Integrating Home Equity and Retirement Savings through the "Rule of 30"

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Executive Summary

- This paper examines the effect of using reverse mortgage credit lines to supplement retirement income by two types of retirees that have not been addressed in the previous literature: (1) those whose retirement savings are significantly below those of the mass affluent; and (2) those who are "house rich/cash poor."
- Results of this analysis demonstrate an important contrast with the results of the earlier literature; specifically, the greater percentages of home value, when coordinated with the retirement savings portfolio, resulted in substantially greater percentages of the portfolio that can be drawn.
- This paper suggests a new alternative to the 4 percent rule that can guide planners and retirees toward an optimal cash withdrawal strategy. This new rule takes into account the total of the retiree's retirement savings plus his or her home value.
- The quantitative analysis in this paper uses the same spreadsheet models and strategies first presented in the *Journal* by Sacks and Sacks (2012). This paper builds on that work by extending the analysis to a broader range of retirees.

Using home equity to enhance retirement income is an emerging topic in the financial planning profession. Research on strategies for tapping home equity to boost the sustainability of retirement income drawn from securities portfolios, such as 401(k) accounts or rollover IRAs, is quite recent. The concept was first introduced in the *Journal of Financial Planning* by Sacks and Sacks (2012) and Salter, Pfeiffer, and Evensky (2012), both of which focused on home equity accessed by reverse mortgage credit lines.

Research continued in 2013. Pfeiffer, Salter and Evensky (2013) focused their analysis primarily on cash flow sustainability rather than on portfolio survival, which was the focus of their 2012 work. And Wagner (2013) based his analysis of cash flow sustainability on a strategy that used the reverse mortgage annuity.

Pfeiffer, Schaal, and Salter (2014) presented results based on a strategy that used the reverse mortgage credit line as the last resort. And Pfau (2016a) presented a comparison of the strategies from the previous literature, including six strategies using the reverse mortgage credit line and one strategy using the reverse mortgage annuity.

Although the previous literature examined model retirees whose ratio of home value to the value of their retirement savings portfolio was 1:2, Sacks and Sacks (2012) and Pfau (2016a) suggested expanding the research to retirees with different ratios. This paper followed that suggestion, broadening the range of retirees examined using two strategies. Future research might examine how other strategies would apply to the broader range of retirees examined here.

Like much of the existing literature on reverse mortgages, this paper uses the term "reverse mortgage" to mean the Home Equity Conversion Mortgage, or HECM, established and regulated by the federal government.

Table 1: Median Home Equity, Home Value, and Retirement Savings by Percentile of Retirement Savings

Married homeowners with positive retirement savings, ages 63 to 65						
Percentile of Retirement Savings	Retirement Savings	Home Equity	Home Value	Home Equity as a Percent of Home Value	Mortgage Debt as a Percent of Home Value	Home Equity as a Percent of Retirement Savings
Less than 25	$13,000	$104,000	$175,000	59%	41%	800%
25 to 49.9	$150,000	$125,000	$180,000	69%	31%	83%
50 to 74.9	$383,000	$200,000	$295,000	68%	32%	52%
75 to 89.9	$700,000	$303,000	$470,000	64%	36%	43%
90 to 100	$1,811,000	$490,000	$650,000	75%	25%	27%

Source: Tomlinson, Pfeiffer, and Salter (2016)

Home Equity and Retirement Savings

Although data on retirement savings and home equity have been amassed from a number of surveys, there is not much coherence among, nor coherence between, the datasets. Some datasets consolidate data from ages 55 to 64 and 65 to 74 while others focus on the age group 63 to 65. And data on retirement savings is often tracked separately from data on home equity, making it difficult to draw conclusions about the distributions of the combination of home equity and savings.[1]

Some attempts have been made to correlate and combine home equity and retirement savings data. For example, Tomlinson, Pfeiffer, and Salter (2016) showed retirement savings, home equity, and home values for married retirees ages 63 to 65 who had non-zero retirement savings (see Table 1).

If, as some economists project, the use of home equity for generating retirement income grows in prevalence in the coming years (e.g., Merton 2015; Guttentag 2017), this conjoint analysis of the total resources available to retirees will improve financial planners' understanding of the true state of retirement readiness of the population who will be retiring in the next five to 10 years.

This paper introduces a new rule, called the "rule of 30." As the rule gains acceptance—and as the limits of its applicability are determined—this analysis based on retirement savings plus home value becomes that much more important. Retirement savings are assumed to be held in a diversified portfolio of securities—typically, but not necessarily, in a 401(k) account or a rollover IRA.

Types of Retirees Considered

As previously noted, it can be difficult to draw conclusions about the distributions of the combination of home equity and retirement savings from the existing data. Nonetheless, for most segments of the population, from the "mass affluent" (who fit within the top quartile of Table 1) to the "almost affluent" (defined here as Table 1's second quartile), home equity represents a significant component of total assets available in retirement.

Rather than extend the analysis of Tomlinson, Pfeiffer, and Salter (2016), this paper focused on four representative retirees drawn from Table 1 and explored more deeply the reverse mortgage strategies that each type of retiree might use to meet their retirement income objectives. As a part of that analysis, the following question was explored: is there an optimal percentage of total retirement income resources that a broad range of retirees could withdraw (from one or both sources) each year that would maximize retirement income while minimizing the probability of exhausting all assets before the end of retirement?

