

From theory to practice: Guaranteed income and hybrid annuity target-date funds

- During the accumulation phase, most retirement plan participants focus on saving and investing systematically, making target-date funds (TDFs) a world-class, broadly applicable solution. As participants transition to decumulation, their financial goals tend to become more individualized and driven by distinctive factors.
- Since the passage of the SECURE Act, interest has increased¹ in hybrid annuity TDFs.² This new type of investment product combines asset accumulation from a traditional TDF with guaranteed income from annuities.³
- We evaluate investment merits and practical considerations for hybrid annuity TDFs using our life-cycle model and a voice-of-client study. In line with academic research, we find that hybrid annuity TDFs show investment merit. However, there are potential challenges around suitability, complexity, and costs that need to be sorted out. We discuss considerations for plan sponsors to address these concerns and unlock the benefits of hybrid annuity TDFs.

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¹ See Cerulli Associates report—"U.S. Defined Contribution Distribution 2022: Tailoring Solutions to the Consultant-Intermediated Fiduciary Landscape."

² Please note hybrid annuity TDFs are different from blend TDFs that combine active and passive funds used in different TDF sleeves.

³ Product guarantees are subject to the claims-paying ability of the issuing insurance company.

Introduction

For over two decades, target-date funds (TDFs) have helped participants invest and grow their financial capital to complement their human capital. As the qualified default investment alternative (QDIA) in most 401(k) plans, TDFs have become a critical, "one-stop-shop" retirement savings and investment tool for participants during the long accumulation stage of their working lives. As participants move from accumulation to decumulation, their investment needs become less homogeneous given individualized factors such as health, family dependencies, desire to leave (or not) a financial legacy, and risk preferences. While the defined contribution (DC) industry has largely solved the accumulation stage of the life-cycle journey through TDFs, it is still seeking consensus on the best products and services to help retirees in the decumulation stage. The only broad agreement reached thus far is recognition that retirement often looks different for most participants, creating a need for greater personalization in investment strategies.

Although investment-management firms construct their TDFs to provide retirement income sufficiency, the burden is on participants to save adequately to meet their retirement

income needs. More recently, the passage of the SECURE Act⁴ and rising interest rates have generated increased focus on guaranteed sources of income such as annuities. Articles in the popular press,⁵ discussions with plan sponsors and consultants, and questions from participants about guaranteed retirement income are on the rise. And with that increased attention, a new investment product has emerged that combines annuities with a TDF. We refer to this product as a hybrid annuity TDF.⁶

In this paper, we review a range of hybrid annuity TDFs and evaluate the investment merits of each compared with a traditional TDF. We begin by describing hybrid annuity TDFs and their underlying components. Next, we use the Vanguard Life-Cycle Investing Model (VLCM) to evaluate the impact of hybrid annuity TDF strategies on participant outcomes. Beyond investment merit, there are many usability, acceptability, implementation, and feasibility considerations for these solutions. We discuss these considerations along with the key benefits, risks, and hurdles associated with hybrid annuity TDFs. Finally, we share insights from our voice-of-client study on retirement income solutions, conducted with plan sponsors, investment consultants, and participants.

⁴ See "Setting Every Community Up for Retirement Enhancement Act of 2019 (SECURE Act)" at [DOL.gov](https://www.dol.gov).

⁵ See "Fidelity and State Street Push to Make 401(k)s More Like Pensions," Anne Tergesen, *The Wall Street Journal*, April 19, 2023, and "Want to Make Your 401(k) More Like a Pension? Do This.," Lisa Scherzer, *Barron's*, November 20, 2023.

⁶ Although we refer to this product type as a "fund" for simplicity, it can also be structured as a trust.

What are hybrid annuity TDFs?

Hybrid annuity TDFs combine the asset accumulation offered by a traditional TDF with an annuity that provides guaranteed lifetime income. They are a class of packaged solution intended to stabilize assets as the participant approaches retirement and then provide guaranteed income during it. Most hybrid annuity TDFs have three components:

- A multi-asset allocation to support asset growth.
- An income funding strategy for the guaranteed income product purchase.
- An annuity for guaranteed income.

A hypothetical hybrid annuity TDF with these components is illustrated in **Figure 1**. As shown, the allocation to the multi-asset allocation decreases while the allocation to the income funding strategy increases along the life-cycle glide path. This is done to gradually reduce exposure to risky assets and increase assets dedicated to the income funding strategy for annuity liability management.

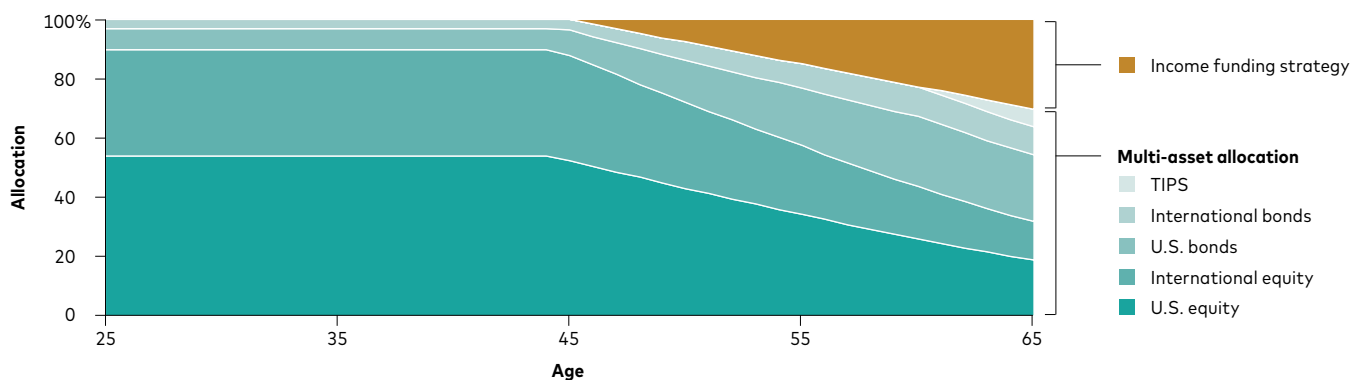
Multi-asset allocation

In a hybrid annuity TDF, the multi-asset allocation provides asset growth during the accumulation phase. It is a diversified portfolio following a glidepath that de-risks as a participant approaches retirement. Closer to retirement age, hybrid annuity TDFs automatically start reallocating assets from the multi-asset allocation to the income funding strategy to support an annuity purchase. During the decumulation phase, depending on the provider, the multi-asset allocation could follow a de-risking glidepath or remain static.

Income funding strategy

The income funding strategy is an annuity liability management strategy where invested assets are used to prefund the annuity purchase. It often comprises lower-volatility asset classes and aims to mitigate annuity pricing risk. Allocation to this strategy gradually increases with a participant's age and peaks near the time of final annuity purchase. While the income funding strategy is always liquid, the structure and approach vary among hybrid annuity TDF providers. For example, one provider's income funding strategy entails aligning assets to expected annuity cash flows and pricing, while a few others use group annuity contracts in which a participant earns a crediting rate from the insurer during the accumulation phase.

FIGURE 1
Components of a hypothetical hybrid annuity TDF



Source: Vanguard.

Annuity

Hybrid annuity TDFs use an annuity component as a source for guaranteed income during the decumulation phase. All annuities included in our analysis are fixed-rate annuities⁷ that provide a guaranteed income stream based on a payout rate determined at the time of annuity purchase. As many of the hybrid annuity TDFs available in the market use fixed-rate annuities, we have not considered indexed or variable annuities where annuity income stream is linked to capital market performance. In this paper, we cover the annuity types commonly used in hybrid annuity TDFs, namely:

- **Single premium immediate annuity (SPIA):** Starts providing income immediately after annuity purchase.
- **Deferred income annuity (DIA):** Starts providing income at a future date after annuity purchase.
- **Qualified longevity annuity contract (QLAC):** Starts providing income at a later stage of retirement (age 78-plus). This deferred annuity is exempt from required minimum distributions (RMDs).

The “Hybrid annuity TDF assumptions” section in the **Appendix** provides additional details on hybrid annuity TDF assumptions used in this paper.

Investment merit of hybrid annuity TDFs

Evaluation framework

We evaluate the investment merits of hybrid annuity TDFs by using VL_{CM},⁸ our proprietary utility-based framework that incorporates participants' goals and preferences while evaluating different investment strategies. Utility is a proven way to represent human behavior and decision-making. It captures the asymmetric trade-offs between the positive feelings arising from a good outcome and the amplified negative feelings that accompany a bad one. We use the Constant Relative Risk Aversion utility function that economists have applied to solve life-cycle problems for over 50 years, starting with Samuelson (1969) and Merton (1969). It affords us the flexibility to study the impact of risk aversion, saving patterns, and funding scenarios on portfolio choice.

⁷ Our analysis does not cover all forms of guaranteed income products. Hybrid annuity TDF providers also use other insurance products such as guaranteed lifetime withdrawal benefits that are not considered in this paper.

⁸ See Aliaga-Díaz et al. (2021).

