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Safe Withdrawal Rates for Japanese Retirees Today

Morningstar Research
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Introduction

Japan faces many retirement challenges. People are living longer, interest rates are at zero, and most personal financial assets are parked in low-return bank deposits. Each of these characteristics lowers the portion of savings a retiree can withdraw each year while safely expecting savings to reach the end of retirement. This portion is commonly known as the "safe withdrawal rate."

Most research on safe withdrawal rates is based on historical investment returns of U.S. assets. This approach fails Japanese investors in two ways. First, given historically low interest rates in major world economies, we can expect future returns to be lower than long-term historical averages. For example, research by Blanchett, Finke, and Pfau (2013) using U.S. projected returns suggests safe withdrawal rates for U.S. retirement investors are likely to be much lower when based on forward-looking returns than historical values. Second, Japanese investors differ from their U.S. counterparts in terms of personal characteristics (such as longevity), typical investments (bank deposits vs. market investments), and basic old-age government benefits.

In this paper, we use historical returns to explore safe withdrawal rates, both in Japan and internationally. More importantly, we estimate safe withdrawal rates for Japanese investors based on our current return and risk expectations for Japan.

National Pension payments cover, on average, more than 80% of income and 60% of living expenses for retirees beyond age 65 in Japan. The remaining portion of retiree expenses should be financed by withdrawal of personal savings. But how much can someone withdraw safely each year, given rising longevity and low investment return expectations?

We find the historical performance of stock and bond markets in Japan has been significantly different from (lower than) other advanced countries, and expect these low returns to continue, especially for bonds and bank deposits. A balanced portfolio with more equity and with more international diversification is likely to be the best asset allocation for Japanese retirees.

We also conclude that safe withdrawal rates for Japanese retirees are lower today than the frequently cited "4% Rule." While individual circumstances will vary widely, our findings serve as a useful starting point for retirees and their financial advisors.

Past: Safe Withdrawal Rates in Historical / International Perspective

The Shortcomings of the 4% Rule

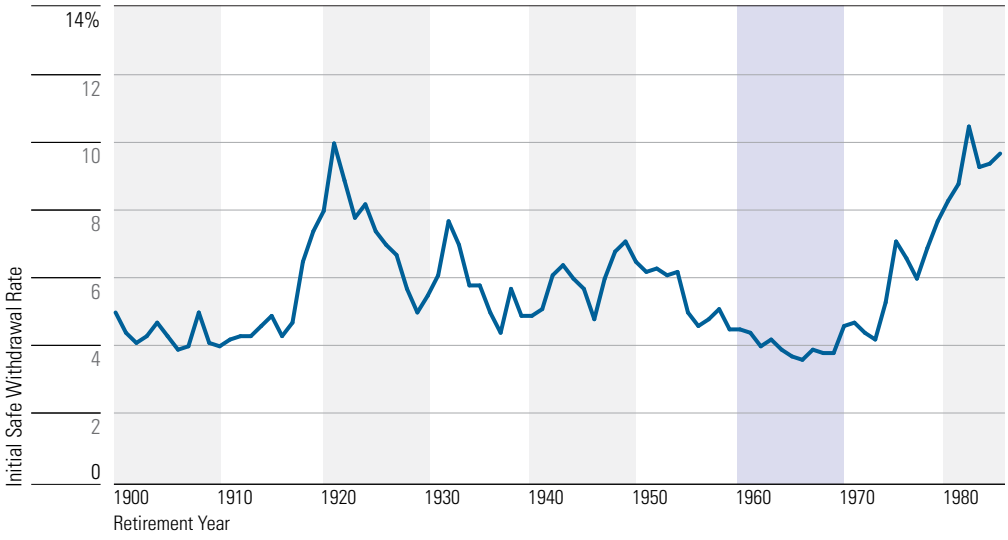
Research by Bengen (1994), among others, suggests an initial safe withdrawal rate from a portfolio is 4% of the assets, where the initial withdrawal amount would subsequently be increased annually by inflation and assumed to last for 30 years (which is the expected duration of retirement). This finding led to the creation of the "4% Rule," a concept that is often misunderstood and incorrectly applied:

- The 4% value applies only to the first year of retirement, whereby subsequent withdrawals are assumed to be based on that original amount increased by inflation.
- A retirement period estimate of 30 years may be too short or too long based on the unique attributes of a retiree household.
- The analysis was based entirely on historical U.S. returns.

Exhibit 1 uses our withdrawal model to trace how initial safe withdrawal rates have changed over time. The horizontal axis is the retirement year when it is assumed that one had retired and lived afterward for 30 years or more. As our historical data is available up to 2015, the last retirement year was 1986.

This exhibit shows the highest initial rolling safe withdrawal rate for a U.S. retiree from 1900 to 1986, where retirement is assumed to last 30 years and the retirement income need is increased annually by inflation for the duration of retirement (i.e., is a constant annual inflation-adjusted level of income). During the 30 years in retirement, it is assumed that the retiree keeps a 50/50 balanced portfolio that provides retirement income.

Exhibit 1 Initial Safe Withdrawal Rate %—Where the 4% Rule Comes From



Source: Morningstar. The returns used in this analysis come from the Dimson, Marsh, and Staunton dataset updated to 2015 and reflect a portfolio that is 50% US stocks and 50% US bonds rebalanced annually.

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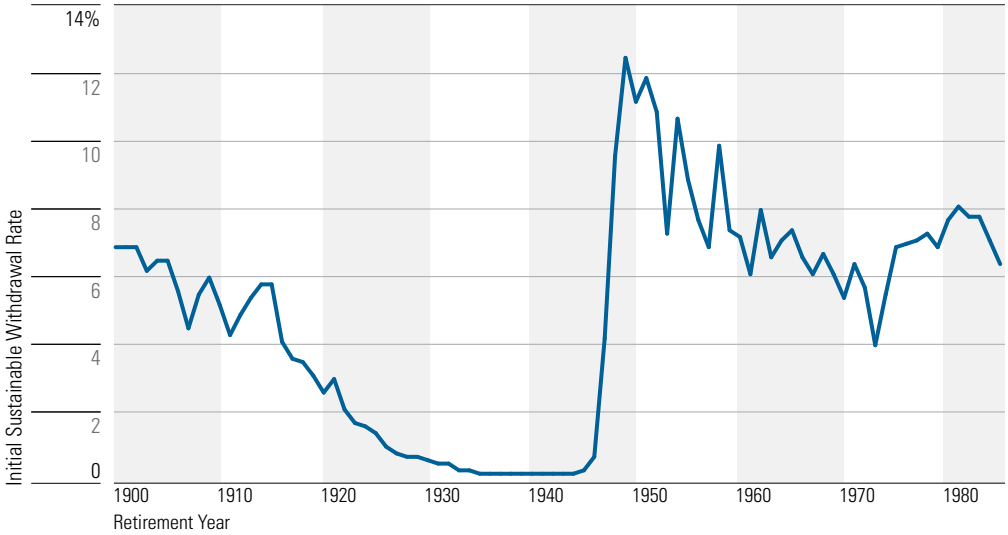
The shaded area shows the worst period for initial withdrawal rates over the historical test period and is effectively where the 4% rule originates, as 4% represents the highest initial safe withdrawal rate for U.S. retirees. In other words, it is the "worst" possible initial withdrawal rate using U.S. historical data. While the average is obviously much greater as this chart indicates, that was the worst-case scenario historically for U.S. retirees.

There are several problems extrapolating these results to other countries. First, Bengen did not include fees in his original analysis. There is a definite cost to investing that needs to be considered when estimating withdrawal rates. Second, the analysis assumes retirement lasts 30 years, while in reality, the expected duration of retirement and the respective modelling period will vary by retiree. Third, just because a 4% initial withdrawal has been safe in the U.S., does not mean it would have been safe elsewhere. In Italy, for example, Exhibit 3 demonstrates that it would not. Finally, it is wrong to assume that past returns are a reasonable basis for estimating future retirement incomes. Today's markets arguably offer lower prospective returns than historical long-term averages. Lower future returns need to be considered when advising retirees on safe initial withdrawal rates.

Historical Returns: An International Perspective

Return assumptions are a significant driver of safe initial withdrawal rate estimates, probably ranking second in importance behind the length of retirement. In Exhibit 2 we recreate the analysis in Exhibit 1, replacing historical U.S. returns with historical returns for a Japanese investor. We also assume a portfolio fee of 1.00%.

Exhibit 2 The 4% Rule: A (Historical) Japanese Perspective



Source: Morningstar. The returns used in this analysis come from the Dimson, Marsh, and Staunton dataset updated to 2015 and reflect a portfolio that is 50% Japanese stocks and 50% Japanese bonds rebalanced annually.

