacy by comparing the accumulated retirement wealth to the predicted consumption needs of the retirement period (expected annual expenditure during retirement). Approaches that measure retirement need with income replacement rates (Moore & Mitchell, 2000; Wolff,

2002) or absolute standards like the poverty rate (Wolff, 2002) assume that household needs in retirement are relatively uniform as a percent of income or of the poverty standard. Households may need more or less according to different situations and these methods do not consider such variations in situations and goals at retirement.

Using the 1995 Survey of Consumer Finances (SCF) data, Yuh, Montalto et al. (1998) compared retirement wealth and retirement need for American households. The authors defined retirement adequacy as retirement wealth being more than retirement needs. Retirement wealth included financial assets, non-financial assets and retirement income from Social Security and pensions. Real rates of return were used to project the accumulation of these assets. Historical rates of return were used to estimate the real rates of return in the future. Retirement needs were defined as the present value of the desired annual spending during retirement.

Yuh, Montalto et al. (1998) found that only 52% of the US households were adequately prepared for retirement according to the measure they developed. A logistic model (logit) was estimated to find the effects of household characteristics on their retirement adequacy. Income, Defined Benefit/Contribution Plan ownership, stock ownership, and retirement age had positive effects on retirement adequacy. Overspending had a negative effect, partly because of the definition of retirement needs based on a projection of current spending. This study was one of the few that used planned retirement age rather than assuming that everyone retired at a particular age such as 65. As Montalto, Yuh, and Hanna (2000) found, there is a substantial variation in planned retirement ages, with 17% planning to retire by age 55, and 51% by age 62, so taking into account a household's planned retirement age can make a big difference in retirement adequacy projections.

Moore and Mitchell (2000) investigated patterns of asset accumulation and saving needs of older Americans by using the Health and Retirement Study (HRS) for a sample of 6,306 households. They explored retirement adequacy by comparing the projected saving rates to the optimal saving rates under the life cycle model. First, the authors examined the HRS household's net worth levels, which included four different types of wealth: net financial wealth, net housing wealth, pension wealth, and the present value of social security benefits. Their second step was to project assets at retirement to a retirement age of 62 and then 65. Different

allocation of assets will lead to different asset levels over time because of the various rates of return. They found that for retirement at 62, only 31% of the sample households were prepared to consume at the pre-retirement level after retirement and did not need additional savings. For retirement at 65, only 40% of these households had adequate retirement wealth. Saving rates were positively related and replacement rates were negatively related to wealth. At either retirement age, the majority of the households were not prepared for retirement. The multivariate analysis showed that males were more likely to be prepared for retirement because women have longer life expectancy. Having a pension and owning a home had positive effects on retirement adequacy.

The Capital Accumulation Guideline

Griffith (1985) was the first researcher to apply financial ratios in assessing the financial status of individuals and families. Griffith created a case study and calculated 16 ratios using the balance sheet. The Capital Accumulation Ratio was not among the 16 ratios studied. However, Griffith stated that "what the net worth segments tell of progress toward meeting financial goals" should be our interest in analyzing clients' financial position. Griffith concluded that if most of a household's net worth was in the residence property, this household was not in a good position to achieve financial goals.

Lytton et al. (1991) used a hypothetical case study and suggested nine financial ratios that can be broadly applied and interpreted by financial counselors and planners as well as individuals and families. They recommended that the investment assets-to-net worth ratio (i.e., Capital Accumulation Ratio) be at least 25%. The authors suggested that this ratio is usually less than 20% for young people and as they advance through the life cycle toward retirement, this ratio should increase.

Using SCF data that were collected in 1983 and 1986, DeVaney (1993) examined changes in financial status for households between 1982 and 1985 by studying financial ratios. She calculated the ratio values and compared them to the guidelines suggested by experts. The median value of the ratio of investment assets to net worth was 39% in 1983 and 41% in 1986, based on her definition of investment assets, which included the sum of stocks, bonds, mutual funds, cash value of life insurance, checking and savings accounts, money market accounts, IRA and Keogh accounts, real estate other than home, and business assets. In 1983, 62.0% of households met the 25% guideline and in 1986, 64.4% of households met the guideline.

