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An International Perspective on "Safe" Savings Rates for Retirement

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Abstract

This article simulates the savings rates required to meet retirement income goals in the worst-case scenario from overlapping historical periods for savers in 19 developed market countries. In the baseline, workers save for 30 years to replace 50 percent of their pre-retirement net income with subsequent inflation adjustments over a 30-year retirement. Public pension benefits would be added to this. The worst-case scenario saving rates ranged across the countries from 16.3 percent to 74.3 percent. Americans enjoyed the best worst-case savings scenario, and a broader international perspective suggests more caution may be needed when formulating retirement planning guidance.

JEL Codes: C15, D14, G11, G17

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Introduction

With increasing life expectancies and greater demands being placed on individuals to make preparations for their own retirements, an important and difficult question regards determining the savings rates that will provide sufficient wealth to cover one's desired retirement expenditures.

Savings rates advice is typically based on deterministic assumptions about returns. An important recent example of this approach is Munnell, Golub-Sass, and Webb (2011), who provide savings guidelines for various retirement ages, savings periods, and deterministic return assumptions. Their analysis highlights the important role of Social Security in the United States, as delaying retirement can dramatically reduce the required savings rate. Saving for a retirement income target representing a replacement rate of 80 percent of gross pre-retirement salary, they find that delay leads to larger benefits and reduced demands on the financial portfolio, as well as for more years of wealth compounding and additional savings.

Leaving deterministic assumptions aside, Ibbotson, Xiong, Kreitler, Kreitler, and Chen (2007) instead use Monte Carlo simulations to forecast investment returns. They make savings rates calculations based on various replacement rates for net pre-retirement income, which is the non-saved portion of pre-retirement income. This is important to ensure a smoother spending pattern between the pre- and post-retirement periods. They also incorporate Social Security and assume that retirees will purchase a fixed immediate annuity at the retirement date.

Pfau (2011) uses historical simulations to estimate the historical savings rates which would have proved sufficient in hindsight to cover all desired retirement expenditures. He identifies the “safe” savings rate as the worst-case necessary savings rate from rolling historical periods. If all historical retirees had used this savings rate, they could have all withdrawn from their financial portfolio what they needed to meet their spending goals regardless of the implied withdrawal rate or retirement date wealth accumulation.

Studies about savings rates are generally conducted with the U.S. historical experience in mind, and the few studies not based on deterministic data tend to rely on U.S. data since 1871 or 1926. From an international perspective, this was a remarkable period for financial market returns. Outcomes estimated with this data may be too optimistic for forward looking retirees in the United States or in any other country. Dimson, Marsh, and Staunton (2004) stress this point, arguing that looking only to past U.S. data for future predictions will lead to "success bias" and "irrational optimism." In the first case, they note that though the U.S. enjoyed remarkable growth and success in the twentieth century, this would have been difficult to predict in 1900 and cannot be extrapolated into the future. The U.S. data does not reach over a long enough time interval to be confident about its characteristics, as there are too few nonoverlapping periods. Examining asset returns for a larger selection of countries should provide a better idea about the range of possibilities for the future. Such data will help provide a better idea about savings rate guidelines based on what happened in 19 developed market countries, a GDP-weighted world portfolio, and a GDP-weighted portfolio of countries other than the United States. Retirement income strategies are most actively studied in the U.S., and this obscures how exceptional the U.S.

experience has been. American savers may wish to plan for a situation more in line with the international experience, and may not wish to base retirement planning recommendations solely on what would have worked historically in the United States.

Methodology and Data

This article uses a historical simulations approach, considering the perspective of individuals retiring in each year of the historical period. In the baseline case, an individual saves for retirement during the final 30 years of work, and he or she earns a constant real income in each of these years. A fixed savings rate determines the fraction of this income saved at the end of each of the 30 years. Retirement begins at the start of the 31st year, and the retirement period lasts for 30 years. Withdrawals are made at the beginning of each year during retirement. An underlying asset allocation of 50 percent stocks and 50 percent bonds is used throughout the lifecycle, with annual rebalancing. Withdrawal amounts are defined as a replacement rate from final pre-retirement salary. The baseline individual wishes to replace 50 percent of net salary (pre-retirement salary less savings) with withdrawals from accumulated wealth. This withdrawal amount is adjusted for inflation in subsequent years. Portfolio administrative and planning fees are not charged, and taxes are not deducted. A particular savings rate was successful if it provided enough wealth at retirement to sustain 30 years of withdrawals without having the account balance fall below zero. Actual wealth accumulations and withdrawal rates may vary substantially for different retirees.