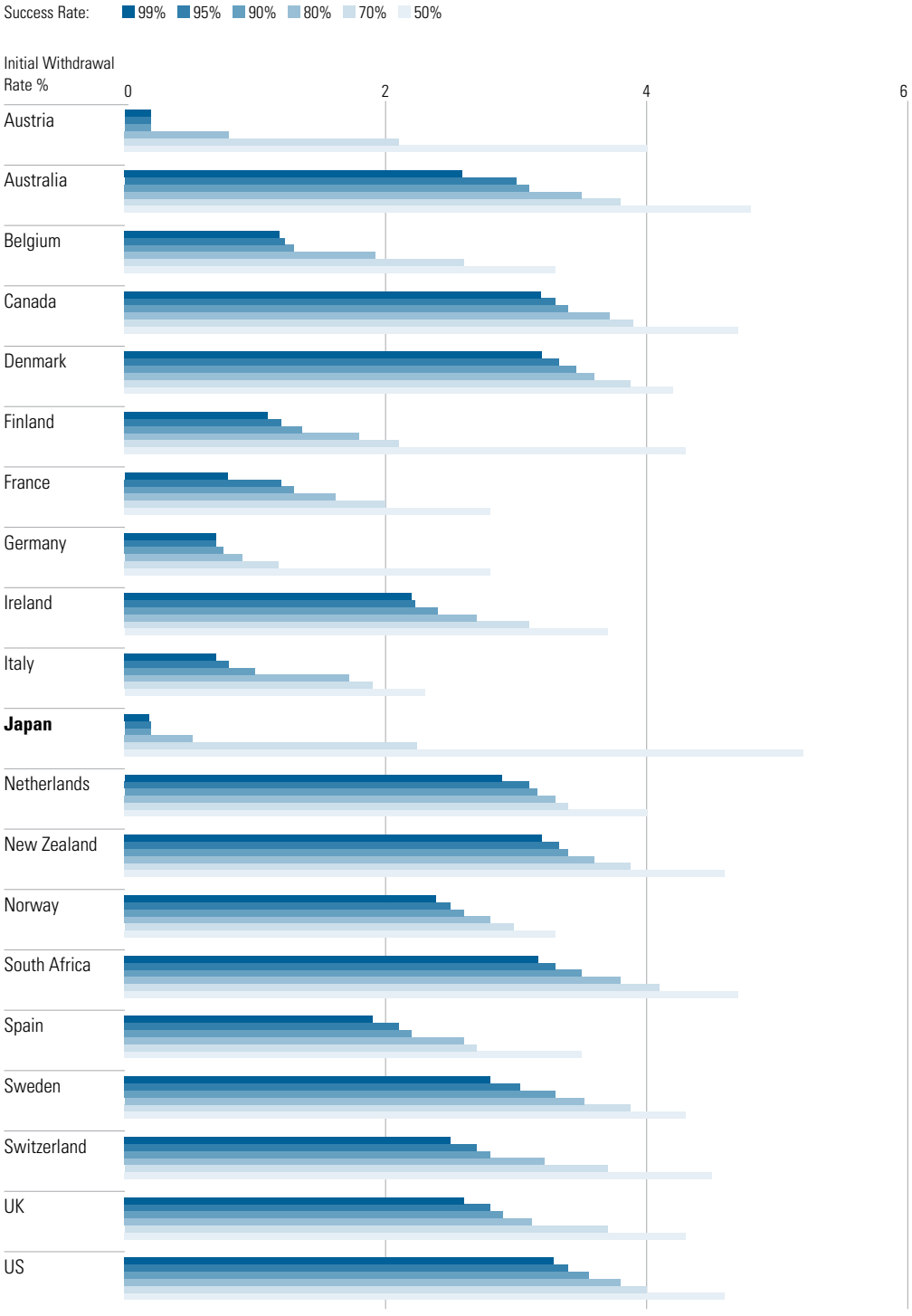
The safe initial withdrawal rates in Exhibits 1 and 2 differ considerably. This suggests the retirement experience has been very different for Japanese retirees than for other international investors.

The persistent down-trend of safe withdrawal rates from 1920 through 1950 was largely due to depressed stock market returns during the Great Depression in the 1930s and hyperinflation after World War II. The consumer price index provided by DMS shows that inflation index level rocketed by almost 80 times from 2.80 in 1940 to 220.50 in 1950. Those who had retired in 1920s and '30s would have suffered significantly from declining purchasing power during retirement.

Next, we look more broadly at initial safe withdrawal rates historically experienced for each of the 20 countries in the Dimson, Marsh, and Staunton dataset. The results, shown in Exhibit 3, include the safe initial withdrawal rates for varying target probabilities of success and assume a retirement period of 30 years, a portfolio invested domestically in 50% stocks and 50% bonds, and an annual portfolio fee of 1.0% of assets.

The true safe withdrawal rate varies significantly by country and target success rate. An estimate's degree of safety is measured by the probability of success target. The lower the initial withdrawal rate is, the higher the probability of success. For example, using the historical returns in Japan, a 95% target success rate would yield an initial withdrawal rate of a mere 0.2%, tied with Austria for the lowest initial safe withdrawal rate among the 20 countries. In contrast a 95% target success rate would yield an initial safe withdrawal rate of 3.9% for the U.S. Historical U.S. investment returns have yielded the highest initial safe withdrawal rates across the 20 countries historically, closely followed by Canada. This suggests safe withdrawal rates based on historical U.S. returns may be overly optimistic on a global basis, especially for Japanese investors whose portfolios would likely differ significantly from that of the average U.S. investor. For example, based on the results in Exhibit 3 for a 90% success rate, U.S. investors could safely withdraw 3.6% in their first year of retirement, while the average initial rate across the 20 countries is 2.3% (and 0.2% for Japan).

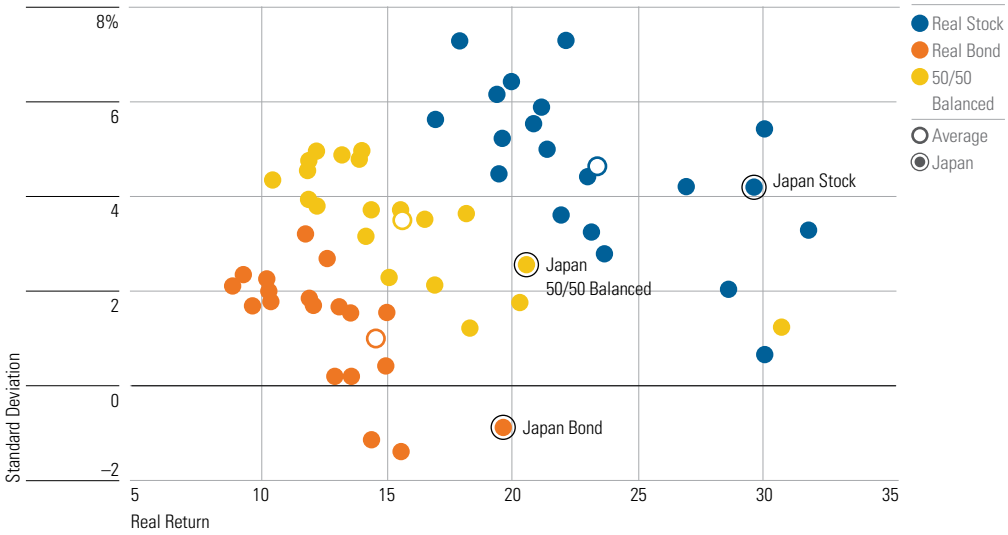
Exhibit 3 Safe Initial Withdrawal Rates at Various Target Success Rates by Country



Source: Morningstar and Dimson, Marsh, and Staunton (2012). Success rates are defined by the percentage of simulation runs in which savings are not depleted before the end of the retirement period. Saving more, earning more on investments, and being in retirement less time (retiring later or not living as long) increase the likelihood of retirement success.

Historical returns and inflation play an important role when determining safe withdrawal rates. Exhibit 4 shows historical inflation-adjusted (real) returns and risk for stocks and bonds by country over the entire test period (from 1900 to 2015) as well as the returns for a 50/50 balanced portfolio. For any single country, stock portfolio has higher real return but higher risk as well, and bond portfolio does not earn much over inflation. Balanced portfolio is a better choice having higher return than bond and lower risk than stock. While investors are likely to exhibit a home-country bias when building their portfolios, adding international or global investments would reduce return variability between countries.

Exhibit 4 Historical Inflation-Adjusted Returns and Risk by Country: 1900-2015



Source: Morningstar and Dimson, Marsh, and Staunton (updated to 2015). Note: Austria bond is not included in the Exhibit as its standard deviation is 50.96%.

Japanese investors have historically experienced lower returns but greater risk than the 20-country average. The real equity return of 4.20% ranks 14th out of 20 countries, the real bond return of -0.88% ranks 17th, and the 50/50 portfolio real return of 2.56% ranks 15th. These below-average returns result in historical safe initial withdrawal rates that are approximately 2 percentage points lower than the international averages across different target probabilities of success.

Risk and Return of Asset Classes for Japan over the past 60 years

Things improved significantly after World War II. Those who retired after 1948 experienced safe withdrawal rates mostly at 6% or more. A one-time drop of sustainable withdrawal rates occurred in the early 1970s due to excessive inflation triggered by the first oil crisis in 1973. Except during this relatively short period, Japanese inflation was lower than that of the U.S. post-war period. In addition, the stock market performed well until the 1980s, hitting a historical peak at the end of 1989. Retirees in this period enjoyed higher sustainable withdrawal ratios.

More recently, Japanese investors experienced poor investment performance following the collapse of the bubble economy. Stock prices and real estate prices declined in the 1990s, interest rates declined due to the Bank of Japan's easing of monetary policy, and the real economy suffered from deflation in 2000s.

The long-run performance of Japanese financial markets is comparable to that of U.S. markets. Exhibit 5 compares historical average return and risk (standard deviation), both nominal and real, of three asset classes and inflation between Japan and the U.S. over the 60 years through 2016. In the post-WWII period, Japanese equity showed strong performance until the 1980s, but it has poorly performed afterward. Only recently has it recovered, as Prime Minister Shinzo Abe introduced his "Abenomics" economic stimulus initiatives with aggressive monetary easing by the Bank of Japan. The long-run similarity between the Japanese and U.S. markets justifies our use of an asset allocation analysis methodology first applied to the U.S. market.

Exhibit 5 Asset Class Historical Performance in Japan Versus US—60 years (1957-2016)

		Return		Risk	
		US	Japan	US	Japan
Nominal	Equity	10.6	9.7	14.5	17.8
	Bond	7.0	5.9	10.0	4.8
	Cash	4.5	4.5	0.9	1.1
	Inflation	3.6	3.0	1.2	2.3
Real	Equity	7.0	6.6	14.7	18.0
	Bond	3.4	2.9	10.2	5.3
	Cash	0.8	1.4	1.1	2.2

Source: Morningstar Direct. Note: All data are annualized percentages calculated from monthly data. US market data are sourced from Ibbotson's Stocks, Bonds, Bills, and Inflation (SBBI) dataset. Equity is US Large Stock total return, bond is US Long-Term Government Bond total return, cash is US 30 day T-Bill total return, and inflation is US Inflation (CPI). Japanese market data are as follows. Equity is total return of Tokyo Stock Exchange 1st Section (called TOPIX with dividend since 1989), bond is that of long-term (10-year) Japanese Government Bond, cash is overnight call rate, and inflation is Consumer Price Index. Japanese bond has lower risk (4.8%) because (1) it was not actively traded in market until the 1970s, and (2) duration is shorter than that of US long-term bonds.

