2023 Robo-Advisor Landscape

Our take on the digital advice industry and the best options for individual investors.

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Contents

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Corrections and Clarifications
Corrections issued July 6, 2023.

Executive Summary

The growth and refinement of the robo-advisor industry over the past 15 years have provided investors, especially those of modest means, with access to diversified, professionally managed portfolios. Given their low required account balances, modest costs, and ease of use, robo-advisors are a compelling option for young investors who have less complicated financial situations. But choosing the right one can be a challenge. This industry landscape report evaluates 18 leading robo-advisors while providing data on up to 20. It focuses on the features and benefits that are most likely to help investors reach their financial goals: fees, quality of investment advice, financial planning tools, and other factors.

Our research found broad similarities among major retail-oriented U.S. digital advice providers in investor engagement and advice delivery. Nearly all use questionnaires to gather information on client goals, time horizons, and risk tolerance and then feed that data into advice engines that recommend one of several portfolio options, typically consisting of low-cost, passively managed funds.

Providers differ more in how much additional financial planning they offer. Most focus on digital investment management and add some basic features. The top providers, however, offer comprehensive tools, ranging from online-only counsel to on-demand access to human financial advisors.

Cost is another key differentiator. The median advisory fee among robo-advisors surveyed was 0.25% of assets per year—much cheaper than traditional financial advisors' typical 1.00% levy. But specific fee levels and how they are charged vary. The optimal fee structure depends on how much money clients invest and whether they want basic investment advice or more-comprehensive financial planning.

Of the 18 robo-advisors evaluated, Vanguard Digital Advisor and Fidelity Go ranked first and second, respectively, thanks to their low costs, nuanced asset-allocation approaches, broad range of financial planning tools, and transparency. Though they made some improvements, Titan Invest and several bank-affiliated providers were still the least attractive because of higher costs, poor transparency, or limited financial planning tools.

Key Takeaways

- Despite its growth potential, the digital advice industry still accounts for a small percentage of investable assets in the United States.
- Dedicated digital advice firms often struggle to reach profitable scale, while the large brokerage firms and wealth managers that acquire them often struggle to integrate their digital advice capabilities.

- The typical robo-advisor playbook includes portfolios composed of passively managed, low-cost exchange-traded funds with a range of risk levels. But asset-allocation ranges vary, and several providers have added active or quasi-active strategies.
- The lines between robo-advisors and traditional financial advice continue to blur, as firms such as Ally Invest, Merrill Lynch, and J.P. Morgan have added hybrid offerings that blend automated advice with access to a human advisor.
- Vanguard and Fidelity Go stood out as the best options, although we also assigned above-average scores to Schwab Intelligent Portfolios, Betterment, and Wealthfront.
- Titan Invest, E-Trade Core Portfolios, Merrill Guided Investing, UBS Advice Advantage, and Ally Invest scored poorly because of higher costs, limited planning features, and/or a lack of transparency.

Introduction

The robo-advisor industry is more than a quarter century in the making, but it remains a story of untapped potential, both for digital advice providers and the investors who stand to benefit. Indeed, industrywide assets of around $740 billion as of early 2022[1] made up only a small fraction of the $31.4 trillion U.S. retail market, which Cerulli Associates defines as investors with $100,000 to $5 million of financial assets. Meanwhile, even as access to low-cost portfolios diversified by asset class and region has become the norm, leading robo-advisor providers have only recently added basic features, such as nonretirement goal planning, and services like tax-loss harvesting aren’t standard yet.

As robo-advisors compete for new business by adding investing and planning capabilities, it can be hard to discern which ones are advancing or failing behind industry changes. Varied pricing models and often poor transparency into underlying investments, where conflicts of interest and risks can lurk, complicate matters further.

This paper surveys the industry landscape and assesses 18 major robo-advisor providers. Vanguard and Fidelity received the two highest scores. We consider three others to be above average, and some competitors aren't far behind. Several offerings, though, warrant caution, because of above-average costs and/or transparency issues.

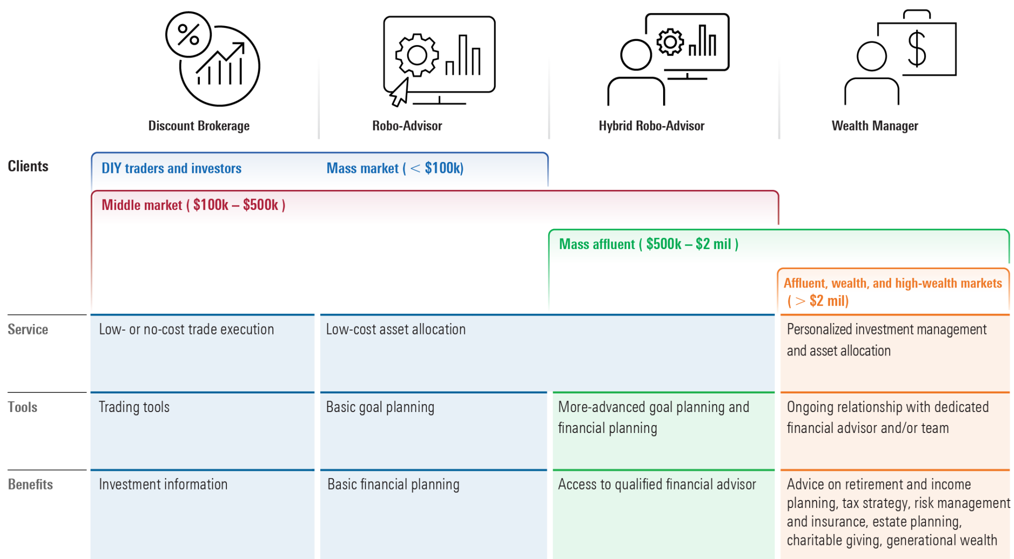
Definition

The birth of robo-advisors reflects the confluence of many trends, including the growth of the internet, the surge in popularity of ETFs and other low-cost investment options, and the decline of defined-benefit pension plans. At the risk of oversimplifying, though, robo-advisors are the offspring of the marriage between Modern Portfolio Theory and advanced computing power. In fact, Nobel laureate William Sharpe, one of the fathers of the capital asset pricing model, founded in 1996 what would emerge as the first robo-advisor, Financial Engines. Initially an online advice provider whose recommendations investors had to implement on their own, the firm became a robo-advisor once it launched computer-based discretionary asset management.

1 https://www.theroboreport.com/data/aum-statistics/

Such algorithmic asset management is what separates robo-advisors from do-it-yourself trading platforms and advice providers, on the one hand, and higher touch, personalized wealth management, on the other. Morningstar's Michael Wong defines robo-advisors as platforms that offer automated, semitailored strategic asset-allocation investment portfolios directly to retail customers.[2] Additional services and financial planning tools are common, as is some access to human advisors, the "robo' or "robot" moniker notwithstanding.

Exhibit 1 Robo-Advisors Fill Niche Between Discount Brokers and Traditional Wealth Management



Source: Morningstar. Wealth tiers are based on research from Cerulli Associates.

Scope

This research focuses on U.S.-based robo-advisors and digital wealth managers, most of which include access to human advisors, that are widely available to individual investors, and it excludes those limited to retirement assets. While it gives information on up to 20 providers, it assesses only 18. We didn't assess Ellevest because Morningstar has an ownership stake in the company. We also omitted J.P. Morgan Automated Investing, which uses some funds that track Morningstar indexes. We did, however, assess Betterment. Although Betterment's sustainability-focused portfolios include three ETFs tracking Morningstar indexes, those funds claimed a small fraction of the firm's total assets as of Dec. 31, 2022.

This year we added three robo-advisors: Citi Wealth Builder, Empower Personal Wealth, and U.S. Bancorp Automated Investor. Three robo-advisors from our 2022 study are not in this one: Capital One sold its robo-advisor business in April 2022; BlackRock sold its direct-to-consumer FutureAdvisor business to Ritholtz Wealth Management in February 2023; and Morgan Stanley has essentially

2 Wong, M.W. 2015. "Hungry Robo-Advisors Are Eyeing Wealth Management Assets? We Believe Wealth Management Moats Can Repel the Fiber-Clad Legion." P. 2.

replaced its Access Investing with the E-Trade Core Portfolios service, which Morgan Stanley picked up when it bought the online broker in 2020.

Our 18 assessments draw on a combination of regulatory filings and online information, along with additional insights from robo-advisor survey responses, follow-up interviews, and product demonstrations. Acorns, Citi Wealth Builder, Empower Personal Wealth, Marcus Invest, and UBS Advice Advantage each declined our survey request or did not grant an interview, but we proceeded with publicly available information, albeit with some adjustments for insufficient data (detailed below).

Methodology

We based our assessments on the factors most likely to help investors succeed. Our methodology draws on the Morningstar Medalist Rating and other evaluations, such as our 529 college savings plan and health savings account research as well as our Best Interest Scorecard methodology,[2] but it is tailored to robo-advisors.

Our assessments prioritized low, transparent fees; a robust risk-tolerance questionnaire; logical mapping to portfolios; sound portfolio diversification that steers clear of questionable asset classes and investment tactics; and a broad range of planning-related features.

We scored robo-advisors on a five-point scale in four categories: total price (30% weighting); the process used to select investments, construct portfolios, and match portfolios with investors (30%); the provider organization behind the digital platform (20%); and breadth of services (20%). We summed each weighted component to arrive at an overall score, which we then used to rank the robo-advisors. Robo-advisors with scores between 5.0 and 4.5 earned High assessments; from 4.4 to 3.5 were Above Average, 3.4 to 2.5 Average, 2.4 to 1.5 Below Average, and 1.4 or below Low.

Since information about the risk levels, asset mixes, and underlying funds is essential for consumers to make an informed decision before signing up, we assigned each offer that fell short a Quality of Investments/Portfolio Construction score of 1 out of 5. This year, we penalized Citi Wealth Builder and UBS Advice Advantage for insufficient disclosure, whereas in our 2022 study, we penalized two other offers.

2 https://assets.contentstack.io/v3/assets/blt4eb669caa7dc65b2/bltb38f56957e3f90f1/best-interest-scorecard-methodology.pdf

Exhibit 2 Morningstar's Robo-Advisor Assessment Criteria

Category	Weighting %
Price	30
Quality of Investments/Portfolio Construction	30
Provider	20
Breadth of Services	20

Source: Morningstar. Data as of May 31, 2023.

Key assumptions and questions related to each of the four categories include:

Price (30%)

- Assumption:
  - All else being equal, lower fees are better, but we also looked for transparency and pricing models that align with investors' interests.
- Questions:
  - What is the total annual cost (including underlying fund expense ratios) for an account with a $15,000 balance, assuming no market fluctuations, and how does that cost change at smaller and larger asset levels?
  - Aside from asset-based fees, how does the platform make money off of client assets and/or the client relationship?
  - What role, if any, do fee waivers play?

Quality of Investments/Portfolio Construction (30%)

- Assumption:
  - A seasoned team with strong resources selects investments and constructs portfolios that emphasize client results over sales of questionable proprietary products that do not align with investors' interests.
- Questions:
  - Who is in charge, and what are their qualifications?
  - Does the team select quality investments across a range of proven asset classes to build and maintain portfolios with sensible allocations?
  - How does the platform collect client-specific information on risk tolerance and other factors, and how does that information influence portfolio construction?
  - What drives investment changes?

Provider (20%)

- Assumption:
  - The organization behind the robo-advisor is aligned with clients while demonstrating a thoughtful approach, long-term commitment, and a track record of doing right by investors.
- Questions:
  - Are topnotch investment research leaders in charge of the platform?

- Does the platform stand on its own, or is it integrated into the firm's broader suite of offerings?
- Are there potential conflicts between the ultimate owners of the firm and its clients?

Breadth of Services (20%)

- Assumption:
  - Tools and services support holistic financial planning for varied investing goals.
- Questions:
  - What is the breadth of investing and planning features available on the platform?
  - Does the program include key features, such as account aggregation, tax-loss harvesting, and planning for multiple goals?
  - Do tools and services consider investors' total assets and tax situation?
  - Do investors have access to humans, especially qualified financial professionals?

Results: Vanguard Tops the List Again

Vanguard Digital Advisor, and its premium sibling Vanguard Personal Advisor Services, once again received the only High overall assessment, while Fidelity Go, Schwab Intelligent Portfolios, Betterment, and Wealthfront repeated with Above Average assessments. Meanwhile, only Titan received a Low assessment.

Despite the similarities of this year's results to those of 2022, there are important differences. SigFig dropped to Average from Above Average as the one-time pioneer fell behind best-in-class rivals. The overall scores among the Above Average robo-advisors also shifted. Betterment dropped from second to a fourth-place tie with Wealthfront, partly driven by our concerns around Betterment's expanded lineup of portfolio options, including risky cryptocurrency-focused portfolios.

Vanguard is now the only robo-advisor to receive a High mark in three of our four categories after multiple enhancements boosted its Quality of Investments/Portfolio Construction and Breadth of Services scores to High from Above Average. Vanguard added ESG options, active equity and fixed-income funds, and a municipal-bond strategy, which helped the former grade, and introduced tax-loss harvesting to all its advice clients to lift the latter. Vanguard also improved the tax efficiency of its onboarding process for clients who are new to the advice program. If those clients have embedded capital gains in one or more of up to 90 Vanguard strategies, they no longer must sell those holdings. Instead, Vanguard uses a completion methodology to round out their portfolio exposures.

Schwab Intelligent Portfolios, meanwhile, maintained its High Breadth of Service score. Schwab offered tax-loss harvesting before Vanguard, and its overall suite of capabilities still compares favorably.

Vanguard remained the only robo-advisor with a High Price assessment. At as little as 0.20% per year for advisory and underlying fund fees, Vanguard Digital Advisor isn't the cheapest entry-level offering; but it offers new investors the most value for its cost. Similarly, Vanguard Personal Advisor Services' starting advisory fee of 0.30%, while not the lowest for those with more-complicated needs or preferences, is still cheap for a higher-end service combining automated features with human financial advisors.

Although Schwab Intelligent Portfolios and SoFi Wealth appear to be bargains, concerns about each kept their Price assessments at Above Average and Average, respectively. Schwab Intelligent Portfolios charges no advisory fee for accounts with at least $5,000 but allocates a significant portion of client assets to in-house cash accounts. That drags on returns in up markets while generating revenue for Schwab, which receives the spread (or difference) between the revenue it earns on asset balances and the yield it pays investors.

SoFi Wealth will be hard-pressed to maintain its current pricing, and it suffers from other weaknesses. SoFi charges no advisory fee and has waived the expense ratios for its two proprietary funds that together make up nearly two thirds of each portfolio's equity allocation. The service, part of what SoFi calls its "Financial Services Productivity Loop" strategy, seems as much designed for making money through cross-selling as for serving investment needs. Meanwhile, its two SoFi ETFs track growth benchmarks, which could backfire if value stocks take an extended turn leading the market.

No robo-advisor received a perfect score, including Vanguard. Its Provider mark dropped to Above Average from High because of a dubious partnership. Invest for Amex by Vanguard, launched in April 2022, offers Vanguard's digital financial planning to some U.S. American Express cardholders but charges a gross advisory fee 30 basis points higher than Vanguard Digital Advisor's. The program also levies additional fees that are contrary to Vanguard's reputation for keeping investors' costs low.

The lowest-scoring robo-advisors were not all bad, either. For example, Titan, which ranked last with Low scores in three of four categories, reduced its pricing and added more diversified portfolio building blocks in the form of stock and bond ETF portfolios. These modest improvements are steps in the right direction.