Greninger et al. (1996) employed a Delphi technique with a survey of financial planners and educators to identify and refine financial ratios. A panel of 156 financial planners and educators had consensus on 20 out of a total of 22 ratios discussed. They agreed that net investment assets, not including equity in a home, should be a little over 50% of net worth. The mean ratio that financial planners suggested was 57% and educators suggested 53%.

Based on this result from the Delphi study, Greninger et al. (1996) concluded that for typical individuals and families, if the ratio of net investment assets to net worth is at least 50%, they are financially healthy in terms of this particular ratio. However, these recommendations for typical individuals and families do not allow for variation in these ratios by demographic characteristics.

Using the 1989 SCF data, DeVaney (1995) examined factors related to retirement preparation of the older and younger baby boomers. She wrote "It seems unlikely that people in general will learn and apply a complex approach to assess their financial status. A rule of thumb approach could be more useful" (DeVaney, 1995, p. 28). She implied that a household is adequately prepared for retirement if the household meets the 25% Capital Accumulation Ratio guideline. In this article, she refined the definition of investment assets, dropping checking and savings accounts and money market accounts. She added pension plan assets, certificates of deposit, accounts receivable, artwork, antiques and tax-deferred savings as parts of investment assets.

DeVaney (1995) found that age and education had a positive effect on meeting the 25% guideline for both older and younger boomers. The proportion meeting the guideline was 42.5% for the younger cohort and 55.4% for the older cohort. For the younger cohort, being white and expecting a large inheritance are positively related to meeting the guidelines. For the older ones, those households with the head being in good health, being male, and having a pension are more likely to meet the 25% guideline.

In the Yao, Hanna and Montalto (2002) analysis of the 1998 SCF, 56% of all U.S. households met the 25% guideline but only 40% met the 50% guideline. Education, income, number of years until retirement, overspending, and financial risk tolerance were positively related to meeting the guidelines. They pointed out some of the complications of the ratio, such as households having negative or very low net worth, and concluded that the 25% guideline might be more reasonable than the 50% guideline.

Relationship of Retirement Adequacy and The Capital Accumulation Ratio Guideline

A number of studies have analyzed household financial ratio guidelines, and others have analyzed retirement adequacy. However, the only study that discussed the relationship of the Capital Accumulation Ratio to retirement adequacy (DeVaney, 1995) simply suggested that meeting the Capital Accumulation Ratio Guideline of 25% would indicate that a household had enough investment assets for an adequate retirement. This article attempts to fill the research gap by investigating whether the capital accumulation ratio guidelines, either the 25% proposed by DeVaney (1995) or the 50% level suggested by Greninger et al. (1996), are good indicators of retirement adequacy.

Methodology

This article defines projection of accumulated retirement resources and retirement needs in the same manner as in Yuh, Montalto et al. (1998). Details of the methodology can be found in Yuh (1998).

Projection of Retirement Resources

Accumulated retirement resources included financial assets, non-financial assets including housing wealth, and retirement income from defined contribution plans, defined benefit plans and Social Security. Social Security pensions were calculated based on planned retirement ages and projected wages, using the calculations provided by the Social Security Administration (Yuh, 1998, pp. 67-69). The method described in Yuh (1998, pp. 69-70) for projecting the value of investment assets at retirement was updated using the compounded (geometric) rates of return for 1926-1998 reported in Ibbotson Associates (1999).