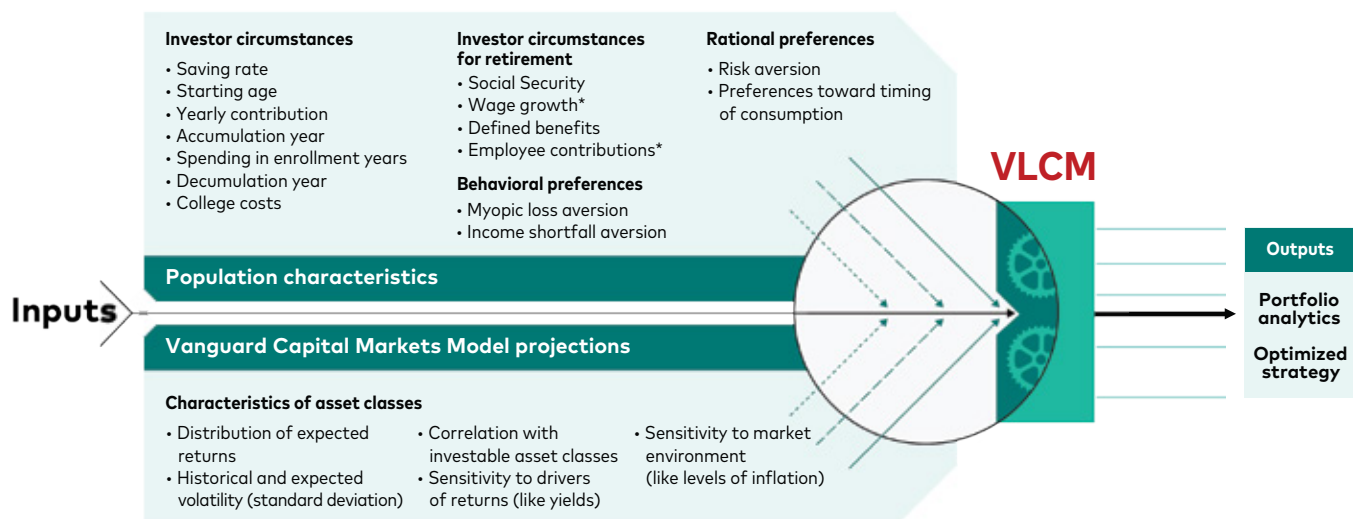
The VLCM evaluates investment strategies by quantifying the utility derived by the participant from the spending and bequest that can be funded from their investment portfolio and other sources over their lifetime in the presence of uncertain asset returns. As shown in **Figure 2**, the model leverages long-term asset return expectations derived from the Vanguard Capital Markets Model® (VCMM),⁹ incorporates multiple income sources such as defined benefit (DB), annuities, and Social Security, and accounts for different participant goals like retirement consumption, bequest, and stability of portfolio balance. VLCM outcome metrics include accumulated wealth, consumption, certainty fee equivalents, and probability of success.

The VLCM allows for uncertainty in market returns, inflation, and participant longevity. Asset class returns from VCMM incorporate a wide range of market scenarios. The VLCM also adjusts the annuity prices for these variations in market scenarios. The “Life-cycle modeling inputs” section in the Appendix provides more details on VLCM assumptions used in this paper.

What is certainty fee equivalent?

Throughout this paper, we use certainty fee equivalent (CFE) as a metric to evaluate hybrid annuity TDFs. CFE translates the improvements in a participant’s consumption, wealth, and portfolio stability into units of returns. It can be thought of as the additional annual fee¹⁰ a participant would be willing to pay for an alternative asset allocation (e.g., a hybrid annuity TDF) relative to a reference asset allocation (e.g., a traditional TDF). A positive CFE indicates higher utility from the hybrid annuity TDF compared to the traditional TDF, while a negative CFE indicates lower utility. The higher the CFE, the greater the utility a participant would derive from the hybrid annuity TDF compared to the traditional TDF.

FIGURE 2
Vanguard Life-Cycle Investing Model



*Data sourced from Vanguard's report, *How America Saves*.

Note: See the “Life-cycle modeling inputs” section in the Appendix for additional details.

Source: Vanguard.

⁹ See the “Vanguard Capital Markets Model (VCMM)” section in the Appendix for additional details.

¹⁰ To evaluate CFE, we calculate the expected utility x of the hybrid annuity TDF from the full range of market scenarios in our Monte Carlo simulation. With the same participant characteristics (savings, expenses, preferences), we calculate the expected utility y for the reference portfolio, a traditional TDF. CFE is the haircut applied to a full range of uncertain asset returns that makes the utility x from the hybrid annuity TDF the same as the utility y from the traditional TDF.

How do hybrid annuity TDFs create investment value?

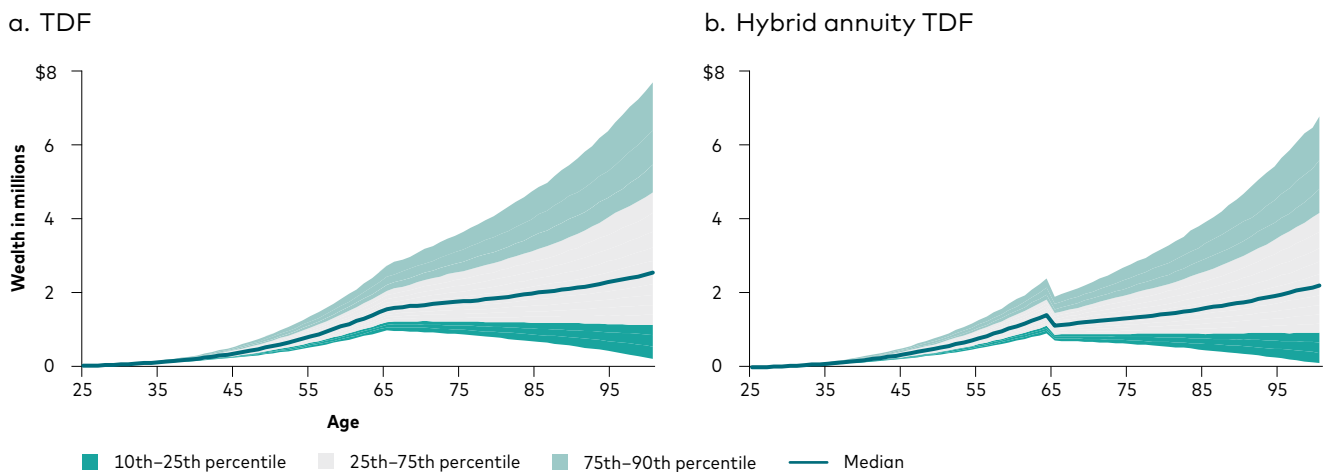
The main driver of investment value for hybrid annuity TDFs is the stable consumption under multiple market and longevity scenarios during the retirement phase of a participant’s life-cycle. Income from the investment portfolio might not be sufficient to meet a consumption goal during unfavorable market regimes (market risk) or in cases where a participant outlives their retirement savings (longevity risk). Hybrid annuity TDFs remove some of these risks by providing income from the annuity, but this benefit comes at a cost of reduced accumulated wealth from the annuity purchase. For a participant, accumulating sufficient wealth is important not just for a bequest goal, but also to support any ad hoc expenses that could be planned (like a vacation or house renovation) or unplanned (health care expense or urgent repair work).

Figures 3a, 3b, 4, and 5 show three metrics from Monte Carlo simulations where we analyze outcomes from 10,000 different market scenarios. Figures 3a and 3b compare the expected wealth for a TDF with a hybrid annuity TDF that uses an SPIA. The expected wealth for the hybrid annuity

TDF drops near retirement due to the annuity purchase. Figure 4 shows the income floor provided by hybrid annuity TDFs in the form of a reduction in expected income shortfall compared to a TDF. Income shortfall is the amount by which a participant fails to meet the retirement income goal, expressed as a percentage of that goal. The average income shortfall represents scenarios in which income from the portfolio and all other sources (such as Social Security, annuity, pension, etc.) is less than the retirement income goal.

The TDF has a lower average income shortfall than the hybrid annuity TDF in the early years of retirement but, given the guaranteed income payout from the annuity, the hybrid annuity TDF makes up for this income shortfall in the later years of the participant’s life-cycle. Depending on their goals and preferences, participants will value this tradeoff between reduced wealth and retirement income sufficiency differently. Those who have high aversion to outliving their retirement savings may prefer a hybrid annuity TDF, whereas those with bequest or higher wealth objectives may not find sufficient value in a hybrid annuity TDF.

FIGURE 3
Expected wealth: TDF versus hybrid annuity TDF



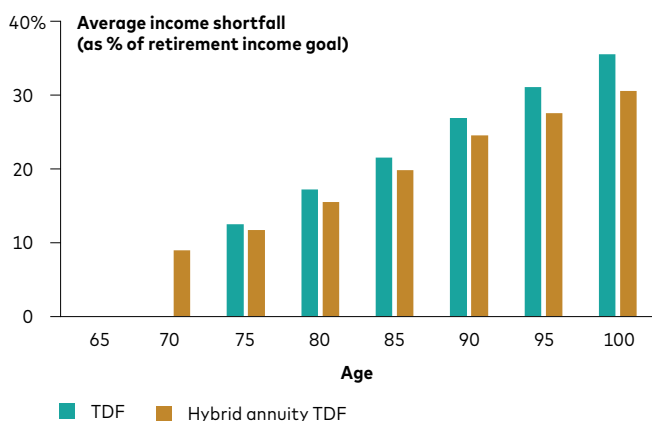
Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for an annuity purchase is 100%. See the “Hybrid annuity TDF assumptions” and “Life-cycle modeling inputs” sections in the Appendix for additional details.

Sources: Vanguard and CANNEX.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modeled asset class. Simulations as of December 29, 2023. Results from the model may vary with each use and over time. For more information, please see the Appendix.

Figure 5 shows the probability of meeting spending goals at specific ages for a TDF and a hybrid annuity TDF. It is calculated as the percentage of scenarios from the 10,000 Monte Carlo simulation scenarios where income from the investment portfolio and other sources is sufficient to meet retirement expenses. While the probability of success indicates the chances of someone meeting their goals, it does not provide any information on the extent to which these goals are missed (income shortfall).

