Dimensional's Solutions for Effective Retirement Planning

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Two key elements of striving toward a successful retirement are for plan sponsors, advisors, consultants, and plan participants to have access to (1) low-cost investment solutions that manage the right risks and balance the tradeoff between growth and risk management, and (2) meaningful information to facilitate decision making. Relevant information about expected retirement spending ("consumption") allows plan sponsors to more effectively implement default savings rates, auto-escalation procedures, and communication initiatives to help improve the retirement readiness of plan participants. In addition, we believe plan sponsors, advisors, and consultants can use tools such as Dimensional's My Retirement Income Calculator to prepare plan reports that include individualized information concerning the retirement readiness of their participants.

Plan sponsors can also provide ongoing resources that help participants evaluate the effect of their decisions on expected outcomes. Participants need to determine when to retire and the level of consumption they may need in retirement. To make these decisions, participants need to know the estimated amount of consumption they can expect from their account balance and future contributions. They also need the degree of uncertainty around those expectations. Armed with this information, plan participants can decide how much to save, when to retire, and how much to consume in retirement. Research shows that providing information to plan participants about the effect of their own choices on expected outcomes helps them make better decisions (EBRI 2014,[1] Levi 2014,[2] Goda et al. 2014[3]). Research also shows that failing to plan properly can lead to costly mistakes in terms of early withdrawals or penalties (Argento et. al. 2013[4]).

There is one important caveat: This type of information is only meaningful if the underlying investment solution manages the right risks and balances the tradeoff for the consumption goal. The risks to be managed are the risks that can affect the level of future retirement consumption that is sustainable with a given level of wealth. The right tradeoff is between the opportunity of asset growth and

1. How Would Defined Contribution Participants React to Lifetime Income Illustrations? Evidence from the 2014 Retirement Confidence Survey, *EBRI Notes*, March 2014. Survey funded in part and underwritten by Dimensional Fund Advisors.
2. Information Architecture and Intertemporal Choice: A Randomized Field Experiment in the United States.
3. What will my account really be worth? Experimental evidence on how retirement income projections affect saving. *Journal of Public Economics* 28, August 2014.
4. Early Withdrawals from Retirement Accounts During the Great Recession, Argento, Robert, Bryant, Victoria L., Sabelhaus, John. www.federalreserve.gov/pubs/feds/2013/201322/201322abs.html.

consumption risk management. Estimates of how much retirement consumption your account balance can sustain are not helpful without the right risk management, since you have no confidence in your ability to achieve that level of consumption when you retire. In our analysis, we assume a plan participant can invest in a solution that manages market, counterparty, inflation, and interest rate risks. By managing these risks, the uncertainty about retirement consumption can be reduced. This means the solution has to have a risk management investment matched to the participant's desired retirement date.

We believe that with the right goal and risk management framework, a retirement solution is more likely to seamlessly transition from accumulation to retirement, when assets will be used to provide real (inflation-adjusted) consumption.

DIMENSIONAL'S MY RETIREMENT INCOME CALCULATOR AND ITS BENEFITS

The Dimensional My Retirement Income Calculator provides perspective on an individual's expected retirement outcome by assessing an investor's ability to fund future retirement consumption goals with his/her savings. By using market data to estimate the future cost of a consumption stream, the calculator allows plan sponsors, advisors, consultants, and plan participants to estimate the ability of today's balance and contribution rate to support future retirement consumption.

It is important to consider current balance and contributions in terms of future consumption. The calculator provides participants the ability to see how present and future consumption are related. For financial planning purposes,