Projection of Retirement Needs

The value of retirement needs is the present value of a stream of spending during retirement. In Yuh (1998, pp. 54-57), spending equations were estimated using the Consumer Expenditure Survey, then these equations were used in the Survey of Consumer Finances to estimate spending. Yuh assumed that it was reasonable to have the same spending after retirement as the current level of spending, adjusted for changes in household size (children leaving home), age, and mortgage status. Even though some expenditures may change after retirement, the budget share for housing for the elderly is roughly the same as for the non-elderly, and the budget share for medical expenditures is much higher for the elderly (Rubin & Koelin, 1996). It is true that average expenditures for the elderly are much lower than for the non-elderly, but part of the decrease may be due to failure to plan rather than a preference for lower

spending. Yuh (1998, p. 80) found that her method resulted in a 52.0% adequacy rate, compared to 46.5% using a more standard method based on the replacement rates proposed by Palmer (1994), assuming in both cases average investment returns.

Data and Sample Selection

The data analyzed in this study are from the public use tape of the 1998 Survey of Consumer Finances (SCF). The 1998 SCF is representative of 102.6 million households. In order to be more accurate in retirement adequacy analysis, only a part of the total sample was selected, using the same criteria used by Yuh, Montalto et al. (1998). The sample selected for the retirement adequacy analysis included households with heads' age between 35 and 70 in 1998. The rationale behind this sample selection was that projecting future earnings and retirement ages for workers under 35 might be very uncertain, and after 35 there would typically be more accuracy in projection of real earnings. There is no real benefit under the Social Security system of delaying start of pensions after age 70, and there are penalties for delay of withdrawal from most retirement accounts beyond age 70. Furthermore, for households with a worker over 70, planning for retirement is a very different proposition from the typical retirement planning process. Therefore, we excluded households with workers over the age of 70. We also excluded households with no full-time worker in 1998, and we excluded households that did not indicate the age at which the head planned to stop full time work. Only those households with positive non-investment income and total annual household income above the poverty threshold were included in the sample. This sample selection resulted in a total sample size of 1,652 households.

Selection of Variables

Dependent variable. Under the life cycle model, being able to consume at the preretirement level should be the definition of retirement adequacy (Yuh, Montalto et al., 1998). Therefore, a household is adequately prepared for retirement if its total retirement need is less or equal to its total retirement income (Hatcher, 1997). According to the equation provided in Yuh, Montalto et al. (1998), at the point of retirement, the sum of the accumulated assets plus the present value of pension income is compared to the present value of retirement consumption. If a household's retirement wealth is no less than retirement needs, then it is adequately prepared for retirement.

Independent Variables. Yuh, Montalto et al. (1998) explored four categories of variables: demographic, financial, saving/investment decision, and attitude/expectation variables. This paper replicates their variable selection and measurement for the logistic regressions. Demographic variables included age, educational attainment, marital status, and race/ethnicity of the householder. Table 1 shows the demographic and Table 2 the financial characteristics. The life cycle model assumes that a household will steadily accumulate investments until retirement, so age should have an influence on retirement adequacy. If there are no systematic differences in preferences and if economic factors are controlled, other demographic variables should not have an effect on retirement adequacy, but they are included because any differences would be of interest in terms of implications for policy and educational programs.

Financial characteristics included annual household income, ownership of defined benefit or defined contribution plans, and housing tenure status. In the life cycle model, a household's lifetime consumption is financed by their lifetime resources. All of these variables have effects on household life cycle spending and saving decisions, therefore they were included. Saving/investment decision variables included the planned retirement age of the householder, the proportion of current non-housing assets held in stock, whether the household has retirement as one of its saving goals, and spending behavior (greater than, equal to, or less than income) of the household. The planned retirement age of the householder affects the household's lifetime resource allocation, therefore, it was included. It is a common notion that if households hold stocks, they will need to save less out of income to meet their financial goals. This is also the rationale for the inclusion of the proportion of current non-housing assets held in stock. Whether a household had retirement as one of its saving goals and the household's spending behavior should affect its spending and savings decisions, therefore, they were included.

Attitude/expectation variables included anticipated life expectancy of the householder, the household's risk tolerance, and the household's expectations of the adequacy of defined benefit pension income and of household income growth. Anticipated life expectancy of the householder was relevant because it is one of the most important elements in the household's savings decision-making.