Exhibit 3 Morningstar's Robo-Advisor Assessments

Provider	Price[1]	Score	Quality of Investments/ Portfolio Construction	Score	Provider	Score	Breadth of Services	Score	Overall	Score
Acorns	Below Average	2	Average	3	Average	3	Below Average	2	Average	2.5
Ally Invest	Below Average	2	Average	3	Average	3	Low	1	Below Average	2.3
Betterment/ Betterment Premium	Above Average	4	Average	3	Average	3	Above Average	4	Above Average	3.5
Citi Wealth Builder	Average	3	X Insufficient Data	1	Average	3	Below Average	2	Below Average	2.2
E-Trade Core Portfolios[2]	Average	3	Low	1	Below Average	2	Low	1	Below Average	1.8
Empower Personal Wealth/ Personal Capital	Low	1	Below Average	2	Average	3	Above Average	4	Below Average	2.3
Fidelity Go	Above Average	4	Above Average	4	Above Average	4	Above Average	4	Above Average	4.0
Marcus Invest	Above Average	4	Low	1	Below Average	2	Below Average	2	Below Average	2.3
Merrill Guided Investing	Below Average	2	Average	3	Average	3	Low	1	Below Average	2.3
Schwab Intelligent Portfolios/ Schwab Intelligent Portfolios Premium	Above Average	4	Below Average	2	Above Average	4	High	5	Above Average	3.6
SigFig	Above Average	4	Above Average	4	Average	3	Below Average	2	Average	3.4
SoFi Wealth	Average	3	Below Average	2	Below Average	2	Above Average	4	Average	2.7
Titan	Below Average	2	Low	1	Low	1	Low	1	Low	1.3
UBS Advice Advantage	Low	1	X Insufficient Data	1	Below Average	2	Average	3	Below Average	1.6
US Bancorp Automated Investor	Above Average	4	Above Average	4	Average	3	Below Average	2	Average	3.4
Vanguard Digital Advisor/ Vanguard Personal Advisor Services	High	5	High	5	Above Average	4	High	5	High	4.8
Wealthfront	Above Average	4	Average	3	Average	3	Above Average	4	Above Average	3.5
Wells Fargo Intuitive Investor	Below Average	2	Below Average	2	Average	3	Average	3	Average	2.4

Source: Morningstar. Data as of May 31, 2023.
1 High and Above Average Price scores indicate more modest and thus attractive fees, while Low and Below Average signify the opposite.
2 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
X Insufficient portfolio data resulted in a score of 1.

To facilitate further comparison between the robo-advisor offers we evaluated, we provide a brief overview of each, arranged alphabetically below.

Acorns | Average

Acorns doesn't quite live up to the hype.

The company boasts prominent board members and investors, including stars Jennifer Lopez, Alex Rodriguez, and Ashton Kutcher as well as finance authorities Richard Thaler, Shlomo Benartzi, and Harry Markowitz. It stands out for its focus on micro-savings, with features that help investors round up spending on everyday purchases to build an investment balance. It also offers an "Earn Program" that provides rebates on purchases made through select companies. With no investment minimum and a straightforward investment approach, it's easily accessible for beginning investors.

However, its subscription-based pricing model is pricey given its target audience. The company had offered a $1 per month Lite option, but its cheapest subscription tier now charges $3 per month, or $36 per year. That translates into 24 basis points for a $15,000 account but is steep (3.27%) relative to its average account size of about $1,100.

Acorns lacks some key features. It offers automatic rebalancing but no tax-loss harvesting and few if any planning-related features. Acorns' "Early" program includes Uniform Transfers to Minors Act/Uniform Gifts to Minors Act accounts, which are suboptimal for at least two reasons: They're not tax-advantaged, and account owners have full access to the funds when they reach the age of 21 in most states (18 in a few). Acorns defaults these accounts into the Aggressive portfolio, which is also less than ideal for kids approaching college age. Its approach to emergency savings is suboptimal, as well. Customers can set up an emergency fund, which is a non-interest-bearing demand deposit. With other cash options now yielding 5% or more, it’s unclear why anyone would find this option appealing.

Acorns offers a small number of portfolios corresponding to different risk levels (five Core portfolios and four Socially Responsible Investing portfolios). Asset allocation is straightforward, and the quality of the underlying investments (mainly from iShares, Vanguard, J.P. Morgan, and Goldman Sachs) is above average. However, investors can now opt into a bitcoin ETF with up to 5% of portfolio assets or directly invest in stocks with up to 50% of their assets.

The management team seems heavy on tech and venture capital types and light on investment research. Seth Wunder started as chief investment officer in October 2021 after working as a hedge fund manager, but his record is largely unknown. CEO Noah Kerner also has retooled the firm's growth plans after a scuttled 2022 IPO via a special-purpose acquisition company merger; for instance, in April 2023, it bought U.K.-based child and teen banking startup GoHenry.

Ally Invest | Below Average

Ally Invest still has some attractive features for Ally Financial banking customers, but it has otherwise ceded ground to rivals and now merits a Below Average assessment.

The April 2016 acquisition of TradeKing paved the way for its May 2017 rebranding as Ally Invest. Mitesh Patel, who had worked at Ally from 2009 to 2014, then rejoined in May 2018 to develop the service. He works with an investment committee whose members participate in portfolio development.

Between mid-2018 and late 2019, Patel and his team added investment options and some planning capabilities while lowering the service's minimum investment to $100 from $2,500. Ally's current suite of 32 portfolios relies on inexpensive Vanguard and iShares ETFs and comes in two basic types: Market Focused (2% cash allocation) for a 0.30% annual advisory fee and Cash Enhanced (30% cash allocation), which has no advisory fee. Each type has a core, tax-optimized, and ESG version. All three versions have five different allocations based on one's risk profile (conservative, moderate, moderate growth, growth, and aggressive growth). There is also an income version of each type.

The portfolios include domestic market-cap tilts and varied regional exposures. For example, the Market Focused Core Aggressive portfolio's 93% equity stake is divided among U.S. large-cap (33%), mid-cap

(17%), and small-cap (6%) stocks as well as non-U.S. developed (30%) and emerging (7%) markets. A tiered rebalancing approach is distinctive: The thresholds are smaller for asset classes with single-digit allocations and larger for those with double-digit allocations, though Ally does not disclose those thresholds.

In May 2022, Ally launched a wealth management service. It includes access to a human advisor alongside the digital advisor for a tiered fee: 0.85% for a household’s first $250,000 in assets, 0.80% for its next $750,000, and 0.75% for assets exceeding $1 million. Those fees, however, are high compared with the premium offers of best-in-class rivals such as Betterment, Fidelity, and Vanguard.

Ally has other weaknesses. It hasn’t added capabilities like its competitors have. Features that have become common, such as aggregation of outside accounts, multiple goal planning, and tax-loss harvesting, are not available. Moreover, Ally defaults clients into the Cash Enhanced portfolios, whose 30% cash allocation may earn a competitive rate relative to other high-yield savings accounts but will struggle to keep up with inflation and likely cause investors to miss longer-term gains available from greater market exposure.

Betterment/Betterment Premium | Above Average

Betterment's broad range of services and value set it apart, but investors would be better served sticking to its core offering and avoiding its gimmicky extras like cryptocurrency.

Betterment offers a lot for its below-average price tag. It charges a 0.25% asset-based, annual fee for automated portfolio management. Advice is part of the offer, too, and investors who use multiple banking and investment accounts can get help with retirement investing, goal planning, and prioritizing and tax treatment on various accounts. On-demand access to an investment advisor via Betterment Premium cost another 0.15%, or 0.40% per year in total, but Betterment is one of the few robo-advisors that lets clients pay a $399 hourly rate for advice on specific situations like retirement, college savings, marriage, or other planning topics. Lower-balance investors should note that Betterment raised rates for clients with less than $20,000 to $4 per month. However, cash and all assets held at Betterment count toward making the hurdle, and committing to monthly investments of $250 or more also gets investors the lower 0.25% fee.

Betterment's cash offering may be useful for meeting its lower-fee threshold. Betterment paid an annual percentage yield of 4.5% as of mid-June 2023. The entire balance up to a $2 million limit is FDIC insured because Betterment works with partner banks that ultimately hold the deposits (Wealthfront does the same, as does Vanguard in its cash-plus accounts).

Portfolio construction is well-thought-out. Betterment bases its allocation guidance on a simple risk-tolerance questionnaire that focuses on the amount and timing of the money a client needs. It documents on its blog how it builds and maintains various target-risk portfolios while also attempting to maximize their tax efficiency. It is one of the few robo-advisors that employs glide paths to gradually make client portfolios more conservative over time. Its Core portfolio series offers a mix of low-cost ETFs with exposure to major asset classes, such as U.S. stocks, developed- and emerging-markets non-U.S. equities, investment-grade bonds, world bonds, and Treasury Inflation-Protected Securities. Betterment tilts its U.S. equity portfolio toward value and smaller-cap stocks to generate higher expected returns. It offers a growth-tilted companion series dubbed Innovative Technology, but the series overlaps with Betterment's Core series, and it shows the firm's penchant for marketing to younger investors.

Betterment also offers target income, smart-beta, and sustainability-focused portfolios. In 2022, it added four flavors of cryptocurrency portfolios—Universe, Sustainable, Metaverse, and Decentralized Finance—for 1.0%, or 1.15% for Premium, 4 times the firm's general fee. It recommends investors put no more than 5% of their total wealth in crypto.

Betterment's disclosure hasn't been completely transparent, though. The SEC fined the firm $9 million in April 2023 for not disclosing tax-loss-harvesting program changes and coding errors that cost about 25,000 clients a combined $4 million from 2016 through 2019. A long-running error in a robo's algorithms is concerning, as is the lack of disclosure here.

Still, Betterment offers robust core investment and financial planning options at reasonable costs, and its website gives investors who want in-depth research and methodology documents plenty to read before they invest. It's a strong competitor, especially for investors looking for a clean, easy-to-use interface.

Citi Wealth Builder | Below Average

Citi Wealth Builder's limited range of planning-related services and uncertainty owing to a recent leadership change make it a less competitive player in the space.

The leadership change occurred on March 30, 2023, when Citigroup hired Andy Sieg to head its global wealth arm. Sieg had been heading up Bank of America's Merrill Wealth Management unit. At Citi, Sieg inherits an offering with a less-robust portfolio construction approach than its best-in-class rivals. Clients must have a Citibank checking account to access the digital platform, which offers three categories of portfolios—index, sustainability, and active—each with five risk tiers. Citi Investment Management runs the ESG and active portfolios with its own models. In April 2023, Citi said it would bring the index portfolios that Invesco had managed in-house. Each portfolio will continue to invest in a mix of stocks, bonds, and short-term investments, depending on the client's risk tolerance and time horizon, but Citi doesn't disclose much else about its asset-allocation process or the funds it uses. Consequently, it gets a score of 1 for portfolio construction.

On the positive side, Citi's flat advisory fee has dropped 30 basis points to 0.25%, the median of robo-advisors we surveyed. Citi, however, removed fee waivers on the underlying strategies, which could increase the offering's overall cost.

Despite the competitive fee, Citi's range of services is subpar. Clients can contact a coach at any point, but the platform does not advertise financial planning capabilities and seems more service- than advice-focused. Citi promotes its coaches as contacts for client questions about the program, site operations, technical support, and limited education and informational materials, but they don't provide investment advice.

Citi's services fall short in other ways. It does not offer tax-loss harvesting, for example. Like other bank-offered robo-advisors, Citi Wealth Builder is a small part of its institution's wealth management arm and another way to get clients in the door for more profitable services.

Empower Personal Wealth/Personal Capital | Below Average

Formerly the financial technology upstart Personal Capital, Empower Personal Wealth is now ensconced in a North American insurance and asset-management conglomerate. Though it arguably helped create the category, Empower opted out of our survey because it does not consider itself a robo-advisor but rather a comprehensive wealth manager that uses digital tools to reach and serve the mass affluent. The digital component of its services, which any investor can access online, makes it a hybrid offering that falls within this report's scope. Based on what can be gleaned from public disclosures, though, Empower's relatively high fees result in a Below Average assessment.

The firm helped create robo-advisors through entrepreneurs with connections to successful startups like PayPal. They founded Personal Capital in 2010 as a digital financial planner and investment manager. It eventually offered planning, budgeting, retirement, college savings, tax, and investing tools. Its Personal Capital Dashboard became popular with younger savers and investors, especially acolytes of the financial independence retire early, or FIRE, movement, whose adherents practice rigid frugality so they can quit working while still young. Now known as the Empower Personal Dashboard, the service still lets users track their spending, savings, checking, investment, and other accounts in one place and suggests potential tweaks.

The firm's status as an independent disruptor changed in 2020 when Montreal-based holding company Power Corporation added Personal Capital to its collection of businesses, which include Great-West Lifeco. By April 2023, Personal Capital moved its headquarters, changed its name, replaced its leadership, and merged with Power subsidiary Empower Annuity Insurance Company of America. In many ways, it is a brand-new company.

Empower Personal Wealth provides a comprehensive range of services, albeit for a steep fee. Those with less than $250,000 in assets can expect more basic options—essentially ETF portfolios based on client goals and risk tolerance; those with $250,000 to $1 million get more comprehensive advice, including a dedicated certified financial planner and more customized portfolios that include individual securities; at higher levels the firm layers in private banking and estate planning; individuals and families with more than $5 million can invest in private equity.

This is a wide range of services, but it comes at a cost: 0.89% for accounts smaller than $1 million. The annual levy declines with asset size, but no further than 0.49% for balances of more than $10 million, which is still above average. Though smaller investors who accumulate enough money to walk away from the grind early may still find Empower's tools useful, the $100,000 minimum threshold for its investment services means this offering is not for economic underdogs.

That said, Empower's strengths extend beyond its tools. It has an experienced investment team that uses mostly low-cost ETFs. It can also use the size of its parent company to deepen and expand its services or pass on economies of scale to its users. However, lower fees and more clarity on how it builds portfolios and navigates potential conflicts of interest within the Power empire would help this digital advisor's cause.

E-Trade Core Portfolios | Below Average

E-Trade's investment management and tech teams are streamlining their offering and pulling in resources from new overseer Morgan Stanley, but it needs to do more to be a compelling service.

Since Morgan Stanley acquired E-Trade in February 2020, E-Trade has discontinued some of its legacy products and services while preparing new research and advisement capabilities from Morgan Stanley Wealth Management. What hasn't changed is its overall 0.30% advisory fee, which remains middling and doesn't include underlying fund fees. The firm estimates that underlying fees should average roughly 0.05% on its traditional Core Portfolios, but the SRI and Smart Beta portfolios cost more. Additionally, though E-Trade allows nonclients to see the overall asset allocations in recommended portfolios, it does not disclose specific holdings, which would further clarify the offering's fees. This lack of transparency also makes it difficult to ascertain the effectiveness of the firm's portfolio construction methodology.

E-Trade now relies on Morgan Stanley's macro research capabilities for capital markets assumptions on key asset classes, but the investment team that built the firm's portfolios, which are broadly diversified, do not shift greatly over time, hasn’t changed. The program's asset classes seem standard, ranging from various flavors of U.S. and non-U.S. equities to taxable and municipal bonds. It also includes sustainability-focused holdings in the SRI portfolios and factor-based funds in the Smart Beta portfolios. E-Trade says it employs mostly cheap, beta-focused ETFs from third-party providers, but it's hard for potential investors to verify the claim without a full list of underlying holdings.

The portfolio assignment process is also a mixed bag. After going through a short risk questionnaire, E-Trade assigns clients to one of six target risk portfolios, ranging from aggressive to conservative. It makes sense for E-Trade to prevent clients from altering their portfolio assignment more than one degree higher or lower, but it does not consider risk capacity or adjust client portfolios based on time horizon or investing goals. E-Trade plans to add features, such as tax-loss harvesting, which Morgan Stanley Access Investing offered before it closed to new investors in October 2022. Access Investing will eventually merge with other managed accounts like E-Trade Core Portfolios. Even with tax-loss harvesting, though, E-Trade lacks other compelling features, such as integrated goal planning across a variety of internal and external accounts and a way to seek more comprehensive counsel from financial advisors.

In fact, E-Trade has lost some features it once had. It shut its legacy hybrid robo-advisor and managed accounts in 2021 and 2022. Morgan Stanley Wealth Management has a legion of financial advisors, but E-Trade's offering currently does include access to this team. Despite some ad hoc access to financial planning calls, E-Trade clients seeking more comprehensive advice must quit E-Trade and reenroll in a Morgan Stanley Wealth Management managed account. This lack of integration is a problem, and E-Trade still wasn't done integrating its back-office and operational systems with Morgan Stanley's as of May 2023.

Overall, operational uncertainty, portfolio opacity, and lack of a compelling set of advice features merit a Below Average assessment for E-Trade Core Portfolios.