Exhibit 1 Dimensional's My Retirement Income Calculator: A Hypothetical 35-Year-Old
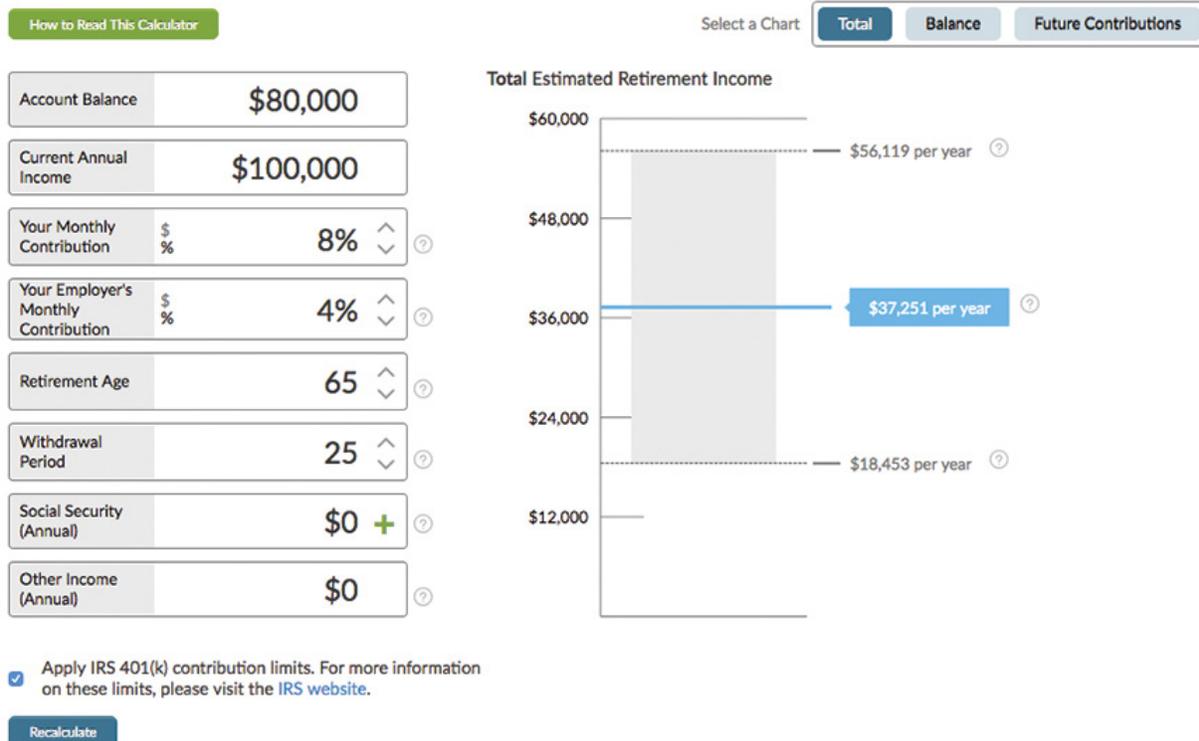
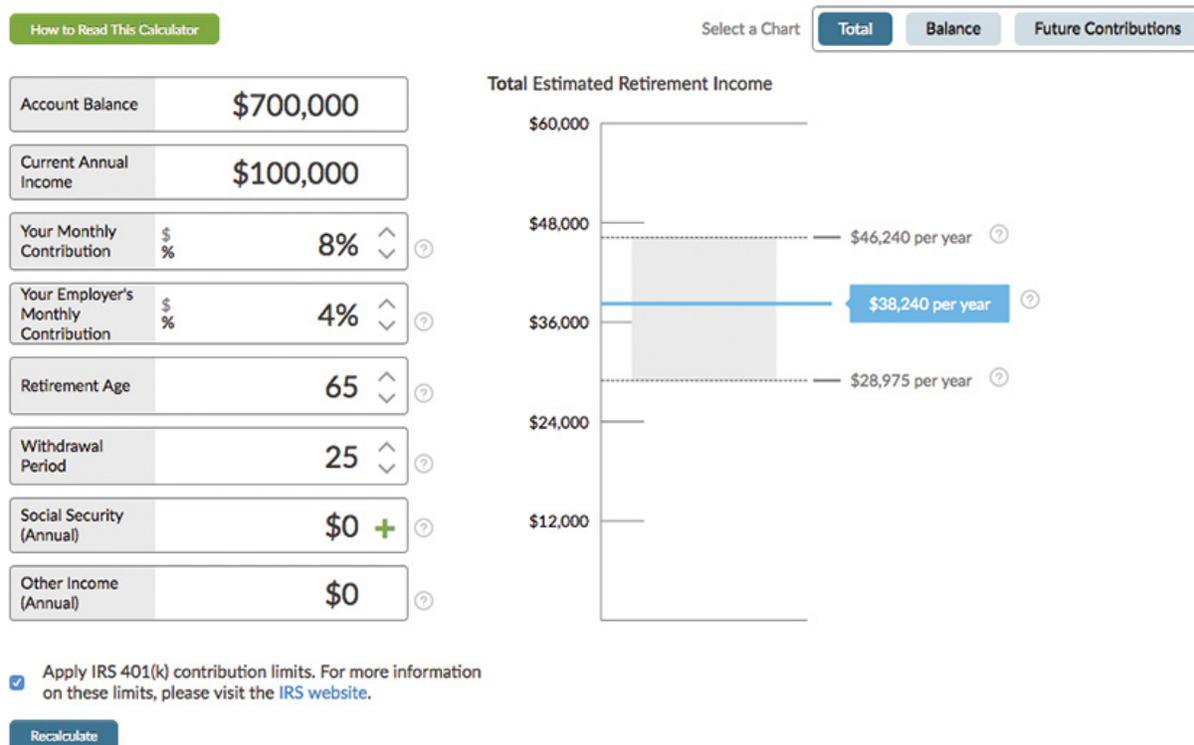*As of March 31, 2016. For illustrative purposes only.*

we believe this is a better comparison and can be more meaningful for a person's financial decisions.