Table 1
Demographic characteristics and proportion of households with adequate retirement wealth by characteristics

Variables	Percentage distribution of households	Percent meeting 25% guideline	Percent meeting 50% guideline	Percent with retirement adequacy
Total	100.00	73.3	53.7	56.2
Age*				
35-44	43.9	74.9	56.4	52.8
45-54	36.6	73.0	51.6	57.9
55-70	19.6	70.6	51.4	60.6
Education †				
less than high school graduate	6.3	53.6	35.0	45.3
high school graduate	30.3	61.8	42.9	51.4
some college	28.4	73.9	53.7	52.8
college degree (B.S.) or more	35.2	86.3	62.8	65.0
Marital status ‡				
Couple	68.0	76.0	54.7	61.5
unmarried female	18.7	67.6	52.6	43.7
unmarried male	13.3	67.9	50.0	46.5
Race/ Ethnicity ‡				
White, NonHispanic	83.3	75.4	54.6	58.8
Black, NonHispanic	9.2	68.0	54.6	38.0
Hispanic	4.4	47.1	34.2	44.0
Other, NonHispanic	3.1	69.4	53.1	56.6
Normal income ‡				
\$0 < income ≤ \$32,000	22.8	50.1	36.6	35.4
32,000 < income ≤ 45,000	16.3	69.5	45.8	46.6
45,000 < income ≤ 71,000	29.7	75.7	54.1	63.1
>71,000	31.2	90.1	69.7	69.7

Chi-square test ‡ $p < 0.0001$; † $p < 0.001$; * $p < 0.05$.

The household's self-reported risk tolerance was included because it directly affects the household's investment decisions. If a household expects to have an adequate income from defined benefit pensions, it is logical for the household not to save for retirement. However, the household may not be adequately prepared for retirement according to our definition. Therefore, the variable of household's expectations of the adequacy of retirement pension income was included in the model. The household's expectation of its income growth was included because life cycle theory implies that the pattern of income before retirement should influence the accumulation of investment assets (Hanna, Chang, & Fan, 1995).

Hypotheses

1. Yuh, Montalto, et al. (1998) discussed expected effects of independent variables on retirement adequacy. Since these effects are not the focus of this article, the hypotheses for these variables are not discussed. If the Capital Accumulation Ratio, defined as the ratio of investment assets to net worth, is a perfect indicator of retirement adequacy, then we can expect the following to happen: all households that are adequately prepared for retirement will meet the ratio guideline; those that are not adequately prepared for retirement will not meet the ratio guideline.

2. If the variable that represents meeting the guideline is included in the retirement adequacy model, it is expected that all other variables will be insignificant in the multivariate logistic regression analysis.

Statistical Method

Two chi-square analyses were conducted, one comparing retirement adequacy to meeting the 25% guideline, and another comparing retirement adequacy to meeting the 50% guideline. A multivariate logistic regression model was used to examine which types of American households were more likely to be adequately prepared for retirement, replicating Yuh, Montalto et al. (1998) both in terms of variables included and the way each variable was measured. Then a dummy variable indicating whether the household met the 25% Capital Accumulation Ratio guideline was added to the logistic regression. The same procedure was followed for the 50% Capital Accumulation Ratio guideline. The logistic regressions were intended to provide additional insights into the relationship between the ratio guidelines and retirement adequacy, and which independent variables might have insignificant effects on retirement adequacy after the addition of the ratio guideline variable.