Fidelity Go | Above Average

Fidelity Go stands out for its simple but effective approach, which draws on Fidelity's strong global research and asset-allocation team. Many key executives within the Fidelity Strategic Advisors unit overseeing this program have spent at least 15 to 20 years with the firm. Fidelity Go is free for accounts with balances up to $25,000. Accounts above that level pay 0.35% annually, which automatically entitles the investor to unlimited one-on-one coaching calls with a Fidelity advisor. Before 2022, such coaching was only available to participants who opted into Fidelity Personalized Planning & Advice, a separate premium service that has since been merged into Fidelity Go.

The program starts with a relatively thorough risk-tolerance questionnaire. Questions cover the investor's investment goals, time horizon, household income, risk tolerance, investment experience, investment knowledge, reaction to falling markets, emergency fund, spending as a percentage of income, likelihood of unexpected future expenses, household financial situation including job security, and value of total assets. Fidelity then uses this information to map investors to a taxable or retirement-oriented portfolio, with each spanning seven different risk levels. The portfolios all focus on a short list of core asset classes, such as U.S. stocks, international stocks, and intermediate core bonds; esoteric asset classes or ESG-focused strategies aren't part of the offer.

Fidelity Go's 0% investment advisory fee for low balances makes it a compelling option for smaller investors. The plan invests in a streamlined list of zero-expense-ratio Fidelity Flex funds, which keeps total costs below average even for higher-balance participants who pay the 0.35% management fee.

The program also offers ongoing support. Text alerts and other communications let customers know how they are progressing with their goals, as well as providing behavioral nudges to encourage long-term investing. However, Fidelity Go does not currently offer tax-loss harvesting.

All Fidelity Go participants have access to tools for spending and debt management, while those with balances above $25,000 also get unlimited advice and planning calls. Users can choose from a menu of coaching solutions focused on different topics, including retirement planning and budgeting. In contrast to Betterment and Schwab, not all of Fidelity Go's financial advisors hold the CFP designation, though most do.

Marcus Invest | Below Average

Lowering fees was a plus, but Marcus Invest's transparency is an issue, and Goldman Sachs' early 2023 retreat from its consumer business leaves this offering well behind most competitors.

After falling 10 basis points in late 2022, Marcus Invest's 0.25% advisory fee is now in line with the median of robo-advisors we surveyed. However, the firm also stopped offering a rebate to investors with Goldman Sachs ETFs in their portfolios, which partially offsets the fee savings for some investors.

Clients choose from three investment styles: Core, ESG, and Smart Beta. The styles share asset-class allocations but use different ETFs to populate their portfolios. Established Goldman Sachs teams, such as the Investment Strategy Group and Alternative Investments and Manager Selection, design and execute the portfolios, which vary in increments of 10 percentage points from 100% fixed income to 100% equity. The program bases portfolio selection on investors' stated investment time horizons and risk tolerances. Once they receive a recommended portfolio, investors can choose that portfolio or one directly above or below it on the risk spectrum. They can also opt to start over again for a new recommendation.

Marcus Invest lacks features like financial planning advice and tax-loss harvesting that come with top robo-advisors, but poor portfolio transparency and the offering's viability are larger concerns. Goldman doesn’t share allocation information with nonclients, which leaves would-be investors in the dark on issues such as how much may be allocated to emerging markets in different portfolios. Further, when Goldman splintered its consumer business in October 2022, it announced a strategic pivot away from its Marcus platform. Then, in February 2023, the firm said it would sell part of its personal loan book. Robo-advice appears safe for now, but the retreat from a consumer-focused business raises uncertainty here.

Merrill Guided Investing | Below Average

Merrill Guided Investing, or MGI, and its premium cousin Merrill Guided Investing with Advisor, or MGIA. seem like afterthoughts within Bank of America Merrill Lynch's wealth management empire and merit a Below Average assessment.

Launched in 2017, MGI is a pricey bridge between Bank of America Merrill Lynch's self-directed investing platform and its financial advisors. MGI's 0.45% advisory fee is hefty as is MGIA's 0.85% levy, which adds a team of financial consultants and access to hybrid active/passive portfolios. Granted, as members of the bank's Preferred Rewards program accrue assets, fees can drop to 0.30% and 0.70%, respectively, assuming a balance of at least $100,000. Still, clients with $20,000 or less pay the full advisory fee. As for underlying fund charges, since Merrill doesn't offer funds of its own, it primarily uses cheap third-party ETFs. However, the fund options become more expensive in the sustainability-focused portfolios and higher still for active options in the hybrid portfolios.

Portfolio construction is fairly standard, with five risk-tolerance levels across a handful of portfolio types. Clients in MGI have access to both taxable and tax-aware core portfolios, which consist of low-cost passive ETFs (the tax-aware version substitutes munis for taxable bonds), and a taxable-only sustainability-focused passive offering that tilts toward holdings with better environmental, social, and governance scores. MGI has a $1,000 investment limit but puts clients with less than $5,000 into a "strategic" version of one of these three portfolios, which employ one ETF per broad asset class, including U.S. and non-U.S. equity, and bonds.

MGIA offers the same suite of portfolios (without the simplified Strategic Asset Allocation option). It also grants access to hybrid active/passive versions of the three taxable, tax-aware, and sustainability portfolios. Investors can see the asset-allocation details of these hybrid MGI portfolios without signing up for the service but not the recommended active options themselves, which makes it difficult to recommend the portfolios.

Merrill's short risk-tolerance questionnaire also could also be improved. Clients can gauge the likelihood of achieving a set goal over timelines they provide while signing up, but MGI does not consider a client's risk capacity, and an account's funding level seems to play an undue role in the asset-allocation process.

Merrill's relatively active asset-allocation approach is unique. A large veteran team oversees macro research, asset allocation, and manager selection for both simple passive ETFs and complex active strategies. Through a series of investment subcommittees, team members determine both a set of infrequently updated Strategic Asset Allocation targets, which represent broad weightings to equities and bonds, and Tactical Asset Allocation targets. Team members update the latter at least quarterly, though in practice more frequently. Shifts can be as minor as adjusting allocations between developed- and emerging-markets non-U.S. equities or as major as adding a subasset class. The results of Merrill's asset-allocation approach don't stand out, however. Composite returns provided for each target allocation don't show an edge. The firm's historic preference for value stocks over growth stocks and late-2022 decision to diversify across fixed income have not led to a significant net-of-fees performance advantage versus asset-class benchmarks.

The platform's dearth of additional features is noteworthy given its relatively lofty fees and lack of integration with Bank of America's more extensive, and impressive, research and educational offerings on its brokerage platform. When setting goals, MGI's software suggests time horizon and contribution changes if Monte Carlo simulations project a low probability of success. Yet, it doesn't provide more extensive advice if it looks like clients won't hit their goals, nor does it provide tailored advice toward achieving multiple goals. Tax-loss harvesting capabilities or integration of external accounts are absent. MGIA also provides only access only to Series 6 and Series 7 certified "financial consultants" rather than CFP-certified advisors. Clients who want access to CFPs must unenroll from this program and reenroll in one of Merrill's more extensive managed account or advisory relationship offerings.

Schwab Intelligent Portfolios/Schwab Intelligent Portfolios Premium | Above Average
Schwab's robo-advisor program narrowly misses greatness because of one fatal flaw.

Schwab Intelligent Portfolios—especially with the addition of the Premium service—comes closer than most of its peers to matching the value-add of a human financial planner. The program's comprehensive financial planning services include advice on mortgages, college savings, retirement savings, retirement income, and budgeting. Unlimited one-on-one guidance from a CFP professional is also available.

That makes Schwab one of the most compelling robo-advisors, with only Betterment and Vanguard providing a similar range of financial planning tools and advice. Schwab's pricing is relatively attractive, especially for higher account values. After paying a one-time $300 planning fee for the first year, an investor with a $200,000 account would pay just $360 annually for Schwab's Premium account offering, compared with $800 for Betterment, $700 for Fidelity Go, and $600 for Vanguard Personal Advisor Services.

Schwab's portfolio construction process is also above average. It uses an extensive risk-tolerance questionnaire to match investors with a portfolio designed for one of 12 risk levels. The portfolios provide comprehensive asset-class exposure, including large- and small-cap stocks in the U.S. and international markets, gold, TIPS, REITs, corporates, mortgages, Treasuries, high-yield bonds, municipal bonds, world bonds, and emerging-markets debt. The quality of the underlying investment offerings is solid, and Schwab takes a well-considered, research-based approach to portfolio construction. The firm is also thoughtful about rebalancing and tax management.

Excessive cash allocations are an Achilles' heel, however. They range from 6% to 30% of assets depending on the portfolio's risk level, which is a significant drag on returns for clients. Schwab's Total Return Taxable Portfolio—8, which held about 63.8% of assets in stocks, 25.3% in bonds, and 8.9% in cash at year-end 2022 is a case in point. The cash buffer helped it lose roughly 1 percentage point less than the moderate allocation Morningstar Category average (negative 12.67% versus negative 13.84%) during 2022’s bear market. But over the trailing five-year period through March 31, 2023, the Schwab portfolio lagged that category norm by 1.9 percentage points per year, on average.

Even now that cash yields have topped 5% as of early June 2023 (and Schwab took the positive step of linking the monthly yield on customers’ cash balances to Schwab Government Money Fund SWGXX), above-average cash allocations will probably be a negative over longer periods. Schwab, meanwhile, has an incentive to park customers' assets in its proprietary deposit accounts. Schwab paid $187 million in settlements and fees for its previous disclosure practices related to its use of cash.

Even with this flaw, Schwab still ranks among the best robo-advisor options, especially for investors with enough assets to benefit from its comprehensive advice on financial planning and retirement income.

SigFig | Average

SigFig is a lean offering that checks a lot of the right boxes for a robo-advisor, though it doesn't possess the same scale of resources as some competitors.

Following its 2006 launch as an online forum for sharing investment ideas, what was then called Wikinvest pioneered features now common among robo-advisors. After pivoting toward automated investment advice in 2011, the firm curated a group of financial advisors to provide in-person consultations. It also introduced tax-advantaged and taxable portfolios as well as tax-loss harvesting.

SigFig's management fee remains competitive. The program is free for accounts with less than $10,000 and charges 0.25% for accounts at and above that size. It uses low-cost ETFs for its portfolios (the ETFs differ depending on which custodian the customer chooses for the account) but does not waive or return fees on these holdings.

SigFig's portfolio construction approach is simple but sensible. Allocations are strategic and updated periodically, depending on the market environment and SigFig's capital markets assumptions. Those allocations are generally reasonable, with equity weightings for taxable portfolios ranging from 26% to 90% of assets, depending on the risk level, and 13% to 85% for tax-advantaged portfolios. Regardless of risk tolerance, however, all the tax-deferred portfolios allocate at least 7% of assets to emerging-markets debt, which seems aggressive, as well as 5% to REITs. In addition, the portfolios rely on one broad index for U.S. stock exposure, with no granularity for separate style or market-cap allocations.

The firm's executive team appears well-resourced, although a few senior leaders have left in recent years. Chief investment officer Terry Banet, who joined in 2011, has extensive experience from investment research and asset-allocation roles at J.P. Morgan and elsewhere. The firm's size peaked in 2019, however, and appears to have shrunk significantly since.

The service has some weaknesses. It does not provide advice for multiple investment goals and lacks more dedicated educational resources that could help clients make SigFig their one-stop shop. In addition, the privately held firm's focus on partnering with larger corporations like UBS and Wells Fargo raises questions about whether it will remain a stand-alone robo-advisor. Several stand-alone robo-advisor firms have been acquired in recent years, and SigFig's small size and limited revenue base could make it a more likely acquisition target than some of its peers.

SoFi Wealth | Average

SoFi clients can start a robo-advisor account with as little as $1 and talk with a financial planner at no additional cost. While those attributes are attractive, the service has some questionable features that lessen its appeal.

Originally a student loan refinancing service, SoFi has expanded into personal loans, mortgages, banking services, and insurance. The company launched SoFi Automated Investing in 2017. SoFi's business strategy relies on retaining clients in its ecosystem of personal finance products. The company calls this the "Financial Services Productivity Loop," which emphasizes monetization through cross-selling as much as serving investment needs. As a publicly traded firm since June 1, 2021, SoFi is now under pressure to generate earnings, but it has lost a total of $1.5 billion since 2018. That raises concerns about SoFi's client acquisition strategy in comparison to loss-leader approaches used by profitable firms like Fidelity.

Despite its losses, SoFi has been waiving the 0.19% annual fees for the proprietary ETFs it uses as the main equity exposure in clients' portfolios. This is likely an asset-gathering strategy for the two ETFs, which have around $500 million in assets combined. Should those waivers expire, the ETFs' expense ratios would no longer be in line with SoFi's low-cost aims.

These two SoFi ETFs also have an inherent growth bias that might not be suitable for a core equity allocation. While SoFi does offer five different equity/fixed-income allocations, depending on client risk tolerance, the growth-leaning ETFs still account for two thirds of the equity exposure. The portfolios also tilt more toward U.S. stocks than broad global benchmarks. These two biases have enhanced back-tested results that SoFi marketing material has used to promote its offer's performance versus a blended benchmark that also includes a 0.48% management fee, even though benchmark-tracking passive options are available for a fraction of that fee.

SoFi offers clients access to financial advisors by phone, virtual meetings, and electronic messages at no extra charge. SoFi's advisors must have Series 65 licenses and either have the CFP designation or be actively working toward it. SoFi also provides an online library of articles on a broad range of topics including goals, saving, investing, budgeting, debt repayment, home buying, and insurance. These articles might double as marketing for its various personal finance services, though.

Titan | Low

Despite making several improvements, Titan remains aggressive, narrowly focused, and unproven; it remains the least attractive robo-advisor among those evaluated.

Pricing is better. Titan eliminated a monthly fee for accounts with less than $10,000 and dropped its flat 1% asset-based charge for accounts with $10,000 or more in favor of a tiered, asset-based levy ranging from 70 to 90 basis points, depending on asset size. When it rolled out stock and bond ETF portfolios in 2023, it also chose not to charge a management fee on top of those of the underlying funds, which dropped the blended fee for a $15,000 account to 0.495%.

Titan's charges remain above average, however, and the underlying fees of some of the strategies in its client portfolios are very high. Titan styles itself as a lower-cost wealth manager for younger, tech-savvy, up-and-coming investors who still cannot afford a private banker, but it is far from a low-cost option.

Increased diversification is laudable. The firm added broad stock and bond strategies to the mix of options it uses as building blocks for clients. Sample portfolios provided to Morningstar now rest on a foundation of cheap, diversified equity and fixed-income ETFs. Client portfolios had previously included only Titan's in-house concentrated equity and cryptocurrency accounts and a handful of third-party, closed-end funds.

Those problematic options remain, though. The external closed-end funds invest in esoteric asset classes, such as private credit and venture capital, that most investors do not need and would not miss. Meanwhile, Titan's in-house strategies have mixed records, at best, and are concentrated and risky. Its three equity strategies invest in 15 to 25 stocks each, with Flagship focusing on U.S. large caps, Opportunities on U.S. small- and mid-caps, and Offshore on non-U.S. companies. Titan Crypto has simplified its strategy—from shifting among five to 10 digital currencies to holding equal weights of bitcoin and ethereum and rebalancing quarterly—but it remains wildly volatile, vaulting 58% in 2023's first three months after dropping more than 72% throughout 2022.

Titan plans to develop its services further, but it is not a holistic planner. It does not provide tax advice or manage its portfolios to minimize tax consequences, which means rebalancing portfolio allocations among its volatile equity and crypto strategies can result in big tax bills for taxable clients. Titan uses client information to place them in aggressive, moderate, or conservative portfolios. It tries to hedge its in-house strategies: 0%, 5%, and 10%, respectively, when not in a market downturn, and 5%, 10%, and 20% during one. Titan uses technical signals to differentiate a hedge-worthy downturn from normal volatility, a notorious challenge even for investors who are not also trying to build and run a digital wealth management platform.

Titan's in-house active management team continues to lack depth and experience. The five-member squad averages fewer than three years with Titan and nine in the investment industry. The firm's chief investment officer and most senior investment team member Clayton Gardner just hit 10 years of industry experience in July 2022 and serves as co-CEO and co-founder.

Titan has made strides, and it provides younger investors who have smaller account balances access to asset classes that are usually the reserve of older and more well-heeled clients. But compared with other robo-advisors, its fees are not competitive, its portfolios aggressive, and its advice offering a work in progress.