When savings rates are relatively low, the difference in replacing gross and net income is also low. As higher savings rates are required, the limitations of considering

replacement rates from gross salary become more apparent. In some cases the savings rate needed to replace a portion of gross salary exceeds 100 percent, and a net replacement rate must be used.

No account is made for any payroll taxes or benefits provided by public pension systems in these countries, as the objective is to understand more about historically successful savings rates and their link to asset returns. Depending on the level of public pensions, as well as individual goals, the baseline 50 percent net replacement rate could be too high or too low. In the United States, the additional 30 to 50 percent of gross pre-retirement income provided by Social Security would substantially raise the overall spending level.

Data for annual financial asset returns between 1900 and 2010 are from the Dimson, Marsh, and Staunton Global Returns dataset commercially available from Ibbotson Associates and Morningstar. For each of 19 developed market countries, a GDP-weighted world index, and a GDP-weighted ex-U.S. index, annual data is available for stocks, bonds, bills, and inflation. With these 111 years of data, it is possible to consider 30-year careers which are followed by retirements beginning in the years 1930 to 2011, as well as 30-year retirements beginning between 1900 and 1981. To consider a 60-year lifecycle with 30 years of work followed by 30 years of retirement, there are 52 overlapping periods per country with retirements beginning between 1930 and 1981. Detailed data definitions and sources are provided in Dimson, Marsh, and Staunton (2002).

Results

Table 1
Summary Statistics for Real Asset Returns, 1900-2010

	Real Stocks			Real Bonds			50% Stocks / 50% Bonds		
	Geom. Mean	Arith. Mean	Std. Dev.	Geom. Mean	Arith. Mean	Std. Dev.	Geom. Mean	Arith. Mean	Std. Dev.
Australia	7.4	9.1	18.2	1.4	2.3	13.2	4.9	5.7	12.6
Belgium	2.5	5.1	23.6	-0.1	0.6	12.0	1.8	2.9	15.2
Canada	5.9	7.3	17.2	2.1	2.6	10.4	4.4	4.9	10.8
Denmark	5.1	6.9	20.9	3.0	3.7	11.7	4.4	5.3	14.1
Finland	5.4	9.3	30.3	-0.2	1.0	13.7	3.4	5.2	18.5
France	3.1	5.7	23.5	-0.2	0.8	13.0	2.0	3.2	15.4
Germany	3.1	8.1	32.2	-1.9	0.8	15.5	1.4	4.4	20.7
Ireland	3.8	6.4	23.2	0.9	1.9	14.9	2.8	4.1	16.6
Italy	2.0	6.1	29.0	-1.7	-0.4	14.1	1.0	2.8	18.5
Japan	3.8	8.5	29.8	-1.1	1.6	20.1	2.3	5.0	20.9
Netherlands	5.0	7.1	21.8	1.4	1.8	9.4	3.8	4.5	12.2
New Zealand	5.8	7.6	19.7	2.0	2.4	9.0	4.3	5.0	12.0
Norway	4.2	7.2	27.4	1.7	2.4	12.2	3.7	4.8	16.0
South Africa	7.3	9.5	22.6	1.8	2.3	10.4	5.0	5.9	14.3
Spain	3.6	5.8	22.3	1.3	2.0	11.8	2.9	3.9	14.3
Sweden	6.3	8.7	22.9	2.4	3.2	12.4	5.0	5.9	14.1
Switzerland	4.2	6.1	19.8	2.1	2.5	9.3	3.6	4.3	12.5
UnitedKingdom	5.3	7.2	20.0	1.4	2.2	13.7	3.7	4.7	14.8
United States	6.3	8.3	20.3	1.8	2.3	10.2	4.6	5.3	12.2
World Ex-US	5.0	7.0	20.4	1.2	2.2	14.2	3.4	4.6	15.6
World	5.5	7.0	17.7	1.7	2.2	10.4	3.9	4.6	12.0
Minimum	2.0	5.1	17.2	-1.9	-0.4	9.0	1.0	2.8	10.8
Maximum	7.4	9.5	32.2	3.0	3.7	20.1	5.0	5.9	20.9

Source: Own calculations from Dimson, Marsh, and Staunton Global Returns Dataset.