Table 2
Financial characteristics and proportion of households with adequate retirement wealth by characteristics

Variables	Percentage distribution of households	Percent meeting 25% guideline	Percent meeting 50% guideline	Percent with retirement adequacy
Ownership of Defined Benefit plan				
Yes	33.6	75.2	50.8	71.7
No	66.4	72.4	55.1	48.3
Ownership of Defined Contribution plan ‡				
Yes	57.7	86.3	63.3	64.6
No	42.3	55.7	40.6	44.8
Housing tenure ‡				
own with mortgage	64.0	77.0	55.4	63.1
own without mortgage	15.8	67.2	38.0	65.3
Rent	20.3	66.4	60.2	27.3
Planned retirement age †				
61 or earlier	34.8	80.7	59.3	49.8
62 – 65	50.9	69.0	50.5	58.6
66 or later	14.3	70.9	51.3	63.2
Stock Share of non-housing assets‡				
stock percent = 0%	41.9	52.8	39.1	35.1
0% < stock percent <13.5%	16.4	83.1	64.6	57.3
13.5% ≤ stock percent <36.5%	14.4	81.6	54.7	65.7
stock percent 36.5% or higher	27.3	94.7	68.9	82.9
Have retirement as a saving goal ‡				
Yes	67.7	79.3	57.5	62.7
No	32.3	60.8	45.7	42.5
Spent less than income ‡				
Yes	66.0	78.4	57.2	68.5
No	34.0	63.4	46.7	32.3
Subjective life expectancy				
expect to live less than 24 years	24.4	67.3	48.2	52.9
expect to live 25 to 32 years	26.1	73.7	52.9	59.5
expect to live 33 to 42 years	28.3	75.9	54.9	58.2
expect to live 43 or more years	21.2	76.3	59.3	53.2
Willing to take above average or substantial financial risk ‡				
Yes	31.6	88.2	66.6	68.7
No	68.4	66.5	47.7	50.4
Expect enough pension				
Yes	50.2	76.6	54.3	58.6
No	49.8	70.1	53.0	53.8
Expect income growth*				
Yes	23.2	79.0	65.2	59.6
No	76.8	71.6	50.2	55.2

Chi-square test ‡ $p < 0.0001$; † $p < 0.001$; * $p < 0.05$.

Results

After applying the sample selection criteria, the total sample size for the analysis related to the relationship between meeting the ratio guidelines and retirement adequacy was 1,652. The second column of Table 1 and 2 shows the distribution of variables, which are somewhat similar to the distribution shown in Yuh, Montalto et al. (1998), in both cases for households with an employed head age 35 to 70. Over half (56.2%) were adequately prepared for retirement, 73.3% met the 25% Capital Accumulation Ratio

guideline and 53.7% met the 50% guideline. The increase in retirement adequacy compared to Yuh, Montalto et al. (1998) can be explained by income and stock market increases between 1995 and 1998. The higher proportions meeting the ratio guidelines compared to Yao et al. (2002) can be explained by the sample selection in this study, restricting analysis to households with a worker age 35 to 70 rather than all households.

Table 1 and 2 show the percentage of households in each demographic, financial, and attitude/expectation category that met the guidelines and that had retirement adequacy. Groups that had especially low rates of retirement adequacy (35% or less) included low income households, renters, those without any direct or indirect stock ownership, and those who spent at least as much as income. Groups that had relatively low rates (50% or less) of meeting the 25% guideline included low income households and Hispanics.

Capital Accumulation Ratio and Retirement Adequacy

Bivariate results. Table 3 shows that 46.3% of the households met the 25% guideline and were adequately prepared for retirement (retirement resources are more than or equal to retirement needs), while 16.8% of the household did not meet the 25% guideline and were inadequately prepared for retirement, for total of 63.1% having a consistent relationship between the ratio guideline and retirement adequacy. However, 36.8% had an inconsistent relationship, with 27.0% meeting the 25% guideline but not adequately prepared for retirement, and 9.8% not meeting the 25% guideline but adequately prepared for retirement.

Of the 73.3% who met the 25% guideline, 63.2% were adequately prepared for retirement, while of the 53.7% who met the 50% guideline, 62.9% were prepared for retirement. In other words, meeting the more stringent guideline did not increase a household's chance of being prepared for retirement. More than half of those who did not meet the 50% guideline were adequately prepared for retirement. The lower guideline (25%) was at least as good a proxy for retirement adequacy as the higher guideline (50%), so only the multivariate results with the 25% guideline will be presented. (The results of the logit with the 50% guideline are available from the authors, but are generally similar to the results of the 25% guideline.)