FIGURE 4
Average income shortfall:
TDF versus hybrid annuity TDF



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for an annuity purchase is 100%. See the "Hybrid annuity TDF assumptions" and "Life-cycle modeling inputs" sections in the Appendix for additional details.

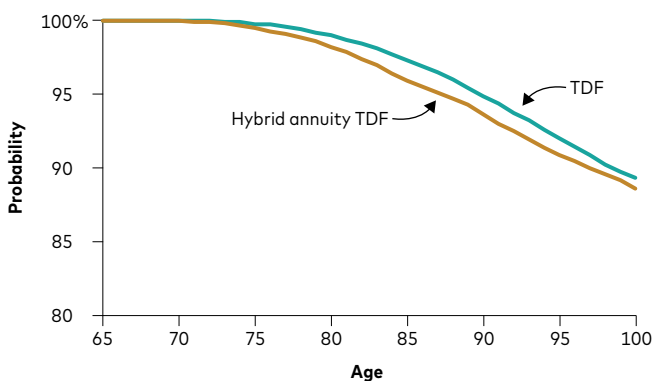
Sources: Vanguard and CANNEX.

But, of course, both probability and magnitude of income shortfall are necessary to accurately forecast the potential for retirement success, which we define here as enough income to last through an individual's lifetime. Relying entirely on the probability of success for hybrid annuity TDF evaluation would not fully represent the experience participants get by investing in them. For example, the hybrid annuity TDF discussed above has a

lower income shortfall than a TDF due to the annuity income during the decumulation phase. In contrast, the same hybrid annuity TDF also has marginally lower probability¹¹ of meeting its retirement income target compared to a TDF.

In other words, while the chances of missing the income target could increase with hybrid annuity TDFs, the extent to which a participant misses their goal decreases. To holistically accommodate the signals from the accumulated wealth, the magnitude, and the probability of income shortfall, we use VLCM with a utility metric (CFE)¹² for our hybrid annuity TDF evaluation. Utility is a proven way to effectively evaluate investment strategies in supporting participant goals. Coming back to the hybrid annuity TDF discussed above, given a lower income shortfall, its utility of lifetime consumption is higher—resulting in a positive CFE value of 0.24% compared to a TDF.¹³

FIGURE 5
Probability of success:
TDF versus hybrid annuity TDF



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for an annuity purchase is 100%. See the "Hybrid annuity TDF assumptions" and "Life-cycle modeling inputs" sections in the Appendix for additional details.

Sources: Vanguard and CANNEX.

¹¹ The hybrid annuity TDF has a lower probability of success compared with the TDF because a part of the hybrid annuity TDF portfolio is used for an annuity purchase.

¹² Researchers have also used other evaluation metrics. For example, Dus et al. (2005) used shortfall expectation, a metric that combines both the probability and average size of income shortfall.

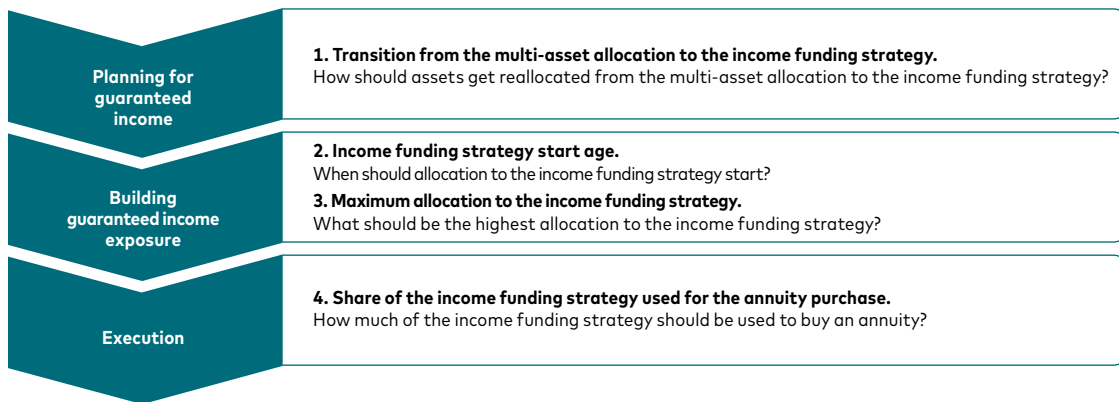
¹³ We have assumed that the participant has a higher preference for meeting the consumption goal than leaving a bequest. Such a participant derives higher utility from a hybrid annuity TDF because of its lower income shortfall, resulting in a positive CFE for the hybrid annuity TDF despite lower ending wealth compared with a TDF.

Investment case for hybrid annuity TDFs

Asset managers could construct a range of hybrid annuity TDFs by using combinations of the three building blocks discussed earlier: multi-asset allocation, income funding strategy, and an annuity. Just like a traditional TDF, the optimal design for a hybrid annuity TDF depends on

several factors such as participant demographics, goals, risk tolerance, and other investor preferences. We analyze the potential value offered by different hybrid annuity TDFs in consideration of four key design elements shown in **Figure 6**.

FIGURE 6
Evaluating hybrid annuity TDFs based on 4 key design elements



Source: Vanguard.

1. Transition from the multi-asset allocation to the income funding strategy

Most hybrid annuity TDFs use the income funding strategy as a source for annuity purchase. They facilitate this by reallocating assets from the multi-asset allocation to the income funding strategy. Ideally, the hybrid annuity TDF provider will determine an optimal mix of multi-asset allocation, income funding strategy, and annuity by considering many factors like a participant's goals, preferences, demographic inputs, asset returns, etc. The value a participant derives from a hybrid annuity TDF depends on the asset class

used to source the income funding strategy. In this analysis, we compare three hypothetical approaches:

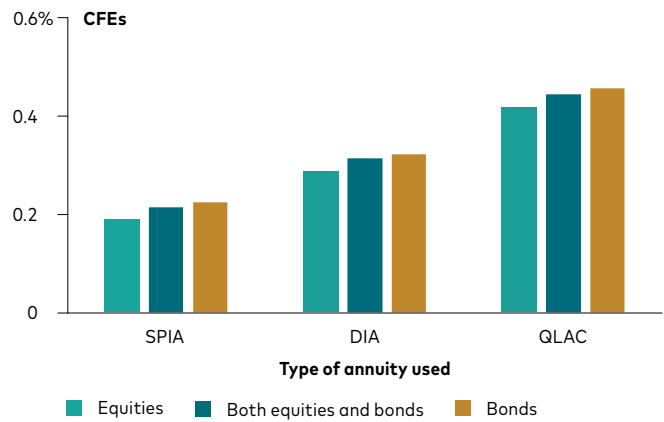
- Sourced from equities.
- Sourced from bonds.
- Sourced from both equities and bonds.¹⁴

¹⁴ We assume the income funding strategy is sourced from both equities and bonds in the proportion they are held in the multi-asset allocation.

In **Figure 7**, we show the impact of alternative sources for the income funding strategy. The hybrid annuity TDFs shown use one of an SPIA, DIA, or QLAC with an income funding strategy that starts at age 55 and reaches its maximum allocation of 25% by age 65. In this analysis, the income funding strategy is represented by a stable value fund composed of U.S. bonds. For equities and bonds, we assume broad market, global exposure. While the income funding strategy has a lower volatility, its long-term expected returns are lower than those for equities and bonds.¹⁵

Sourcing the income funding strategy from equities instead of bonds has some straightforward implications for participant outcomes. Using equities to fund the income funding strategy would lead to lower growth potential compared with the case where allocation is sourced from bonds. While the guaranteed income from a hybrid annuity TDF helps to support consumption, the cumulative lifetime consumption might be lower when portfolio assets have lower growth potential. Moreover, the ending wealth available for a bequest goal could also be lower. As expected, the hybrid annuity TDF where the income funding strategy is sourced from equity has the lowest growth potential, leading to the lowest CFE. Please note that the CFE difference among funding sources would increase if a participant's preference for bequest versus a consumption goal increases.

FIGURE 7
Impact of alternative funding sources for the income funding strategy on hybrid annuity TDF value



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for the annuity purchase is 100%. See the "Hybrid annuity TDF assumptions" and "Life-cycle modeling inputs" sections in the Appendix for additional details.

Sources: Vanguard and CANNEX.

Optimal hybrid annuity TDF allocation

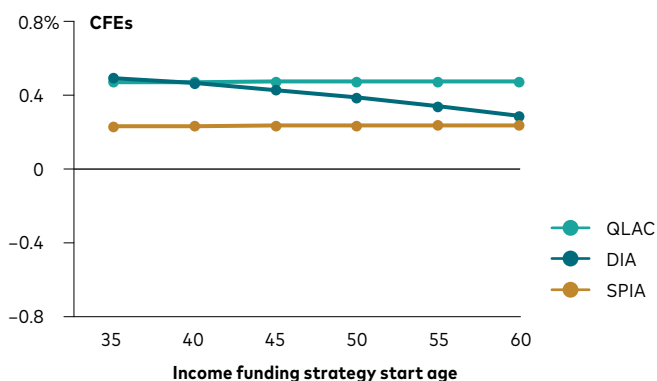
For the rest of this paper, all CFEs shown are for optimized hybrid annuity TDFs. We determine the optimal hybrid annuity TDF allocation based on three income funding strategy variables—start age, maximum allocation, and share of the strategy used to buy an annuity. These variables will determine the overall exposure to the income funding strategy in a hybrid annuity TDF. For the remaining hybrid annuity TDF allocation (the multi-asset allocation), there could be multiple choices in the form of equity-bond glidepaths. We evaluate multiple glidepaths that could be used as a multi-asset allocation and select the one that provides the highest utility to a hybrid annuity TDF participant.

¹⁵ See the "Hybrid annuity TDF assumptions" section in the Appendix for the income funding strategy return calculation.