Table 1 provides summary statistics for the underlying real asset returns. These include the returns for stocks, bonds, and a 50/50 portfolio. Most studies of sustainable retirement savings and withdrawal rates are based on U.S. data, and this table highlights

how U.S. investors historically enjoyed a better than average investment environment. The 6.3 percent compounded real stock return in the U.S. was exceeded only in Australia and South Africa. Across the countries, values ranged from 2 percent to 7.4 percent. For bonds, the compounded return in the U.S. averaged 1.8 percent, comparing internationally to a range from -1.9 to 3 percent. Compound real bond returns were higher in five other countries. As for the diversified portfolio, results for the U.S. include a compounded real return of 4.6 percent, comparing internationally to values between 1 and 5 percent. In obtaining these high compound returns, American-based investors tended to enjoy both high arithmetic returns and low standard deviations. As the U.S. enjoyed among the highest returns and the lowest volatility for asset returns, trying to extrapolate about sustainable retirement strategies using U.S. data may provide a misleadingly rosy picture both for residents of other countries and for Americans who are still in the retirement planning stage.

Next, Table 2 provides the international comparisons for the historical worst-case retirement savings scenarios across the countries. This table integrates the working and retirement phases to determine the savings rate needed to finance the planned retirement expenditures for rolling periods from the data. This table expands from the baseline scenario (save for 30 years to finance a 50 percent net replacement rate in retirement over a 30-year retirement period) to also include gross and net replacement rates for 20, 30, and 40 years of work. For 30 years of work, results for an 80 percent replacement rate are also shown. Results in this table are for a fixed 50/50 asset allocation of stocks and bonds.

Table 2
Worst-Case Savings Rate Needed to Support 30 Years of Desired Retirement Spending
Asset Allocation: 50% Stocks & 50% Bonds

Years of Retirement Savings	20	20	30	30	30	30	40	40
Replacement Rate for Retirement	50% Gross	50% Net	50% Gross	50% Net	80% Gross	80% Net	50% Gross	50% Net
Australia	52.5	34.5	27.9	21.8	44.7	30.9	18.4	15.5
Belgium	128	56.3	62.1	38.3	99.4	49.9	43.7	30.4
Canada	40.2	28.7	19.8	16.5	31.6	24.0	11.7	10.5
Denmark	50.1	33.4	25.7	20.5	41.1	29.2	15.1	13.2
Finland	109	52.2	33.9	25.3	54.2	35.2	27.7	21.7
France	166	62.4	93.6	48.4	150	60.0	76.7	43.4
Germany	235	70.2	96.2	49.1	154	60.7	63.6	38.9
Ireland	61.6	38.2	32.6	24.6	52.2	34.3	18.2	15.4
Italy	172	63.3	95.4	48.9	153	60.5	76.9	43.5
Japan	666	87.0	288	74.3	461	82.2	177	63.9
Netherlands	48.3	32.6	27.9	21.9	44.7	30.9	16.1	13.9
New Zealand	49.0	32.9	26.7	21.1	42.7	30.0	17.0	14.5
Norway	67.9	40.5	39.1	28.1	62.5	38.5	22.5	18.4
South Africa	46.1	31.6	20.4	17.0	32.6	24.6	12.7	11.3
Spain	79.6	44.3	47.3	32.2	75.7	43.1	33.8	25.3
Sweden	41.7	29.5	22.4	18.3	35.9	26.4	13.4	11.8
Switzerland	54.1	35.1	19.8	16.6	31.7	24.1	12.4	11.0
UnitedKingdom	45.0	31.1	22.4	18.3	35.9	26.4	13.6	12.0
United States	41.2	29.2	19.4	16.3	31.1	23.7	11.5	10.4
World Ex-US	79.7	44.4	36.2	26.6	57.9	36.7	25.8	20.5
World	53.7	35.0	22.2	18.2	35.5	26.2	14.2	12.5
Minimum	40.2	28.7	19.4	16.3	31.1	23.7	11.5	10.4
Maximum	666.3	87.0	288.4	74.3	461.4	82.2	177.0	63.9

Note: Assumptions include an inflation-adjusted salary that is fixed in real terms, no administrative fees, annual inflation adjustments for withdrawals, and annual rebalancing to fixed asset allocation.

Source: Own calculations from Dimson, Marsh, and Staunton Global Returns Dataset.