In addition to the combination issue noted earlier, another complicating factor in the data is that about 20 percent to 30 percent of retirees have mortgages still outstanding on their homes when they retire.[2] Because of the reduced (or zero) HECM credit line available when a conventional mortgage is yet to be paid off, the analysis presented here considered only those retirees who own their homes free and clear, and whose value is consistent with the home equity values shown in Table 1. However, the majority of retirees own their homes free and clear.[3] Therefore, the terms "home value" and "home equity" are synonymous in this paper.

As noted, Table 1 shows median values of both retirement savings and home equity. In order to better capture the range of financial situations among the population of retirees as well as the acute retirement income generation problems facing the retiree with significant home value but limited retirement savings, this study considered not only "typical" retirees but also "house rich/cash poor" retirees.

Table 2 describes the four representative retirees analyzed in this study.

Retiree No. 1: The mass-affluent retiree. Retiree No. 1, the typical mass-affluent retiree, has been defined and discussed in the existing literature. Sacks and Sacks (2012) considered a mass-affluent retiree with a home of value $417,000 at the outset of retirement and a portfolio of retirement savings of $800,000. Similarly, Salter, Pfeiffer, and Evensky (2012) considered a retiree with a home of value

Table 2: Descriptions of the Four Representative Retirees

Retirees		Home Equity	Retirement Savings
Retiree No. 1	Mass-affluent retiree	$400,000	$800,000
Retiree No. 2	House-rich mass-affluent retiree	$800,000	$400,000
Retiree No. 3	Almost-affluent retiree	$150,000	$300,000
Retiree No. 4	House-rich almost-affluent retiree	$300,000	$150,000

of $250,000 and a portfolio of retirement savings of $500,000. (Although these figures place the hypothetical retiree at the low end of the "mass affluent" range, the ratio of home value to retirement savings is the same, 1:2.) Pfau (2016a) reviewed a series of previous papers and their respective algorithms, considering a retiree with a home value of $500,000 and a $1 million retirement portfolio, again replicating the 1:2 ratio of home value to retirement savings. With the possible exception of certain areas on the West Coast and in the Northeast where home values have climbed to extraordinary heights, these values would likely be typical of "mass-affluent" retirees.

The results of this study indicate that, in the case of the typical mass-affluent retiree considered, the probability of cash flow survival over a 30-year retirement would be at least 90 percent with an initial withdrawal rate of approximately 5 percent of the portfolio's initial value. Thus, using the reverse mortgage credit line, in either the simple algorithm (referred to as the "coordinated strategy") suggested by Sacks and Sacks (2012), or the more complex algorithm (referred to as a "standby line of credit") suggested by Pfeiffer, Salter, and Evensky (2013), increased the initial withdrawal rate that had approximately a 90 percent probability of 30-year cash flow survival from Bengen's (1994) 4 percent (with no use of home equity) up to 5 percent.

By contrast, if the reverse mortgage credit line was used only as a last resort, and not in either of these algorithms, the increase in effective safe withdrawal rate was negligible. Therefore, for this typical mass-affluent retiree, the reverse mortgage credit line used in either algorithm resulted in a roughly 25 percent increase in the retiree's inflation-adjusted retirement income throughout his or her 30-year retirement.[4]

A question that arises, and one that is explored in the remainder of this paper, is: how, and to what extent, is the retirement income of the other three representative retirees affected by the use of one of those strategies, specifically the coordinated strategy of the Sacks and Sacks (2012) algorithm?

Retiree No. 2: The house-rich mass-affluent retiree. Retiree No. 2, the "house-rich" mass-affluent retiree, is defined here as one who has a home value of $800,000 at the outset of retirement and a retirement portfolio value of $400,000 at the same time. This representative retire has the same total retirement income resources as Retiree No. 1, but the opposite ratio of asset values (2:1).

For this retiree, his or her home value is substantially greater than the value of his or her retirement savings. Such a situation may have arisen because the retiree lives in a part of the country where exceptional increases in home value have occurred, or perhaps because of lifestyle choices resulting in buying a larger home at the expense of reduced retirement savings. This representative retiree does not appear to have been considered in any detail in the financial planning literature. Therefore, the situation of this type of retiree is examined in quantitative detail in later sections of this paper.

Retiree No. 3: The almost-affluent retiree. Retiree No. 3, the almost-affluent retiree, is one who has a home of value $150,000 at the outset of retirement and a retirement portfolio of $300,000 at the same time. This representative retiree is not quite affluent, having total retirement income resources of $450,000 at the outset of retirement.

Moreover, it follows from Table 1 that this retiree is not quite typical, because he or she has retirement savings greater than his or her home value, whereas the table (and other data) indicate that most retirees—especially those with total retirement income resources in the middle of the economic spectrum—have retirement savings that are less than their home values. It is worth noting, and relevant to the calculations set out in the later portion of this paper, that the ratio of home value to retirement savings (1:2) is the same for this retiree as for Retiree No. 1, the typical mass-affluent retiree.

Retiree No. 4: The house-rich almost-affluent retiree. Retiree No. 4, the "house-rich" almost-affluent retiree, is one who has a home value of $300,000 at the outset of retirement and a retirement portfolio of $150,000. This retiree has the same total retirement income resources as Retiree No. 3, but the ratio of home value to retirement savings (2:1) is the same as for Retiree No. 2. The amount of total asset value, plus the fact that home value is greater than retirement savings, makes this retiree more broadly representative than the others.