2. Income funding strategy start age

Income funding strategy start age is the age when hybrid annuity TDFs start allocation to the income funding strategy. The impact of using different income funding strategy start ages could vary based on the type of annuity being used. **Figure 8** shows the impact of different start ages based on the type of annuity.

FIGURE 8
Impact of income funding strategy start age on hybrid annuity TDF value



Notes: The income funding strategy start age is 35–60, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for the annuity purchase is 100%. See the “Hybrid annuity TDF assumptions” and “Life-cycle modeling inputs” sections in the Appendix for additional details.

Sources: Vanguard and CANNEX.

Hybrid annuity TDFs using an SPIA

In our analysis, we assume that the SPIA is bought at the retirement age of 65, the same age that the annuity payment begins. While some hybrid annuity TDFs offer an option to buy an SPIA earlier than retirement age, we use the same annuity purchase age of 65 for consistency across different hybrid annuity TDFs. The gold line in Figure 8 shows the CFEs for SPIA-based hybrid annuity TDFs with different income funding strategy start ages. For SPIA-based hybrid annuity TDFs, given that most of the value is driven by the guaranteed income from the

annuity, changing the income funding strategy start age (and hence the overall exposure to the income funding strategy over a participant’s lifetime) has marginal impact on CFE. We also see a similar trend in CFEs for different income funding strategy start ages with QLAC-based hybrid annuity TDFs.

Hybrid annuity TDFs using a DIA

DIA-based hybrid annuity TDFs aim to provide an experience akin to buying deferred annuities at regular intervals between the income funding strategy start age and retirement age. In our analysis, we assume income from the DIA starts at the retirement age of 65. The dark green line in Figure 8 shows the CFEs for DIA-based hybrid annuity TDFs with different income funding strategy start ages. Compared to an SPIA, a deferred annuity typically provides higher income for the same annuitization age and annuity purchase amount. This is due to the higher mortality credits¹⁶ embedded in a deferred annuity, as well as the higher return potential for the insurer on the annuity premium given a longer deferral period. This higher income from a DIA results in a higher CFE for hybrid annuity TDFs using a DIA compared to those using an SPIA.¹⁷

Looking across DIAs with different deferral periods, the longer the deferral period, the higher the mortality credits and higher the income offered by a deferred annuity. When the income funding strategy starts at an early age, hybrid annuity TDFs could use DIAs with a longer deferral period, leading to higher investment value (in terms of CFE). It’s worth noting that despite high mortality credits, there are well-known behavioral hurdles and practical considerations that make use of a DIA unlikely at a very early age. Participants would need to overcome potential resistance to giving up control of a portion of their assets and committing part of their portfolio to an insurance product that will earn a lower return than a multi-asset allocation.

¹⁶ Mortality credit represents the increase in income from longevity risk pooling by insurer.

¹⁷ This is also consistent with work by Shoven and Walton (2023) that showed systematic deferred annuity purchases provide better outcomes than an immediate annuity purchased at retirement.

Hybrid annuity TDFs using a QLAC

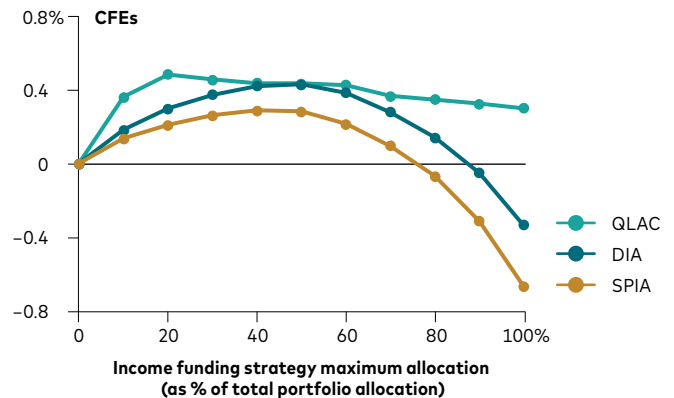
Similar to the case with an SPIA, we assume that the QLAC is bought at the retirement age of 65 with income starting at age 80. In our analysis, the allocation to a QLAC is capped at the limit for a QLAC purchase under the SECURE 2.0 Act: \$200,000.¹⁸ The light green line in Figure 8 shows the CFEs for QLAC-based hybrid annuity TDFs with different income funding strategy start ages. Because a QLAC is a deferred annuity, it offers a higher annual income than an SPIA or DIA with a lower deferral period than a QLAC. Higher paychecks from a QLAC during the later years of retirement are more likely to provide income adequacy because the probability of depleting one's portfolio is greater in this period. This results in higher CFEs from hybrid annuity TDFs using a QLAC compared to those using an SPIA or DIA. Comparing different start ages for the income funding strategy, hybrid annuity TDFs with QLACs, just like SPIA-based hybrid annuity TDFs, provide marginal CFE change.

3. Maximum allocation to the income funding strategy

In most hybrid annuity TDFs, the allocation to the income funding strategy increases with age and reaches its highest value near retirement age. As shown in **Figure 9**, all else being equal, the impact of changing the maximum allocation to the income funding strategy is consistent across hybrid annuity TDFs using an SPIA or DIA. Investing in hybrid annuity TDFs involves a trade-off between the potential to accumulate assets and the annuity longevity hedge. By increasing the allocation to the income funding strategy (and hence the annuity), participants could miss out on equity growth opportunities. Accordingly, the value offered by hybrid annuity TDFs first increases with the income funding strategy allocation and then starts decreasing.

The impact of missed growth opportunity is more pronounced in hybrid annuity TDFs using a QLAC. In our analysis, the income from a QLAC starts at a much later age compared with an SPIA or DIA. The participant needs to rely on portfolio withdrawals (along with Social Security and other income sources) to fund retirement expenses before the QLAC income kicks in. Allocating a higher amount to the QLAC could result in the participant depleting a large share of their portfolio before the annuity income starts. Due to this dynamic, the value from QLAC-based hybrid annuity TDFs peaks much earlier compared with hybrid annuity TDFs using an SPIA or DIA. Also worth noting is that the \$200,000 cap applied on a QLAC purchase means CFEs for QLAC-based hybrid annuity TDFs do not change much for an income funding strategy maximum allocation higher than 40%.

FIGURE 9
Impact of income funding strategy allocation on hybrid annuity TDF value



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 100% and the share of the income funding strategy used for the annuity purchase is 100%. See the "Hybrid annuity TDF assumptions" and "Life-cycle modeling inputs" sections in the Appendix for additional details.

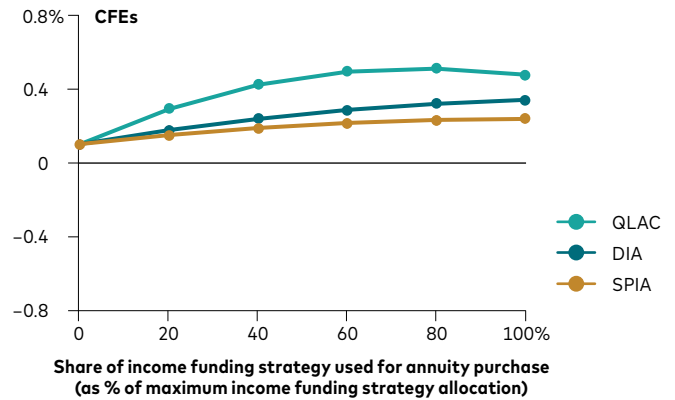
Sources: Vanguard and CANNEX.

¹⁸ The cap on a QLAC is also adjusted for inflation.

4. Share of the income funding strategy used for the annuity purchase

Many hybrid annuity TDFs include an option to partially utilize assets invested in the income funding strategy for annuity exposure. Assets from the income funding strategy that are not used for an annuity purchase could either be invested in the multi-asset allocation or remain in the income funding strategy. In this analysis, we assume the latter scenario. Participants having a high preference for a retirement spending goal derive greater benefit when a higher proportion of the income funding strategy is used for the annuity purchase. **Figure 10** shows the investment value from using different shares of the income funding strategy for the annuity purchase. Higher value (CFE) is realized when participants use a greater proportion of assets invested in the income funding strategy to purchase the annuity.

FIGURE 10
Impact of annuitization on hybrid annuity TDF value



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for the annuity purchase is 0%–100%. See the “Hybrid annuity TDF assumptions” and “Life-cycle modeling inputs” sections in the Appendix for additional details.

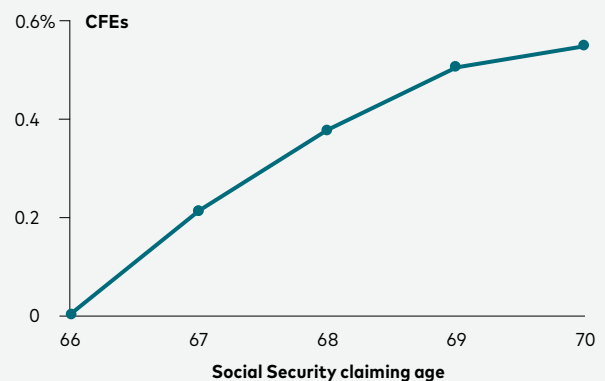
Sources: Vanguard and CANNEX.

Leveraging a universal annuity: Delaying Social Security

Social Security is the universal guaranteed income most U.S. workers are eligible to receive starting at age 62.¹⁹ The inherent benefits of delaying Social Security have been analyzed by many researchers (see Horneff et al. (2023) and Milevsky (2013)).²⁰ The Social Security payment increases for each year until age 70 that a participant delays claiming the benefits. Participants generally have to rely on their investment portfolios for meeting consumption goals during the period between retiring and starting to claim Social Security benefits. The appeal of delaying Social Security will depend on several factors, like how well funded the participant's portfolio is for meeting retirement goals, how much of their retirement expenses are covered by Social Security, and whether they have any other income sources like DB, annuity income, etc. For those who are most concerned about funding a long retirement, the decision to delay Social Security—even if it means partially spending down the portfolio in the meantime—can actually represent the best path to success by converting the uncertainty of market returns into the certainty of higher Social Security payments.