Perhaps the most important result in this table is that the worst-case savings rates are lower in the U.S. than for any other country in all cases, except for Canadians saving

over a 20-year period. For a 30-year savings period, in the worst-case Americans would have needed to save 16.3 percent for a 50 percent net replacement rate, and 23.7 percent for an 80 percent net replacement rate. In some countries, the worst-case scenarios were substantially worse. For instance, in the baseline case with 30 years of work and a 50 percent net replacement rate, 5 countries experienced worst-case savings rates of over 30 percent. When it comes to gross replacement rates, grey coloring highlights countries where savers would have faced the impossible task of saving more than 100 percent of their salary over 30 years. Only net replacement rates are feasible.

The table also shows how longer savings periods can reduce the worst-case savings rates. For example, Australians aiming for a 50 percent net replacement rate would have found a savings rate of 34.5 percent for 20 years, 21.8 percent for 30 years, and 15.5 percent for 40 years. This demonstrates the importance of starting to save early. Note as well that for all countries, the savings rate required over 30 years for an 80 percent net replacement rate is less than the savings rate over 20 years for a 50 percent net replacement rate.

For the next three figures, a distribution of outcomes is shown. The median outcome is identified with a wide light grey dash, the 25^{th} to 75^{th} percentiles are identified with a thick black bar, the 5^{th} to 95^{th} percentiles with a medium grey bar, and the entire range with a thin light-grey bar.

Figure 1 shows the entire distribution of required savings rates across the historical period for each country. This is for the baseline case of a 50 percent replacement rate with 30 years of savings and 30 years of retirement. Countries are ranked from lowest to highest

in terms of the worst-case required savings rates, which is naturally the maximum value of the distribution for each country. For some countries, the variation in savings rates across retirement years is small. For instance, in the U.S., these required savings rates range historically from 10.4 to 16.3 percent. The variations were greater in most other countries though. As well, the median savings rate exceeds 15 percent in all but three countries. It was the lowest (13.1 percent) in the United States.

Figure 1
Distribution of Minimum Required Savings Rates Across Retirement Years by Country
To Support a 50% Net Replacement Rate for 30 Years with 30 Years of Savings
Asset Allocation: 50% Stocks & 50% Bonds