Assumptions and Background for the Analysis

Economic concerns of retirees. Retirees have several major economic concerns, most notably: (1) inflation-adjusted cash flow survival throughout retirement; (2) additional cash availability in the event of emergency or other unanticipated need; and (3) legacy.

It was assumed in this analysis that the overriding economic concern for many retirees is to maintain cash flow throughout retirement. Accordingly, the quantitative analysis presented in this paper addressed that concern.

Cash flow. Cash flow survival is defined here as a 90 percent or greater probability that cash flow to the retiree, based on the initial withdrawal and continuing at constant purchasing power each year thereafter, will continue for at least 30 years following the outset of retirement.

The measure of cash flow itself is expressed in terms of an "initial withdrawal rate." Typically, this rate has been defined as a percentage of the value of the retirement savings portfolio at the outset of retirement. Many financial planners use this measure and some recommend that retirees adhere to a "4 percent rule" (Bengen 1994). Pfau (2014) examined several more nuanced approaches to withdrawal rates, exploring situations in which the 4 percent rule may be too low or too high.

The results presented here express the initial distribution rate in the traditional way so that comparisons can be made to the 4 percent rule, but these results also indicate that expressing the initial withdrawal rate as a fraction of total retirement income resources may be more useful and more broadly applicable. As shown below, in the context of investment returns consistent with historical averages, a "rule of 30" where the initial distribution rate is 1/30 of the total retirement income resources (including home value), provides a more stable and consistent retirement income strategy across various classes of retirees.[5]

The HECM's growing line of credit. Also important to the analysis is the growing line of credit. A majority of the roughly one million reverse mortgage loans currently outstanding are HECMs.[6] A unique feature of HECMs is that when some or all of the loan proceeds are taken in the form of a line of credit, the amount available to be taken grows over time. After the credit line is established, the amount available to be taken grows at the same rate as the interest applicable to the amount that actually is taken. (See the appendix for details on the assumptions related to the interest rate on the line of credit.)

The amount available when a reverse mortgage is established depends upon the age of the borrower at that time and is greater for an older borrower than for a younger borrower. However, the increment as a function of age is substantially smaller than the increment that results from an early establishment followed by the increase resulting from the application of the interest rate.

The effect of the HECM's interest-based increase in the amount available is important in enabling a retiree to have cash available throughout a 30-year retirement. Moreover, at this time, reverse mortgages other than HECMs are not available as credit lines. Therefore, the reverse mortgage credit line considered in this paper was the HECM credit line.

Another important aspect of the HECM is the non-recourse feature. Regardless of the duration through which the HECM credit line is in place (and growing), the Federal Housing Administration guarantees that the retiree (or his or her heirs) will never have to pay back more than the value of the home. For many retirees, this guarantee, when combined with the growing line of credit feature, may be significant.

Reverse mortgage specifications. Two specific aspects of reverse mortgage credit lines affect the quantitative analysis (for general information about reverse mortgages, see Giordano (2015) and Pfau (2016b)). They are: (1) the amount available at the establishment of the reverse mortgage line of credit; and (2) the cost of the reverse mortgage credit line.

The amount of credit line initially available is a function of the age of the borrower at the establishment of the credit line and the prevailing expected rate. In this analysis, the borrower was assumed to be 65 years old. The prevailing expected rate at the time of this writing (May 2017) meant that the amount initially available was approximately 54 percent of the home value (the Monte Carlo simulation program determined the amount available at later ages for the spreadsheets using Strategy No. 2).

Other than approximately $125 for a mandatory counseling session, there are no out-of-pocket costs for establishing or maintaining a reverse mortgage line of credit. The costs for establishing the reverse mortgage itself include three parts (described in detail in Giordano (2015) and Pfau (2016b)), all of which become part of the debt. These amounts can be negotiated with the lender to be brought down from a high of approximately $12,000 to near zero, in exchange for higher ongoing interest rates.

The calculations in this analysis used fees of $7,500, comprised of $3,000 for the mortgage insurance premium (as prescribed by HUD), plus $3,000 origination fee (calculated as the average of the figures shown on the Mortgage Professor website, mtgprofessor.com), plus $1,500 closing costs.

The Analysis

The analytic technique used here was similar to that used by Sacks and Sacks

(2012), although this paper used a similar spreadsheet model for each of the four representative retirees. The spreadsheet model used the following input parameters: (1) initial value of the retirement savings portfolio; (2) initial value of the retiree's home; and (3) initial withdrawal rate.

The model used two worksheets run simultaneously.[7] The two worksheets were identical in all respects (including the investment performance of the portfolio, the rate of inflation, and the amount drawn by the retiree) except for the strategy used to determine whether the retirement income was withdrawn from the portfolio, and/or the reverse mortgage line of credit was used (in other words, whether Strategy No. 1 or Strategy No. 2 was used).

On each worksheet, the calculations of investment gain or loss and of retirement income withdrawal were performed for each year in a 30-year period. The investment gain or loss was determined stochastically, as was the inflation adjustment to the withdrawal amount.