In **Figure 11**, we show the value a participant gets by using a traditional TDF and delaying the claiming of Social Security benefits until different ages. The increase in benefits that comes with delayed claiming would provide a higher floor to consumption, boosting the overall welfare over a participant's lifetime. The CFEs are calculated by comparing the strategy of delayed Social Security claiming with default Social Security claiming at age 66. All else being equal, the benefit increases with the Social Security claiming age.

FIGURE 11
Delaying Social Security shows good investment value for certain participants



Source: Vanguard.

¹⁹ See "Eligibility for Social Security in Retirement" at SSA.gov.

²⁰ See also "How Delaying Social Security Can Trump Long-Term Portfolio Returns or Lifetime Annuity" at Kitces.com.

From theory to practice: Key considerations for hybrid annuity TDFs

Investment case

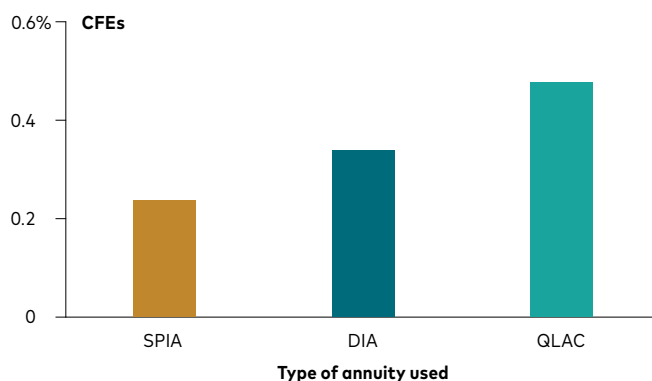
The value of using annuities as a source of guaranteed lifetime income has been explored by many researchers and practitioners (see Blanchett (2016), Blanchett and Finke (2022), and Horneff et al. (2020)). Guaranteed income during retirement could leave certain participants better off, especially those looking to hedge longevity risk. But there has been a reluctance among participants to convert some of their liquid portfolio to an illiquid asset like an annuity, suggesting the existence of behavioral hurdles that are more influential than the associated investment merits. We acknowledge that all these hurdles remain with hybrid annuity TDFs. But setting aside the hurdles and focusing solely on the investment case, our analysis shows that hybrid annuity TDFs could offer incremental value for certain participants compared with a traditional TDF. Key observations from our analysis of the investment merits of hybrid annuity TDFs include:

- As has been established in many academic studies, we find annuities offer an opportunity to improve participant outcomes. This is not limited to any one annuity type (see work by Soni (2023) on an SPIA, Konicz and Mulvey (2013) on a DIA, and Horneff et al. (2020 and 2023) and Dus et al. (2005) on a QLAC). Rather, we see value in a range of annuity options.
- Our analysis shows that there is value in planning (systematically allocating to the income funding strategy to purchase annuities can help). But it's also noteworthy that most of the value of a hybrid annuity TDF comes from the annuity income stream. The low volatility from the income funding strategy benefits the participant but its incremental impact on CFE is marginal. Participants could potentially get similar investment value by using a traditional TDF and purchasing an annuity on their own.
- We find that there is more value in deferred annuities compared with an immediate annuity. When in retirement, participants are typically spending from their portfolio, which limits their ability to recover from market downturns and hence increases their exposure to market risk compared with the accumulation phase. This situation, combined with higher mortality credits, makes deferred annuities more attractive. Having some guaranteed income later in life supplements Social Security and can improve outcomes. Lastly, annuitization could also be an effective tool for participants if they are impacted by cognitive decline in later life.

Earlier, we analyzed a range of hybrid annuity TDFs that could be created using possible combinations of three building blocks—multi-asset allocation, income funding strategy, and annuity. Not all of these combinations would entail an investment product because of multiple behavioral hurdles and practical considerations (we'll delve deeper into hurdles and considerations later in this paper).

As part of a DC plan, hybrid annuity TDFs would need to serve a broad participant base, and many of the hybrid annuity TDF designs discussed earlier wouldn't be appropriate for all participants. For example, participants likely wouldn't be interested in a hybrid annuity TDF in which allocation to the income funding strategy begins at age 35 if they have a higher risk tolerance (desire to allocate all their investment dollars to a growth strategy) or a greater preference for bequest than our base case. Narrowing the range of possible solutions, **Figure 12** shows those closest to the design of some of the hybrid annuity TDFs currently available in the market. In these hybrid annuity TDFs, the income funding strategy starts at age 55 and reaches a maximum allocation of 25% at retirement age.

FIGURE 12
Hybrid annuity TDFs show good investment value for certain participants



Notes: The income funding strategy start age is 55, while the maximum allocation to the income funding strategy is 25% and the share of the income funding strategy used for the annuity purchase is 100%. See the "Hybrid annuity TDF assumptions" and "Life-cycle modeling inputs" sections in the Appendix for additional details.

Sources: Vanguard and CANNEX.

As we demonstrate in Figures 3a, 3b, 4, and 5, hybrid annuity TDFs create investment value by providing stable consumption under multiple market and longevity scenarios. The investment value, as reflected by CFE, shows that hybrid annuity TDFs have a good investment case for some and could support retirement spending through guaranteed income from annuities.

However, plan sponsors and participants would likely need considerable support and education to adopt hybrid annuity TDFs. It's also worth noting that participants seeking a simple and transparent solution remain well served by traditional TDFs. Hybrid annuity TDFs would be more impactful for participants who have a high preference for guaranteed income and low motivation to leave a bequest. Another option for such participants beyond hybrid annuity TDFs is to invest in a traditional TDF and use part of their assets to buy an annuity independently. The investment value they get from this strategy would depend on various factors like asset allocation, annuity availability, annuity pricing, behavioral hurdles, etc. The key benefit with this approach is that the annuity solution is customized to individual preferences and circumstances.

Access to a packaged solution

Before the first TDF was launched, participants could create a TDF-like investment experience by changing their asset allocation with their life stage. This required constant active engagement from participants to manage their portfolios. TDFs provided a solution and revolutionized the DC industry by taking away this overhead from participants. It is still too early to tell if hybrid annuity TDFs can provide a similar ease of use, but practitioners are trying to create a smooth investment experience by offering access to a professionally managed product that transitions automatically from growth-focused multi-asset allocation to an income-providing allocation.

Participants could potentially get a similar experience by building a portfolio on their own. But that would come with additional overheads related to changing the portfolio allocation, transitioning assets to a liquid instrument to buy an annuity, regularly entering the annuity contracts, etc. Hybrid annuity TDFs package all these building blocks together and take away the hassle from participants. Critically, unlike traditional TDFs, all hybrid annuity TDFs still require some level of active engagement from participants since decisions such as the amount and timing of an annuity purchase must be made. This level of engagement could be difficult to obtain from participants defaulted into a hybrid annuity TDF product.

Prefunding an annuity purchase

As explained earlier, most hybrid annuity TDFs use an income funding strategy where assets from the multi-asset allocation are moved to a less-volatile allocation for funding the future annuity purchase. The allocation to the income funding strategy gradually increases with a participant's age and peaks as they approach retirement. For some hybrid annuity TDFs, one of the benefits of the income funding strategy is the reduction in annuity pricing risk. In such cases, the annuity contracts are purchased over an extended period, making it less likely to purchase the entire intended annuity amount at a time when interest rates are unfavorable. Additionally, the less-volatile nature of the income funding strategy makes assets allocated to the annuity purchase fairly stable.

Most hybrid annuity TDF providers offer choices for participants—to remain invested in the multi-asset allocation and income funding strategy or to start the income from the annuity. With this feature, participants have the flexibility to modify their decision if their circumstances change by the time they retire. In our view, optionality for the annuity contract is critical given its irrevocability.

Prefunding an annuity purchase adds a layer of complexity. Participants need to engage with their plan to opt in or opt out of annuity income. A typical TDF participant may not have the engagement level needed to make this decision appropriately. Also worth noting is that many participants are not likely to have perfect foresight regarding how much they would need to annuitize in future. While allocation to the income funding strategy may begin at least 10 years prior to retirement, the option to annuitize is presented at or near retirement. The risk is that a participant's personal circumstances could change dramatically over those 10 or more years.

Consider a participant who was reasonably healthy at age 55 but has seen their health deteriorate by retirement age. This participant should choose to opt out of the annuity income because the need for a longevity hedge is considerably lower given that poor health. For such a participant, and any others who do not annuitize, there is an opportunity cost to investing in the income funding strategy since those assets could have seen higher growth if invested in the multi-asset portfolio.

At a plan level, it is unlikely that all participants would choose to annuitize in the same way. Each participant is likely to have unique requirements regarding the amount and timing of their guaranteed income. This poses a challenge in implementing hybrid annuity TDFs as the default investment option in a DC plan.

How can plan sponsors deliver the potential value of hybrid annuity TDFs in practice?

Hybrid annuity TDFs represent an innovative approach to retirement planning that offers many potential benefits to participants. These TDFs can accommodate the varying needs of retirees for guaranteed income, be a source of longevity hedge, and provide participants with an increased sense of security. Implementing these funds, however, presents challenges that could be

mitigated through strategic planning. To understand the perceived benefits and hurdles in the adoption of hybrid annuity TDFs, we conducted a voice-of-client study involving direct and indirect research across three key segments within the DC space: plan sponsors, consultants, and plan participants.²¹ In **Figure 13**, we outline a set of considerations for plan sponsors evaluating hybrid annuity TDFs.