Present: Retirement Income in Japan

Three Levels of DB Plans and Two Types of DC Plans

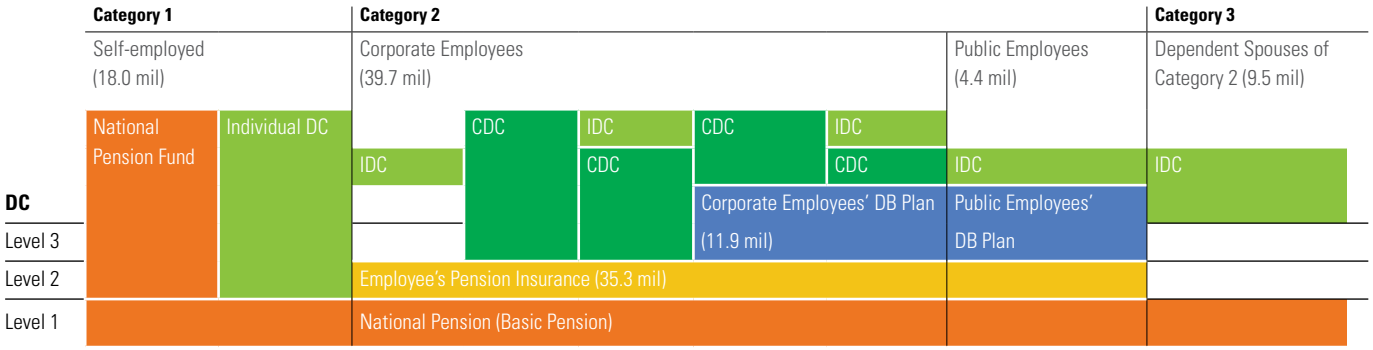
Japan's pension system (see Exhibit 6) consists of three levels of defined benefit (DB) plans plus two types of defined contribution (DC) plans. Beneficiaries are classified into three categories, depending on employment status. Category #1 includes 18 million self-employed people of various occupations. Category #2 consists of 39.7 million corporate-sector employees and 4.4 million public-sector employees. Category #3 is assigned for category #2 beneficiaries' dependent spouses who do not work. Combining all three categories, it covers virtually all citizens.

In the DB plan system, Level I and Level II are government-sponsored programs administered by the Ministry of Health, Labor and Welfare (MHLW). The Level I "National Pension (Basic Pension)" is eligible for all Japanese citizens above age 20. Level II consists of two programs. The National Pension Fund is for independent business operators (Category #1 members), and Employee's Pension Insurance is for employees of private firms and public entities (Category #2 members). Benefit payments are based on number of years worked and salary level of each beneficiary.

A large part of the National Pension's payment is financed by the "pay-as-you-go" method, while the rest is prefunded. Prefunded assets are managed by the Government Pension Investment Fund (GPIF), which is the largest asset owner in the world. Level III DB plans, which are sponsored either by corporations or public entities, cover one-third of category #2 private-sector workers because only large companies can sponsor the plan.

On top of three layers of DB plan structure, two types of DC plans have become available—corporate-sponsored DC (CDC) and individual sponsored DC (IDC). To help those not well covered by Level III DB plans save, DC plans were introduced in 2002. From January 2017, IDC plans have become also available to people who have not been covered by DCs—part of private and public employees—and to Category #3 members (dependent spouses of Category #2 members).

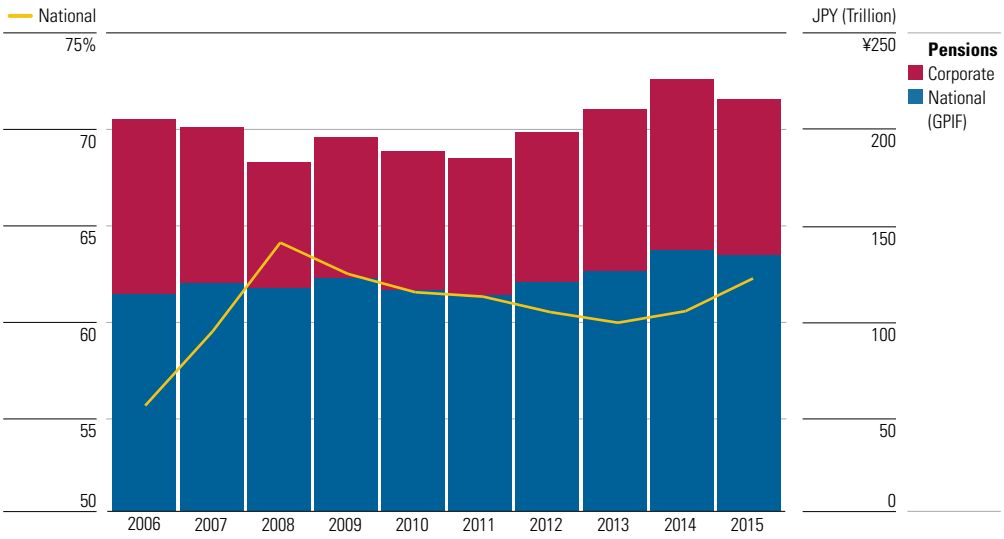
Exhibit 6 Japan's Pension Plan Systems



Source: Ministry of Health, Labor and Welfare.

Total assets of DB plans under government and corporate programs, was JPY 217 trillion as of end of fiscal year 2015 (March 2016). GPIF manages JPY 135 trillion, accounting for 62%. Excluding government sponsored plans, corporate DB total assets amount to JPY 82 trillion. In addition, approximately JPY27 trillion pension assets (not shown in Exhibit 7) is estimated for public employees at national and municipal governments, but its historical data was not available.

Exhibit 7 Defined Benefit Pension Assets

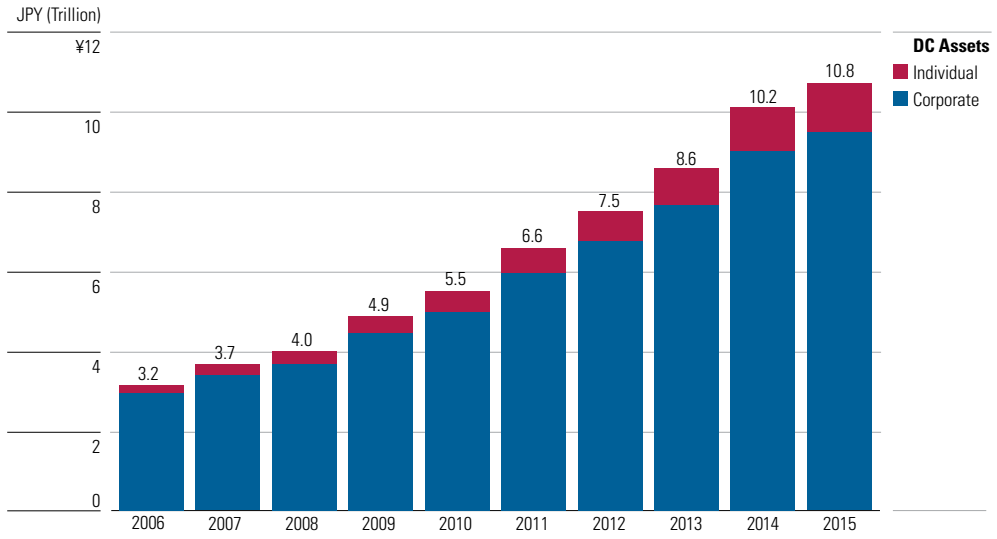


Source: GPIF, Pension Fund Association.

The DC plan was introduced in 2002 and has grown consistently to JPY 10.8 trillion as of March, 2016. The majority of DC plans are corporate-sponsored, where the employer is primarily responsible for monthly contributions. Matching contributions by employees became allowed in 2014. (This is the key difference from U.S. 401(k) plans in which employees' contribution are matched by employers.)

For self-employed workers, the individual DC plan was introduced in 2002. However, it has not been used as much as expected because financial institutions have not actively promoted this program, largely due to the relatively small account balances. Individual DC plans account for only JPY 1.2 trillion, or about 11 % of total DC assets.

Exhibit 8 Defined Contribution (DC) Assets

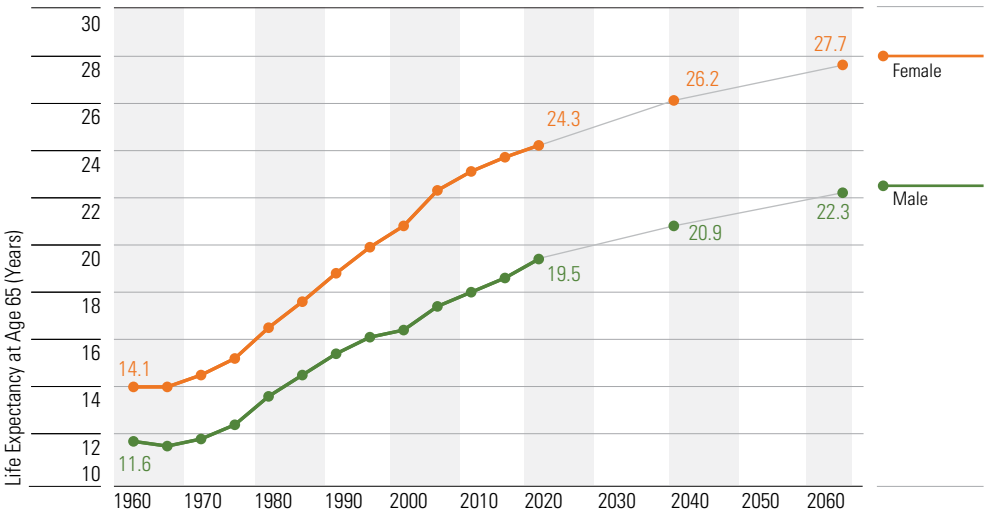


Source: Pension Fund Association.

Longevity Risk

An important consideration when estimating safe withdrawal rates is longevity risk. The life expectancies for Japanese people in Exhibit 9 are based on the period life expectancy method, which estimates the average number of years a person will live if the current age-specific mortality rates were applied to the rest of the person's life. The cohort life expectancy method assumes improving mortality rates over a person's lifetime. In other words, instead of being based on the mortality rates for all ages in a given year, the cohort life expectancy approach takes the age-specific mortality rate year by year for the particular year in which the person would be that age.