UBS Advice Advantage | Below Average

UBS has been busy lately, but its Advice Advantage program doesn't seem like a priority.

UBS' priorities shifted with its March 2023 acquisition of Credit Suisse and then shifted further with Sergio Ermotti’s April 2023 return as CEO, a role he held from 2011 to 2020. Ermotti, who will oversee the Credit Suisse integration, has a different approach to the future of wealth management than his predecessor at UBS, Ralph Hamers. Ermotti wants to focus on the rich and avoid going downstream to bring in new clients, while Hamers emphasized mass-oriented digital offerings like the Advice Advantage program and well-respected competitor Wealthfront, which UBS tried to acquire in early 2022. But that acquisition fell through in September 2022, and since then it has not been clear how Advice Advantage fits into UBS' plans, especially given Ermotti's priorities.

Meanwhile, hefty costs and poor transparency remain significant negatives for UBS Advice Advantage. The program's 0.75% annual fee makes it among the priciest robo-advisors, and those fees are in addition to underlying fund expense ratios, which are difficult to determine because UBS does not disclose the funds it uses. Although UBS halved its account minimum to $5,000, it is still less accessible than some competitors.

UBS Advice Advantage leverages SigFig's algorithm, as it has since the program's 2018 debut. It offers investment advice, custody, trading/execution, and performance reporting. Investors can choose from five different portfolio risk levels based on a standard risk-tolerance questionnaire. UBS develops and maintains the model portfolios while using the algorithm for ongoing monitoring, rebalancing, and tax-loss harvesting. UBS portfolio allocations draw from its capital markets assumptions and related strategic asset allocations as well as covariance estimates. However, key executives listed in Form ADV are all part of UBS' larger Wealth Management platform, so it is unclear whether this program has a dedicated investment management team. In addition, UBS' lack of transparency extends not just to the funds it uses but to the asset classes themselves.

UBS Advice Advantage includes access to financial advisors as well as portfolio diagnostics, which incorporate outside holdings. It seems to play a secondary role within UBS' larger universe, though.

With a disappointing amount of publicly available information, no details disclosed about underlying funds, and its viability in question, this offering deserves little credit.

U.S. Bancorp | Average

U.S. Bancorp Automated Investor is a straightforward offering that delivers on its simple promises.

U.S. Bancorp launched Automated Investor in 2018 and lowered the minimum investment from $5,000 to $1,000 in 2021 as part of a product revamp. The service charges a flat fee of 0.24%, lower than the average annual fee from surveyed providers. A matrix of three major goals and five risk levels sorts client portfolios into varying allocations of global equity and U.S. fixed-income ETFs, which is adequately granular.

Well-constructed portfolios stand out as the service's strong point. The service automatically applies glide paths for clients with a retirement or major purchase goal, a useful yet still rare feature among other providers. This scales down the portfolio's equity exposure as the end date approaches to limit risk and maximize capital preservation. The underlying funds consist of low-cost, third-party ETFs tracking sensible indexes, which provide access to a standard range of asset classes. The nontaxable portfolio holds a diversified mix of large- and mid-cap U.S. equity, real estate, developed- and emerging-markets equity, alongside core and high-yield U.S. bonds. The tax-efficient version swaps the core bond exposure for a broad municipal-bond ETF. U.S. Bancorp does not put clients' assets in any gimmicky products or niche market areas, in line with its long-term, goal-oriented investment philosophy.

A third-party trading algorithm automatically rebalances the portfolios and harvests losses for taxable accounts. Tax-loss harvesting capabilities notwithstanding, U.S. Bancorp lacks core features such as retirement withdrawal advice or outside account aggregation that prevent it from being a one-stop shop for clients. Its simple three-question risk assessment could also use improvement.

The service is currently only available to existing U.S. Bank customers, though the firm plans to open the platform to nonbank customers soon, likely as part of an effort from parent U.S. Bancorp to branch out to lower-net-worth clients. Despite well-publicized turmoil in regional banks earlier this year, U.S. Bancorp's stable market position as the fifth-largest U.S. bank has shielded it from severe stress thus far.

Vanguard Digital Advisor/Vanguard Personal Advisor Services | High

Vanguard Digital Advisor, or VDA, and its hybrid sibling Vanguard Personal Advisor Services, or PAS, which combines automation with human expertise, once again earn the top spot among robo-advisors we surveyed. In fact, Vanguard has extended its lead through multiple enhancements, with only an uncharacteristic pricing misstep keeping it from a perfect score.

Vanguard has been in the advice business since 1996, but it did not move into discretionary asset management until the respective May 2015 and May 2020 launches of PAS and VDA. Aiming to transform advice in the same way its retail indexing business revolutionized investment management, Vanguard has spent heavily on both services through hiring personnel, increasing choice among investment strategies, and adding capabilities. In recent years, Vanguard has introduced ESG options, active equity and fixed-income funds, and a municipal-bond strategy. Tax-loss harvesting is now available to all advice clients, who also benefit from tax-efficient implementation, including a completion methodology that tailors exposures around 90 existing Vanguard strategies so investors transitioning to VDA can avoid realizing capital gains on existing holdings.

The core of VDA, however, remains its four broadly diversified passive ETFs focusing on U.S. and non-U.S. stocks and U.S. and non-U.S. bonds along with a portfolio construction approach that combines relative simplicity with customization. Using those ETFs, or similar exposures crafted from Vanguard’s advice-eligible investment options, VDA draws on the Vanguard Life-Cycle Investing Model to create more than 300 glide paths based on an investor's age, goals, and risk tolerance. The risk-tolerance assessment uses third-party Capital Preferences' well-researched scenarios. VDA then evaluates portfolios daily and rebalances when any asset class is off target by more than 5 percentage points. The glide paths are updated annually as model inputs change.

VDA and PAS have evolved into an ecosystem of advice, united by a common investment philosophy, similar if not identical investment strategy building blocks, and low costs. Where they differ is in the degree of customization and suite of services available. Clients with at least $3,000 can enter the digital-only version of that ecosystem, VDA, for as little as 0.20% per year (including underlying fund fees) and utilize an impressive array of planning tools, including outside account aggregation, custom goal planning, debt planning, a rainy day tool, healthcare estimator, and Medicare match. Clients with at least $50,000 can opt for the hybrid PAS service for a 0.30% annual advisory fee (not including underlying fund fees) and have unlimited access to a pool of CFPs, who can further customize their portfolios around non-Vanguard fund holdings and individual stock ownership. At $500,000, clients receive a dedicated CFP who touches base at least twice a year. Clients with more than $5 million have access to a private equity option and estate planning and trust services, all for declining fees that drop to 0.20% for assets exceeding $5 million to $10 million, 0.10% for the next $15 million, and 0.05% for assets above $25 million.

The pricing misstep affected Vanguard's Provider score as it involves the "Invest for Amex by Vanguard" partnership. Although that partnership has become more attractive since its April 2022 debut by dropping its investment minimum to $3,000 from $10,000, for example, its gross advisory fee remains 30 basis points higher than that of Vanguard's in-house offering. American Express reward points, which begin tallying once an account has $50,000, may make up for some of that difference but not all of it. More problematic still, the partnership's additional fees run counter to Vanguard's generally rock-solid commitment to keeping costs low and avoiding layered fees. Indeed, from 2021 to 2022 Vanguard's non-U.S. fund business returned $125 billion in assets to their institutional owners because those institutions had been acting as intermediaries in layering on fees that hurt end investors.

Overall, though, Vanguard continues to set the standard for low-cost digital financial advice.

Wealthfront | Above Average

Wealthfront has considerable merits, but strategic shifts and questionable allocations hold it back.

The merits start with competitive fees. Its 0.25% annual advisory charge matches the median of robo-advisors we survey while the expense ratios for most of the underlying funds used in the portfolios are reasonable. The quality of the underlying funds is also generally strong; most of them receive Morningstar Medalist Ratings of Gold or Silver. The program includes a thorough questionnaire that incorporates behavioral economics research to evaluate both risk tolerance (an investor's subjective willingness to take risk) and risk capacity (their objective ability to take risk given their financial assets and other resources).

Wealthfront uses the responses to slot investors into a portfolio matching one of 20 risk levels spanning three account types: taxable, retirement, and socially responsible investing. Customers also have access to financial planning tools, though not to human financial advisors, for spending, savings, income, inflation, Social Security, taxes, college planning, and home equity. The website includes information on a wide range of planning-related questions, as well as numerous methodology papers and performance disclosures.

In addition, Wealthfront has one of the best user interfaces we've seen. The program's goal-centric approach is specifically designed to help investors focus on the long term. Investors can set multiple goals and experiment with various assumptions to see if they're on track or not. Wealthfront also takes a more precise approach to tax-loss harvesting that incorporates direct indexing, which enables it to harvest losses at the individual stock level. It embraces a "play-to-learn" philosophy that lets investors buy and sell individual stocks, but still encourages them to build diversified portfolios.

Still, popular but not necessarily prudent investment trends seem to drive some of Wealthfront's strategic decisions. Many of its portfolios are on the aggressive side; for example, its retirement portfolios allocate up to 19% to emerging-markets stocks, 15% to real estate, and 10% to emerging-markets debt. It previously opted investors into a risk parity strategy that ranked in the global allocation Morningstar Category's bottom 2% for the trailing five-year period through May 2023. Wealthfront also allows investors to invest up to 10% of their assets in cryptocurrency through Grayscale Bitcoin Trust GBTC and/or Grayscale Ethereum Trust ETHE, which are high-cost vehicles whose grantor trust structure leads to significant performance divergences from the benchmark. Finally, Wealthfront had previously agreed to be acquired by Swiss banking giant UBS, but the two firms have now mutually agreed to terminate their merger agreement.

Overall, though, there are more positives than negatives here.

Wells Fargo Intuitive Investor | Average

Wells Fargo Intuitive Investor's recent improvements aside, it remains a middle-of-the-road offering, though not a bad choice for existing Wells Fargo clients.

Designed exclusively for those who are already banking clients, the program's 0.35% asset-based fee is 10 basis points higher than the median of robo-advisors we surveyed, but the investment minimum has fallen to $500 from $5,000 a year prior. Expense ratios for the underlying funds are between 0.07% and 0.15%, however, which partially offsets the impact of above-average fees at the program level.

Like UBS, Wells Fargo uses SigFig's proprietary portfolio management algorithm to monitor, rebalance, and harvest tax losses. Investors begin with a questionnaire that assesses risk tolerance, time horizons, and specific investment objectives. Clients can move up or down one risk level from the recommended investment objective. Suggested asset-allocation strategies include a series of nine portfolio risk levels with a globally diversified overlay or sustainability-focused one, which Wells added over the past year. Each portfolio comprises seven to 11 ETFs, mostly iShares ETFs and Goldman Sachs Smart Beta products. Wells Fargo intends the portfolios to be well-diversified, cost-effective, and long-term-oriented, thanks to an investment philosophy that shies away from niche products. Portfolio allocations are reasonable, with minimal cash allocations and adequate exposure to major asset classes. In addition, portfolio transparency has moderately improved.

The breadth of services is average. Access to a financial advisor at no cost and tax-loss harvesting are positives. So, too, are goal-oriented resources to help investors stay on track, and Wells Fargo has made some efforts to offer educational content for beginning investors. Unlike some best-in-class providers, though, it doesn’t offer investment calculators or methodology papers.

Industry History and Trends

Robo-advisors emerged from two major trends in the early 2010s. First, online, self-driven brokerages from outfits like E-Trade and Schwab grew rapidly; and second, financial startups capitalized on distrust of traditional wealth management institutions in the wake of the global financial crisis.

Client acquisition and retention were the main challenges during this early period, especially for stand-alone startups. To broaden their appeal, most surviving providers have converged toward providing portfolios composed primarily of low-cost ETFs. For instance, Wealthfront's predecessor KaChing began as a stock-picking platform. KaChing's original business model of identifying "genius" stock-pickers and allowing the retail audience to invest alongside them did not last. Between its 2008 founding and early 2012, the platform remade itself into a full-fledged robo-advisor, offering portfolios of ETFs optimized according to risk tolerances. In late 2012, it hired as its chief investment officer Burton Malkiel, the well-known author of *A Random Walk Down Wall Street* and advocate of low-cost passive strategies.

Other startup robo-advisors followed similar trajectories. SigFig began in 2006 as Wikinvest, an online repository for user-generated stock recommendations, before pivoting to automated portfolio advice in 2012. SoFi launched in 2011 as a peer-to-peer student loan financier before expanding to other services later in the decade. Only a few providers, such as Betterment and Acorns, have stuck with the now-popular automated robo-advice service since their public launches.

Several successful robo-advisors emerged from acquisitions. Ally Invest stems from Ally Financial's June 2016 acquisition of TradeKing, which since 2014 had been offering its own robo-advisor (developed with Morningstar's Ibbotson Associates). Empower Retirement purchased Personal Capital in 2020, which since its 2011 launch had offered free account aggregation tools and pricier wealth management services, and renamed it Empower Personal Wealth in February 2023.

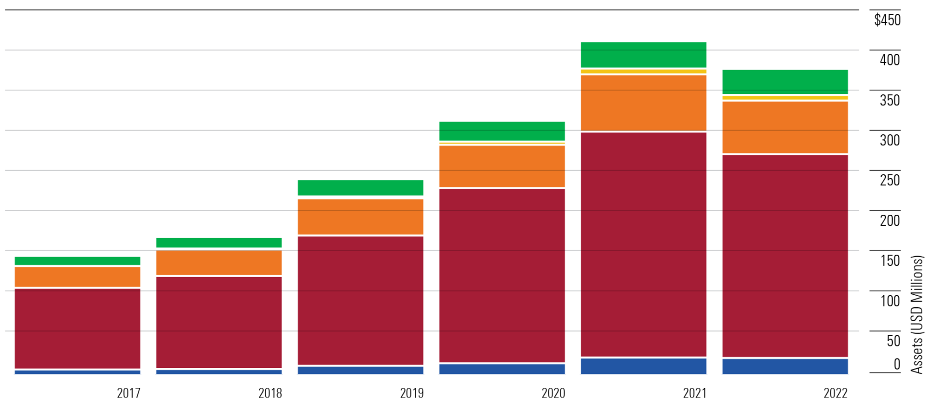
Failed acquisitions and integrations outnumber successes, however. NestWise, a subsidiary of LPL Financial Holdings LPLA, acquired the hybrid service Veritat Advisors around mid-2012 to serve middle-class savers. By Sept. 1, 2013, LPL closed the business. John Hancock acquired robo-advisor Twine from Guide Financial in 2015 and shut it down in December 2021. LearnVest, which had launched in 2008, was bought by Northwestern Mutual in 2015 but shut down three years later. Principal Financial Group bought digital advice startup RobustWealth in 2018 and closed it in September 2021.

More recently, Capital One sold its Capital One Investing client portfolios to SageView Advisory Group in April 2022, only two years after acquiring the service. After largely ignoring FutureAdvisor's direct-to-consumer business since buying it in 2015, BlackRock sold it to Ritholtz Wealth Management in early 2023. UBS said in January 2022 it would acquire Wealthfront to break into the U.S. mass-affluent market, yet the firms called off the merger just nine months later in September 2022.

It's unclear if Morgan Stanley's 2020 acquisition of E-Trade will follow this trend. Morgan Stanley is currently directing new clients toward E-Trade Core Portfolios and will eventually phase out Morgan Stanley Access Investing. As part of the ongoing integration, E-Trade can now use Morgan Stanley's macro research but lost other features, such as premium accounts with access to financial planners.

The industry is now at a crossroads. Assets in robo-advisors have continued to grow through 2023, but new startups are rare. Many of the largest players are asset managers that added robo-advisor capabilities over the past decade, including Vanguard, Fidelity, and Schwab. The nine robo-advisor offerings for which we have data from year-end 2017 through 2022 grew more than 50% per year, on average, even though growth either slowed or receded in 2022's market tumult.

Exhibit 4 Asset-Growth Trends for Selected Robo-Advisors



	2017	2018	2019	2020	2021	2022
Betterment	12,410.0	14,250.0	21,390.0	25,850.0	33,910.0	32,300.0
Fidelity[1]	133.0	1,290.1	2,247.7	3,875.8	7,137.2	7,089.4
Schwab	26,766.0	32,645.0	45,866.0	53,442.0	70,676.0	66,079.0
Vanguard	101,000.0	115,000.0	161,000.0	216,400.0	279,100.0	251,800.0
Wealthfront	8,866.5	9,407.5	13,484.5	16,627.0	23,649.5	23,078.5

Sources: Company surveys, Form ADV filings, and Morningstar research. Data as of Dec. 31, 2022.
1 Estimates based on the underlying assets for the Fidelity Flex funds used in the program.