FIGURE 13

Beyond the investment case: Considerations for plan sponsors evaluating hybrid annuity TDFs

	Description	Considerations
Suitability	The annuity component may not be optimal for everyone. The type, timing, and amount of the annuity are likely to differ significantly across the participant population.*	Include a few personalization options for more engaged participants that can be tailored to their individual financial goals and life circumstances.
Evolving guaranteed income needs	Gradually building annuity exposure for guaranteed income is akin to trying to hit a moving target. The need for guaranteed income evolves, making it challenging to set fixed annuitization strategies. Participants' decisions on when and how much to annuitize may shift over time due to a change in personal preferences (such as behavioral or risk tolerance), circumstances (such as health status and household structure), or financial planning goals (such as bequest, debt management, and emergency savings).**	Consider implementing adjustable annuity plans that more engaged participants can modify as their needs evolve, and adding tools to simulate future financial scenarios.
Portability	Participants are unable to transfer annuity benefits as easily as funds.	Explore partnerships with annuity providers to enhance portability or introduce portable annuity options.
Liquidity	Transitioning from liquid assets to illiquid annuity contracts is a barrier for many participants due to the control they relinquish over their accumulated assets.	Offer educational workshops that address the benefits and safety of annuities, reinforcing the security they provide in retirement. Providing additional benefits to participants such as access to emergency savings accounts and financial support services further enhances participant readiness.
Complexity	Assessing annuity options and the exposure to interest rate variability can pose additional risks. Participants find annuity trade-offs difficult to assess.***	Provide transparent pricing models and clear, understandable explanations of how annuities work, including potential financial impacts.
Cost	Hybrid annuity TDFs tend to cost more than off-the-shelf TDFs. There are additional, often opaque, expenses associated with the annuity component.	Offer transparent information on costs and charges, reinforce it with the value of the solution, and provide financial planning support.
Integration	It can be difficult to integrate DC plans with annuity recordkeeping, potentially resulting in a disjointed user experience.	Invest in technology solutions that streamline integration and improve the user experience for plan participants.
Engagement and financial literacy	Participants often show limited engagement and lack comprehensive understanding of financial products. Effectively using an annuity for retirement planning requires participant engagement, at a minimum, to opt in or opt out of annuitization.	Because successful implementation requires active engagement from both the plan sponsor and participants, considerable effort should be devoted to targeted communication campaigns and interactive tools, with a goal of boosting financial literacy and engagement.

* Blanchett (2016) showed that the optimal level of annuitization varies among participants and is highly dependent on participant and plan attributes.

** Turra and Mitchell (2004) discussed how health shocks and uncertain medical expenses could lessen a participant's preference for an annuity. Davis et al. (2022) listed high debt obligation and lack of access to liquidity among factors influencing annuity ownership. Goldman Sachs (2023) stated that hard-to-predict financial challenges like job changes, caregiving, hardships, or retiring early are more frequent and could significantly impact retirement savings.

*** See Lusardi and Mitchell (2014). Investing in annuities requires retirement planning and an objective assessment of income needs, which makes financial literacy a key attribute. Lusardi and Mitchell (2017) showed financial literacy positively impacts individuals' retirement preparedness.

Source: Vanguard.

21 For additional details, see the "Capturing the voice of the client" section in the Appendix.

By addressing each challenge directly with tailored solutions, plan sponsors can effectively deliver the potential value of hybrid annuity TDFs. These strategies not only mitigate risks but also enhance the appeal of hybrid TDFs, making them more accessible and beneficial for participants. With thoughtful implementation and robust participant engagement, these products can be beneficial for participants seeking guaranteed income, paving the way for a new avenue in retirement planning.

Conclusion

Hybrid annuity TDFs are a new generation of retirement solution to support both the accumulation and decumulation phases of retirement savings. They are professionally managed products that transition automatically from growth-focused multi-asset allocation to an income-providing allocation. We analyzed a range of hybrid annuity TDF strategies that could be created using possible combinations of three building blocks—multi-asset allocation, income funding strategy, and annuity. The value offered to a participant depends on the design of the hybrid annuity TDF and is influenced by factors like timing and amount of the income funding strategy, annuity type, and share of the income funding strategy used to buy the annuity. Our analysis shows that hybrid annuity TDFs can

provide investment merit and could boost retirement consumption, especially for those looking for longevity-risk mitigation.

Despite the investment case for certain participants, hybrid annuity TDFs also come with hurdles around implementation, participant behavior, and suitability. Our voice-of-client study shed light on the perceived benefits and concerns of plan sponsors, consultants, and participants regarding hybrid annuity TDFs. Plan sponsors and participants would need additional support and education for adoption of this product. Given that the retirement journey can be different for each participant, the need for a guaranteed income source could also differ. Most hybrid annuity TDFs involve a decision to annuitize, and many participants are not actively engaged or informed enough to make an appropriate decision about when to purchase an annuity and how much to annuitize.

The analysis presented in this paper highlights that there are both rewards and risks associated with hybrid annuity TDFs. Participants seeking a simple and transparent solution are well served by traditional TDFs. As the default investment for many DC plans, TDFs have acted as a one-size-fits-all solution. Whether hybrid annuity TDFs could do the same will depend greatly on their ability to add broad value for plan sponsors and all plan participants. Currently, we believe that the jury is still out.

References

- Abashidze, Nino, Robert L. Clark, Beth Ritter, and David Vanderweide, 2018. *Annuity Pricing in Public Pension Plans: Importance of Interest Rates*. No. w25343. Cambridge, Mass.: National Bureau of Economic Research.
- Aliaga-Díaz, Roger, Harshdeep Ahluwalia, Victor Zhu, Scott Donaldson, Ankul Daga, and David Pakula, 2021. *Vanguard's Life-Cycle Investing Model (VLCM): A General Portfolio Framework for Goals-Based Investing*. Valley Forge, Pa.: The Vanguard Group.
- American College of Financial Services, 2024. *Retirement Income Literacy Study*.
- Arapakis, Karolos, and Gal Wettstein, 2023. *What Matters for Annuity Demand: Objective Life Expectancy or Subjective Survival Pessimism?* CRR WP 2023-2. Chestnut Hill, Mass.: Center for Retirement Research at Boston College.
- Beshears, John, James J. Choi, David Laibson, Brigitte C. Madrian, and Stephen P. Zeldes, 2014. What Makes Annuitization More Appealing? *Journal of Public Economics* 116: 2–16.
- Blanchett, David M., 2016. "Defaulting Participants in Defined Contribution Plans into Annuities: Are the Potential Benefits Worth the Costs?" *The Journal of Retirement* 4(1): 54–76.
- Blanchett, David M., 2015. Dynamic Choice and Optimal Annuitization. *The Journal of Retirement* 3(1): 38–49.
- Blanchett, David M., 2020. The Value of Allocating to Annuities. *The Journal of Retirement* 8(1): 40–52.
- Blanchett, David, and Michael Finke, 2022. *Welfare Improvements From Default Annuitization in Defined Contribution Plans*. Washington, D.C.: Retirement Income Institute.
- Brown, Jeffrey R., Jeffrey R. Kling, Sendhil Mullainathan, and Marian V. Wrobel, 2013. *Framing Lifetime Income*. No. w19063. Cambridge, Mass.: National Bureau of Economic Research.
- Brown, Jeffrey R., Jeffrey R. Kling, Sendhil Mullainathan, and Marian V. Wrobel, 2008. Why Don't People Insure Late-Life Consumption? A Framing Explanation of the Under-Annuitization Puzzle. *American Economic Review* 98(2): 304–309.
- Charupat, Narat, Mark J. Kamstra, and Moshe A. Milevsky, 2012. *The Annuity Duration Puzzle*. Available at SSRN: ssrn.com/abstract=2021579.
- Davis, Hallie, Andrea Hasler, and Annamaria Lusardi, 2022. Debt, Illiquidity, and Financial Illiteracy as Barriers to Annuity Ownership. *The Journal of Retirement* 10(2): 33–53.
- Dus, Ivica, Raimond Maurer, and Olivia S. Mitchell, 2005. *Betting on Death and Capital Markets in Retirement: A Shortfall Risk Analysis of Life Annuities*. No. w11271. Cambridge, Mass.: National Bureau of Economic Research.
- Finke, Michael, 2023. *Understanding Annuity Mortality Credits*. Washington, D.C.: Retirement Income Institute.
- Finke, Michael, and Jason J. Fichtner, 2022. Employee Opinions About Partial Annuitization in a Retirement Plan. *The Journal of Retirement* 9(3): 9–31.
- Goldman Sachs Asset Management, 2023. *Retirement Survey & Insights Report 2023*. Goldman Sachs.
- Horneff, Vanya, Raimond Maurer, and Olivia S. Mitchell, 2023. Fixed and Variable Longevity Income Annuities in Defined Contribution Plans: Optimal Retirement Portfolios Taking Social Security Into Account. *Journal of Risk and Insurance* 90(4): 831–860.
- Horneff, Vanya, Raimond Maurer, and Olivia S. Mitchell, 2020. Putting the Pension Back in 401(k) Retirement Plans: Optimal Versus Default Deferred Longevity Income Annuities. *Journal of Banking & Finance* 114: 105783.
- Hurwitz, Abigail, and Olivia S. Mitchell, 2022. *Financial Regret at Older Ages and Longevity Awareness*. No. w30696. Cambridge, Mass.: National Bureau of Economic Research.
- Konicz, Agnieszka Karolina, and John M. Mulvey, 2013. Applying a Stochastic Financial Planning System to an Individual: Immediate or Deferred Life Annuities? *The Journal of Retirement* 1(2): 46–60.
- Lobel, Hank, Colleen Jaconetti, and Rebecca Cuff, 2019. *The Replacement Ratio: Making It Personal*. Valley Forge, Pa.: The Vanguard Group.
- Look, Spencer, and Aron Szapiro, 2022. *The Retirement Plan Lifetime Income Strategies Assessment*. Chicago: Morningstar.