The 30-year calculation was repeated 10,000 times. In a certain number of those repetitions, the cash flow survived for 30 years, and in the other repetitions it did not. (The three most significant determinants of cash flow survival are the initial withdrawal rate, the sequence of investment returns, and the strategy for dealing with negative returns.) In each of the 10,000 repetitions, the initial withdrawal rate was the same, and the average investment return was the same, but the sequence of investment returns, being randomly selected, was not the same in each. A simple count was made of cash flow survival over the 10,000 trials (with the two worksheets run simultaneously in each trial and the results of the 10,000 trials shown on a histogram for each worksheet). The percentage of the repetitions in which the cash flow survived was termed the "cash flow survival probability."

The primary focus was on the comparison of the cash flow survival probabilities of the two strategies for each of the four representative retirees.

The quantitative analysis was based on the premise that the retiree sought to draw on his or her total retirement income resources at a rate that yielded the maximum amount of constant purchasing power throughout a 30-year retirement. Therefore, in each part of the analysis, the initial withdrawal rate that resulted in a 90 percent cash flow survival probability was used.

The assumed portfolio. The securities portfolio held by the representative retirees in all of the analyses and results shown was assumed to be a 60/40 portfolio comprised of the following indices, in the following proportions:

- *60 percent equities*: S&P 500 (40 percent); U.S. small stock (10 percent); and MSCI EAFE (10 percent).
- *40 percent fixed income*: Lehman Brothers long-term government/credit bond index (10 percent); Lehman Brothers intermediate-term government/credit bond index (15 percent); and U.S. one-year Treasury constant maturity (15 percent).

A normal distribution of the investment returns was assumed from each asset class. The geometric mean and standard deviation projected for the investment return of each asset class, consistent with historical averages, are set out in Appendix A. More recent (more conservative) figures for the same asset classes are set out in Appendix B. Correlation matrices were also constructed and incorporated into the simulation program.

Because the portfolio composition was the same in each of the 30 years of each trial, the portfolio was, in effect, rebalanced each year.

Establishing the HECM line of credit. As indicated previously, the primary financial objective of many retirees, especially those in the house-rich categories, was assumed for this analysis to be inflation-adjusted cash flow survival throughout retirement. And for analytic purposes, the duration of retirement was assumed to be 30 years.

The model for the analysis was that in the first year of retirement, a certain amount was withdrawn from the portfolio, and each subsequent year's withdrawal was equal to the previous year's withdrawal, adjusted only for inflation. Thus, the annual withdrawals provided constant purchasing power throughout retirement. Following the well-established convention, the initial withdrawal was expressed as a percentage of the initial portfolio value.

This analysis also used two alternative strategies for establishing and drawing on a HECM line of credit to enhance the 30-year survival of cash flow.

Strategy No. 1. Establish a reverse mortgage credit line at the outset of retirement. At the beginning of the first year of retirement, the first year's draw is taken from the portfolio. The amount of the draw is equal to 1/30 of the total retirement income resources (or 1/34, if conservative projections of investment returns are used). At the end of each year, the investment performance of the portfolio during that year is determined. If the performance was positive, the ensuing year's income is withdrawn from the portfolio. If the performance was negative, the ensuing year's income is withdrawn from the reverse mortgage credit line.[8] This is the "coordinated strategy" described by Sacks and Sacks (2012).

Strategy No. 2: From the outset of retirement, withdraw retirement income only from the portfolio. Do not establish a reverse mortgage credit line unless and until the portfolio is exhausted. From and after that point, as the only source of retirement income, the credit line is drawn upon continuously unless and

Table 3: Initial Draw Amounts for Various Retiree Types

Initial draw amounts that result in an approximately 90 percent probability of 30-year constant purchasing power cash flow survival when the coordinated strategy is used with different investment return projections.

Panel A: Investment return assumptions consistent with historical averages (see Appendix A)					
	Home Value/ Retirement Savings/ Total	**Draw Under 4 Percent Rule****	**Draw Under Rule of 30**	**Draw as Percent of Retirement Savings**	**Approximate Probability of 30-Year Cash Flow Survival**
Retiree No. 1	$400k/$800k/$1,200k	$32,000	$40,000	5.0%	90%
Retiree No. 2*	$800k/$400k/$1,200k	$16,000	$34,500	8.6%	90%
Retiree No. 3	$150k/$300k/$450k	$12,000	$15,000	5.0%	90%
Retiree No. 4	$300k/$150k/$450k	$6,000	$15,000	10.0%	90%
Panel B: Current investment return projections (see Appendix B)					
	Home Value/ Retirement Savings/ Total	**Draw Under 3.2 Percent Rule****	**Draw Under Rule of 34**	**Draw as Percent of Retirement Savings**	**Approximate Probability of 30-Year Cash Flow Survival**
Retiree No. 1	$400k/$800k/$1,200k	$25,600	$35,300	4.4%	90%
Retiree No. 2*	$800k/$400k/$1,200k	$12,800	$30,500	7.6%	90%
Retiree No. 3	$150k/$300k/$450k	$9,600	$13,250	4.4%	90%
Retiree No. 4	$300k/$150k/$450k	$4,800	$13,250	8.8%	90%

* For Retiree No. 2, the rule of 30 only takes account of home value up to the HECM limit of $636,150.
** The 4 percent and the 3.2 percent rules relate only to draws solely from the portfolio.

until it is exhausted. This is the "last resort strategy" described by Sacks and Sacks (2012).[9]

Figure 1 and Figure 2 demonstrate the dramatic increase of cash flow survival probability of Strategy No. 1 over Strategy No. 2, which is the strategy often recommended by many financial planners.[10]

Key Findings

The key findings reported in this paper are the following:[11]

1. Broad range of retirees. An effective coordinated approach to drawing upon total retirement income resources (defined here as the total of retirement savings *plus* home value) can be used across a broad range of retirees both in terms of their total retirement income resources and in terms of the ratio of their home value to the initial value of their retirement savings. These findings are explained in greater detail in the following paragraphs and are illustrated in Table 3.