Exhibit 9 Projected Life Expectancies—Japan



Source: Population Projections for Japan, National Institute of Population and Social Security Research.

The information in Exhibit 9 suggests that life expectancy will likely continue increasing. At age 65, Japanese men in 2015 would live for another 19.5 years and women for 24.3 years. According to the projection by National Institute of Population and Social Security Research, life expectancies from age 65 will be even longer in the future. In 2035, men at 65 would live another 21 years and women for 26 years. In 2060, men would live for another 22 years and women for almost 28 years.

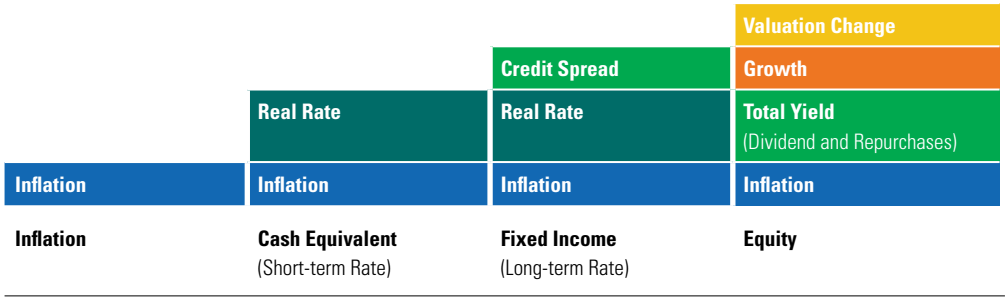
Future: Safe Withdrawal Rates: A Forward-Looking Perspective

Return Expectations

It is impossible to predict the future. What we can do, however, is create a series of intermediate-term valuation-implied returns based on the current prices of assets. While using historical returns is sometimes viewed as a simpler path than attempting to forecast returns, we believe using forward-looking returns is the best approach since it incorporates today's market conditions.

Morningstar's Investment Management group creates valuation models for more than 100 assets including cash, fixed income, and equity in all major markets and regions worldwide. We use a supply-side building-block approach to create valuation-implied projected returns. First introduced by Diermeier, Ibbotson, and Siegel (1984), and later adapted to stocks by Ibbotson and Chen (2003), the supply-side model is based on the idea that equity returns can be decomposed into underlying economic and corporate fundamentals. Fixed-income returns are derived using a similar approach based on expectations for cash rates, inflation, term spread, and credit spread. These long-term expectations are then modified to reflect the current deviation of the asset class from our estimate of fair value. These concepts are illustrated in Exhibit 10.

Exhibit 10 Building Blocks for Equity and Fixed-Income Returns



Source: Morningstar Investment Management.

Intermediate-term prospective returns for most capital markets are generally estimated to be lower than those observed in the last century. This is particularly the case for equities, where above-average valuations in many markets have diminished future return expectations. Interest-generating assets are also being affected by lower prevailing market yields. Morningstar's Investment Management group uses several valuation models to estimate fair value, as our research suggests that a combination of multiple valuation measures has a significantly better predictive power than any single model. Specifically, our valuation models rely on several forward-looking measures of normalized earnings such as profit margins, return on book-equity, and inflation-adjusted average earnings over the business cycle. Other equity building blocks incorporate earnings growth, total yield (dividends plus buybacks) and inflation. Having estimated the fair value of the equity asset classes, we assume that prices revert to fair value over a 10-year period.

Exhibit 11 includes information about our projected returns for a variety of asset classes. As the Bank of Japan introduced "negative interest rates" in early 2016, Japanese bonds have negative expected returns. In addition, the BoJ adopted a policy to directly maintain the 10-year government bond yield around 0%. International bonds have relatively higher risk, with an annualized standard deviation at 11.0%, most of which is accounted for by currency risk. Meaningful positive returns are likely to be available only from domestic and foreign equities.

Exhibit 11 Arithmetic Real Return and Risk Assumptions for Various Japanese Investments

	Expected Return	Risk
Japan Equity	7.01	20.5
International Equity ex Japan	7.67	19.9
Japan Bond	–0.03	3.5
International Bond ex Japan	0.85	11.0
Japan Cash	0.00	1.1
Japan Inflation	0.38	2.5

Source: Morningstar Investment Management. Arithmetic returns are used in the return projections. The returns shown are before fees, taxes and inflation.

Using the expected returns from Exhibit 11, we ran additional forecasts to determine safe withdrawal rates for Japanese retirees. The portfolios used in these examples are built on a more diversified combination of asset classes than used in the previous simulations. Some of the potential allocations are shown in Exhibit 12. These are post-retirement portfolios. (Note: The portfolio with 20% equity will be used later in Exhibit 16 and 17).

Exhibit 12 Portfolio Allocations

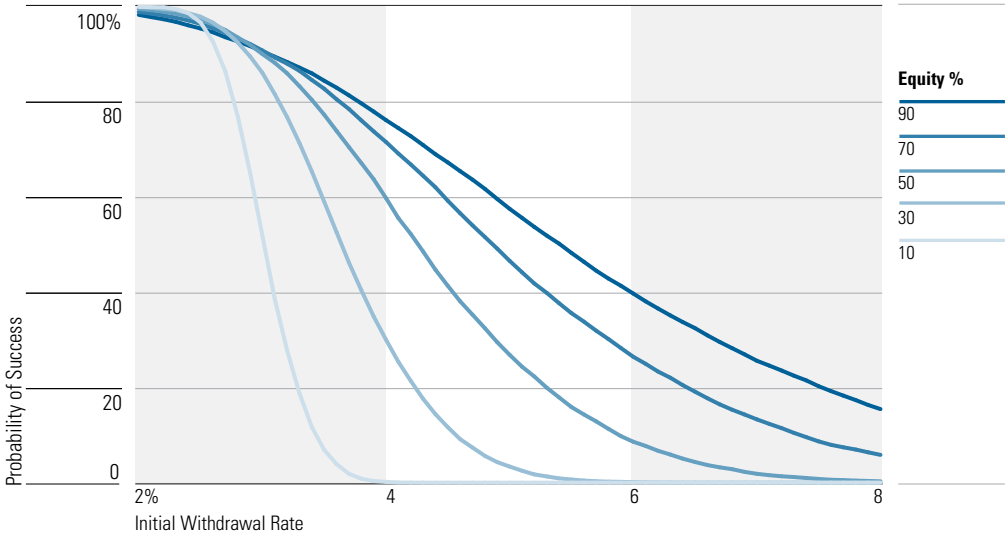
	Equity %					
	10	20	30	50	70	90
Japan Equity	5	10	15	25	30	40
International Equity ex Japan	5	10	15	25	40	50
Japan Bond	10	12	15	20	15	5
International Bond ex Japan	5	5	5	5	5	0
Japan Cash	75	63	50	25	10	5
Total	**100**	**100**	**100**	**100**	**100**	**100**
Nominal Annual Return	0.77	1.51	2.24	3.71	5.21	6.64
Nominal Annaul Standard Deviation	2.21	3.79	5.45	8.84	12.29	15.47
Real Annual Return	0.39	1.13	1.86	3.33	4.83	6.26
Real Annaul Standard Deviation	3.13	4.41	5.91	9.15	12.52	15.65

Source: Authors' calculations.

Hypothetical Simulations

Exhibit 13 includes information on the probability of success for various initial withdrawal rates based on different equity allocations (10% to 90% in 20-point increments), under the assumption that retirement lasts 30 years and a portfolio fee costs 1.00% per year.

Exhibit 13 Success Rates for Various Initial Withdrawal Rates and Portfolios (30-Year Retirement Period)

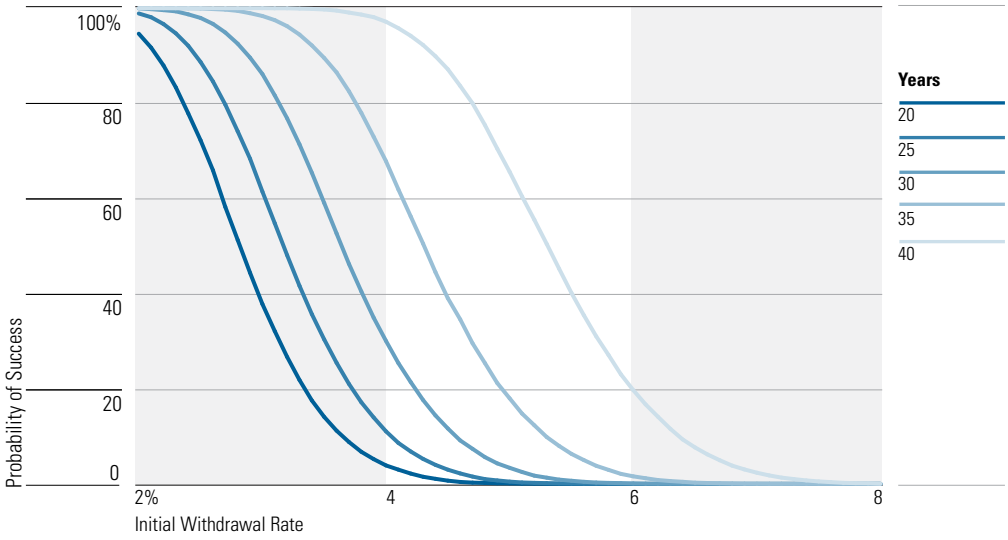


Source: Authors' calculations.

As shown in Exhibit 13, portfolios with higher allocations to equities have higher initial withdrawal rates but also tend to have more risk. Most retirees are uncomfortable taking excessive risk in their portfolios. Therefore, it's important to strike a good balance between the two.

Exhibit 14 includes information on the probability of success for various initial withdrawal rates based on different retirement periods, under the assumption that the portfolio is invested in 50% equities and 50% bonds. The chart illustrates the large impact the retirement period can have on the initial withdrawal rate, in particular the jump from 20 to 30 years. At the 80% probability level, increasing the retirement period from 20 to 30 years reduces the initial withdrawal rate by approximately 47% (5.0% to 3.4%). Similarly, the probability of success for a 4% initial withdrawal rate is 96% for a 20-year period, 60% for a 30-year period, and 31% for a 40-year period.

Exhibit 14 Success Rates for Various Initial Withdrawal Rates and Retirement Periods With 50% Equity



Source: Authors' calculations.