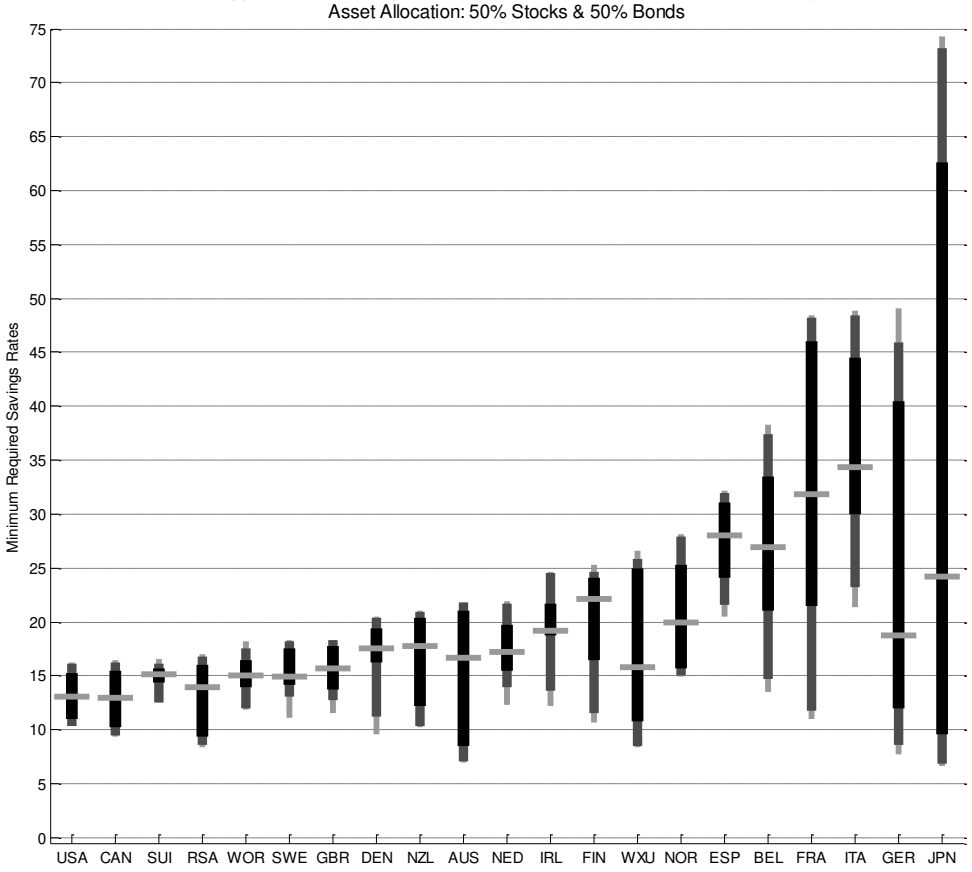


Figure 2 provides the distribution of required savings rates across countries for each retirement year. The distribution of these savings rates narrows in more recent years, with

perhaps a slight downward trend as well, particularly since the 1950s. The median across countries tended to range between 15 and 20 percent before falling to