Meeting The Global Retirement Funding Challenge
A Next-Generation Solution for the Future

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Global Challenges to Funding Retirement

Sources of potential non-sustainability of current retirement funding systems

• Shifting demographics: populations aging rapidly
• Increasing longevity: population living longer
• Economy shift from rural agriculture toward city industrial
• Legacy of large unfunded liabilities of define-benefit and pay-as-you-go pension plans from inadequate contributions and overly optimistic return-earning
• Contribution and balance sheet risks too great for plan sponsors
• Traditional role of defined-contribution plans ("DC") was supplemental and not for core retirement funding
Improving the Chances for a Good Retirement

Only four ways to improve the chances for achieving a good retirement

• Save more for retirement and lower lifetime consumption level
• Work longer before retiring
• Take more risk and be prepared for the consequences if the risk is realized
• Improve the income benefits from the assets that are already available to retiree
  − Annuities, including “tail-insurance” for longevity risk
  − Reverse mortgage
  − Goal-based investment strategies, as practiced in defined-benefit pension funds
  − Redesign employer contribution schedule to reduce interest rate risk to participants, keeping fixed the contribution cost
What is a Good Retirement Goal?

“An inflation-protected income for life that allows you to sustain the standard of living you enjoyed in the latter part of your working life.”
How Can We Achieve That?

Key Design Principles for a DC Solution

1. Set replacement income as the goal for retirement

2. Offer robust, scalable, low-cost investment strategies

3. Determine strategy taking into account all dedicated-to-retirement assets

4. Measure shortfall risk by income volatility -- not wealth volatility

5. Customize goals based on salary, age, gender & assets
6. Adjust portfolio allocations and goals in response to changes in both market and personal conditions

7. Be effective even for those who are completely unengaged

8. For the engaged, provide only meaningful information and meaningful, easy-to-make choices

9. Offer a seamless transition from accumulation to payout phase

10. Offer a wide array of payout flexibility, including deferred annuities to manage longevity risk
## How is this Approach Different from Current DC Practice?

<table>
<thead>
<tr>
<th></th>
<th>Conventional DC Approach</th>
<th>New DC Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment goal</strong></td>
<td>Wealth accumulation</td>
<td>Retirement income</td>
</tr>
<tr>
<td></td>
<td><em>No specified wealth goal</em></td>
<td><em>Specified desired-income goal</em></td>
</tr>
<tr>
<td><strong>Risk measure</strong></td>
<td>Volatility of portfolio returns</td>
<td>Volatility of funded ratio</td>
</tr>
<tr>
<td></td>
<td><em>Income shortfall</em></td>
<td><em>Income shortfall</em></td>
</tr>
<tr>
<td><strong>Success measure</strong></td>
<td>Account balance size</td>
<td>Funded ratio</td>
</tr>
<tr>
<td></td>
<td><em>Relative to desired-income goal</em></td>
<td><em>Relative to desired-income goal</em></td>
</tr>
<tr>
<td><strong>Asset allocation strategy</strong></td>
<td><em>Generic proportions Fixed or age-only based</em></td>
<td><em>Dynamic individualized Based on age, income, funded ratio.</em></td>
</tr>
<tr>
<td></td>
<td><em>Focused on improving funded ratio while managing income volatility</em></td>
<td></td>
</tr>
</tbody>
</table>


Interest Rate Volatility is Large and a Critically Important Risk for Retirement Income
Effect of Interest Rate Level on Retirement Funding
Price of $100,000 per year inflation-protected life income beginning at age 65

For illustrative purposes only.
Mexican Inflation-Protected Real Interest Rates (2006-2016)

Long Term Mexico Inflation-Protected Bond Yields

1. Shows the yield-to-maturity of the most recently issued (on-the-run) inflation-linked 30-year maturity bond. Data from Barclays Emerging Markets Inflation-Protected Index
Real Interest Rate Risk to Retirees In Accumulation Phase

• In the last 10 years, long-maturity inflation-protected interest rates in Mexico have varied between 4.98% and 1.92%. The annuity retirement income benefit with payments beginning at age 65 at a 4.98% rate will be lower if rates were to fall to 1.92% as follows:

<table>
<thead>
<tr>
<th>Age now</th>
<th>Decline in Retirement Income (Funded Ratio)$^1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>- 28%</td>
</tr>
<tr>
<td>60</td>
<td>- 38%</td>
</tr>
<tr>
<td>55</td>
<td>- 47%</td>
</tr>
<tr>
<td>50</td>
<td>- 54%</td>
</tr>
</tbody>
</table>

• The average duration needed to hedge an immediate life annuity, is around 12 years. Often managers place more emphasis on wealth [aka price] volatility than on retirement income volatility and therefore hold much shorter duration fixed income than appropriate.