Exhibit 15 has been provided to include additional information about specific appropriate withdrawal rates for different portfolio allocations, retirement periods, and target success levels.

Exhibit 15 Withdrawal Rates by Portfolio Risk Level, Time Period, and Target Probability of Success Rate

Portfolio % / Probability of Success %	**Retirement Period** (Years) 20	25	30	35	40
10% Equities					
99	3.8	2.9	2.3	1.9	1.6
95	4.0	3.1	2.5	2.1	1.7
90	4.2	3.2	2.6	2.2	1.8
80	4.3	3.4	2.7	2.3	1.9
70	4.4	3.5	2.8	2.4	2.0
50	4.6	3.6	3.0	2.5	2.1
30% Equities					
99	3.7	2.8	2.3	1.9	1.6
95	4.1	3.2	2.6	2.2	1.9
90	4.3	3.4	2.8	2.4	2.1
80	4.6	3.7	3.1	2.6	2.3
70	4.9	3.9	3.3	2.8	2.5
50	5.3	4.3	3.6	3.1	2.8
50% Equities					
99	3.4	2.6	2.2	1.8	1.6
95	4.0	3.2	2.7	2.3	2.0
90	4.4	3.5	3.0	2.6	2.3
80	4.9	4.0	3.4	2.9	2.6
70	5.2	4.3	3.7	3.2	2.9
50	5.9	4.9	4.2	3.7	3.4

Portfolio % / Probability of Success %	**Retirement Period** (Years) 20	25	30	35	40
70% Equities					
99	3.0	2.3	1.9	1.7	1.4
95	3.8	3.1	2.6	2.3	2.0
90	4.4	3.5	3.0	2.6	2.4
80	5.0	4.1	3.6	3.2	2.9
70	5.5	4.6	4.0	3.6	3.3
50	6.4	5.4	4.8	4.4	4.1
90% Equities					
99	2.7	2.1	1.7	1.5	1.3
95	3.7	3.0	2.5	2.2	2.0
90	4.3	3.5	3.0	2.7	2.4
80	5.1	4.3	3.7	3.4	3.1
70	5.7	4.9	4.3	3.9	3.6
50	6.9	6.0	5.4	4.9	4.6

Source: Authors' calculations.

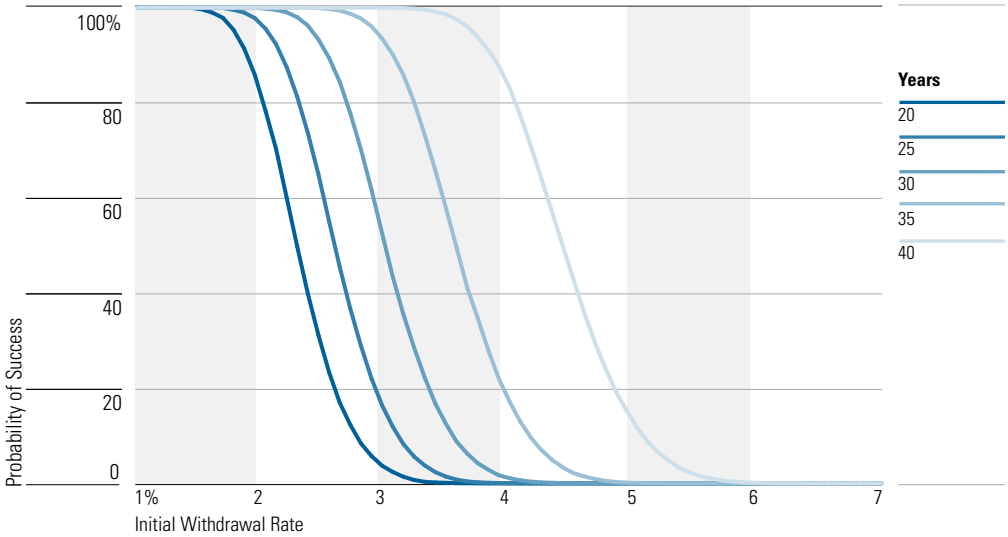
The initial savings required to fund retirement can be estimated by taking 1 divided by the target initial withdrawal rate. For example, if 4% is the assumed safe withdrawal rate, the initial savings required to fund the retirement income goal would be 25 times that income need (1/0.04=25). The initial withdrawal rates in Exhibit 25 differ significantly for the various portfolios. Longer retirement periods, higher probabilities of success, and more conservative portfolios tend to yield lower initial sustainable withdrawal rates.

For example, assuming a 50% equity portfolio and a 30-year retirement period, a 99% probability of success yields an initial sustainable withdrawal rate of 2.2% (1/0.022=45.5x multiple) versus an initial rate of 4.2% (1/0.042=23.8x multiple) for a 50% probability of success, which are significantly different levels of required savings. Overall, the results in Exhibit 15 suggest the actual level of required savings to fund retirement is a very personalized and complex decision where a financial advisor has the potential to add significant value.

Realistic Cases for Japan

Simulations in Exhibits 13 to 15 are hypothetical cases under assumptions of different asset allocations. Japanese individuals' personal assets are very conservatively invested with safe assets—50% in bank deposits and an additional 15% in insurance products. (See Exhibit B4 in Appendix B) Therefore, an asset allocation with 20% equity would be a more relevant and realistic assumption for a retiree who hopes to live in part off of savings.

Exhibit 16 Success Rates for Various Initial Withdrawal Rates and Retirement Periods (With 20% Equity)



Source: Authors' calculations.

Exhibit 17 Withdrawal Rates by Time Period, and Target Probability of Success Rate (With 20% Equity)

Portfolio % / Probability of Success %	**Retirement Period** (Years) 20	25	30	35	40
20% Equities					
99	3.8	2.9	2.4	1.9	1.6
95	4.1	3.2	2.6	2.2	1.9
90	4.3	3.4	2.7	2.3	2.0
80	4.5	3.6	2.9	2.5	2.1
70	4.7	3.7	3.1	2.6	2.3
50	4.9	3.9	3.3	2.8	2.4

Source: Authors' calculations.

Implications

How should retirees and financial advisors use this research? First, the assumed retirement period should vary by client. For instance, a 30-year time horizon is ideal for a hypothetical 65-year-old retiree who might expect to live to age 95. But based on the life tables, remaining life expectancy at age 65 is less than 30 years (approximately 21 years), so many will die with money unspent. Our simulations with retirement lasting over 30 years resulted in some relatively low safe initial withdrawal rates; however, it may be possible to hedge this longevity risk through annuitization (the pooling of longevity risk).

Most retirees will also not need to spend the same amount every year. For couples, the longer-lived member won't spend as much as a single-person household. Retirees generally decrease spending as they increasingly experience physical and mental limitations through retirement, although spending may rise later in life due to higher medical costs. In addition, most retirees are willing to cut spending a little when markets don't do as well if they can resume normal spending when markets recover. Incorporating variability into spending can increase the safe initial withdrawal rate significantly.

The probability of success is only one way to measure outcomes for a retiree. It fails to show the magnitude of the failures early in retirement, and it doesn't consider the security of retirees who live well beyond the 30-year (or other estimated) retirement period. By neglecting to consider the magnitude of failure, portfolio risk increases, leaving retirees vulnerable to adverse market events, particularly those early in retirement.

Japanese Retiree Household Income and Expenses

The Japanese government's Statistics Bureau conducts a survey of household income and consumption every five years. The most recent survey's data on the income and expense of the average household with two or more family members in age group 60 years or above are summarized in Exhibit 18. For example, a typical age 65-69 household has JPY 229,895 of monthly income, of which almost 80% comes from pension payments (mostly from DB plans). Monthly expenses amount to JPY 312,105, of which pension benefits cover 60% or more, resulting in a shortfall of JPY 82,210 that should be financed by personal savings.

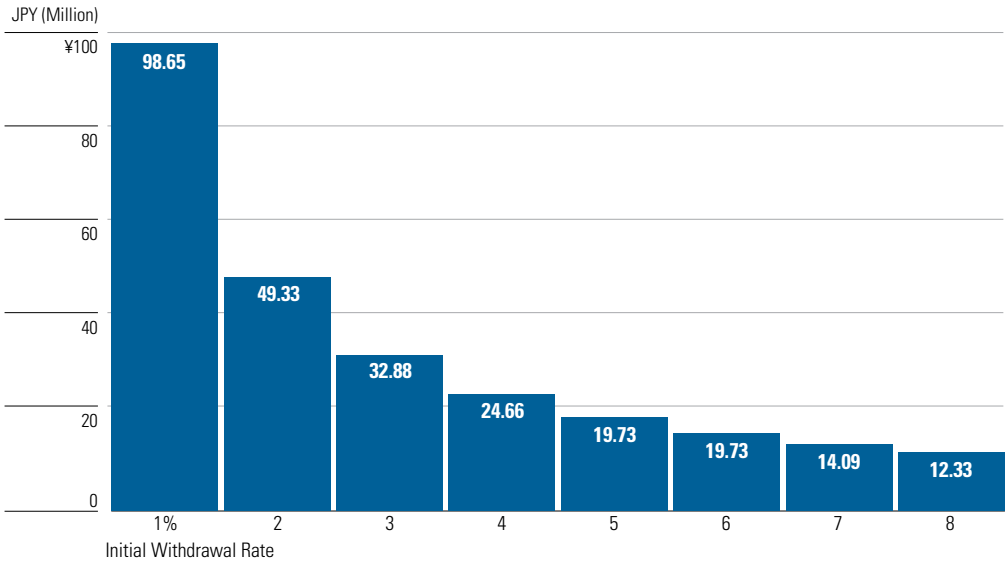
Exhibit 18 Withdrawal Required to Support Retiree's Household in Japan (JPY/month)

	Age Group			
	60-64	65-69	70–74	75+
Income				
Miscellaneous Income	56,253	47,208	27,958	24,343
Social Welfare (Pension)	117,001	182,687	181,257	185,942
Total	**173,254**	**229,895**	**209,215**	**210,285**
Expense				
Consumption	276,620	275,872	248,122	227,266
Non-consumption	31,264	36,233	29,782	28,565
Total	**307,884**	**312,105**	**277,904**	**255,831**
Income–Expense	–134,630	–82,210	–68,689	–45,546
Pension				
% of Income	68%	79%	87%	88%
Covers % of Expenses	38%	59%	65%	73%
Number of Family Members	2.59	2.51	2.40	2.36
% of House Ownership	93.3%	93.2%	92.4%	92.7%