One reason participants may have low savings rates is that while they understand the opportunity cost of a dollar saved today, they cannot easily quantify the benefit of that dollar for retirement (see Bernheim et al. 2011,[5] Choi et al. 2012,[6] and Levi 2014).

Exhibit 1 shows a simple example of a 35-year-old plan participant with an income of $100,000, an 8% savings rate, and an employer contribution of 4%, bringing her total savings per year to $12,000. She has a current balance of $80,000. These saving behaviors are estimated to yield, starting at age 65, $37,251 per year (expected median income at retirement) for a withdrawal period of 25 years.[7]

To estimate the effect of uncertain market returns, the calculator shows an uncertainty around the estimated median income. The upper level is an estimate of the 75th percentile of projected income (if market returns are greater than expected), while the lower level is an estimate of the 10th percentile of projected income (to give participants an estimate of the tail risk they may face in case of poor market performance). Participants further from retirement may see much larger uncertainty in those projections because they are likely to have a greater allocation to growth assets. Such assets increase their exposure to equity markets and do not seek to hedge the potential impact of future interest rate movements or inflation on their projected income. The range between the upper and lower estimate helps reflect these sources of uncertainty. Exhibit 1 shows that the range of the uncertainty band is wide (approximately 100% of the median estimate),

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Exhibit 2 An Example Participant at Age 60

As of March 31, 2016. For illustrative purposes only.

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5. Bernheim, B. Douglas, Andrey Fradkin, and Igor Popov 2011. "The Welfare Economics of Default Options: A Theoretical and Empirical Analysis of 401(k) Plans." NBER Working Paper 17587. National Bureau of Economic Research.

6. Choi, James J., Emily Haisley, Jennifer Kurkoski, and Cade Massey. 2012. "Small Cues Change Savings Choices." NBER Working Paper 17843. National Bureau of Economic Research.

7. See Appendix for methodology detail and assumptions.

highlighting the fact that many potential market outcomes are possible over a 30-year period. The median can serve as an indicator of whether participants are on track with their goals, and, if properly monitored, the median estimate can help participants stay on track.

The participant in our example shows an estimated median replacement rate of 37% of the final salary of $100,000. Adding a Social Security estimate of approximately $27,000 (which the calculator can incorporate using the amount estimated from the Social Security Administration's calculator), the overall replacement rate is 64%.[8] Participants can use these calculations to see if they are on track for their own replacement rate. Adjustments to contribution amounts in the calculator (from the employee or employer) can help participants consider the impact of adjustments to their savings plan.[9]

Exhibit 2 shows a 60-year-old participant with an account balance of $700,000. Contributions are still 8% and 4% (employee and employer contribution, respectively). The median income estimate is $38,240, very similar to the median in Exhibit 1. We can think of this example as the participant in Exhibit 1 at age 60 with an additional 25 years of savings and an accumulated balance of $700,000. Since most of the invested assets are focused on investments that seek to manage the risks relevant to retirement income, the range of outcomes has substantially narrowed to within 45% of the median estimate.

If the example participant retires at 65 with an account balance of $860,000, this balance yields a median income of $37,286, on track with previous estimates. At this stage, the range of uncertainty is within 29% of the median.

As retirement approaches, the participant is assumed to have an increasing allocation to inflation-protected bonds. This strategy is designed to manage the uncertainty around how much retirement consumption the participant can afford from his or her savings. Because of this, the range around the median retirement consumption estimate narrows. Why?
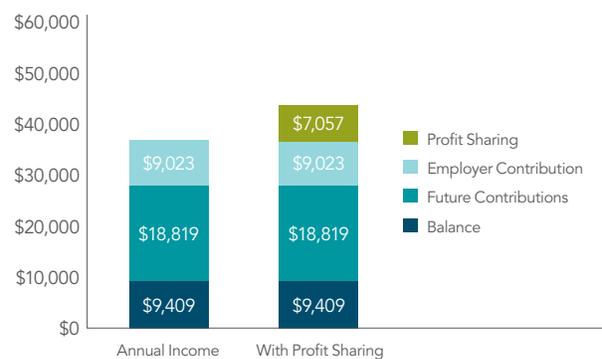
The assumed asset allocation is less exposed to equity risk and seeks to hedge the effects that future interest rate changes or inflation can have on expected retirement consumption. This approach to risk management also implies the retirement consumption estimates can depend more on market data and less on assumptions about expected global equity and bond returns as retirement approaches.[10]