lower levels in the final years for which 30 years of retirement could be considered.

Figure 2
Distribution of Minimum Required Savings Rates Across Countries by Retirement Years
To Support a 50% Net Replacement Rate for 30 Years with 30 Years of Savings
Asset Allocation: 50% Stocks & 50% Bonds

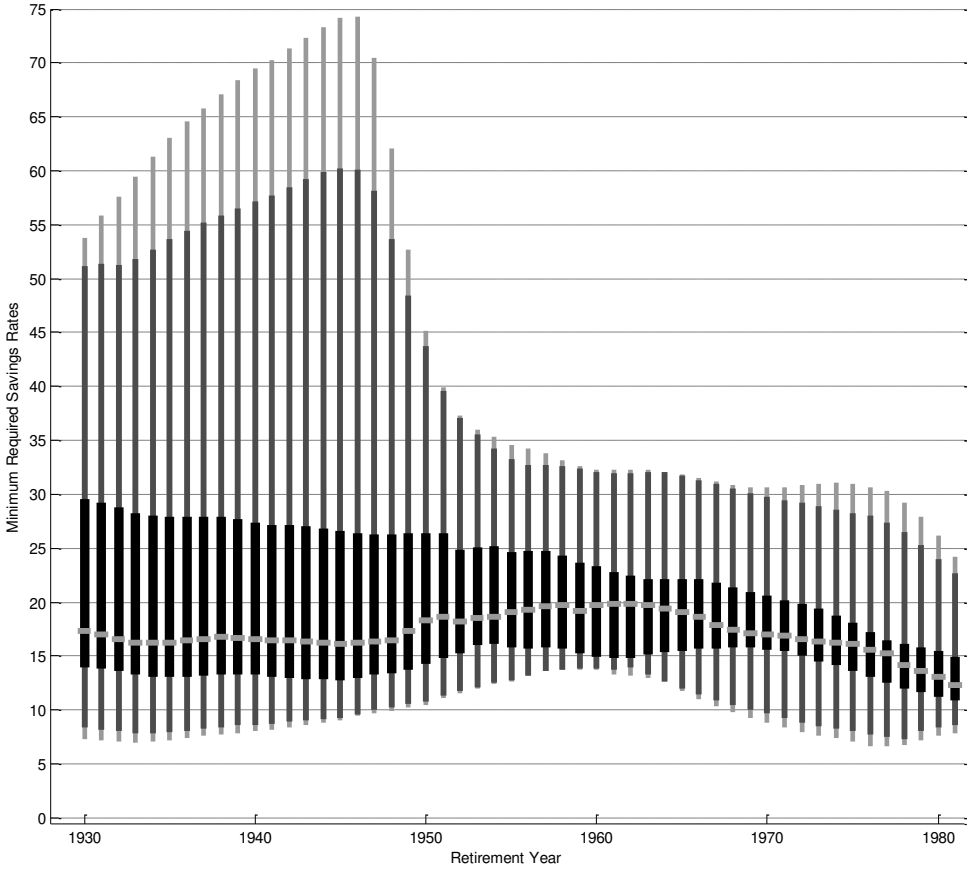
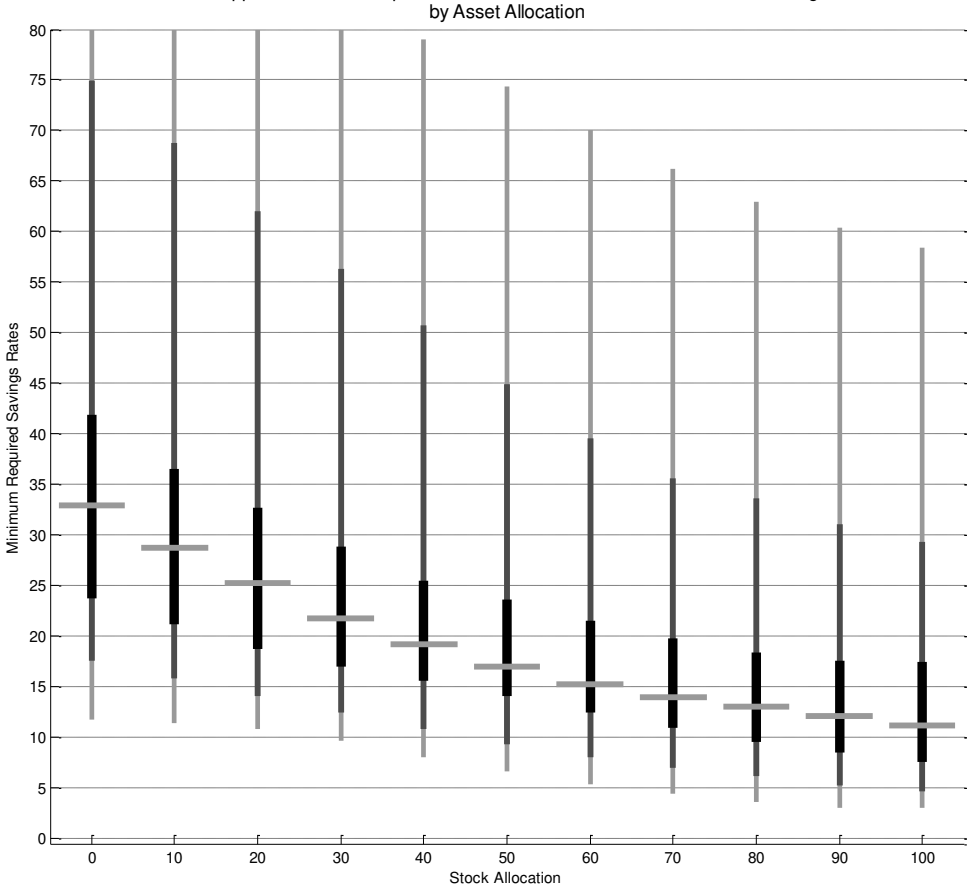