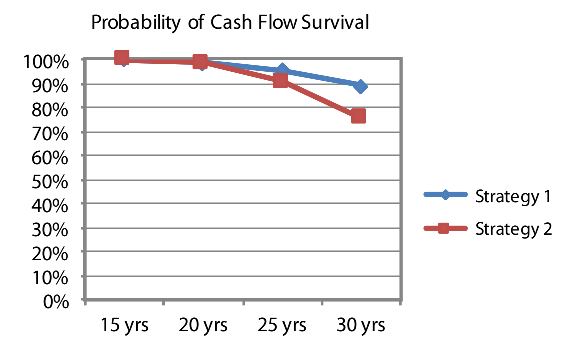
2. For any given amount of total retirement income resources, the dollar amount of initial withdrawal was constant regardless of the ratio of home value to retirement savings. The dollar amount of the initial withdrawal that resulted in an approximately 90 percent probability of cash flow survival was the same across a broad range of ratios of home value to initial value of retirement savings portfolio. That dollar amount was determined as a fraction of the retirees' total retirement income resources. This finding resulted when the coordinated strategy was used for the withdrawals, but not when the last-resort strategy was used.

3. Across a broad range of amounts of total retirement income resources, the applicable fraction was constant. In addition to the range of ratios described above, the fraction described above applies to a broad range of amounts of total retirement income resources. That is, once the fraction was determined for one value of total retirement income resources, the same fraction, applied to any other value of total retirement income resources, yielded, for that value, the applicable dollar amount of initial withdrawal that resulted in cash flow survival. This observation reflects that the computations scale up to greater amounts of total retirement income resources and scale down to lower amounts (see Table 3 and Table 4).

4. The relevant fraction is a function of the investment returns. If the investment return figures used are consistent with historical averages, the dollar amount of the initial withdrawal for any given total of retirement savings plus home value (at the outset of retirement) turned out to be 1/30 of that total. Accordingly, the finding is termed the "rule of 30." If more recent (and more conservative) projections of investment returns were used, the dollar amount reflected in the result described above turned out to be 1/34 of the total of retirement savings plus home value. However, it is important to note that, with these more conservative projections, the 4 percent rule became a 3.2 percent rule. This result is analogous to the results found by Finke, Pfau and Blanchett (2013) and by Pfau (2014).

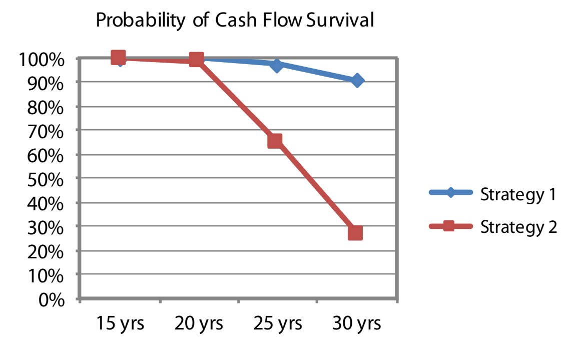
Figure 1: Comparison of Cash Flow Survival Probabilities for 2 Retirees with Equal Total Retirement Income Resources ($1.2 million)

Retiree No. 1: Mass-Affluent Retiree



Home value: $400,000
Initial portfolio value: $800,000
5% initial draw rate = 5% x $800,000 = $40,000
$40,000 = **1/30** x $1.2 million

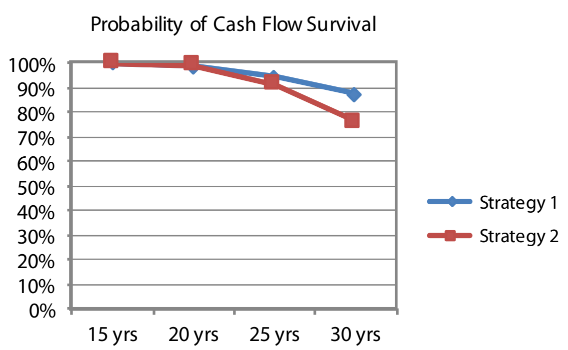
Retiree No. 2: House-Rich Mass-Affluent Retiree



Home value: $800,000
Initial portfolio value: $400,000
8.63% initial draw rate = 8.63% x $400,000 = $34,500
$34,500 = **1/30** x $1,036,150 (where $1,036,150 is "total retirement income resources")

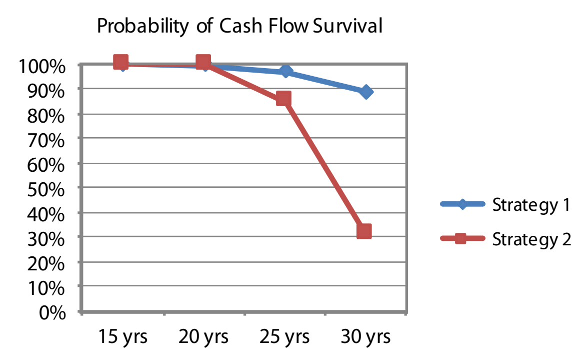
Figure 2: Comparison of Cash Flow Survival Probabilities for 2 Retirees with Equal Total Retirement Income Resources ($450,000)