Fidelity's growth trajectory since 2017 continued to be the fastest, though that rate is likely to slow as its estimated $7 billion in assets under management multiplies. The annual growth rates of providers with tens of billions in assets, including Schwab, Betterment, and Wealthfront, have settled around 20%. So too has Vanguard's, even though it is nearly 4 times the size of its next-biggest rival, Schwab.

Industry leaders are in a robo-advisor capability arms race. Tax-loss harvesting, for instance, is now offered by nine of the 20 robo-advisors we surveyed. Vanguard recently made automated tax-loss harvesting available to all tiers of its offering, joining SigFig, Wells Fargo (via its SigFig partnership), Betterment, Wealthfront, and U.S. Bancorp. Schwab currently offers the feature only to accounts with $50,000 or more, while E-Trade plans on introducing the feature later this year. Many providers also have added or are planning to add ESG versions of their portfolios.

Exhibit 5 Robo-Advisor Historical Milestones (2007-23)

	Date		Activity
Startups create the robo-advisor concept	**2007**	Feb	Wealthfront predecessor KaChing raises Series A funding
		Mar	SigFig predecessor Wikinvest raises Series A funding
	2008	Jan	Betterment's parent company founded in New York
	2010	May	Betterment officially launches at TechCrunch Disrupt New York
		Nov	Betterment raises Series A funding
	2011	Jun	SoFi created by four Stanford students to disrupt student-loan market
		Dec	Wealthfront launches new online financial advice service
	2012	Jan	Acorns launched by father-and-son team with focus on micro-investing
		May	Wikinvest rebrands as SigFig and shifts focus to digital portfolio allocation and rebalancing
	2014	Nov	Ellevest[1] co-founded by Sallie Krawcheck and Charlie Kroll
Incumbents enter the market	**2015**	Mar	Charles Schwab introduces Schwab Intelligent Portfolios
		May	Vanguard launches Vanguard Personal Advisor Services, a hybrid advice offering
		Sep	BlackRock acquires FutureAdvisor
	2016	Jun	Ally Financial acquires robo-advisor platform by purchasing TradeKing
		Jul	Fidelity Investments introduces Fidelity Go
	2017	Feb	Bank of America/Merrill Lynch introduces Merrill Guided Investing service
		May	SoFi introduces SoFi Wealth service
		Nov	Wells Fargo launches Intuitive Investor service with technology from SigFig
		Dec	Morgan Stanley introduces Morgan Stanley Access Investing platform
	2018	Feb	Titan Invest launches as a robo-advisor with a self-styled hedge fund focus
		Apr	UBS launches UBS Advice Advantage designed with SigFig technology
Acquisitions, IPOs, and additional launches	**2019**	Aug	Capital One Financial acquires United Income[2]
	2020	May	Vanguard introduces Vanguard Digital Advisor platform
		Oct	E-Trade Financial is acquired by Morgan Stanley[3]
	2021	Feb	Goldman Sachs introduces robo-advisor Marcus Invest after delaying its planned 2020 launch by one year
		May	SoFi goes public through a reverse merger and begins trading on the Nasdaq
		Dec	SageView Advisory Group acquires $900 million of client portfolios from Capital One Investing
	2022	Jan	Wealthfront agrees to be acquired by UBS Group for $1.4 billion
		Aug	Truist Wealth introduces robo-advisor Truist Invest
		Sep	UBS/Wealthfront deal canceled
		Nov	J.P. Morgan introduces hybrid robo-advisor[4]
	2023	Feb	BlackRock agrees to sell direct-to-consumer FutureAdvisor business to Ritholtz Wealth Management
		Apr	Betterment agrees to pay $9 million SEC fine over tax-loss harvesting mishap

Sources: Morningstar research, PitchBook, and online articles. Data as of May 31, 2023.
1 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
2 Morningstar was previously a minority owner of United Income, which was acquired by Capital One in 2019.
3 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
4 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.

Even as providers like Vanguard and Fidelity have augmented their existing capabilities, some robo-advisors have pulled back. Both Merrill Lynch and Morgan Stanley have lagged in adding additional goal planning and account aggregation features to their platforms, preferring instead to direct clients toward their human advisors. Other banks like J.P. Morgan, Wells Fargo, and U.S. Bancorp built their own services or partnered with other providers, but these haven't upended traditional wealth management components. Automated wealth advice is not going away, but it is increasingly unlikely that robo-advisors will replace all human advisors. Over the past decade, an increasing number of robo-advisors have added access to human advisors.

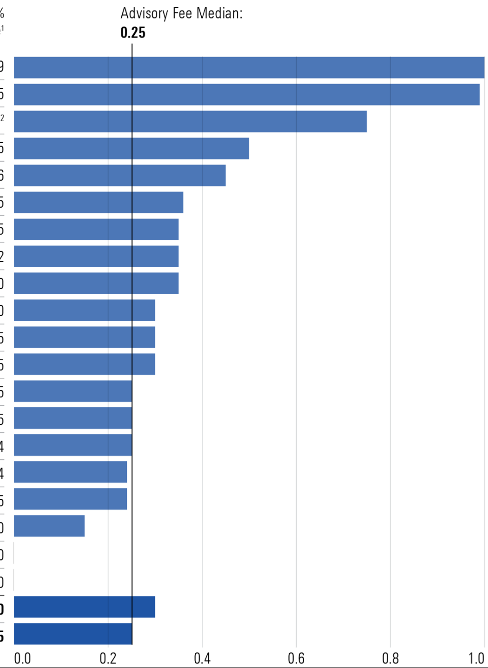
Against this backdrop regulatory scrutiny has increased. SEC chair Gary Gensler has worried in recent years about the fiduciary duty of online investing platforms, including robo-advisors. Concern centers around the potential for providers to exploit their services to drive their own revenue. In June 2022, Schwab got into trouble with the SEC for allocating a higher-than-average percentage of clients' portfolios to cash parked in Schwab's proprietary deposit accounts. This hefty cash stake reduced returns while adding to Schwab's revenue, which Schwab failed to disclose. Most recently, the SEC fined Betterment in April 2023 for misleading clients over the frequency of its tax-loss harvesting algorithm. SEC scrutiny might also damp the development of artificial intelligence in the space, as providers navigate fiduciary compliance with Regulation Best Interest.

Pricing

Price gets a 30% weight in our robo-advisor rankings. One of the few investing certainties is that the less investors pay for asset management and advice, the more they keep. The price assessment is holistic and accounts for varied pricing models. It begins with advisory fees, calculating the annual cost for an investor with a hypothetical $15,000 balance.

Exhibit 6 Annual Advisory Fees for Selected Robo-Advisors

	Minimum Investment Amount (USD)	Annual Advisory Fee % for $15,000 balance[1]
Empower Personal Wealth/Personal Capital	100,000	0.89
UBS Advice Advantage	5,000	0.75
Titan	500	0.495[2]
Merrill Guided Investing	1,000	0.45
Ellevest[3]	none	0.36
J.P. Morgan Automated Investing[4]	500	0.35
Wells Fargo Intuitive Investor	500	0.35
Betterment[5]	none	0.32
Ally Invest	100	0.30
E-Trade Core Portfolios[6]	500	0.30
Marcus Invest	5	0.25
Wealthfront	500	0.25
Citi Wealth Builder	5,000	0.25
SigFig	2,000	0.25
Acorns	none	0.24
US Bancorp Automated Investor	1,000	0.24
Vanguard Digital Advisor	3,000	0.15
Schwab Intelligent Portfolios	5,000	0.00
SoFi Wealth	1	0.00
Fidelity Go	10	0.00
Advisory Fee Average		**0.30**
Advisory Fee Median		**0.25**



Sources: Company surveys, Form ADV and 13-F filings, and Morningstar research. Data as of May 31, 2023.
1 Does not reflect potential fluctuations owing to account appreciation or depreciation.
2 Titan's fee assumes a blended account with active and passive investments.
3 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
4 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
5 Betterment charges $4/month for accounts less than $20,000. However, that fee converts to 0.25% in a number of ways, including with a $250/month automated deposit into a Betterment account at any balance.
6 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.

Exhibit 7 Additional Fee Details (Excluding Premium Offerings)

	Fee Waiver Credit for Underlying Funds?	Additional Details
Acorns	No	$3/month regardless of investing or retirement account size, but fee increases to $5/month for a family plan with additional accounts (for example, UTMA); annual fee would be 0.40%.
Ally Invest	No	Advisory fee is for "Market Focused" portfolios. "Cash Enhanced" portfolios do not charge an advisory fee since they allocate 30% to an Ally high-yield savings account.
Betterment	No	Betterment charges $4/month for accounts less than $20,000. However, that fee converts to 0.25% a number of ways, including with a $250/month automated deposit into a Betterment account at any balance.
Citi Wealth Builder	No	—
Ellevest[1]	No	Monthly subscription plans: Essential ($1/month), Plus ($5/month or $54/year), and Executive ($9/month or $97/year). The Plus plan would be 0.36% of assets for a $15,000 account.
Empower Personal Wealth/Personal Capital	No	0.89% for 0 to $1 million; 0.79% to $3 million; 0.69% for next $2 million, 0.59% for next $5 million; 0.49% for more than $10 million. Four levels of service: Investment service for less than $250,000; Wealth Management for $250,000 to $1 million; Private Client for more than $1 million; more than $5 million eligible for private equity.
E-Trade Core Portfolios[2]	No	—
Fidelity Go	Yes	Free up to $25,000. Investors are automatically opted into a 0.35% asset-based fee as soon as they reach $25,000 in assets.
J.P. Morgan Automated Investing[3]	Automated Investing will reduce its account management fee by the portion of expense ratios that is paid to J.P. Morgan or its affiliates.	—
Marcus Invest	No	A prior fee credit on proprietary ETFs within the Marcus Invest portfolios ended in 2023.
Merrill Guided Investing	Currently waiving program fee for new accounts for six months	Tiered fee for clients enrolled in Preferred Rewards: 0.45% for accounts with less than $20,000 (inclusive of linked Bank of America and Merrill Lynch assets), 0.40% for $20,000-$50,000, 0.35% for $50,000- $100,000, and 0.30% for more than $100,000.
Schwab Intelligent Portfolios	No	Requires keeping a significant portion of portfolio assets in a cash sweep option.
SigFig	No	No fee for accounts with less than $10,000.
SoFi Wealth	Limited	Proprietary ETF fees waived until mid-2023; no waiver or credit for nonproprietary ETF fees.
Titan	Limited	Dropped a $5/month for accounts with less than $10,000, switched to tiered, asset-based schedule ranging from 0.70% to 0.90%, and waives its management fee for sub-accounts using third party ETFs and CEFs.
UBS Advice Advantage	No	—
US Bancorp Automated Investor	No	—
Vanguard Digital Advisor	Yes	Vanguard Digital Advisor's 0.20% gross advisory fee comes with a 0.05% credit for underlying fund fees of 0.05%. Thus, the net advisory fee is 0.15%.
Wealthfront	No	If a client gets a friend to open an account, they both get $5,000 managed free for life. If a client gets two friends to open an account, all three get $10,000 managed free for life, and so on.
Wells Fargo Intuitive Investor	No	—

Sources: Company surveys, Form ADV, and 13-F filings, and Morningstar research. Data as of May 31, 2023.
1 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
2 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
3 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.

Advisory fees have ticked down since the 2022 study. This year they ranged as high as 0.89%, rather than last year's upper bound of 1.00%, and the 0.25% median was 5 basis points lower. Most offers still charge clients a fixed percentage of assets under management, with some billing less as accounts exceed certain thresholds. Others, like Acorns and Betterment, charge fixed monthly fees. Betterment's $4 monthly fee for accounts with less than $20,000 translates into a 0.32% levy on a $15,000 balance, but the price tag drops to 0.25% under certain conditions, such as if investors commit to making $250 monthly automated deposits.

We also consider other ways providers might make money off client assets, such as steering clients into low-yielding cash accounts, as well as the expense ratios of funds that robo-advisors recommend to clients. Some providers don't charge fees on top of those of the underlying funds. Schwab Intelligent

Portfolios, for example, invests most client assets in Charles Schwab Investment Management funds but levies no overall fee. Other providers, such as Fidelity Go and SoFi Wealth, make some or all the underlying funds free. In most cases, though, the underlying funds' fees are an additional expense.

Other costs are less apparent. For example, asset-allocation and fund selection choices may result in opportunity costs. Allocations to cash or money market funds could weigh on long-term returns. As mentioned above, Schwab Intelligent Portfolios, allocates a portion of client assets to a proprietary deposit account. SoFi uses novel, proprietary funds that have underperformed more established outside offerings in client portfolios. For example, from their April 2019 debut through May 2023, SoFi Select 500 ETF SFY and SoFi Next 500 ETF SFYX have lagged Vanguard Growth ETF VUG and Vanguard Mid-Cap ETF VO, which are low-cost, cap-weighted alternatives in the same Morningstar Categories, by 2.6 and 2.8 annualized percentage points, respectively. Such funds are often better for the robo-advisors than for their clients.

Robo-advisors also can make money from their clients' trading. Many receive payment for order flow, which entails executing ETF trades via unaffiliated brokers who will pay the robo-advisor for the traffic. The amounts are typically just a sliver of a penny per share, but they can add up and create incentives for robo-advisors to encourage trading.

The Price assessment is not entirely quantitative. We consider qualitative criteria, too, and transparency is chief among them. Investors should be able to easily understand how much they are paying, exactly what they are paying for, and whether their providers are making money off their assets in ways not reflected in their headline fees. SoFi and Schwab Intelligent Portfolios charge no advisory fees but the former pressures clients to buy other products and services, while the latter often funnels assets into revenue-generating in-house cash accounts. Meanwhile, Vanguard's simple fee calculator and plain-English explanations of how it charges investors, what it charges them for, and what potential conflicts of interest it faces in serving them is a model of fee transparency.

Fairness is another, more subjective input. The economics of the platform should scale to investors' benefit. The more they invest, the less they should pay as a percentage of assets and the more they should get in terms of level of service. As it stands today, this sort of investor-friendly practice is not standard—likely because the offerings themselves have yet to achieve sufficient scale to share benefits with their clients.

Risk-Tolerance Questionnaires

The process for most new robo-advisor clients starts with a risk-tolerance questionnaire, which attempts to discern how much risk potential clients can endure to achieve their investment goals. Questions typically focus on an investor's level of investment experience, how they feel about risk in general, or how much they would be willing to lose for the chance of a given investment gain. The risk-tolerance questionnaire also attempts to quantify abandonment risk—or the likelihood of a client selling in a market drawdown.

This risk-tolerance questionnaire acts as a check on typical retirement need calculations, which estimate how much money a client will require at retirement to support ongoing withdrawals. As a rule of thumb, robo-advisors typically steer younger clients who do not need their money for several years toward portfolios with more stocks and other volatile assets and older investors (or those who need their money sooner) toward portfolios heavier in bonds and other less volatile asset classes.

But there's no consensus on how risk-tolerance questionnaires should be designed or whether they actually work. Thus, a handful of services skip the risk-tolerance questionnaire and recommend portfolios based largely on the client's investing horizon and ultimate investment needs. Betterment, for example, determines a client's asset mix based on the goal type, target dollar amount, and time horizon. An algorithm then translates these inputs into 101 different risk levels, with stock allocations ranging from zero to 100% of assets. Similarly, Ellevest doesn't ask people about their risk tolerance because it's a situation-dependent, subjective measure. Instead, Ellevest (like Betterment) assigns clients to portfolios based on their investment goal, time horizon, and risk capacity, or ability to take on risk given their financial situations.

Robo-advisors' questionnaires tend to vary in depth and breadth. Like SoFi, U.S. Bancorp, and Marcus Invest, Merrill Edge Guided Investing asks only a handful of questions about clients' comfort with market turmoil and their desire to sell assets that have suffered losses. Other services' inquiries go deeper. Schwab Intelligent Portfolios asks more than a dozen questions, many of which can branch depending on the responses. Although Fidelity Go defaults to allowing clients to pick their own risk tolerance, it offers a series of 10 additional questions that may recommend a different risk-tolerance level.