Source: Statistics Bureau, Ministry of Internal Affairs and Communications, "2014 National Survey of Family Income and Expenditure". http://www.stat.go.jp/data/kakei/

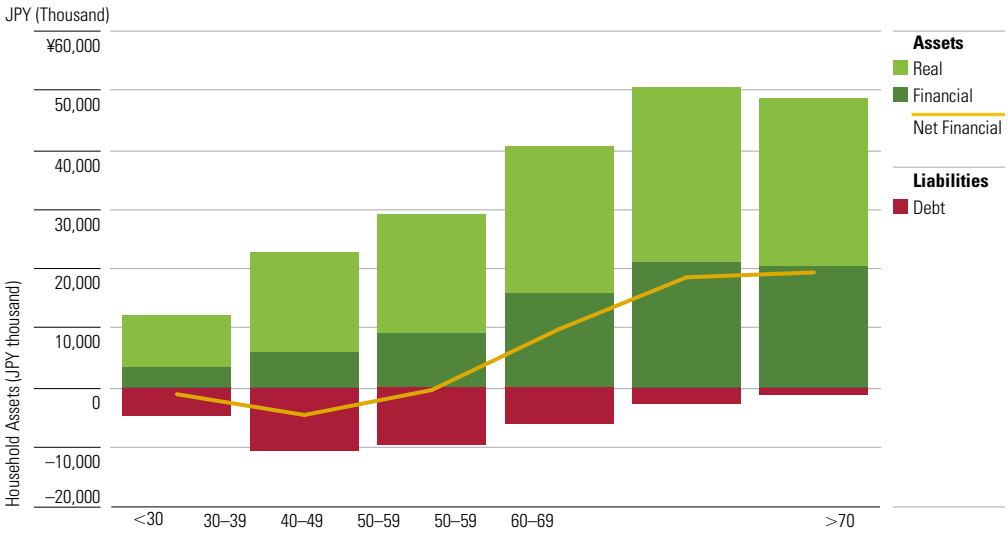
If a household of retirees faces a monthly shortfall of JPY 82,210 in age group 65-69, we can calculate the target savings needed at age 65. Exhibit 19 shows the required amount at various initial withdrawal rates. For example, if one's safe withdrawal rate is 3% for the next 30 years in retirement, financial assets must be approximately JPY 33 million at age 65. This is the target amount one should try to accumulate during his/her working years through savings and investments.

Exhibit 19 Target Amount at Age 65



Source: Authors' calculations.

Exhibit 20 Assets and Liabilities of Households by Age Group



Source: Statistics Bureau, Ministry of Internal Affairs and Communications, http://www.e-stat.go.jp

Is this target amount realistic? Using data from the same Statistics Bureau survey, Exhibit 20 shows assets and liability of households by age group. For age groups over 60, the average household had JPY 20 million as financial assets and JPY 30 million of real assets (mostly residential houses).

If the target amount is JPY 33 million as demonstrated in Exhibit 19, savings at age 65 is not sufficient. An additional JPY 13 million is required. How can one make up this shortfall? Isn't it too late to build additional financial assets?

There are number of possible options. One is to monetize owned real assets, either by selling the house or making a reverse mortgage arrangement with a bank. Another is to reduce living expenses to make up for the shortfall. As Exhibit 18 shows, monthly expenses decline as one gets older, and the monthly shortfall becomes less than that initially experienced at age 65.

To prevent finding a likely shortfall just before retirement, it is strongly recommended to start investing early in one's life, gradually and consistently saving toward a target, and convert a part of savings invested in zero-rate assets into stocks and investment trusts for higher returns.

4. Conclusions

This paper provides a relatively comprehensive overview of safe withdrawal rates for retirees based on both historical returns and forward-looking returns. Overall these findings suggest that financial advisors and retirees in Japan should use lower initial safe withdrawal rates than noted in prior research—the lower end of the range now starts toward 2.5% or 3.0% and not the previous 4.0%. The generous capital market returns of the prior century that bolstered a comfortable and long-lasting retirement portfolio may lead to withdrawal assumptions that would give 21st-century retirees a false sense of security. We need to plan for retirement looking realistically to the future, not the past; that leads us to using valuation-implied returns instead of long-run historical data when estimating future returns.

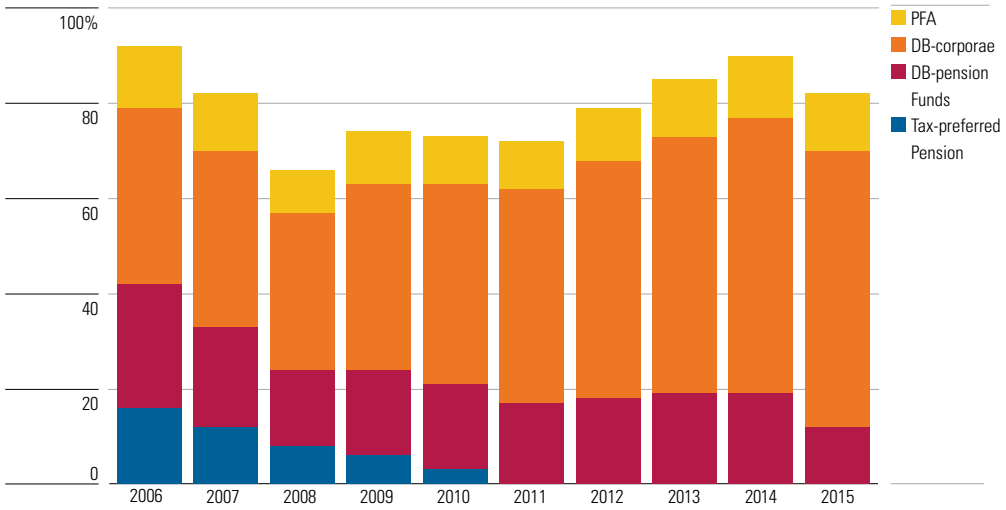
This paper also shows how probability of success can be used to understand potential retirement outcomes. While expected returns are a midpoint operating at the 50% probability of success, our definition of "safe withdrawal" has been calculated in the range of 70% to 99% success. Helping retirees understand the certainty of retirement incomes in this context is an important step to better meeting expectations.

This analysis provides a useful framework to consider the question of retirement spending, but it also highlights the importance of understanding the specific needs and preferences of a retiree in framing investment objectives. Sufficient saving remains the most crucial step toward a successful retirement. This paper may also be used to help people approaching retirement estimate the savings needed for the retirement they desire.

Appendix A: Aggregate Size of Japanese DB and DC Pensions

Corporate plan types have changed over the years. The legacy Tax-Preferred Pension plans for smaller private firms have been gradually terminated and replaced by newly introduced corporate DB plans or switched to corporate-sponsored DC plans. The corporate DB sector includes Pension Fund Association (PFA), which is a quasi-government public entity responsible for managing pension funds for employees who retire early and exit from a private corporate plan.

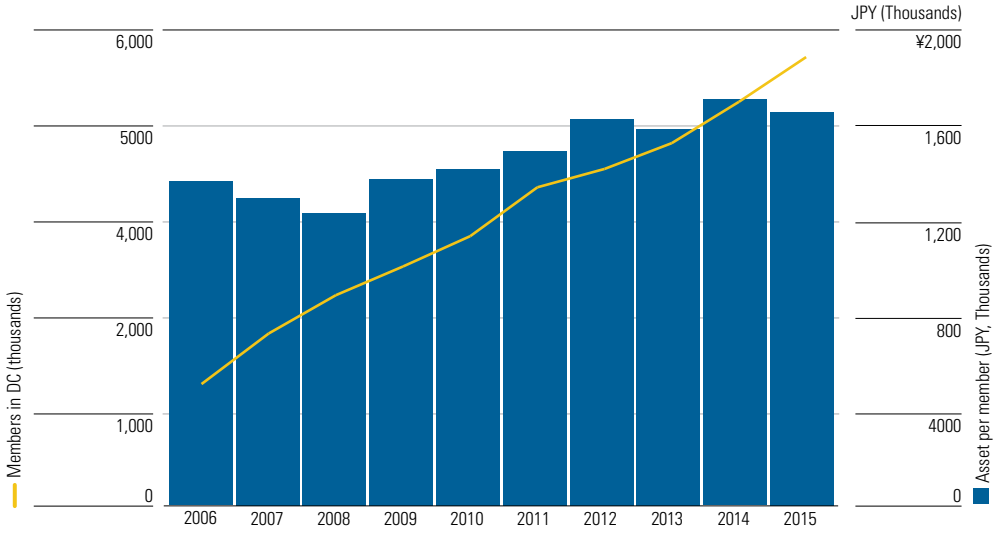
Exhibit A1 Defined Benefit Pension Assets Ex-National Pension



Source: Pension Fund Association.

While the aggregate asset size of DC plans is still small compared to DB plans, Exhibit A2 shows that DC membership has grown consistently to covering 5.8 million members as of March, 2016. However, average DC assets per member has grown only modestly because new members start their account with small monthly contributions and most of their assets are kept in safe assets (see Exhibit B3 in Appendix B) and grow slowly.