Retiree No. 3: Almost-Affluent Retiree



Home value: $150,000
Initial portfolio value: $300,000
Initial draw rate = 5% x $300,000 = $15,000
$15,000 = **1/30** x $450,000

Retiree No. 4: House-Rich Almost-Affluent Retiree



Home value: $300,000
Initial portfolio value: $150,000
Initial draw rate = 10% x $150,000 = $15,000
$15,000 = **1/30** x $450,000

The findings using the "rule of 30" are shown for the four representative retirees in Panel A of Table 3. Panel B of Table 3 uses the "rule of 34." These results are also shown in a more granular fashion for a larger number of retirees in Table 4 and in Figures 3 and 4.

Observations Regarding Cash Flow

Computations using the "rule of 30" and those using the "rule of 34" both resulted in dollar amounts for retirees No. 2 and No. 4 that were more than twice the amounts resulting from the safe withdrawal rate applicable when only the securities portfolio was drawn upon. Even for retirees No. 1 and No. 3, the "rule of 30" and the "rule of 34" both resulted in dollar amounts of cash withdrawal that were more than 25 percent higher than the amounts that could be safely withdrawn from the portfolio only.

In dollar terms, and in percentage of income terms, these results are significant.

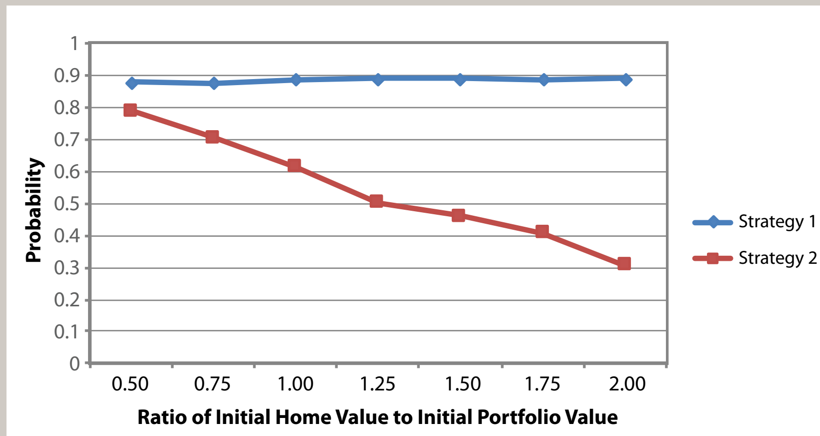
Table 4: Results of Other Combinations of Portfolio Value and Home Value

These alternate combinations comprise the same total retirement income resources ($450,000).

Initial Portfolio Value	Home Value	Ratio of Home Value to Portfolio	Initial Distribution Rate	Dollar Amount of Annual Distribution
$175,000	$275,000	1.57	8.57%	$15,000
$200,000	$250,000	1.25	7.50%	$15,000
$225,000	$225,000	1.00	6.50%	$15,000
$250,000	$200,000	0.80	6.00%	$15,000
$275,000	$175,000	0.64	5.45%	$15,000

For example, retiree No. 4 who retires with a 401(k) account or rollover IRA valued in the vicinity of $150,000 is likely to have Social Security as his or her primary source of retirement income. Assume that his or her annual Social Security income is about $25,000 (adjusted for inflation). Using Strategy No. 1, an initial withdrawal rate of 10 percent of the retirement account ($15,000) annually adjusted for inflation provided a 29 percent greater total cash flow throughout a 30-year retirement than drawing according to the 4 percent rule (equal to $6,000 per year).

Figure 3: Probability of 30-Year Inflation-Adjusted Cash Flow Survival



Detailed Results

Cash flow survival probability. Figure 1 and Figure 2 set out the probabilities of cash flow survival for each of the four representative retirees. In each case, the initial withdrawal rate was selected to yield a 90 percent probability of 30-year (inflation-adjusted) cash flow survival when Strategy No. 1 was used. It turns out that, in every such case, the dollar amount of the distribution was equal to 1/30 of the total retirement income resources.

It is also noteworthy that when Strategy No. 2 was used, the cash flow survival probability was lower when the initial portfolio value was low compared with the home value, than when the initial portfolio value was high compared with the home value. That is because, with low initial portfolio values, under Strategy No. 2 the portfolio was exhausted sooner than with higher initial portfolio values. When then portfolio was exhausted sooner, the reverse mortgage credit line was drawn upon sooner, and it therefore must provide more years of withdrawals. Moreover, early withdrawals from the credit line (once it was established), coupled with relatively late establishment of the credit line, prevented the credit line from growing to a level from which it could sustain the retirement income withdrawals throughout the remainder of the retirement period.