- Lusardi, Annamaria, and Olivia S. Mitchell, 2017. How Ordinary Consumers Make Complex Economic Decisions: Financial Literacy and Retirement Readiness. *Quarterly Journal of Finance* 7(3): 1–31.
- Lusardi, Annamaria, and Olivia S. Mitchell, 2014. The Economic Importance of Financial Literacy: Theory and Evidence. *Journal of Economic Literature* 52(1): 5–44.
- Merton, Robert C., 1969. Lifetime Portfolio Selection Under Uncertainty: The Continuous-Time Case. *The Review of Economics and Statistics* 51(3): 247–257.
- Milevsky, Moshe A., 2013. *Life Annuities: An Optimal Product for Retirement Income*. Charlottesville, Va.: CFA Institute Research Foundation Monograph.
- Milevsky, Moshe A., 1996. *Optimal Asset Allocation Towards the End of the Life Cycle: To Annuitize or Not to Annuitize?* Available at SSRN: ssrn.com/abstract=1077.
- Milevsky, Moshe A., Huaxiong Huang, and Virginia R. Young, 2015. A Glide Path for Target Date Fund Annuitization. *The Journal of Retirement* 3(1): 27–37.
- Samuelson, Paul A., 1969. Lifetime Portfolio Selection by Dynamic Stochastic Programming. *The Review of Economics and Statistics* 51(3): 239–246.
- Shoven, John B., and Daniel B. Walton, 2023. *Target Retirement Fund: A Variant on Target Date Funds That Uses Deferred Life Annuities Rather Than Bonds to Reduce Risk as Retirement Approaches*. No. w30817. Cambridge, Mass.: National Bureau of Economic Research.
- Soni, Amit, 2023. The Role of Annuities in Managing Sequence of Returns Risk Approaching and in Retirement. *The Journal of Retirement*.
- Turra, Cassio M., and Olivia S. Mitchell, 2004. *The Impact of Health Status and Out-of-Pocket Medical Expenditures on Annuity Valuation*. Philadelphia: Pension Research Council.
- Turner, John A., 2014. Why Don't People Annuitize? The Role of Advice Provided by Retirement Planning Software. *The Journal of Retirement* 1(4): 129–134.
- Vanguard, 2022. *How America Saves 2022*. Valley Forge, Pa.: The Vanguard Group.
- Wettstein, Gal, Alicia H. Munnell, Wenliang Hou, and Nilufer Gok, 2021. *The Value of Annuities*. CRR WP 2021-5. Chestnut Hill, Mass.: Center for Retirement Research at Boston College.

Appendix

Vanguard Capital Markets Model (VCMM)

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model (VCMM) regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More importantly, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the VCMM is that the returns of various asset classes reflect the compensation participants require for bearing different types of systematic risk (beta).

At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central

tendency in these simulations. Results produced by the tool will vary with each use and over time. The asset-return distributions used in this paper are drawn from 10,000 VCMM simulations based on market data and other information available. The model uses index returns, without any fees or expenses, to represent asset classes. Taxes are not factored into the analysis.

We implement the framework using five assets. We have assumed a 60:40 home bias within equities and a 70:30 home bias within fixed income toward the U.S. International fixed income is assumed to be currency hedged back to U.S. dollars. We refer to the combined allocation toward U.S. and international (or world ex-U.S.) equities as the overall equity allocation. Equity is the risky asset and fixed income is the less risky asset. We assume that asset returns follow a vector autoregression (VAR) with one lag. VAR is a statistical model used to capture the relationship between multiple quantities as they change over time. VAR(1) means that the probability of achieving each equity and fixed income state in the next period is conditional on the current state of equities and fixed income.

$$\begin{bmatrix} r_t^e \\ r_t^b \end{bmatrix} = \begin{bmatrix} c^e \\ c^b \end{bmatrix} + \begin{bmatrix} \beta_{1,1}^{t-1} & \beta_{1,2}^{t-1} \\ \beta_{2,1}^{t-1} & \beta_{2,2}^{t-1} \end{bmatrix} \begin{bmatrix} r_{t-1}^e \\ r_{t-1}^b \end{bmatrix} + \begin{bmatrix} \varepsilon_t^e \\ \varepsilon_t^b \end{bmatrix}$$

$$\begin{bmatrix} \varepsilon_t^e \\ \varepsilon_t^b \end{bmatrix} \sim N \left(0, \begin{bmatrix} \sigma_{et}^2 & \sigma_{e,bt} \\ \sigma_{e,bt} & \sigma_{bt}^2 \end{bmatrix} \right)$$

- Where r_t^e and r_t^b are the return for equity ("e") and fixed income or bonds ("b") for year t .
- c^e and c^b are the return realized if prior returns are zero.
- β is the coefficient relating prior returns to current returns.
- ε^e and ε^b are the error terms that are normally distributed with a mean 0 and covariance matrix (σ).

Figure 14 and Figure 15 show the long-run return and correlation expectations, respectively.

FIGURE 14
Annualized forward-looking long-run return expectations

	Median return	Volatility
U.S. cash	3.4%	1.8%
U.S. equity	6.2%	17.9%
U.S. nominal bonds	4.6%	6.0%
International equity	8.4%	18.8%
International bonds	4.2%	4.6%
Short-term TIPS	3.7%	5.5%

Source: Vanguard, as of December 29, 2023.

FIGURE 15
Forward-looking long-run correlation expectations

	U.S. cash	U.S. equity	U.S. nominal bonds	International equity	International bonds	Short-term TIPS
U.S. cash	1.0	—	—	—	—	—
U.S. equity	0.0	1.0	—	—	—	—
U.S. nominal bonds	0.2	-0.1	1.0	—	—	—
International equity	-0.1	0.8	-0.2	1.0	—	—
International bonds	0.4	-0.1	0.7	-0.2	1.0	—
Short-term TIPS	0.3	-0.4	0.8	-0.3	0.6	1.0

Source: Vanguard, as of December 29, 2023.

Hybrid annuity TDF assumptions

For our analysis, we have used the following inputs for each of the hybrid annuity TDFs' building blocks. We have used these assumptions to create hypothetical hybrid annuity TDFs that reflect some of the products available in the market. While the actual products would be different, these assumptions allow us to compare the value offered by different types of hybrid annuity TDFs.

Multi-asset allocation

In Figures 3–5, 8–10, and 12, the multi-asset allocation is represented by an optimal equity-bond glidepath determined for each combination of the income funding strategy variables. These variables are income funding strategy start age, income funding strategy maximum allocation, and share of the income funding strategy used to buy the annuity. Once income funding strategy variables are selected, the overall exposure to the income funding strategy is fixed. For the remaining hybrid annuity TDF allocation (multi-asset allocation), there could be multiple choices in the form of equity-bond glidepaths. We evaluate multiple glidepaths that could be used as the multi-asset allocation and select the one that provides the highest utility to a hybrid annuity TDF participant.

In Figure 7, the multi-asset allocation is represented by a hypothetical TDF where equity allocation starts at 90% for age 25 and is reduced to 50% by age 65, before becoming constant at 30% for age 72 and beyond.

Income funding strategy

A range of income funding strategies are used in the marketplace, with value-added features and risks. In our view, the income funding strategy is inherently trying to hit a moving target. That is largely because the actual decision to annuitize might change during the planning horizon. We consider the planning horizon to be the period between the age when participants start contributing to an income funding strategy and the age when they derive guaranteed income from annuities. The amount, timing, and kind of annuity a participant should use is influenced by their unique personal preferences (such as behavioral or risk tolerance), circumstances (such as health status and household structure), and financial planning goals (such as bequest, debt, and emergency savings).

The income funding strategy is represented by a hypothetical stable value fund (SVF) that wraps U.S. nominal bonds. We acknowledge that the SVF is an approximation of the income funding strategy and there could be other more nuanced ways to represent this strategy. The SVF is an insurance product that utilizes accounting techniques to amortize an underlying portfolio's returns over a long time, resulting in reduced volatility exposure for a participant. In an SVF, the crediting rate is used to determine the returns experienced by the participant.

For each of the 10,000 market scenarios, we compute crediting rate using the formula:

$$CR_t(i) = \left(\frac{MV_t(i)}{BV_t(i)} \right)^{\frac{1}{Duration_t(i)}} * (1 + Yield_t(i)) - 1$$

$$MV_t(i) = MV_{t-1}(i) * (1 + PR_t(i))$$

$$BV_t(i) = BV_{t-1}(i) * (1 + CR_{t-1}(i))$$

- Where i is the market scenario.
- t is the participant age.
- $CR_t(i)$ is the crediting rate (return) from the SVF for age t and market scenario i .
- $MV_t(i)$ and $BV_t(i)$ are the market value and book value of the SVF for age t and market scenario i .
- $PR_t(i)$ is the return on the wrapped portfolio in the SVF for age t and market scenario i .
- $Duration_t(i)$ and $Yield_t(i)$ are the duration and yield of the wrapped portfolio in the SVF for age t and market scenario i .

Annuity

Annuities are priced considering various factors like interest rates, mortality rates, market risks, and administrative costs. For our analysis, we have used an annuity pricing model that adjusts the annuity prices for underlying interest rate changes in each of the 10,000 market scenarios with different interest rates and market risks. While we have taken a simplified approach, more sophisticated modifications in annuity pricing, such as the use of life expectancy based on mortality tables, additional product features, or the use of hedging tools, have limited bearing on our analytical conclusion.