Figure 3 shows the distribution of outcomes across countries and retirement years for different stock allocations, again for the baseline case. Generally, saving rates and stock allocations are negatively correlated. Though the fallacy of time diversification is real, over these 60 year periods higher stock allocations tended to support lower worst-case savings rates. Stock allocations of 100 percent supported the lowest savings rates in all countries

except Belgium and Germany (90 percent stocks), Netherlands and Sweden (70 percent stocks), and Switzerland (60 percent stocks). Even in these cases, the differences were mild. The case in which 100 percent stocks resulted in the largest deviation from the optimum occurred in Sweden, in which 70 percent stocks supported a worst-case savings rate of 15.6 percent, compared to 18.6 percent for 100 percent stocks. The historical success for 100 percent stocks does not necessarily suggest higher stock allocations beyond a saver's tolerance for volatility though.

Figure 3
Distribution of Minimum Required Savings Rates Across Countries and Retirement Years
To Support a 50% Net Replacement Rate for 30 Years with 30 Years of Savings
by Asset Allocation

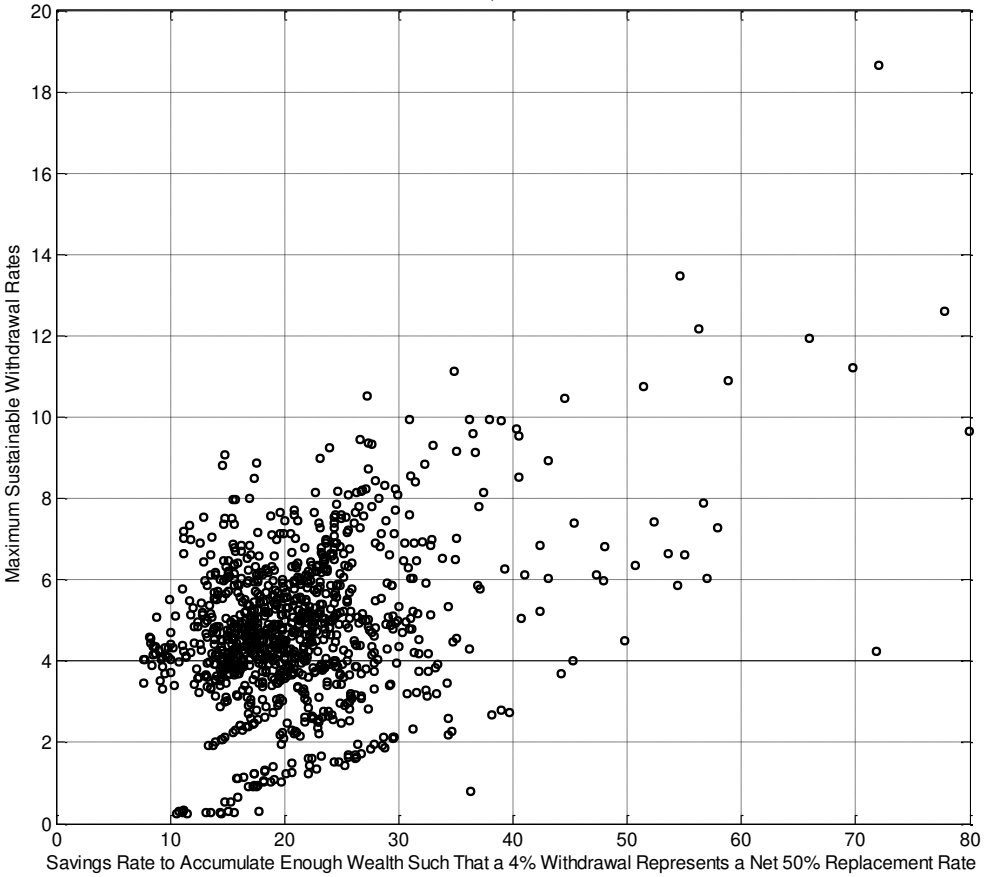


Finally, Figure 4 addresses a matter of particular relevance for this methodology. Here the working and retirement periods are considered together and the links between them that may potentially allow for a less volatile savings rate for different cohorts are interest rates and the level of market valuations at the retirement date. High interest rates at retirement will tend to result in pre-retirement capital losses and post-retirement capital gains, suggesting that higher required savings rates will be connected with higher sustainable withdrawal rates. As well, when market valuations are high, more wealth would have been accumulated with a particular savings rate, but mean reversion after retirement would imply lower returns and a lower sustainable withdrawal rate, again suggesting positive correlation. Retirees enduring harsh pre-retirement conditions may receive some relief with higher sustainable withdrawal rates and do not necessarily need to worry about meeting a wealth accumulation target. To the extent this happens, the "safe" savings rates will be less than those needed for meeting traditional wealth accumulation targets.

Pfau (2011) identified a rather strong relationship between savings rates to meet a wealth target and subsequent withdrawal rates in the historical data for the United States. With a 60/40 allocation to stocks and cash, he found that savings rates could explain 79 percent of the variation in withdrawal rates. This allows "safe" savings rates in the U.S. to be less than those needed to meet wealth accumulation targets for using a "safe" withdrawal rate. However, Figure 4 shows that this relationship does not hold more generally with the combined international data. Though a positive relationship is maintained, the degree of explanatory power is weak (only 12 percent). Unfortunately for retirees, this weakens the notion that those who had to endure rather bad conditions in their pre-retirement period

might be able to increase their withdrawal rates after retirement to benefit from subsequent improvements in market conditions.

Figure 4
Maximum Sustainable Withdrawal Rates for 30 Years of Inflation-Adjusted Withdrawals and No Fees;
and Savings Rate to Accumulate Enough Wealth Such That a 4% Withdrawal Represents a Net 50% Replacement Rate
Across Countries and Retirement Years, Asset Allocation: 50% Stocks & 50% Bonds



Conclusion

The United States enjoyed relatively favorable asset markets with high returns and low volatility during the twentieth century. As this study makes clear, investigating retirement planning matters such as savings rates and sustainable withdrawal rates with past U.S. data may present an exceedingly rosy picture about what future American retirees, or retirees in any country, should expect.

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