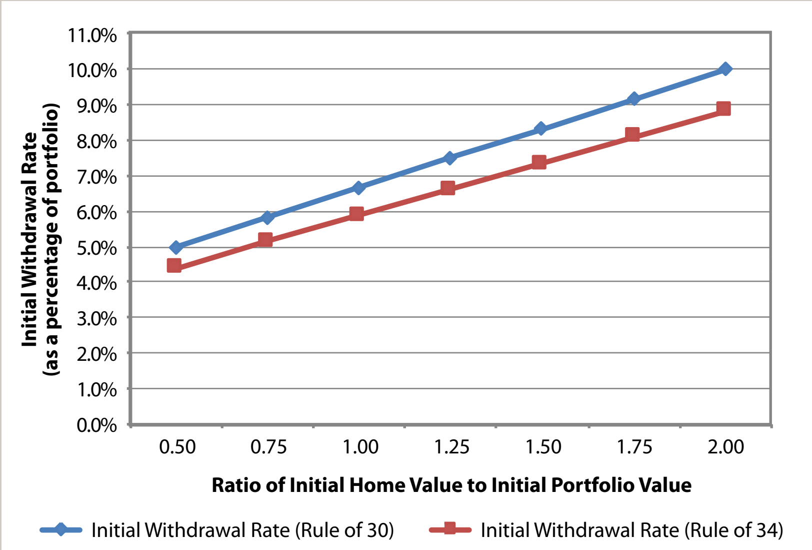
Similar tests were performed with other combinations of portfolio values and home values, all with the same “total retirement income resources.” The rule of 30 was shown to apply in those cases as well, as set out in Table 3.

Other combinations of portfolio value and home value. In each case of analyzing other combinations of portfolio and home values, using Strategy No. 1 yielded a 90 percent probability of inflation-adjusted cash flow throughout a 30-year retirement, and in each case the dollar amount of the initial distribution was equal to 1/30 x total retirement income resources (see Table 4). These results are shown in graphic form in Figure 3.

When considering the results shown in Figure 3, keep in mind that both strategies accessed the home equity. The big difference was in the order in which the access occurred. Under Strategy No. 1, the home equity was accessed in each year following a year in which the volatility of the securities portfolio incurred an adverse investment return. Under Strategy No. 2, the home equity was only accessed if and when the securities portfolio had been exhausted.

Figure 3 shows that when Strategy No. 1 was used, a 90 percent probability of 30-year cash flow survival was

Figure 4: Initial Withdrawal Rates Resulting in 90 Percent Probability of 30-Year Inflation-Adjusted Cash Flow Survival



independent of the ratio of initial home value to initial portfolio value over a wide range of such ratios.

Similar results to those shown in Figure 3 were obtained with values of total retirement income resources equal to $600,000, $750,000, $900,000 and $1.2 million. And although the results shown were obtained using the "rule of 30" with the investment return figures set out in Appendix A, essentially the same independence of ratio was shown with the investment return figures set out in Appendix B.

An obvious corollary of the constant dollar result is that the initial withdrawal that resulted in a 90 percent probability of cash flow survival, as a percentage of the initial portfolio value, varied widely across the range of ratios. This variation is illustrated in Figure 4. Thus, with the ratios of home value to portfolio value (at the outset of retirement) in the range from 0.5 to 2.0, that percentage ranged from about 5 percent to 10 percent when investment returns were consistent with historical averages, and from about 4 percent to 9 percent when investment returns were more conservative.

Limitations and Caveats

The analysis presented has the following limitations and caveats:

As noted earlier, the existing data on the distribution of the combination of retirement savings and home value is very sparse. In the aggregate, Americans have more home value than retirement savings; therefore, there is increasing focus on the use of home equity as a component of retirement income. As a result, there should be an increase in the amount and detail of such combination data. When such data becomes available, analysis similar to that presented here should be performed in order to refine the applicability of this research.

The top two key findings presented in this paper are: (1) when the "coordinated strategy" was used, a constant dollar amount yielded an approximately 90 percent probability of a 30-year inflation-adjusted cash flow survival across a wide range of ratios of home value to initial portfolio value; and (2) the same approach applied across a wide range of total retirement income resources. These findings are empirical observations; they are not mathematically determinable in closed form. Although these findings have been tested and validated for ratios of home value to initial portfolio value ranging from 0.5 to 2.0, it is not clear what the results would be for lower or higher ratios; that is, where there was little or no retirement savings portfolio or accumulated home equity. The findings presented in this paper are unlikely to have any application to a retiree whose total retirement income resources substantially exceeds the HECM limit of $636,150 by an order of magnitude or more.

The Monte Carlo simulations employed in the analyses presented in this paper are purely stochastic. That is, each year's investment performance and inflation amount is treated as entirely independent of those parameters of the previous year. Other approaches exist that reflect the fact that actual financial processes are often subject to a kind of "homeostasis," a reversion to the mean, often resulting from government intervention (such as the Fed changing interest rates to bring down inflation). Strategies No. 1 and No. 2 have not been tested under such approaches to determine whether the resulting cash flow sustainability results would be significantly different from the results obtained with the purely stochastic method employed here.

The analyses reported in this paper assumed that the "expected" interest rates, and therefore the principal limit factors (plfs), would remain constant. The expected rates are currently near the low ends of their ranges, so the plfs, and therefore the amounts available under reverse mortgage lines of credit, are near the high ends of their ranges. If the expected rates increase, the amounts available will decrease, and the effectiveness of the strategies considered would also decrease.