Having the right risk management is crucial to striving toward a successful outcome since retirees need confidence about the level of consumption they can afford in retirement. In some cases, these constraints are especially binding, such as workers with mandated retirement ages or health issues. The framework provided by the calculator gives participants the tools and information needed to calibrate their retirement expectations.

PLAN DESIGN CONSIDERATIONS

Dimensional's My Retirement Income Calculator is also useful for taking a bottom-up approach to retirement planning in that it can be used to break down the estimated retirement income by different sources of savings. In **Exhibit 3**, we can look at how the carried balance, employee contributions, and employer contributions work to create a combined retirement income for the participant.

Exhibit 3: Sources of Projected Retirement Income Estimates for an Example Participant

Legend: Profit Sharing, Employer Contribution, Future Contributions, Balance

	Annual Income	With Profit Sharing
Profit Sharing		$7,057
Employer Contribution	$9,023	$9,023
Future Contributions	$18,819	$18,819
Balance	$9,409	$9,409

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8. The Social Security quick calculator can be accessed at www.ssa.gov/oact/quickcalc/.

9. As an additional help to plan for their goals, the calculator allows the breakdown of income estimates into its component pieces: estimated income from current account balance and estimated income from future contributions.

10. Assumptions about expected growth and expected volatility of the consumption growth assets are needed to make projections. With a longer time to retirement and a greater fraction devoted to growth assets, the estimates are relatively more sensitive to assumptions made. Closer to retirement, a greater fraction is devoted to risk management assets; income estimates from this allocation use market interest rates. See Appendix for methodological details.

These calculations show that the employer contribution accounts for over 25% of the estimated median income for our 35-year-old example participant.

Plan sponsors, advisors, and consultants can also use the calculator to evaluate the effect of plan changes on expected outcomes. As an example, Exhibit 3 shows the potential impact for the 35-year-old participant if the employer decided to provide additional support by implementing a profit-sharing program at around 3% of employee salary. Applying the 3% contribution to the calculator adds about $7,000 per year in retirement, bringing the replacement rate to around 44% before accounting for Social Security. These are tangible impacts that a plan sponsor, conscious of their employee retirement needs, can turn to for the purpose of designing or calibrating their plan to best fit their employee's needs.

CONCLUSIONS

Dimensional's My Retirement Income Calculator provides an innovative and intuitive approach for examining and planning for retirement. By integrating projected retirement income estimates with an appropriately relevant risk management framework, the calculator can provide investors with a retirement planning tool designed to help them monitor and track progress toward retirement readiness. By assuming investments in a combination of growth assets (equities and global bonds) and consumption risk-management assets (inflation-protected bonds matched to a target retirement date), the projections can give plan participants insight about the level of retirement consumption that their savings may support. We believe participants will find this information more useful than a simple account balance on their quarterly statement.

Plan sponsors, advisors, and consultants can use the calculator to design plans that help estimate the effect of changing the design of the employer contribution, auto-enrollment, and auto-escalation features and assessing the retirement readiness of their employees. This valuable information can help plan sponsors to improve participant outcomes and to communicate the entire value of the plan to their employees.

APPENDIX
Key Assumptions

Estimated retirement income projections are based on assumptions about returns using current and historical data, and income is generated through drawing down principal. The My Retirement Income Calculator ("the calculator") uses current interest rates on Treasury Inflation-Protected Securities (TIPS), expected to be updated quarterly. Global Equities are assumed to have a 5% expected real return with a 20% annual standard deviation, and Global Bonds are assumed to have a 1% expected real return with a 5% annual standard deviation. The covariance between Global Equities and Global Bonds is assumed to be zero. (Covariance measures how two asset classes move together.) These assumptions are net of expenses, which are assumed to be 0.30% annually. Annual expected returns are presented in excess of inflation and will be reviewed periodically.

The calculator uses the retirement year to select the appropriate corresponding asset allocation. The asset allocation shifts over time, with a larger portion of assets assumed to be invested in inflation-protected bonds as the retirement year approaches (see **Table 1** below for details).