For each of the 10,000 market scenarios, we compute annuity yields using the formula:

$$Annuity\ Yield_t(i) = Beta * US\ Bond\ Yield_t(i) + Spread$$

$$Spread = Annuity\ Yield_c - Beta * US\ Bond\ Yield_c$$

- Where i is the market scenario.
- t is the participant age.
- $Annuity\ Yield_t(i)$ is the annuity yield at age t and market scenario i .
- $US\ Bond\ Yield_t(i)$ is the yield on U.S. bonds at age t and market scenario i . We use VCMM forecasts for the U.S. bond yield.
- $Annuity\ Yield_c$ is the annuity yield as of December 29, 2023.
- $US\ Bond\ Yield_c$ is the yield on the Bloomberg U.S. Aggregate Bond Index as of December 29, 2023.
- $Beta$ is estimated using the CANNEX Payout Annuity Yield (PAY) Index and Bloomberg U.S. Aggregate Bond Index yields. We use weekly data for the period from January 2005 to December 2023. The CANNEX PAY Index is a baseline measurement of the lifetime yield that a retiree can expect from an immediate income annuity. We use this index for a 65-year-old participant with a single premium immediate annuity.
- $Spread$ is the difference between the annuity yield and the beta-adjusted yield on the Bloomberg U.S. Aggregate Bond Index as of December 29, 2023.

Annuity pricing data: We use annuity prices from CANNEX to calibrate our annuity pricing model.

FIGURE 16
Annuity assumptions for hybrid annuity TDFs

	SPIA	DIA	QLAC
Annuity purchase age	65	Variable (35–65)	65
Annuity income start age	65	65	80
Cost-of-living adjustment	2%	2%	2%
Annuity type	Single, cash refund	Single, cash refund	Single, cash refund
Gender*	Unisex	Unisex	Unisex
Maximum allocation	—	—	\$200,000**

* Unisex annuity prices are calculated as the average of annuity quotes for the male and female genders.

** The Internal Revenue Service's limit for a QLAC allocation. The maximum QLAC allocation is adjusted for inflation.

Source: Vanguard.

Life-cycle modeling inputs

FIGURE 17
Inputs to Vanguard Life-Cycle Investing Model

Input	Assumption	Notes
Starting age	25	—
Horizon age	111	—
Retirement age	65	—
Social Security withdrawal age	65	—
Savings rate (as % of salary)	8.8%–12.0%	The savings rate increases over time because of the expectation of savings escalation for retirement plan enrollees as the participant approaches their retirement date.
Starting real salary	\$52,000	For a participant in the workforce at age 25.
Ending real salary	\$75,000	For a participant starting at age 25 and retiring at age 65. We add productivity growth and inflation to this over time.
Wage scale	Wage Index	Social Security Administration National Average Wage Index
Total replacement ratio	79%	This represents the percentage of preretirement income needed in retirement. It is based on real replacement rate estimates for an ending salary of about \$75,000 and savings rate of 15%.***
Social Security replacement ratio	37%	This is based on real monthly Social Security benefit estimates for an ending salary of about \$75,000 and savings rate of 15%.
DB replacement ratio	None (0%)	—
TDF replacement ratio	42%	This represents retirement expenses that need to be funded by the investment portfolio. It is calculated as: Total replacement ratio – Social Security replacement ratio – DB replacement ratio.
Spending rule	Hybrid spending****	Withdrawal amounts target a specified replacement ratio aimed at maintaining lifestyle in retirement. When wealth balances run low, spending reduces to a sustainable withdrawal amount that is dependent on the years of spending the portfolio is expected to support.

*** See Lobel et al. (2019).

**** We use a hybrid spending rule to reflect a participant aiming to maintain their lifestyle while moving into retirement. We achieve this by using a replacement ratio, which is a conventional practice in the financial planning industry. The VLCM does allow for other spending rules like RMD, fixed percentage withdrawal, etc.

Source: Vanguard.

Wage scale

Participant salary growth is modeled after the U.S. Social Security Administration's National Average Wage Index. The index is based on reported wages across workers' age spectrum of 25–65 for low-, medium-, and high-income earners. This allows us to trace the earnings progression of an average earner over a 40-year working career, accounting for factors such as career development. As modeled, the average participant reaches a peak salary at age 55 (in real terms) and experiences a decline in real salary through age 65. In our life-cycle simulations, we also allow for 1.1% annual salary growth, on a real basis, in addition to the cross-sectional increase in the wage scale, which reflects the historical average productivity growth of the U.S. economy.

Contribution rates

Age-specific contribution rates are derived from *How America Saves 2022* (Vanguard, 2022), a report surveying the approximately 5 million participants served by Vanguard's recordkeeping business. Contribution patterns account for the likelihood that participants will start with a lower savings rate in their early working years and increase their contributions as retirement approaches. Contributions start at approximately

5% at age 25 and increase to approximately 10% at age 65. In addition, the simulations include a company match of \$0.50 per dollar up to 3% of salary, which is consistent with industry averages.

Replacement ratios and drawdown scenarios

We follow industry convention in assuming that retirees will spend a percentage of their age-65 salary every year in retirement from a combination of Social Security benefits and investment income from private sources. In our baseline analysis, the replacement ratio assumption (as a percentage of age-65 salary) is consistent with retirees maintaining the same standard of living enjoyed during their final working years. Replacement ratios vary by income level, as Social Security makes up a smaller percentage at larger salaries.

Survival probability

Participant survival probabilities are calculated using the U.S. Social Security Administration's actuarial life tables. We use gender-neutral survival probabilities in this paper.

Taxes

For simplicity, we ignore the impact of taxes in our model.

Capturing the voice of the client

To better understand client demand, concerns, and preferences related to hybrid annuity TDFs, we conducted a multifaceted assessment in 2023, consisting of direct and indirect research across three impacted segments within the institutional space—plan sponsors, consultants, and plan participants.

Research coverage

This research included:

Direct client discussion

- Client counsel (*10 plan sponsors representing Vanguard's highest-profile plans*).
- Consultant forum (*10 anchor firm consultant representatives*).

Indirect market research

- Escalent defined-contribution decision-maker interviews (*blind interviews with 24 plan sponsors and consultants*).
- Plan participant retirement income surveys (*blind surveys conducted across Vanguard plan participants*).
- Vanguard investor behavior research (*bottom-up analysis of investor behaviors near and in retirement*).

Research findings and feedback

Here are the key takeaways from the voice-of-client study:

Plan sponsors

- While there is broad belief among plan sponsors that the integration of guaranteed income has the potential to add value for many participants, initial uptake is likely limited given concerns about the suitability of annuities for defaulted participants.
- Plan sponsors noted hurdles to hybrid annuity TDF adoption for their plans, including heightened fiduciary risk, inconsistent recordkeeper integration, and educational requirements.
- They also showed a preference for a more holistic retirement income solution rather than a single product that may not be suitable for all participants.

Consultants

- Showed comfort with the investment merit of hybrid annuity TDFs.
- Indicated that hurdles like high cost, low transparency, and greater complexity could impact fiduciary responsibility.
- Noted hybrid annuity TDFs are typically suitable for a small subset of plans, namely those with a distinct need for security of income (e.g., plans with a frozen/phased-out DB), and participants with a high level of engagement.

Plan participants

- While guaranteed income was consistently noted as valuable by plan participants, the desire for and usage of annuities remains very low (annuities accounted for only about 5% of retirement income sources).
- Of the key factors noted for investment and account selection in retirement, "gives me control over my money" was indicated as the top factor.
- Engagement among plan participants using TDFs remains low and when it occurs, participants near retirement tend to move away from a single TDF (e.g., allocate to a different set of investments, roll over the account, or move to advice on a limited basis).

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The Vanguard Life-Cycle Investing Model (VLCM) is designed to identify the product design that represents the best investment solution for a theoretical, representative investor who uses the target-date funds to accumulate wealth for retirement. The VLCM generates an optimal custom glide path for a participant population by assessing the trade-offs between the expected (median) wealth accumulation and the uncertainty about that wealth outcome, for thousands of potential glide paths. The VLCM does this by combining two sets of inputs: the asset class return projections from the VCMM and the average characteristics of the participant population. Along with the optimal custom glide path, the VLCM generates a wide range of portfolio metrics such as a distribution of potential wealth accumulation outcomes, risk and return distributions for the asset allocation, and probability of ruin, such as the odds of participants depleting their wealth by age 95.

The VLCM inherits the distributional forecasting framework of the VCMM and applies to it the calculation of wealth outcomes from any given portfolio.

The most impactful drivers of glide path changes within the VLCM tend to be risk aversion, the presence of a defined benefit plan, retirement age, savings rate, and starting compensation. The VLCM chooses among glide paths by scoring them according to the utility function described and choosing the one with the highest score. The VLCM does not optimize the levels of spending and contribution rates. Rather, the VLCM optimizes the glide path for a given customizable level of spending, growth rate of contributions, and other plan sponsor characteristics.

A full dynamic stochastic life-cycle model, including optimization of a savings strategy and dynamic spending in retirement, is beyond the scope of this framework.

All investing is subject to risk, including the possible loss of the money you invest.

Diversification does not ensure a profit or protect against a loss.

There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income.

Investments in target-date funds are subject to the risks of their underlying funds. The year in the fund name refers to the approximate year (the target date) when an investor in the fund would retire and leave the work force. The fund will gradually shift its emphasis from more aggressive investments to more conservative ones based on its target date. An investment in target-date funds is not guaranteed at any time, including on or after the target date.

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