Appendix A: Historical Averages

The geometric mean and standard deviation projected for the investment return of each asset class, consistent with historical averages, used in the Monte Carlo simulations:

Asset Class	Geometric Mean	Standard Deviation
S&P 500	8.50%	20.65%
U.S. Small Stock (Ibbotson)	9.00%	25.00%
MSCI EAFE	8.00%	24.80%
Lehman Bros. Long-Term Govt./Cred Bond	4.50%	10.80%
Lehman Bros. Intermediate- Term Govt./Cred Bond	4.75%	6.50%
U.S. One-Year Treasury	4.30%	3.00%
Interest (including 1.8% LIBOR plus 2.75% margin plus 1.25% MIP)	5.80%	1.00%
U.S. Inflation	2.00%	1.50%
Home Value Appreciation	2.00%	(assumed constant)

Appendix B: Recent/More Conservative

Projected values of geometric means and standard deviations of the rates of return of each asset class, based on more recent and more conservative figures, used in the Monte Carlo simulations:

Asset Class	Geometric Mean	Standard Deviation
S&P 500	7.00%	20.00%
U.S. Small Stock (Ibbotson)	7.70%	22.00%
MSCI EAFE	8.65%	22.50%
Lehman Bros. Long-Term Govt./Cred Bond	3.30%	12.00%
Lehman Bros. Intermediate-Term Govt./Cred Bond	3.50%	6.50%
U.S. One-Year Treasury	3.30%	2.00%
Interest (including 1.8% LIBOR, plus 2.75% margin plus 1.25% MIP)	5.80%	1.00%
U.S. Inflation	2.00%	1.50%
Home Value Appreciation	2.00%	(assumed constant)

Finally, there has been no consideration of possible changes in the law or regulations governing reverse mortgages in this paper.

Implications for Planners

The foregoing results have great significance for baby boomer retirees who have limited total resources and/or have a disproportionate amount of their wealth in the value of their home.

A simple rule of 30 can be used by a broad range of retirees to help determine how much retirement income their total retirement resources can provide, with a small probability of outliving those resources. The availability of this rule can potentially make retirement income planning more straightforward for a large number of individuals currently considering their future retirement income needs.

In addition, the non-recourse feature of the HECM is significant over the long term (20-plus years into retirement). As a result, establishing a HECM line of credit as early as possible can provide the almost-affluent retiree—particularly if he or she is house rich and cash poor—with a significantly higher retirement income than a later establishment of the credit line, while reducing the probability of exhausting his or her assets. ■

Endnotes

1. See the May 2015 GAO report, "Retirement Security: Most Households Approaching Retirement Have Low Savings" and the 2016 Vanguard report, "How America Saves 2016."
2. See "Home in Retirement: More Freedom, New Choices," a 2014 Merrill Lynch retirement study conducted with Age Wave., specifically figure 7 citing 2013 Bureau of Labor Statistics data. The study is available at agewave.com/wp-content/uploads/2016/07/2015-ML-AW-Home-in-Retirement_More-Freedom-New-Choices.pdf.
3. As a practical matter, for the minority—those who retire with a mortgage debt against their home—a mortgage-free situation could arise through "downsizing" at retirement. The extension of this analysis to situations where a mortgage exists is quite feasible, however, the fundamental results of such an analysis would not differ materially from those shown here.
4. In addition, as noted by Sacks and Sacks (2012) and Salter, Pfeiffer, and Evenksy (2012), the residual net worth of the retiree at the end of his or her 30-year retirement had a 67 percent to 75 percent likelihood of being greater if the coordinated strategy or the Salter, Pfeiffer, and Evensky algorithm was used, than if the last resort strategy was used. This greater residual net worth results in a greater legacy prospect.
5. Over the course of a lengthy retirement, aspects of any retiree's financial situation and the financial environment can, and do, evolve. Accordingly, the "rule of 30," just like the 4 percent rule, will be subject to mid-course corrections.

6. See "HECM or Jumbo Reverse Mortgage: Which Is Better" at lendingtree.com/home/reverse/hecm-or-jumbo-reverse-mortgage-which-is-better.
7. In addition, two other worksheets were run, using the hybrid strategies mentioned in endnote 9, simply to ascertain the results reported in endnote 10.
8. In cases where the investment performance was positive but less than the withdrawal amount scheduled for the ensuing year, only the amount of the positive performance is withdrawn from the portfolio, and the remaining portion of the scheduled withdrawal amount is taken from the reverse mortgage credit line. Also, if the investment performance was negative but the credit line has already been exhausted, the entire withdrawal will come from the portfolio.
9. Two "hybrid" strategies were also considered. In one, the HECM credit line is established at the outset of retirement but only used as a last resort. The other hybrid strategy is essentially the same as Strategy No. 1 except that the HECM credit line is not established until it is first needed to be drawn upon. These strategies are not analyzed in detail here because of space constraints and the fact that, in practice, neither is likely to be implemented.
10. The first hybrid strategy yielded a slightly greater cash flow survival probability than Strategy No. 1, but a substantially smaller legacy potential. The second hybrid strategy yielded results very similar to those of Strategy No. 1.
11. Editor's note: While this paper was in final editing, HUD issued Mortgagee Letter 2017-12 (portal.hud.gov/hudportal/documents/huddoc?id=17-12ml.pdf), which revised initial and annual mortgage insurance premium rates and principal limit factors for all HECMs with FHA case numbers assigned on or after October 2, 2017. The authors note that none of the HUD changes would have a material impact on the key findings presented here, however some numerical results would change slightly.

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