Multivariate Results. Logit models with and without a dummy variable for meeting the 25% guideline (Met25) are shown in Table 4. Both models were significant in predicting whether households were adequately prepared for retirement, with the Chi Square test of the overall model highly significant (Table 4). In the model without the 25% Capital Accumulation Ratio variable (Met25), the high concordance rate (84%) indicated that the variables accounted for a substantial amount of the variation in retirement adequacy. The pseudo R² value of 0.43 is relatively high. In the model adding Met25, the dummy variable of meeting the 25% guideline was significant. Households that met the 25% guideline were 2.1 times as likely as otherwise similar households to be adequately prepared for retirement. However, adding that variable did not improve the prediction of retirement adequacy, as the concordance and the pseudo R squared levels were virtually the same in both models.

Excluding the intercept term, there were 10 variables significant at the 0.02 level or better in the logit without Met25 and also 10 significant variables in the logit with Met25, not counting Met25 (Table 4). Currently spending less than income was strongly related to retirement adequacy in both models. The logit result controls for the effects of other variables, so we can infer that those spending less than income have a predicted retirement adequacy level about 3.5 times the level of otherwise similar households who spent the same or more than income.

Table 3
Meeting Guidelines and Retirement Adequacy

		Adequately prepared?	
		Yes	No
Met 25% guideline?	Yes 73.3%	56.2%	43.8%
	No 26.7%	46.3%	27.0%
Met 50% guideline?	Yes 53.7%	9.8%	16.8%
	No 46.3%	33.8%	19.9%
		22.4%	23.9%

Each Chi-square test significant at 0.0001 level

Of the total sample, 33.8% of households met the 50% guideline and were adequately prepared for retirement, while 23.9% of households did not meet the 50% guideline and were inadequately prepared for retirement, for a total of 57.7% of households having a consistent relationship between the ratio guideline and retirement adequacy. However, 42.3% had an inconsistent relationship, with 19.9% meeting the 50% guideline but not adequately prepared for retirement, and 22.4% not meeting the 50% guideline but adequately prepared for retirement.

Table 4
Logistic Analysis of the Likelihood of Being Adequately Prepared for Retirement

Variables	Without Met25		With Met25	
	coefficient	odds ratio	coefficient	odds ratio
Intercept	-6.0078‡		-5.9775‡	
Met the 25% guideline (Met25)			0.7408‡	2.119
Age (reference category: 53 and over)				
35 – 42	0.1888	1.208	0.1972	1.218
43 – 52	0.0764	1.079	0.0897	1.094
Education (reference category: less than high school)				
high school graduation	0.1342	1.144	0.1025	1.108
some college	-0.1286	0.879	-0.2037	0.816
college and more	0.1448	1.156	0.0399	1.041
Marital Status (reference category: couples/partners)				
Unmarried female	-0.2528	0.777	-0.2274	0.797
Unmarried male	0.0170	1.017	0.0337	1.034
Race/Ethnicity (reference category: Whites)				
Blacks	-0.0982	0.906	-0.0939	0.910
Hispanics	-0.2627	0.769	-0.2035	0.816
Other	0.3342	1.397	0.3514	1.421
Log of normal income	0.3853‡	1.470	0.3515‡	1.421
Defined Benefit Plan ownership	0.9470‡	2.578	0.9798‡	2.664
Defined Contribution Plan ownership	0.1373	1.147	0.0332	1.034
Housing Tenure Status (reference category: own without mortgage)				
Rent	-1.3957‡	0.248	-1.4913‡	0.225
own with mortgage	-0.4606*	0.631	-0.4880*	0.614
Planned Retirement Age (reference category: retire at 61 or earlier)				
retire 62 – 65	0.9069‡	2.477	0.9502‡	2.586
retire 66 or later	1.6757‡	5.342	1.7001‡	5.475
Stock Share of non-housing assets (reference category: 0%)				
0% < stock share < 13.5%	0.8617‡	2.367	0.7216‡	2.058
13.5% <= stock share < 36.5%	0.8851‡	2.423	0.7769‡	2.175
stock share 36.5% or higher	1.6632‡	5.276	1.5139‡	4.544
Retirement as a saving goal	0.1566	1.170	0.1345	1.144
Spent less than income in past year	1.2573‡	3.516	1.2414‡	3.461
Subjective Life Expectancy (reference category: expect to live more than 42 years)				
expect to live less than 25 years	-0.1955	0.822	-0.1741	0.840
expect to 25 to 32 years	0.0626	1.065	0.0704	1.073
expect to live 33 to 42 years	-0.0885	0.915	-0.0822	0.921
Willing to take substantial/above average risk	0.2844	1.329	0.2249	1.252
Expect enough pension	-0.0691	0.933	-0.0832	0.920
Expect income growth	0.2702	1.310	0.2549	1.290
Concordance	84.1%		84.4%	
Pseudo R-square	0.4348		0.4446	