Vanguard's research-based risk-assessment approach stands out. With the help of third-party provider Capital Preferences, it presents investors with six scenarios of varying upside potential to gauge their risk aversion, loss aversion, and decision consistency. Vanguard assigns investors decision consistency scores between 1 and 100 and risk scores between 1 and 100 based on how they respond and uses the marks with other inputs, like age and goals, to create personalized glide paths.

Robo-advisors also differ in how much they allow investors to override or alter the results of their risk-tolerance assessments. Merrill, for example, lets clients bypass the risk-tolerance questionnaire and pick a target-risk portfolio. Wells Fargo gives clients the option of moving up or down one notch on the risk spectrum. Vanguard allows investors to move up or down up to two levels of its five risk tiers of very conservative, conservative, moderate, aggressive, and very aggressive.

Portfolio Construction

Robo-advisors often follow similar portfolio construction strategies. Some prominent exceptions aside, most focus on building balanced portfolios that offer broad, low-cost exposure to major asset classes. Portfolios typically span risk levels and range from equity-oriented portfolios for younger or more aggressive investors to bond-heavy portfolios for older or more conservative investors.

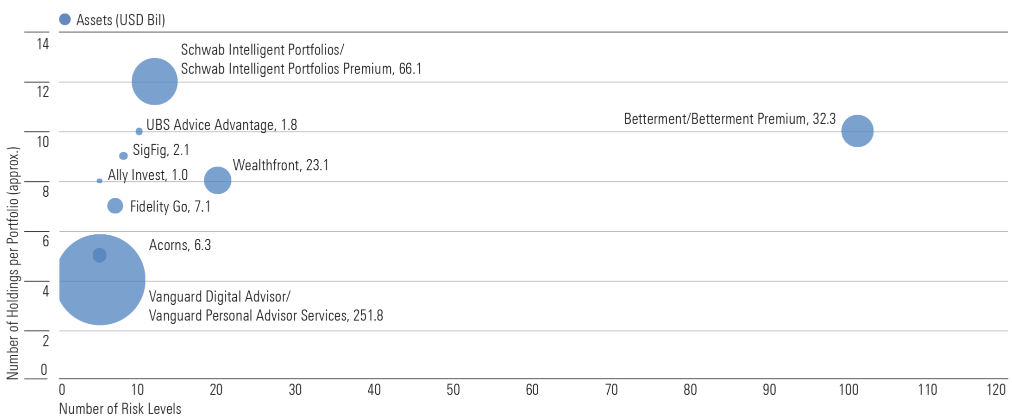
Despite similarities, robo-advisors are not monolithic. Nuances in the way each program approaches fund selection, asset-class exposure, and portfolio maintenance can lead to different results.

Our analysis does not prescribe the best way to construct portfolios. Instead, we look for clearly articulated investment theses that draw on rigorous research and steer clear of problematic strategies, such as market-timing.

Simple vs. Complex

Some providers stick with a handful of funds representing broad asset classes. For example, Fidelity Go holds just six ETFs (plus a tiny cash stake) covering three main asset classes: U.S. stocks, non-U.S. stocks, and bonds. Meanwhile, Schwab Intelligent Portfolios draws on more than 50 different funds from as many as 20 categories in a wide range of asset classes, including gold, commodities, real estate, emerging-markets debt, and fundamental index funds that lean toward value stocks.

Exhibit 8 Simple vs. Complex: Number of Holdings per Portfolio and Risk Levels for Selected Robo-Advisors



Sources: Company surveys, Form ADV filings, and Morningstar research. Data as of Dec. 31, 2022.
1 Vanguard clients who opt for active, municipal-bond, or ESG exposure (and who enter the program without existing taxable positions) could have up to eight additional holdings beyond Vanguard's four core passive funds.

There is no consensus on how many asset classes a diversified portfolio needs. However, most robo-advisors target younger investors with smaller account balances. Investors fitting that profile can often benefit from simplicity and shouldn’t feel compelled to get exposure to every single asset class.

Exhibit 9 Asset Classes Used as Underlying Holdings

✓ Has capability or attribute, blank if not ✗ Insufficient portfolio data disclosed to determine asset class exposure

	Bank-Loan Funds	Commodities	Crypto	Dividend Yield	Gold	High-Yield Corp	International Bond	Mortgage-Backed Securities	Muni Bonds	Private Equity or Alts	REITs	TIPS
Acorns			✓									
Ally Invest				✓				✓	✓			
Betterment/ Betterment Premium[1]			✓		✓	✓	✓		✓		✓	✓
Citi Wealth Builder	✗	✗		✗	✗	✗	✗	✗	✗		✗	✗
Empower Personal Wealth/Personal Capital	✗	✗		✗	✗	✗	✗	✗	✗		✗	✗
E-Trade Core Portfolios[2]	✗	✗		✗	✗	✗	✗	✗	✗		✗	✗
Ellevest[3]				✓	✓				✓		✓	✓
Fidelity Go									✓			
J.P. Morgan Automated Investing[4]						✓						
Marcus Invest						✓			✓		✓	
Merrill Guided Investing						✓	✓	✓	✓			
Morgan Stanley Access Investing											✓	✓
Schwab Intelligent Portfolios/ Schwab Intelligent Portfolios Premium	✓			✓	✓	✓	✓	✓	✓		✓	✓
SigFig							✓		✓		✓	✓
SoFi Wealth				✓		✓			✓			✓
Titan			✓	✓		✓	✓	✓	✓	✓	✓	✓
UBS Advice Advantage						✓	✓		✓			✓
US Bancorp Automated Investor						✓			✓		✓	
Vanguard Digital Advisor/ Vanguard Personal Advisor Services							✓			✓		
Wealthfront[5]			✓	✓			✓		✓		✓	✓
Wells Fargo Intuitive Investor		✓				✓						

Sources: Company surveys, Form ADV and 13-F filings, and Morningstar research. Data as of May 31, 2023.
1 Betterment offers commodities, high-yield bonds, and REITs only within its Flexible portfolios.
2 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
3 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
4 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
5 Wealthfront clients have access to a broader range of asset classes if they choose to customize. Citi Wealth Builder, Empower, and E-Trade do not disclose sufficient portfolio data to determine their asset class exposures.

Static vs. Dynamic

The typical robo-advisor defaults an investor into a portfolio that provides a static stock/bond split to match the investor's risk tolerance. Portfolio allocations correspond to risk levels, typically falling in increments of 10 percentage points, with portfolio weightings of 90% stocks and 10% bonds, 80% stocks and 20% bonds, or 60% stocks and 40% bonds, for example. Managers of those portfolios—if there are even any named—run them as stand-alone funds and hew tightly to the prescribed stock/bond splits. The onus falls on investors to manage their portfolios' risk over time, either by opting into more-conservative options or by retaking the investment risk questionnaire. To their credit, some robo-advisors such as Betterment and Fidelity Go automatically prompt investors to retake the risk-tolerance questionnaire at least once per year.

A few providers—notably Betterment and Vanguard Digital Advisor—also offer glide paths to move their clients from more aggressive to more conservative allocations as they age or approach investment goals, similar to target-date funds. Vanguard maps each client to more than 300 possible glide paths tailored to personal circumstances, considering multiple variables—risk attitude, loss aversion, current age, retirement age, and marital status. Similarly, Betterment starts with recommended portfolio allocations for different types of goals and risk tolerance levels. As a given goal's time horizon shortens, it gradually reduces the portfolio's risk level. In most other programs, though, investors may see their asset allocations shift suddenly (and create potential tax implications) if they change their risk-tolerance level.

Active, Passive, and Customized Offerings

Although low-cost index-tracking ETFs reign supreme across most robo-advisor-built portfolios, a few provide exposure to actively managed open-end funds, individual stocks, or even closed-end funds. In the past year, Titan, which had relied on all active strategies, got more passive, while Vanguard, a bastion of passive investing, got more active. Titan added two diversified portfolios of low-cost ETFs to its lineup of internally managed equity strategies, third-party closed-end funds, and a cryptocurrency offering. Vanguard introduced an active management risk assessment and added a five-fund active equity portfolio and an active bond option to its array of index funds.

Some providers let clients customize their portfolios. Wealthfront customers can change the recommended asset mix and/or add individual ETFs to their accounts. Investors with at least $100,000 in taxable money can opt for direct indexing or a risk parity strategy, while those with a balance of at least $500,000 can opt for a smart-beta strategy. Similarly, Betterment investors can use the recommended portfolio as a starting point but then adjust the individual asset-class weights or underlying holdings. Before implementing the changes, Betterment gives customers feedback on the potential impact of their changes on portfolio diversification and risk.

Exhibit 10 Overall Investment Approach and Options Available

✓ Portfolio ✗ Insufficient portfolio data disclosed to determine investment approach

	Actively Managed or Thematic Funds	Custom/Flexible Portfolios	Growth Tilt	Index Funds	Strategic Beta	Sustainable/ ESG	Value Tilt	Primary Fund Providers Used
Acorns				✓		✓		iShares
Ally Invest				✓		✓		iShares, Vanguard
Betterment/ Betterment Premium	✓	✓	✓	✓	✓	✓	✓	iShares, Vanguard
Citi Wealth Builder	✓		✗	✓	✗	✓	✗	Proprietary
Empower Personal Wealth/Personal Capital		✓	✗	✓		✓	✗	✗
E-Trade Core Portfolios[1]				✓	✓	✓	✓	✗
Ellevest[2]				✓		✓	✓	iShares, Vanguard
Fidelity Go				✓				Fidelity
J.P. Morgan Automated Investing[3]				✓	✓			J.P. Morgan
Marcus Invest				✓	✓	✓	✓	iShares, Vanguard, Goldman Sachs
Merrill Guided Investing				✓		✓		iShares, Vanguard, SPDR
Schwab Intelligent Portfolios/ Schwab Intelligent Portfolios Premium		✓		✓			✓	Schwab, Vanguard
SigFig				✓				iShares, Vanguard, Schwab
SoFi Wealth			✓	✓				SoFi, iShares, Vanguard
Titan	✓	✓	✓	✓	✓			iShares, Vanguard, ARK, Apollo, Carlyle
UBS Advice Advantage	✗	✗	✗	✗	✗	✗	✗	✗
US Bancorp Automated Investor				✓				—
Vanguard Digital Advisor/ Vanguard Personal Advisor Services	✓	✓		✓		✓		Vanguard
Wealthfront[4]	✓	✓	✓	✓	✓	✓	✓	Vanguard, iShares, Schwab
Wells Fargo Intuitive Investor				✓	✓	✓		iShares, Goldman Sachs

Sources: Company surveys, Form ADV filings, and Morningstar research. Data as of Dec. 31, 2022.
1 Morningstar was previously a minority owner of United Income, which was acquired by Capital One in 2019.
2 Morningstar is a minority owner of Ellevest Inc. Ellevest has separately engaged Morningstar Investment Management to provide certain services, including licensing the Wealth Forecast Engine. UBS does not disclose sufficient portfolio data to determine its investment approach. E-Trade and Wells Fargo do not disclose information about their underlying fund holdings.
3 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
4 Wealthfront clients have access to a broader range of asset classes if they choose to customize.
UBS does not disclose sufficient portfolio data to determine its investment approach. E-Trade, Wells Fargo, and Empower do not disclose information about their underlying fund holdings.

While customization may have a niche following, some robo-advisors stray into fad territory. Betterment offers smart-beta portfolios plus four crypto portfolios—including one focused on the metaverse. Wealthfront, meanwhile, promotes small stock baskets to its clients within its app's well-designed user interface. For example, it might encourage investors to consider a handful of electric vehicle makers' stocks. Most investors, though, would be better served by portfolios of low-cost, diversified ETFs.

Value vs. Growth

Providers also differ in the extent to which they favor value- or growth-oriented strategies. SoFi, in particular, has a pronounced growth bias. Its model portfolios include growth ETFs for large- and mid-cap exposure; these two funds together account for nearly two thirds of equity exposure in the model portfolios. Several other providers, including Schwab and Betterment, lean more toward value. Within each major asset class, Schwab includes both a basic market-cap-weighted index ETF and a fundamentally weighted ETF, which tends to have a value tilt because its allocations are based on measures such as revenue, cash flow, and dividends. Wealthfront previously included value factor attributes as part of its smart-beta strategy but recently dropped it in favor of focusing on companies with strong operating profitability.

ESG Options

As the U.S. ESG market has grown, robo-advisor ESG offerings have become almost standard. Responding to investor demand, especially the younger investors who make up their main target audience, just over half of providers surveyed offer an ESG option. Some, such as Vanguard Digital Advisor and Wells Fargo Intuitive Investor, added sustainable investing in 2022. IShares ETFs are the dominant building block of most ESG-themed portfolios in our robo-advisor survey. One fund in particular, iShares ESG Aware MSCI USA ETF ESGU, makes up a significant portion of ESG equity exposure in our survey. On the other hand, Schwab Intelligent Portfolios and Fidelity Go do not offer ESG portfolios and have no plans to. Individual results may vary, but ESG funds and sustainability-themed portfolios tend to be more expensive than non-ESG funds and portfolios with similar investment mandates.

U.S. vs. Non-U.S.

At year-end 2022, non-U.S. domiciled stocks made up about 40% of global market capitalization. However, most robo-advisors display home-country bias, which is not uncommon among U.S. investors. Acorns and Merrill target weights of 70% U.S. equity and 30% non-U.S., which is a split that larger asset managers often use in their target-date funds. This weighting acknowledges the diversification benefits of non-U.S. stocks but also recognizes that many investors prefer to hold more U.S. equities. The Schwab Intelligent Portfolios program also offers U.S.-focused options that investors can opt into, though these portfolios still allocate between 5% and 15% of total assets to non-U.S. stocks.

SigFig and Ally Invest hew more closely to the global market cap, with each provider maintaining a 60/40 U.S./non-U.S. split. Vanguard Digital Advisor offers an even 50/50 split, which in effect overweights non-U.S. stocks.

The take-home point for investors is that nearly all robo-advisors offer some degree of international diversification, but the amount varies significantly by provider.

Municipal Bonds

Tax management is another key difference among providers. Some but not all robo-advisors offer tax-loss harvesting, but providers also differ in the degree to which tax considerations impact portfolio construction. Acorns does not include municipal-bond options in its portfolios, making its service a better fit for investors in lower tax brackets and/or those saving in tax-deferred retirement accounts. Most other providers offer different portfolios of the same risk level tailored to taxable or tax-free accounts. SigFig, for example, includes dividend-oriented REITs only in tax-advantaged accounts while reserving municipal bonds for taxable portfolios. Similarly, most other providers lean heavily on municipal-bond funds in portfolios geared toward investors in taxable accounts. In almost every case, investors opting for these accounts will get municipal-bond allocations regardless of their tax brackets, which may not be ideal for every situation.

Cash Is Trash?

Whether conservative, moderate, or aggressive, robo-advisor portfolios typically allocate up to 3% of assets to cash. Paltry nominal and negative real returns from cash in recent years have pushed some robo-advisors toward bond substitutes, even in conservative portfolios. SigFig allocates up to 15% of assets to short-term Treasuries, SoFi holds up to 30% in a short-term bond fund (plus an additional 5% to a short-term TIPS fund), and Acorns makes liberal use of ultrashort bond funds in its conservative portfolio, though its moderate and aggressive portfolios do not include cash. However, this stance may be tested as yields soared in 2022, causing some providers to miss out on an opportunity to take advantage of higher cash yields.

Along with Schwab Intelligent Portfolios, Ally Invest is one of the few robo-advisors with large cash allocations. It offers both Market Focused portfolios, which allocate 2% to cash and have a 0.30% annual advisory fee, and Cash Enhanced portfolios, which allocate 30% to cash but have no advisory fee. The cash-heavy portfolios target Ally's risk-averse customers who already have most of their assets at the bank. Wealthfront and Betterment also now offer high-yield savings accounts with higher FDIC insurance coverage via partner banks. The cash portion provides ballast while earning a hefty annual rate of 4%, recently competitive with other high-yield savings accounts.