• To correct this, DC rules should change to report the funded ratio and its change.

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1. Percentage changes calculated by computing an annuity price using the minimum and maximum interest rates, and calculating the resulting percentage changes in income.
Mexican Nominal Interest Rates (2006–2016)

Long-Term Mexico Bond Yields

From Federal Reserve Economic Database via OECD. Series is 10 Year Benchmark Yield on Mexican Government Bonds
Nominal Interest Rate Risk to Retirees in Accumulation

- In the last 10 years, long-maturity nominal interest rates in Mexico have varied between 9.8% and 4.6%. The annuity retirement income benefit with payments beginning at age 65 at a 9.8% rate will be lower if rates were to fall to 4.6% as follows:

<table>
<thead>
<tr>
<th>Age now</th>
<th>Decline in Retirement Income (Funded Ratio)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>-37%</td>
</tr>
<tr>
<td>60</td>
<td>-51%</td>
</tr>
<tr>
<td>55</td>
<td>-61%</td>
</tr>
<tr>
<td>50</td>
<td>-69%</td>
</tr>
</tbody>
</table>

- The average duration needed to hedge an immediate life annuity, is around 9 years. Often managers place more emphasis on wealth [aka price] volatility than on retirement income volatility and hold much shorter durations.

- To correct this, DC rules should change to report the funded ratio and its change.

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1. Percentage changes calculated by computing an annuity price using the minimum and maximum interest rates, and calculating the resulting percentage changes in income.
Measuring Correctly the Funded Status and Risk of the Participant’s Portfolio
Measuring the Participant’s Progress to Retirement Goal

Retirement Income Vs Wealth Accumulation

Income is what matters and funded ratio—NOT account balance—is the correct measure of status.

- Average duration needed to hedge an immediate life annuity is about 13 years.
- Risk managers and mandated DC reporting rules emphasize wealth (price) volatility over retirement-income volatility.
- To correct this, mandated DC rules should report and emphasize the funded ratio and its change, instead of account balance and its change.
- If risk is measured incorrectly, one cannot possibly manage risk correctly.
Wrong Measure of Risk!

Retirement Funding Has a Life Income Goal But Current DC Practice Focuses on Wealth-Preservation Risk

The volatility of T-bills is the minimum-risk asset when measured in terms of wealth preservation (USD).

But it is high-risk asset when measured in terms of income preservation (funded-ratio life income units).

Based on T-bill data provided by Bloomberg.
The volatility of life-income asset is high risk when measured in terms of wealth preservation (USD).

But it is the minimum-risk asset when measured in terms of income preservation (funded-ratio life income units).

Annuity returns based on yield from US Treasury Inflation Protected Securities (TIPS). Data provided by Bloomberg.
Risk & Return Measurement: Wealth vs Life Income Goal

Measuring the risk/return trade-off correctly

US DOLLARS WEALTH MEASURE

FUNDED-RATIO INCOME UNITS INCOME GOAL MEASURE

- T-bills
- MSCI World
- Life Income

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Building the Solution
Optimal Allocation Requires Integration of Sources

Create a personal balance sheet for each participant that integrates all funding sources of retirement income.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Minimum Pension</td>
<td>Minimum-Income Goal</td>
</tr>
<tr>
<td>Occupational Defined-Benefit Pension Plan</td>
<td>Surplus Available for Desired-Income Goal</td>
</tr>
<tr>
<td>SIEFORES/ISSSTE Defined- Contribution Balance</td>
<td></td>
</tr>
<tr>
<td>Projected Future Contributions (&quot;Human Capital&quot;)</td>
<td></td>
</tr>
<tr>
<td>Reverse Mortgage Potential</td>
<td></td>
</tr>
</tbody>
</table>
Participant Data is Regularly Reviewed and They Are Mapped To A Model Relative To How They Are Progressing To Their Income Goal

Account Balance
Contributions
Salary
Age
Retirement Age
Income Goal

Funded Status Relative to Achieving Income Goal
Assessment of Participant Dynamic Portfolio Allocation

Driven by Changes in Market and Personal Information, Allocation Based on Both Funding Ratio (“FR”) and Human Capital (“HC”)

For illustrative purposes only. Number of indexes and allocation percentages may vary.
Create a Good Experience for Engaged Participants
Offer Them Only Meaningful Information and Meaningful, Easy-To-Make Choices to Improve Retirement Outcomes

**My Retirement Profile**

Customize your retirement profile below by changing the pre-populated information to reflect your current information and goals.