‡ p < 0.0001; † p < 0.001; * p < 0.02.

Analysis of 1998 Survey of Consumer Finances, combined data set, mean of 1,652 households per implicate, multivariate analyses are unweighted. A more stringent significance level was used (0.02 rather than 0.05) because of the possibility of underestimation of variance from the data imputation method used in the dataset.

Conclusions and Implications

Capital Accumulation Ratio and Retirement Adequacy Analysis

Over 56% of workers were on track for an adequate retirement in the 1998 sample of households aged 35 to 70, which is higher than the 52% found by Yuh, Montalto et al. (1998) in a similar 1995 sample. In comparison, Moore and Mitchell (2000) found that only 31% of a sample of older adults would be able to maintain their pre-retirement spending level if they retired at 62, and 40% would if they retired at 65. Considering that over 73% of the 1998 sample met the 25% Capital Accumulation Ratio Guideline, and almost 54% met the 50% guideline, the ratio guidelines are likely to be too optimistic, especially for other definitions of retirement adequacy reported in the literature.

Relationship of Adequacy to Meeting the Guidelines

The 25% ratio guideline had a 63% success rate (Table 3), and these results were better than random – meeting the ratio did provide some evidence of retirement adequacy. However, the other 37% of the households had an inconsistent relationship between meeting the guideline and adequacy. The 50% ratio guideline had a 58% success rate, but the other 42% of the households had an inconsistent relationship between meeting the guideline and adequacy, and a majority of those who did not meet the guideline had retirement adequacy.

Adding the variable of meeting the 25% guideline to the logit model for retirement adequacy analysis resulted in only a small change in the pseudo R^2 (Table 4). After adding the variable of meeting the 25% guideline into the logit model, the results of other variables on retirement adequacy were similar.

Meeting the 25% ratio guideline does not appear to be an accurate indicator of retirement adequacy. Financial counselors, planners and educators should conduct a full analysis of retirement adequacy rather than using the Capital Accumulation Ratio guideline as a simple indicator. However, the 25% guideline turned out to be a better indicator than the 50% guideline. Therefore, the results of this article support DeVaney's (1997) guideline of 25% rather than the survey results reported by Greninger et al. (1996) which had a consensus of 50%.

There does not seem to be a simple indicator of retirement adequacy. A complete analysis of retirement adequacy such as used by Yuh, Montalto et al. (1998) is needed for retirement adequacy projection for households. Therefore, DeVaney's (1995) suggestion that a rule of thumb approach

would be useful is probably not appropriate. Perhaps encouraging consumers to use online retirement adequacy calculators (e.g., the Ballpark Estimator, <http://www.asec.org/ballpark/>) would be better than using a simple ratio guideline. O'Shaughnessy (2002) discussed some other retirement planning software, but there are no simple and accurate ways to calculate retirement adequacy.

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