Schwab Intelligent Portfolios' hefty cash allocations are more problematic. The portfolios' 13% cash stake, on average, is out of step with other managed investment portfolios. The typical fund in the moderate allocation (formerly allocation—50% to 70% equity) Morningstar Category holds around 7% of its assets in cash, while most target-date funds hold about 3% in cash across their vintages. On the positive side, Schwab now links the cash yield to Schwab Government Money Fund, which offered a relatively competitive seven-day yield of 4.67% as of mid-June 2023.

Granted, higher-than-average cash allocations can pay off at times. Schwab's portfolios likely hold up better than those of most other robo-advisors during market declines, such as 2022's bear market. More often, though, cash drags on investors' long-term results.

FOMO on Cryptocurrencies

Following the huge runup in bitcoin and other cryptocurrencies in 2019, 2020, and part of 2021, many robo-advisors took a close look at whether they should include them as an option for clients' portfolios. Not coincidentally, cryptocurrency has been a huge area of interest for the younger investors who make up the core audience for most robo-advisors.

A year ago, Wealthfront was the only major provider to include a cryptocurrency option, though the much smaller Titan has offered it since 2021, and others have considered adding it. Wealthfront started offering crypto exposure in July 2021 and now gives customers the option of investing up to 10% of their assets in bitcoin and/or ethereum, two of the largest and most established cryptocurrencies. Titan Invest offers an actively managed cryptocurrency portfolio that seeks to outperform the Bitwise 10 Large Cap Crypto Index over a three- to five-year time horizon.

Recently, Acorns and Betterment have also decided to enter the cryptocurrency game. Acorns allowed clients to invest up to 5% of assets in a bitcoin ETF, and Betterment acquired Seattle-based cryptocurrency manager Makara in 2022. Betterment now offers four crypto portfolios: a broad market portfolio as well as portfolios focused on sustainable crypto, decentralized finance, and the metaverse. Betterment doesn’t cap how much investors can put in its crypto portfolios, which are 4 times as expensive as its investment portfolios but suggests a limit of 5% of assets.

Cryptocurrency remains among the most volatile and speculative asset classes in Morningstar's database and has been subject to both dizzying highs and sudden drawdowns. Bitcoin, for example, dropped 77% between its November 2021 high and November 2022 low. Robo-advisor investors should think carefully about whether they can tolerate this asset's risk before adding it to their portfolios.

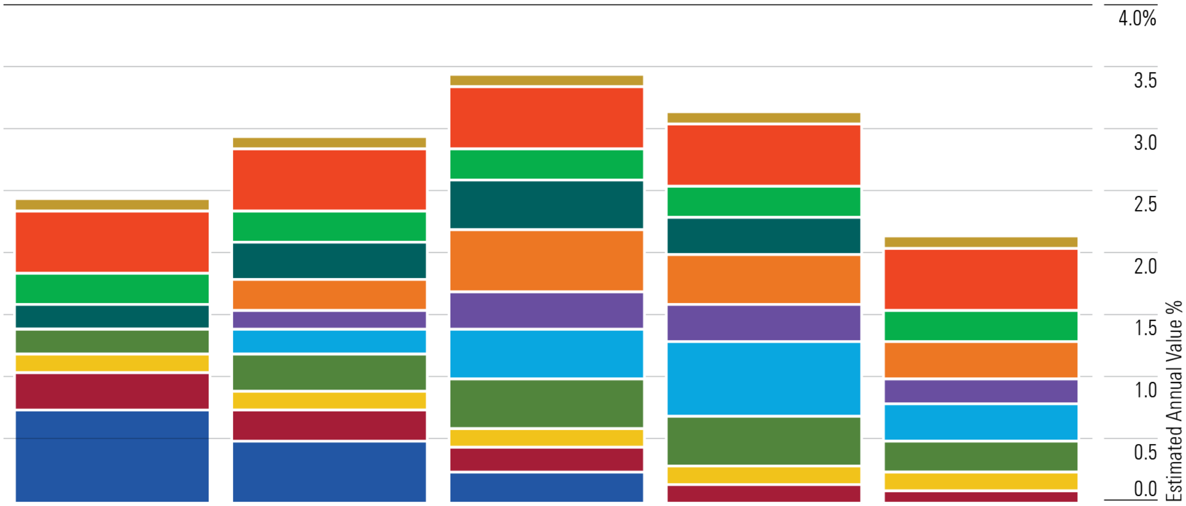
Financial Planning Services

At the most basic level, individuals who sign up for a robo-advisor typically get digital investment management consisting of a diversified portfolio made up of low-cost, passively managed mutual funds or ETFs. Nearly every robo-advisor offers a range of portfolios with different risk levels.

Automatic rebalancing is an essential feature—without it, investors would have to manually adjust their portfolio holdings to keep their asset allocations in line with the original targets. Most robo-advisors use a threshold for rebalancing, meaning they buy and sell a portion of underlying holdings to bring the portfolio back in balance if a major asset class drifts higher or lower than its original target by a certain amount, such as 5 percentage points.

Tax-loss harvesting, which involves selling securities to realize capital losses that can be used to offset realized gains, is another useful feature. To implement this strategy, robo-advisors typically need to designate more than one underlying holding that can be used for each asset class. If the program sells a holding to take advantage of tax losses, it can then replace it with a similar fund in the same asset class. To avoid running afoul of wash-sale rules, the replacement fund can't be substantially identical to the sold holding.

Exhibit 11 Estimated Value of Financial Planning Services (Annual %)



Early Accumulation %	Mid Accumulation %	Transition %	Early Retirement %	Late Retirement %	Service
0.10	0.10	0.10	0.10	0.10	Rebalancing
0.50	0.50	0.50	0.50	0.50	Behavioral Coaching
0.25	0.25	0.25	0.25	0.25	Total Wealth Asset Allocation
0.20	0.30	0.40	0.30	0.00	Retirement Age Guidance
0.00	0.25	0.50	0.40	0.30	Annuity Planning
0.00	0.15	0.30	0.30	0.20	Pension Optimization
0.00	0.20	0.40	0.60	0.30	Retirement Withdrawal Planning
0.20	0.30	0.40	0.40	0.25	Tax Efficient Investing
0.15	0.15	0.15	0.15	0.15	Estate Planning
0.30	0.25	0.20	0.15	0.10	Insurance Planning
0.75	0.50	0.25	0.00	0.00	Savings Guidance

Source: Morningstar, Inc. Data as of May 31, 2023

The need for a lineup of similar but not substantially identical funds in the same asset class highlights the drawbacks of relying only on proprietary funds. Fidelity Go is one of the largest players that does not currently offer tax-loss harvesting, a significant drawback to an otherwise competitive program. Not coincidentally, this program relies on a limited lineup of seven in-house Fidelity Flex funds that serve as the building blocks for portfolios of various risk levels. Lower-rated Marcus Invest, Merrill Guided Investing, and Citi Wealth Builder also do not include this feature.

Vanguard Digital Advisor rolled out tax-loss harvesting in November 2022. It also increased the number of funds it uses to build customized portfolios and associated glide paths, switching from only four to up to 13, which can include a five-fund active equity allocation, an active bond option, three ESG funds, and a muni-bond fund.

One key need that most robo-advisors do not currently fill is helping investors figure out how to draw down assets during retirement. Their target audience tends to be younger investors, but as more individuals reach retirement age, this will become increasingly important.

Exhibit 12 Financial Planning Services Offered

				Tax Options							
	Savings Guidance	Insurance Planning	Estate Planning	Tax-Efficient Investments	Tax-Loss Harvesting	Retirement Withdrawal Planning	Pension Optimization	Annuity Planning	Retirement Age Guidance	Outside Account Aggregation/ Total Wealth	Behavioral Coaching
Acorns											
Ally Invest				✓							✓ [1]
Betterment	✓			✓	✓	✓			✓	✓	✓
Citi Wealth Builder											
E-Trade Core Portfolios[2]				✓							
Ellevest[3]	✓			✓					✓		✓ [4]
Empower Personal Wealth/ Personal Capital	✓		✓ [5]	✓	✓	✓			✓	✓	✓
Fidelity Go				✓						✓	✓
J.P. Morgan Automated Investing[6]	✓								✓	✓	
Marcus Invest				✓							
Merrill Guided Investing				✓					✓ [7]		
Schwab Intelligent Portfolios/ Intelligent Portfolios Premium	✓	✓ [8]	✓	✓ [9]	✓ [9]	✓	✓ [10]	✓ [10]	✓	✓ [10]	✓ [10]
SigFig	✓			✓	✓				✓	✓	
So Fi	✓			✓					✓		✓
Titan Invest											
UBS					✓					✓	
US Bancorp Automated Investor				✓	✓				✓		
Vanguard Digital Advisor/ Personal Advisor Services	✓		✓ [11]	✓	✓	✓			✓	✓	✓
Wealthfront	✓			✓	✓				✓	✓	
Wells Fargo Intuitive Investor	✓				✓				✓		

Sources: Company surveys, Form ADV Part II filings, and Morningstar research. Data as of May 31, 2023.
1 Available with Wealth Management offering
2 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
3 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
4 Free live virtual workshops with CFPs; individual sessions are available with Premium service or a la carte.
5 Clients in the Wealth Management tier ($1 million in assets or more) have access to estate planning specialists.
6 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
7 Available with Merrill Guided Investing with Advisor
8 High-level guidance is available with Schwab Intelligent Portfolios Premium.
9 Tax-loss harvesting is available for accounts with balances of at least $50,000.
10 Available with Schwab Intelligent Portfolios Premium
11 High-level guidance is available with Vanguard Personal Advisor Services/Personal Advisor Select.

Schwab Intelligent Portfolios is currently one of the only major robo-advisors that offers comprehensive advice on retirement income. Its program helps investors determine how much they can afford to withdraw from their portfolios and schedule recurring withdrawals from both taxable and tax-deferred accounts, such as IRAs. The program also incorporates required minimum distributions, which currently apply to investors age 73 and older, who must withdraw a certain amount each year from accounts such as IRAs and 401(k)s based on standard life-expectancy formulas. Schwab's program also considers the order of withdrawals from various types of accounts to minimize taxes.

Similarly, Vanguard Personal Advisor Services has added a dynamic spending capability that helps guide clients toward prudent spending from their portfolios in retirement. Vanguard plans to add that feature to Vanguard Digital Advisor, or VDA. In the meantime, VDA guides clients to ensure they are taking the necessary steps to meet their financial goals and aims to replicate an advisor nudging clients with bite-size pieces of actionable advice. VDA also offers calculators including a rainy day tool and emergency savings estimator, healthcare estimator, Medicare match, and Social Security optimization differentiating the service from competing robo-advisors.

Exhibit 13 Annual Advisory Fees for Selected Premium Offerings

	Minimum Investment Amount ($)	Annual Advisory Fee (%)	Additional Details
Betterment Premium	100,000	0.40	Investors who don't meet the asset minimum required for Premium service have the option of purchasing on-demand financial planning packages (typically priced at $399 per hour).
Ellevest[1]	n/a	n/a	Various coaching packages are available as a supplement to subscription-based packages. Coaching packages generally range from about $150 to $550 per session (depending on the client's subscription level), or more for a comprehensive financial plan. Investors can also pay a flat annual fee ranging from about $1,850 to $3,699 for a comprehensive financial plan and access to a planner with the CFP designation.
Empower Personal Wealth/Personal Capital	100,000	0.89	Clients who invest at least $3 million pay an asset-based fee of 0.79%, with tiered fees decreasing to 0.69% for the next $2 million, 0.59% for the next $5 million, and 0.49% for assets over $10 million.
Fidelity Go	25,000	0.35	Investors are automatically opted into the 0.35% asset-based fee as soon as they reach $25,000 in assets.
J.P. Morgan Personal Advisors[2]	25,000	0.60	Fee decreases to 0.5% on the entire account balance for assets over $250,000 and 0.4% on the entire account balance for assets over $1 million.
Merrill Guided Investing with Advisor	20,000	0.85	Preferred Rewards enrolled clients receive a discount of 0.05% off of the annual rate for the Gold tier, 0.10% for the Platinum tier, or 0.15% for the Platinum Honors, Diamond ,and Diamond Honors tiers.
Schwab Intelligent Portfolios Premium	25,000	n/a	$300 one-time planning fee plus ongoing fees of $30 per month.
Vanguard Personal Advisor Services	50,000	0.30	For an all-index investment option, Personal Advisor clients pay a net advisory fee of approximately 0.30%. For clients with an ESG or active/index investment options approximate net advisory fees are expected to range from 0.24% to 0.26% or 0.26% to 0.35%, respectively.
Vanguard Personal Advisor Services Select	500,000	0.30	Tiered fee decreases to 0.20% for assets over $5 million, 0.10% for assets over $10 million, and 0.05% for assets over $25 million.

Sources: Company surveys, Form ADV Part II filings, and Morningstar research. Data as of May 31, 2023.
1 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
2 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.

Account aggregation, which involves setting up digital links to assets held outside the robo-advisor, is another feature that most investors would probably find useful. Customers can typically set up this feature by providing information for the outside account, allowing the program to pull in updated account values and asset-allocation levels for all their assets, not just those managed by the robo-advisor. Having access to this information can help robo-advisor programs provide more accurate advice on savings, asset allocations, and progress toward investment goals.

Exhibit 14 Key Features and Benefits

	Aggregation of Outside Accounts	Automatic Rebalancing	Drawdown/Retirement Income Advice	Multiple Goal Planning	Tax-Loss Harvesting
Acorns		✓			
Ally Invest		✓		✓	
Betterment/ Betterment Premium	✓	✓	✓	✓	✓
Citi Wealth Builder		✓			
Empower Personal Wealth/Personal Capital	✓	✓	✓	✓	✓
E-Trade Core Portfolios[1]		✓			
Ellevest[2]	✓	✓		✓ [3]	
Fidelity Go		✓			
J.P. Morgan Automated Investing[4]	✓	✓		✓	
Marcus Invest		✓			
Merrill Guided Investing	✓	✓			
Morgan Stanley Access Investing	✓	✓			✓
Schwab Intelligent Portfolios/ Schwab Intelligent Portfolios Premium	✓ [5]	✓	✓	✓ [5]	✓ [6]
SigFig	✓	✓			✓
SoFi Wealth		✓		✓	
Titan		✓			
UBS Advice Advantage	✓	✓			✓
US Bancorp Automated Investor		✓			✓
Vanguard Digital Advisor/ Vanguard Personal Advisor Services	✓	✓	✓	✓	✓
Wealthfront	✓	✓		✓	✓
Wells Fargo Intuitive Investor		✓			✓

Sources: Company surveys, Form ADV Part II filings, and Morningstar research. Data as of May 31, 2023.
1 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
2 Morningstar is a minority owner of Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
3 Multiple goal planning is only available for Executive members.
4 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
5 Account aggregation and multiple goal planning are only available for Premium members.
6 Tax-loss harvesting is only available for accounts of $50,000 and above.

Finally, some robo-advisors offer a variety of other bells and whistles, such as cash management, career coaching, and spending rebates. While price and portfolio construction are some of the most important considerations, the breadth of services offered also distinguishes the best players.

Exhibit 15 Other Features and Benefits

	Asset Location Advice	Career Coaching	College Savings/ 529 plan	Health Savings Account	Loans (margin or other)	Micro-Savings/ Spending Roundups	Portfolio Review	Rebate Program
Acorns		✓[1]	✓[2]			✓		✓
Ally Invest								
Betterment	✓		✓	✓			✓	✓
Citi Wealth Builder								
Empower Personal Wealth/Personal Capital			✓					
E-Trade Core Portfolios[3]								
Ellevest[4]	✓					✓		✓
Fidelity Go				✓			✓	
J.P. Morgan Automated Investing[5]								
Marcus Invest								
Merrill Guided Investing								✓[6]
Morgan Stanley Access Investing								
Schwab Intelligent Portfolios/ Schwab Intelligent Portfolios Premium			✓[7]		✓[7]		✓[8]	
SigFig							✓	
SoFi Wealth		✓			✓			
Titan							✓	
UBS Advice Advantage			✓				✓	
U.S. Bancorp								
Vanguard Digital Advisor/ Vanguard Personal Advisor Services	✓							
Wealthfront	✓		✓		✓			
Wells Fargo Intuitive Investor								

Sources: Company surveys, Form ADV Part II filings, and Morningstar research. Data as of May 31, 2023.
1 Offers access to the job finder tool from ZipRecruiter.
2 Offers UTMA and UGMA accounts.
3 E-Trade Core Portfolios licenses certain services from Morningstar, including fund fact sheets and a risk-tolerance questionnaire.
4 Morningstar holds a minority ownership position in Ellevest, Inc. Ellevest has separately engaged Morningstar to provide certain services, including licensing the Wealth Forecast Engine and consulting on portfolio allocations (including specific ETFs included in client portfolios).
5 J.P. Morgan Automated Investing's portfolios include some funds that track Morningstar indexes.
6 Rebate program available for clients enrolled in Preferred Rewards.
7 Features are available through Schwab's broader brokerage and banking services.
8 Portfolio review is only available for Premium members.