<table>
<thead>
<tr>
<th>My Current monthly income</th>
<th>MEX$20,092</th>
</tr>
</thead>
<tbody>
<tr>
<td>My planned retirement age</td>
<td>65</td>
</tr>
<tr>
<td>My monthly pre-tax contributions</td>
<td>10%</td>
</tr>
<tr>
<td>My retirement income goal</td>
<td>MEX$16,073</td>
</tr>
</tbody>
</table>

**Why is this important?**

**How is this replacement rate calculated?**

- **You are falling short of your income goal by MEX$3,903**
- **MEX$16,073**
- **MEX$12,170**

Figures given in Mexican Pesos. Based on median income of USD$12,806 annually (From OECD), or MEX$241,095 annually (At an exchange rate of 18.83 MEX$/USD$), or MEX$20,092 monthly.
Annuities including “tail-insurance” on longevity deferred to > 85 life annuity allow a substantially larger payout for the same assets as long as one lives, in return for giving up any assets at death when they are no longer needed.

Reverse mortgage [aka home pension] integrates the house into funding as both a pre-paid specialized housing-consumption annuity and a general retirement funding asset. The house is the principal source of personal saving for middle class people and typically the largest asset at retirement.

The reverse mortgage requires no payment of either principal amount or cumulative interest until retiree leaves the house (usually at death). It is non-recourse and so does not jeopardize any other assets in the estate. It is an obvious choice for someone with no bequest motive and it can be used to create an improved bequest function over just leaving the house to beneficiaries at death.

There is a need to improve both annuity and reverse mortgage design to make them more effective. The combination of improved annuities and reverse mortgage offer the prospect of greatly improving standard of living in retirement, without having to increase the retirement asset base.
Post-Accumulation Flexible Spend-Down Strategies

These four components can be customized to cover wide array of individual needs

1. Guaranteed income for life
   - Life Annuity
   - Government Pension
   - DB Pension

2. Conservative draw-down
   (minimum-risk income)
   • Not guaranteed
   • No longevity protection
   • Provides liquidity
   • Permits bequests

3. Desired-income growth goal
   • Targeted increase in income starts at specified date in retirement
   • Invest in risk asset

4. Longevity insurance
   • Deferred annuity
   • Guaranteed income for life > age 85
Robert C. Merton is the School of Management Distinguished Professor of Finance at the MIT Sloan School of Management and University Professor Emeritus at Harvard University. He was the George Fisher Baker Professor of Business Administration (1988–98) and the John and Natty McArthur University Professor (1998–2010) at Harvard Business School. After receiving a Ph.D. in Economics from MIT in 1970, Merton served on the finance faculty of MIT's Sloan School of Management until 1988 at which time he was J.C. Penney Professor of Management. He is currently Resident Scientist at Dimensional Holdings, Inc., where he is the creator of Target Benefit Solution, a global integrated retirement-funding solution system.

Merton received the Alfred Nobel Memorial Prize in Economic Sciences in 1997 for a new method to determine the value of derivatives. He is past president of the American Finance Association, a member of the National Academy of Sciences, and a Fellow of the American Academy of Arts and Sciences.

Merton has also been recognized for translating finance science into practice. He received the inaugural Financial Engineer of the Year Award from the International Association for Quantitative Finance (formerly International Association of Financial Engineers), which also elected him a Senior Fellow. He received the 2011 CME Group Melamed-Arditti Innovation Award, and the 2013 WFE Award for Excellence from World Federation of Exchanges. A Distinguished Fellow of the Institute for Quantitative Research in Finance ('Q Group') and a Fellow of the Financial Management Association, Merton received the Nicholas Molodovsky Award from the CFA Institute. He is a member of the Halls of Fame of the Fixed Income Analyst Society, Risk, and Derivative Strategy magazines. Merton received Risk’s Lifetime Achievement Award for contributions to the field of risk management and the 2014 Lifetime Achievement Award from the Financial Intermediation Research Society.

Merton’s research focuses on finance theory, including lifecycle and retirement finance, optimal portfolio selection, capital asset pricing, pricing of derivative securities, credit risk, loan guarantees, financial innovation, the dynamics of institutional change, and improving the methods of measuring and managing macro-financial risk. Merton received a B.S. in Engineering Mathematics from Columbia University, a M.S. in Applied Mathematics from California Institute of Technology and a Ph.D. in Economics from Massachusetts Institute of Technology and honorary degrees from fifteen universities.