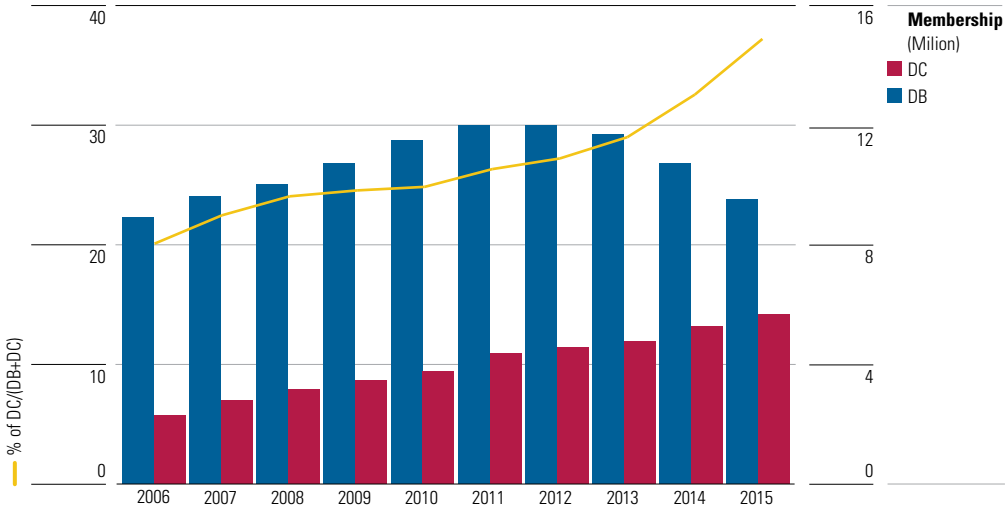
Exhibit A2 DC Assets per Member: 2006-2007



Source: Pension Fund Association.

On the other hand, membership in traditional DB plans has declined from its peak of 12 million in 2011/12 to less than 10 million in 2015. Many corporations have terminated DB plans and replace them with DC plans. As a result, the ratio of DC members to all members (excluding the National Pension) in DB and DC has steadily increased to 37% as of 2015.

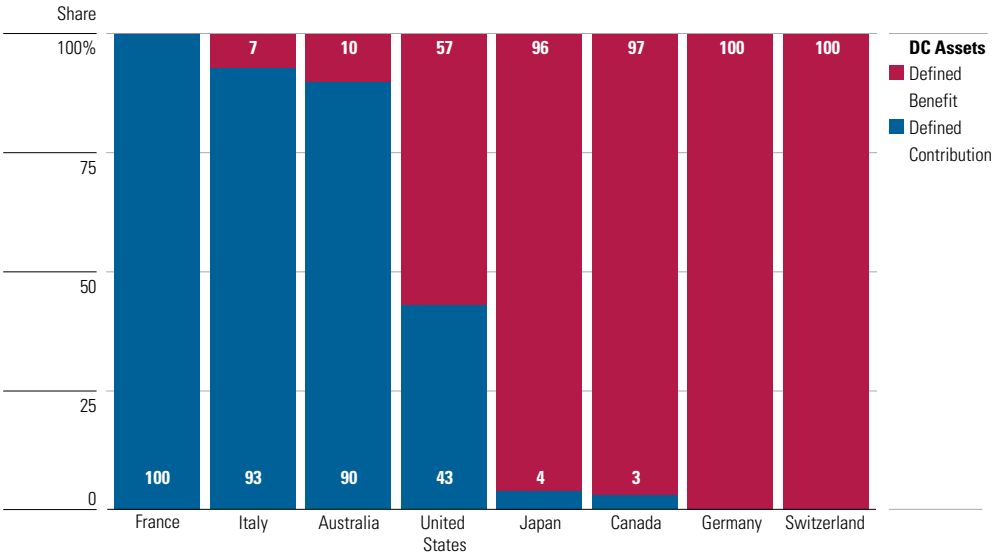
Exhibit A3 Membership in Japanese DB and DC Plans: 2006—2015, Excluding National Pension System



Source: Pension Fund Association.

Comparing asset sizes of aggregate DB and DC plans among major countries, Japan's relative size of its DC market (at 4%) is about the same as Canada's, at 3%. As Exhibit 11 shows, this is far lower than the percentage of assets in other countries with DC plans like the U.S., where DC assets account for 43% of retirement assets.

Exhibit A4 Share of Retirement Funding Scheme (DC vs DB), by Country



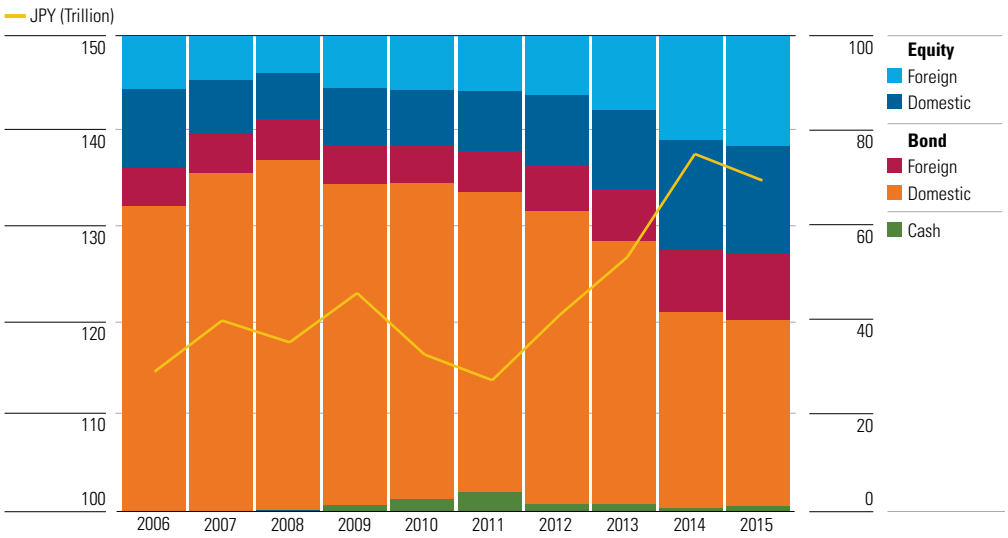
Source: OECD Global Pension Statistics, PFA, GPIF.

Appendix B: Asset Allocation of Japanese DB, DC, and Personal Financial Assets

Retirement income is financed by four sources: (1) government-sponsored DB; (2) corporate-sponsored DB; (3) corporate or individual DC; and (4) personal savings and investments by individuals. Asset allocation in each of these four sources determines the characteristics of funds available for withdrawals.

The government-sponsored DB fund had been traditionally "conservatively" managed by GPIF, investing almost 70% in domestic bonds—most of which were Japanese government bonds. Due to low interest rates, GPIF changed its policy asset allocation to increase its equity position and diversify to international bonds and equities. Domestic bonds have gradually declined to 40% by FY2015 (March 2016).

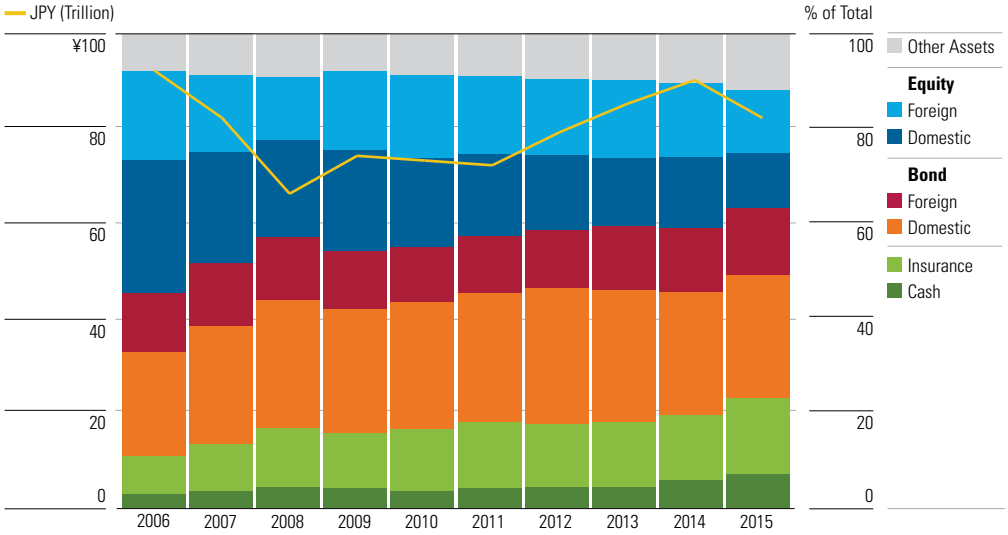
Exhibit B1 GPIF's Asset Allocation and Total Assets



Source: Government Pension Investment Fund.

Corporate DB plans have maintained asset allocation in stable composition over the last decade. Safe assets (cash, insurance, domestic bonds) account for 50% of total assets. Risky assets are diversified among foreign bonds, domestic and foreign stocks, and other assets, including alternatives.

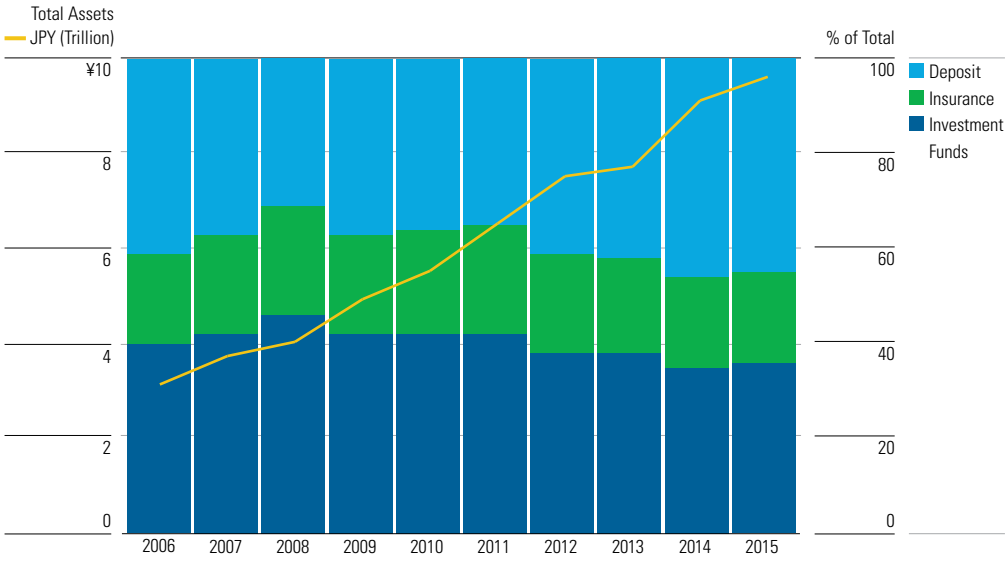
Exhibit B2 Corporate DB Asset Allocation and Total Assets



Source: Pension Fund Association.