Table 1: Assumed Asset Allocation by Years to Retirement

Years to Retirement	Global Equities	Global Bonds	Inflation-Protected Bonds
>25	95%	5%	0%
25	92%	8%	0%
20	79%	21%	0%
15	65%	16%	19%
10	52%	11%	38%
5	38%	5%	56%
Retirement year to 10 years post retirement	25%	0%	75%
>=15	20%	0%	80%

Percentages may not add to 100% due to rounding.

For example, if the computed retirement year is 2045, the calculator will select an asset allocation similar to the point in the table that corresponds with the number of years until 2045. The user's current age and retirement age (default of 65) are used to compute a retirement year. If the computed number of years until retirement falls between the five-year increments listed below, a blended allocation of the two nearest increments is used.

These assumptions are used to compute expected future wealth assuming a lognormal distribution of returns. The lognormal distribution is a standard statistical distribution used to represent outcomes from a random process and is commonly used to represent the distribution of returns. Estimated future wealth is divided by the estimated cost of $1 of inflation-adjusted income for the length of a user's withdrawal period. The cost of $1 of annual inflation-adjusted income during retirement is estimated using current interest rates on TIPS.

Using this methodology, we calculate two estimated distributions of income, one from a user's current account balance and the other from future contributions. The estimated retirement income projection from the current balance illustrates the expected income from a user's current account balance (meaning no additional future contributions are considered). The estimated retirement income projection from future contributions illustrates the expected income from future savings until retirement. It considers your total annual contribution and assumes the same amount (adjusted for inflation) is contributed each year until you retire.

The resulting estimated distributions of income, approximated by a lognormal distribution, are used to compute the median value of estimated retirement income, the 10th percentile of estimated retirement income, and the 75th percentile of estimated retirement income from the current balance and from future contributions. The median of a distribution represents the amount at which half of the expected outcomes are greater than the amount and half of the expected outcomes are lower than that amount. The 75th percentile of a distribution represents the amount at which 25% (or one out of every four) of the expected outcomes are larger than or equal to that amount. The 10th percentile of a distribution represents the amount at which 90% (or nine out of every 10) of the expected outcomes are larger than or equal to that amount.

The total value of the estimated retirement income projection is the sum of the estimated retirement income projections from the current balance and future contributions entered by the user. Taxes, penalties, and other fees or expenses that may be due upon withdrawal are not considered. The estimate is presented in today's dollars. For years past the retirement date, contributions are assumed to be zero, and the total projected retirement income shown represents the income that can be expected from a user's current account balance over the remaining withdrawal period.

Prior to the retirement year, the default withdrawal period is 25 years and can be adjusted by the user. After the retirement year, the default withdrawal period is 25 years minus the number of years since the retirement year and can be adjusted by the user. If the user adjusts the withdrawal period, the estimated retirement income projection is proportionally adjusted to account for the new number of withdrawals.

No representation or warranty is made as to the reasonableness of the assumptions or that all assumptions used in achieving the returns have been stated or fully considered. Changes in the assumptions may have a material impact on the estimated retirement income projections presented.

The assumptions are subject to change as subsequent conditions vary. Assumptions used for the estimated retirement income projections are subject to high levels of uncertainty regarding future economic and market factors that may affect actual future performance. There is no guarantee that these assumptions will be achieved, and actual returns or retirement income could be significantly higher or lower than those shown. These assumptions should not be relied upon as a forecast or prediction of future events, and they should not be construed as guarantees of returns that may be realized in the future from any asset class described herein.

Material Limitations

Because of the inherent limitations associated with the use of illustrative asset allocations based on the above assumptions, investors should not rely on the information shown in the My Retirement Income Calculator when making an investment decision. The illustrative retirement income projections cannot account for the impact that economic, market, and other factors may have on an actual investment portfolio. Unlike actual portfolios, the projections shown in the My Retirement Income Calculator do not reflect actual trading, liquidity constraints, fees, expenses, taxes, and other factors that could impact an investor's realized future returns and retirement income.

The estimated retirement income projections are hypothetical in nature and are not a guarantee of future results. Since past performance is not an accurate predictor of the future and reliance on historical and current data involves inherent limitations, you must understand that the estimates are only a tool to be used in evaluating your retirement portfolio. Actual results will vary.

Investments in stocks and bonds are subject to risk of economic, political, and issuer-specific events that cause the value of these securities to fluctuate. International investments are subject to additional risks such as currency fluctuation, political instability, and adverse economic conditions. The estimated retirement income projections are based on hypothetical investments in global equities, global bonds, and Treasury Inflation-Protected Securities. Other investments not considered may have characteristics similar or superior to those being analyzed.

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