Robo-Advisors vs. Traditional Advisors

Digital investment advice—as opposed to traditional financial advice provided by a human being—can be a compelling option for many investors, particularly those with smaller account balances. There are some key differences in the types of services each provides, though.

The most obvious difference is whether an actual person mediates the investment advice—albeit with varying degrees of reliance on algorithms—or if the algorithm exclusively provides it. In the traditional model, financial advisors provide customized investment management and financial planning services. They also meet with clients on a regular basis, typically at least once or twice a year. More informally, they are often available for impromptu calls to advise on key investment decisions or provide reassurance during periods of market turbulence.

In the early days of digital investment advice, many heralded it as a replacement for traditional, human-delivered financial advice. A key assumption was that younger generations who grew up with social media and the internet at their fingertips might even prefer not to meet with anyone in person.

But research has shown that few investors prefer to handle their financial decisions exclusively online. Research from Phoenix Marketing and Cerulli Associates[4] indicates that only 5% of survey respondents expressed a preference for working with an online-only advisor. Similarly, a Vanguard survey[3] found that more than 90% of clients currently working with a human advisor said they would not consider switching to a digital advisor, but 88% of clients currently working with a robo-advisor would consider shifting to a human advisor.

Many robo-advisors have tried to bridge the gap between digital and human investment advice by incorporating real-time behavioral nudges via text or email to encourage their users to stick with their investment plans and continue taking the steps needed to meet their goals. As we discussed in the Industry History and Trends section, several robo-advisors have also introduced hybrid offerings that combine digital tools with access to a human advisor.

Another obvious difference between robo-advisors and traditional advisors is the degree of customization and hands-on investment management. Decades ago, financial advisors focused on adding value by picking stocks or actively managed mutual funds for their clients. With the shift toward fee-based advisory models, however, hands-on investment management is no longer a primary part of the value proposition for most financial advisors. Instead, financial advisors can add the most value by helping clients sort through other complex financial issues, such as insurance planning, estate planning, stock-based compensation programs, and comprehensive tax planning.

However, many investors at the lower end of the mass affluent tier (which Cerulli Associates defines as those with investable assets from $500,000 to $2 million) may not need this scope of advice. For those who do not need complex financial planning, cost is a key differentiator, and robo-advisors have a significant cost advantage. An investor with a $500,000 portfolio, for example, might pay about 1.00% of assets per year to a traditional financial advisor, which translates into $5,000 per year. An investor with the same $500,000 portfolio who paid a typical level of fees for a robo-advisor (about 0.30% of assets), in contrast, would pay only $1,500 per year. Moreover, many financial advisors will not accept new clients unless they have a higher level of investable assets.

Another way to frame the price of digital advice versus more traditional advice is to compare it with the average cost for a stand-alone financial plan, which is a comprehensive analysis of a client's goals, income, assets, debts, planned expenses, retirement savings, and anticipated retirement spending. Advisors often use sophisticated financial planning software to enter detailed information and assumptions, which are then translated into a year-by-year projection of the client's financial information. This type of software also typically incorporates Monte Carlo analysis, a statistical model that simulates thousands of different potential outcomes to estimate the probability of success or failure for a given plan. Based on research from Cerulli Associates,[4] advisors typically charge $2,325 for a

4 The Cerulli Report—U.S. Retail Investor Products and Platforms 2022: Creating an Omnichannel Experience

3 https://corporate.vanguard.com/content/corporatesite/us/en/corp/articles/quantifying-value-human-and-digital-advice.html

4 The Cerulli Report—U.S. Advisor Metrics 2022: Trends in Advisor Compensation, P. 138

comprehensive financial plan along these lines, or $1,750 for a more targeted financial plan focusing on a specific area, such as retirement income, tax planning, or education funding.

Several robo-advisors (including Betterment, Schwab, Wealthfront, and Vanguard) allow customers to create similar projections but at a much lower cost. Investors might still be willing to pay up for a human financial advisor but should keep an eye on whether the value of the services they are receiving is worth the cost.

Conclusion

The robo-advisor industry may be more than a quarter century in the making, with many leading providers today getting their start around 15 years ago, but the industry is just now maturing. Services continue adding new, valuable features each year, if not each quarter, and competing on cost. Room for improvement remains, though. A few robo-advisors remain pricey, transparency could be better, and some portfolio options are better than others. The ongoing trend toward adding a human touch to robo-advisor offerings suggests the future will be far from exclusively digital. How robo-advisors incorporate nascent artificial intelligent technology is not yet clear. Nonetheless, sound investing, withdrawals, and holistic financial planning will remain as much art as science. In that sense, there will always be a role for traditional advisors, especially with clients whose needs are complicated. New investors, however, whose modest assets precluded them from receiving financial advice in the past, now have excellent options for getting started through robo-advisors.

Appendix: Sample Robo-Advisor Portfolios

Exhibit A1 Sample Portfolio Holdings: Betterment

Name	Ticker	Morningstar Category	Category Group	Morningstar Medalist Rating	Annual Report Net Expense Ratio (%)	Weighting (%)
Vanguard Total Stock Market ETF	VTI	Large Blend	U.S. Equity	Gold	0.03	23.4
Vanguard Value ETF	VTV	Large Value	U.S. Equity	Gold	0.04	6.2
Vanguard Small-Cap Value ETF	VBR	Small Value	U.S. Equity	Gold	0.07	4.3
Vanguard Energy ETF	VDE	Equity Energy	Sector Equity	Gold	0.10	5.1
Vanguard FTSE Developed Markets ETF	VEA	Foreign Large Blend	International Equity	Silver	0.05	19.3
Vanguard FTSE Emerging Markets ETF	VWO	Diversified Emerging Mkts	International Equity	Bronze	0.08	11.6
iShares Core US Aggregate Bond ETF	AGG	Intermediate Core Bond	Taxable Bond	Gold	0.03	9.8
Vanguard Total International Bond ETF	BNDX	Global Bond-USD Hedged	Taxable Bond	Silver	0.07	10.9
iShares JP Morgan USD Em Mkts Bd ETF	EMB	Emerging Markets Bond	Taxable Bond	Silver	0.39	5.5
iShares 0-5 Year TIPS Bond ETF	STIP	Inflation-Protected Bond	Taxable Bond	Gold	0.03	3.8
Total						**100**

Sources: Betterment and Morningstar Direct. Data as of May 31, 2023. Portfolio holdings are for the tax-deferred version of Betterment's Core Portfolio.

Exhibit A2 Sample Portfolio Holdings: Fidelity Go

Name	Ticker	Morningstar Category	Category Group	Morningstar Medalist Rating	Annual Report Net Expense Ratio (%)	Weighting (%)	
						Retirement	Taxable
Fidelity Flex 500 Index	FDFIX	Large Blend	U.S. Equity	Gold	0.00	41.16	41.16
Fidelity Flex Mid Cap Index	FLAPX	Mid-Cap Blend	U.S. Equity	Gold	0.00	3.92	3.92
Fidelity Flex Small Cap Index	FLXSX	Small Blend	U.S. Equity	Bronze	0.00	3.92	3.92
Fidelity Flex International Index	FITFX	Foreign Large Blend	International Equity	Silver	0.00	21	21
Fidelity Flex Municipal Income	FUENX	Muni National Long	Municipal Bond	N/A	0.00	—	25
Fidelity Flex Cnsrv Inc Muni Bd	FUEMX	Muni National Short	Municipal Bond	N/A	0.00	—	4.5
Fidelity Flex US Bond Index	FIBUX	Intermediate Core Bond	Taxable Bond	Gold	0.00	25	—
Fidelity Flex Conservative Income Bd	FJTDX	Ultrashort Bond	Taxable Bond	N/A	0.00	4.5	—
Fidelity Flex Government Money Mkt	FLGXX	Money Market - Taxable	Taxable Bond	N/A	0.00	0.5	0.5
Total						**100**	**100**

Source: Fidelity and Morningstar Direct. Data as of May 31, 2023. Portfolio holdings are for Fidelity's Growth Strategy Portfolios.

Exhibit A3 Sample Portfolio Holdings: Schwab Intelligent Portfolios

Name	Ticker	Morningstar Category	Category Group	Morningstar Medalist Rating	Annual Report Net Expense Ratio (%)	Weighting (%)	
						Retirement	Taxable
iShares Gold Trust	IAU	Commodities Focused	Commodities	N/A	0.25	2.0	2.0
Schwab Fundamental Emerg Mkts Lg Co ETF	FNDE	Diversified Emerging Mkts	International Equity	Neutral	0.39	8.0	8.0
Schwab Fundamental Intl Lg Co ETF	FNDF	Foreign Large Value	International Equity	Silver	0.25	7.0	7.0
Schwab International Equity ETF	SCHF	Foreign Large Blend	International Equity	Silver	0.06	5.0	5.0
Schwab Fundamental Intl Sm Co ETF	FNDC	Foreign Small/Mid Value	International Equity	Neutral	0.39	5.0	5.0
Schwab Emerging Markets Equity ETF	SCHE	Diversified Emerging Mkts	International Equity	Bronze	0.11	5.0	5.0
Schwab International Small-Cap Eq ETF	SCHC	Foreign Small/Mid Blend	International Equity	Silver	0.11	3.0	3.0
Vanguard Tax-Exempt Bond ETF	VTEB	Muni National Interm	Municipal Bond	Gold	0.05	—	17.8
Schwab US REIT ETF	SCHH	Real Estate	Sector Equity	Silver	0.07	2.0	2.0
Xtrackers International Real Estate ETF	HAUZ	Global Real Estate	Sector Equity	Bronze	0.10	2.0	2.0
Schwab 5-10 Year Corp Bd ETF	SCHI	Corporate Bond	Taxable Bond	Silver	0.04	8.0	—
Schwab Intermediate-Term US Trs ETF	SCHR	Intermediate Government	Taxable Bond	Silver	0.04	3.8	—
SPDR® Blmbg Em Mkts Lcl Bd ETF	EBND	Emerging-Mrts Local-Currency Bond	Taxable Bond	Bronze	0.31	2.0	2.0
Vanguard Mortgage-Backed Secs ETF	VMBS	Intermediate Government	Taxable Bond	Gold	0.04	6.0	—
Schwab Fundamental US Large Company ETF	FNDX	Large Value	U.S. Equity	Silver	0.25	12.0	12.0
Schwab Fundamental US Small Company ETF	FNDA	Small Blend	U.S. Equity	Silver	0.25	8.0	8.0
Schwab US Large-Cap ETF	SCHX	Large Blend	U.S. Equity	Gold	0.03	8.0	8.0
Schwab US Small-Cap ETF	SCHA	Small Blend	U.S. Equity	Silver	0.04	5.0	5.0
Cash	n/a	n/a	n/a	N/A	n/a	8.2	8.2
Total						**100**	**100**

Sources: Schwab and Morningstar Direct. Data as of May 31, 2023. Portfolios shown are for Risk Level 9. Schwab Intelligent Portfolios includes other portfolio options, including U.S.-focused and income-oriented versions.

Exhibit A4 Sample Portfolio Holdings: Vanguard Digital Advisor

Name	Ticker	Morningstar Category	Category Group	Morningstar Medalist Rating	Annual Report Net Expense Ratio (%)	Weighting (%) Retirement (Index only)	Retirement (with active options)	Retirement (ESG)	Taxable (Index only)
Vanguard Advice Select Dividend Growth Fund	VADGX	Large Blend	U.S. Equity	Gold	0.45	—	7.88	—	—
Vanguard Capital Opportunity Fund	VHCAX	Large Growth	U.S. Equity	Gold	0.36	—	17.85	—	—
Vanguard Total Stock Market Index	VTI	Large Blend	U.S. Equity	Gold	0.03	42.00	10.50	—	42.00
Vanguard ESG U.S. Stock ETF	ESGV	Large Blend	U.S. Equity	Silver	0.09	—	—	42.00	—
Vanguard ESG International Stock	VSGX	Foreign Large Blend	Int'l Equity	Silver	0.12	—	—	28.00	—
Vanguard International Core Stock Fund	VZICX	Foreign Large Blend	Int'l Equity	Gold	0.38	—	7.61	—	—
Vanguard Total Int'l Stock Market Index	VXUS	Foreign Large Blend	Int'l Equity	Gold	0.07	28.00	7.00	—	28.00
Vanguard Advice Select Int'l Growth Fund	VAIGX	Foreign Large Growth	Int'l Equity	Silver	0.42	—	7.61	—	—
Vanguard Advice Select Global Value Fund	VAGVX	Global Large-Stock Value	Int'l Equity	Gold	0.4	—	11.55	—	—
Vanguard Core Bond Fund	VCOBX	Intermediate Core Bond	Taxable Bond	Silver	0.1	—	21.00	—	—
Vanguard Total Bond Market Index	BND	Intermediate Core Bond	Taxable Bond	Gold	0.03	21.00	—	—	—
Vanguard ESG U.S. Corporate Bond	VCEB	Intermediate Core Bond	Taxable Bond	Gold	0.12	—	—	12.60	—
Vanguard Intermediate-Term Treasury	VGIT	Intermediate Government	Taxable Bond	Silver	0.04	—	—	4.43	—
Vanguard Short-Term Treasury	VGSH	Short Government	Taxable Bond	Gold	0.04	—	—	3.97	—
Vanguard Total Int'l Bond Market Index	BNDX	Global Bond-USD Hedged	Taxable Bond	Silver	0.07	9.00	9.00	9.00	—
Vanguard Tax Exempt Bond ETF	VTEB	Muni National Interm	Muni Bond	Gold	0.05	—	—	—	30.00
Total						**100.00**	**100.00**	**100.00**	**100.00**

Sources: Vanguard and Morningstar Direct. Data as of May 31, 2023. Portfolios shown are for a 70/30 mix of stocks and bonds.

Exhibit A5 Sample Portfolio Holdings: Wealthfront

Name	Ticker	Morningstar Category	Category Group	Morningstar Medalist Rating	Annual Report Net Expense Ratio (%)	Weighting (%) Retirement	Taxable
Vanguard Total Stock Market ETF	VTI	Large Blend	U.S. Equity	Gold	0.03	45.0	35.0
Vanguard Dividend Appreciation ETF	VIG	Large Blend	U.S. Equity	Gold	0.06	5.0	—
Vanguard FTSE Developed Markets ETF	VEA	Foreign Large Blend	International Equity	Silver	0.05	11.0	8.0
Vanguard FTSE Emerging Markets ETF	VWO	Diversified Emerging Mkts	International Equity	Bronze	0.08	10.0	6.0
Vanguard Real Estate ETF	VNQ	Real Estate	Sector Equity	Gold	0.12	—	12.0
Vanguard Tax-Exempt Bond ETF	VTEB	Muni National Interm	Municipal Bond	Gold	0.05	29.0	—
iShares iBoxx $ Invmt Grade Corp Bd ETF	LQD	Corporate Bond	Taxable Bond	Neutral	0.14	—	29.0
iShares JP Morgan USD Em Mkts Bd ETF	EMB	Emerging Markets Bond	Taxable Bond	Silver	0.39	—	10.0
Total						**100**	**100**

Sources: Wealthfront and Morningstar Direct. Data as of May 31, 2023. Portfolios shown are for Risk Level 6.

Disclosures

One of the authors of this report participates in the Merrill Guided Investing program.

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Corrections and Clarifications

A sentence in the second paragraph of the Results section on Page 6 has been revised to remove a reference to an SEC fine and censure for Betterment in April 2023, which was not one of the reasons that it moved from second place overall to a fourth-place tie with Wealthfront.

Exhibit A4 has been revised to correct the portfolio weightings shown in the table.

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