DC accounts are not effectively invested by members. More than 50% of assets are held in safe assets such as bank deposits and insurance products. As many DC members do not know how to select funds or do not have any interest in investing, their retirement contributions are automatically directed to "default" financial products, which are typically bank deposits or insurance contracts. Even though a balanced fund or target-date fund may be used as a default product, few DC plans currently adopt such a policy. (Exhibit B3 is based on statistics for corporate-sponsored DC plans, which account for almost 90% of total DC assets.)

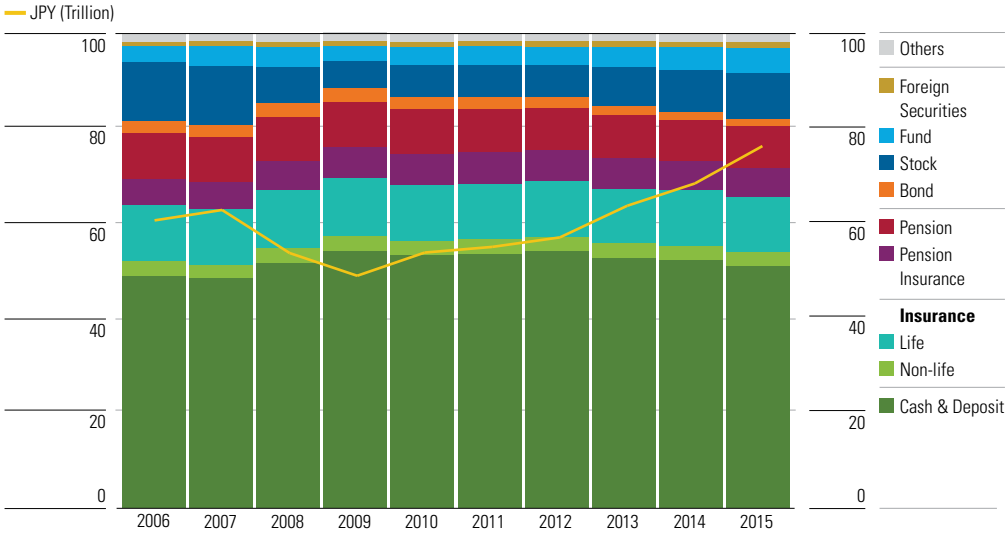
Exhibit B3 DC Accounts Asset Allocation and Total Assets



Source: Ministry of Health, Labor and Welfare, Pension Fund Association.

Personal financial assets are held 50% in bank accounts and 15% in insurance products. In addition, pension insurance entitlements account for 15%. Only 20% remains invested in stocks and investment trust funds (mutual funds).

Exhibit B4 Personal Financial Assets Allocation

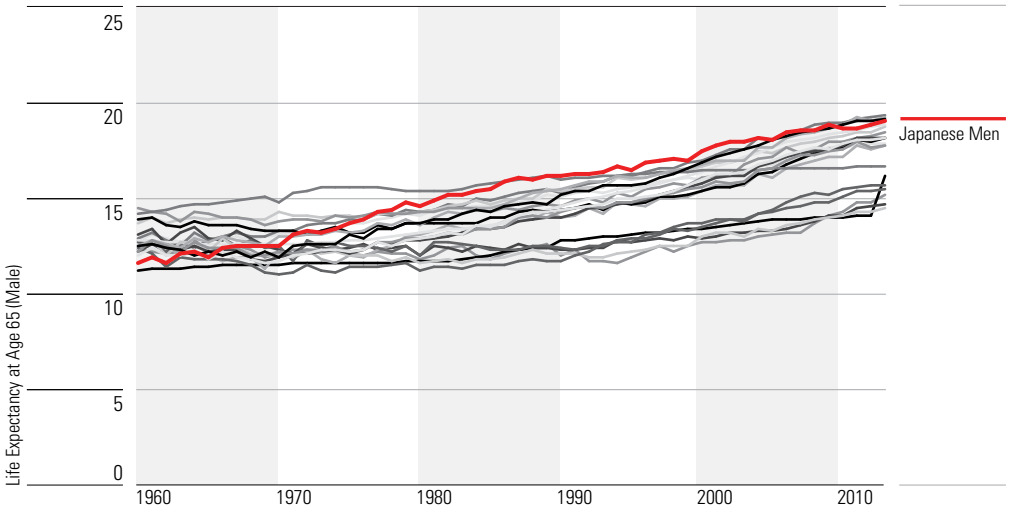


Source: Bank of Japan, Flow of Funds.

Appendix C: Aging Japanese Population

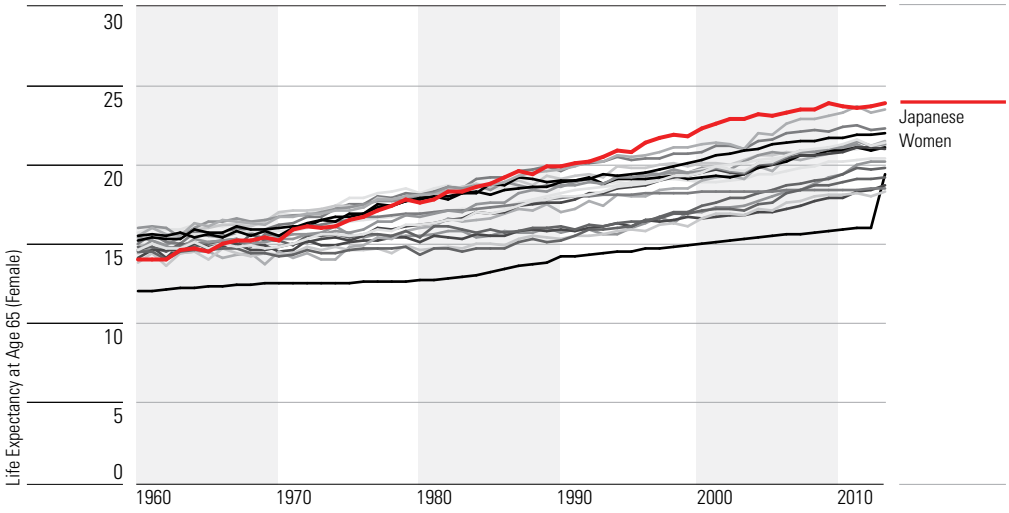
Exhibit C1 includes information about how life expectancy for someone who is 65 years old has changed in Japan from 1960 to 2013. These changes are compared to other OECD countries for which data is available over the entire period. Life expectancies have increased by 7.5 years for men and 9.9 years for women. In 2013, life expectancy for a 65-year-old was 19.1 years and 24.0 years for a man and woman, respectively.

Exhibit C1 Life Expectancies in Japan Versus Other OECD Countries: 1960-2013
Panel A: 65-Year-Old Man



Source: OECD.

Exhibit C1 Life Expectancies in Japan Versus Other OECD Countries: 1960-2013
Panel A: 65-Year-Old Woman



Source: OECD.

What perhaps is most striking about the values in Exhibit C1 is the relative change across the other countries. In 1960, Japanese life expectancies were well below average of other OECD countries; however, over time life expectancies significantly improved to the point that Japan is at or near the top for both men and women in the OECD. In fact, according to the World Health Organization, Japan had the highest life expectancies in the world. This has incredibly important implications when estimating the cost of retirement, because as retirement grows longer it gets more expensive.

Due to aging and a low birth rate, Japan's population structure by age group is no longer shaped as "pyramid" (Exhibit C2). As of 2014, people over 65 years old made up 26% of the entire population, while those under 19 were 17.5% of the population. Those two groups depend on the working population, at 56.5%, to support the lives of senior citizens and children. As the baby boomers are now retiring to join senior citizens supported by pension systems, they must find ways to fill the gap between living costs and pension payments.

This population structure is threating the sustainability of the National Pension that has been maintained as a "pay-as-you-go" system. Fewer working-age people (20 – 64 years old) must support more retirees (above 65 years old) in the future. Some economists worry that Japan's National Pension system might not be sustainable, despite government assurances that it is well sustainable for another 100 years. We do not have enough evidence to support either of those opposing projections.

However, it is apparent that current pension system is outdated because it was originally designed when the longevity of Japanese people was much shorter, as shown in Exhibit C1. There are a few alternative plans to cope with this challenge. One is to gradually push back the starting date of pension payment from 65 years old. Another is to reduce pension payments across all beneficiaries. Neither of these plans is easy to implement for political reasons.

Exhibit C2 "The Distorted Japanese Population Pyramid: Population by Age (2014)

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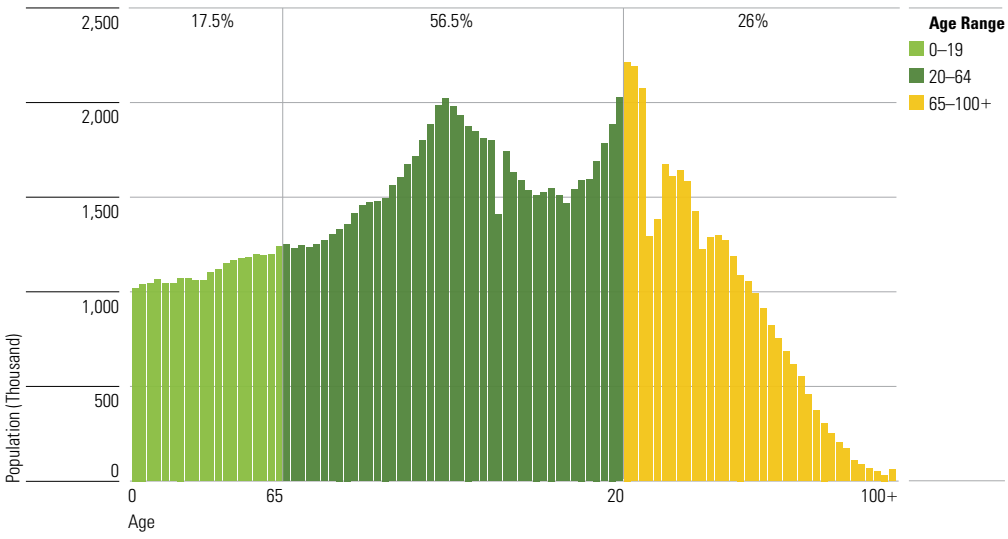

Source: National Institute of Population and Social Security Research.

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