The Efficient Frontuzzle: *What Investment Risk Profiling Still Fails to Solve*

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ABSTRACT: *A global study of over 200 professional financial advisors is undertaken to test how risk profile factors are used to make investment portfolio allocation recommendations. When presented with identical risk profile information, similar to what a competent financial advisor would normally collect from a prospective client, respondents are asked to recommend a portfolio allocation among equity, fixed income, and cash for five hypothetical client scenarios. The results find that financial advisors, using their professional judgment, inconsistently puzzled together the presented risk profile factors into portfolio recommendations, on average doing little more than applying the heuristic 100-minus-age rule to recommendations. These troubling results highlight the regulatory need for uniform risk profile evaluation guidance in fiduciary contexts.*

TOPICS: ***Portfolio construction, risk management, legal/regulatory/public policy****

Financial advisors are regularly expected to puzzle together numerous, and often conflicting, client data into optimized portfolio asset allocation recommendations. However, inconsistencies in how financial advisors measure and evaluate investment risk profile (IRP) factors assumedly also lead to inconsistencies in how financial advisors then make portfolio allocation decisions, which this study attempts to illustrate. This study presented over 200 professional financial advisors with identical risk-profiling information for five hypothetical client scenarios and then asked the advisors to recommend a portfolio allocation among equity, fixed income, and cash. By observing the portfolio allocation recommendations made by financial advisor respondents, this research aims to describe the dispersion of portfolio allocation recommendations and to evaluate the extent to which the advisors relied on age-based heuristics.

In practice, financial advisors commonly use a risk tolerance questionnaire returning a single numerical score to satisfy regulatory requirements; however, financial regulators have not taken steps to prescribe how these scores should be developed, used, or applied to portfolio allocation recommendations. As an example, only 11 percent of the Canadian financial advisory firms surveyed by Brayman et al. (2015) could confirm that their questionnaires are valid in accurately capturing a potential investor's risk tolerance. This result seems to suggest that financial advisors consider the formal risk-profiling process as little more than a regulatory hurdle, relying primarily on their professional judgment when making portfolio recommendations.

While decades of research have undertaken the study of risk tolerance and the behavioral biases of individual investors, the literature is woefully scant on how professional financial advisors use the outcomes of various risk tolerance questionnaires, objective factors, heuristics, and professional judgment to select

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an appropriate portfolio recommendation. Given the high level of trust regularly bestowed on financial advisors to make most if not all investment portfolio decisions in their clients' best interest, more research is needed to explore how individual behavioral biases affect a financial advisor's amalgamation of a client's IRP data and to highlight the need to develop models that financial advisors can use to improve decision-making.

It is generally accepted among researchers that strategic asset allocation policy remains a (if not the most) critical element associated with portfolio returns and therefore with the long-term financial success of investors.[1] For this reason, the development of an appropriate asset allocation policy requires a substantial amount of professional competence and judgment to evaluate and select a comprehensive portfolio of assets that could be considered "optimal" (Black, Ciccotello, and Skipper 2002). The literature, however, does not substantiate that this approach is implemented in practice. In a study of asset allocation recommendations made by several major advisory firms, Canner, Mankiw, and Weil (1997) find that recommended portfolios do not match the optimized portfolio allocations prescribed by economic theory. Portfolios generally hold a higher-than-optimal ratio of bonds to stocks.

INVESTMENT RISK PROFILE FACTORS

The broad terminology and nomenclature of IRP factors are used liberally, and often haphazardly, by financial advisors and in academic research to describe the many facets of risk-taking within a financial context. Often, the term "risk tolerance" is used when the IRP is what is meant. For the purposes of this study, the terminology IRP is employed to describe the combination of factors, including an individual's financial risk tolerance, that may affect a financial advisor's recommended portfolio asset allocation. The term "risk tolerance" is used interchangeably with "willingness to take financial risk" and represents the inverse of the economic concept of risk aversion (Hanna and Lindamood 2004).

Financial risk tolerance (or "willingness") is also sometimes used interchangeably to describe "risk preference." An investor's preference or general feeling or partiality toward one option (or more than one option) over another (Sitkin and Pablo 1992) and an investor's willingness to implement a strategy after a consideration of all other factors constitute decidedly different concepts. For example, an individual who generally prefers hot showers over cold ones may, in the absence of other options, be willing to withstand a cold shower. In the same way, investors may have a general preference for low-risk investments, but when faced with the alternatives of either increasing their current savings or diminishing their future spending goals, they may be willing to tolerate additional portfolio risk.

It is important for the reader to adopt a clear and consistent definitional understanding of the various concepts addressed by the current study. The definitions of IRP factors are consistent with, and summarized from, the detailed risk profile factor descriptions in Carr (2014) and Nobre and Grable (2015), who all attempt to translate the nomenclature for many of the terms listed below, but additional clarification is provided where appropriate. Definitions for loss aversion, knowledge, experience, time horizon, and IRP were developed as they specifically relate to the current study and to their broad usage within financial risk profiling research. The following terms are germane to this study:

- **Risk Tolerance.** The maximum level of uncertainty an individual is willing to tolerate in exchange for incremental units of return. This term is often used interchangeably in everyday nomenclature to mean "risk profile" or "risk attitude"; however, in practice, risk tolerance is an individual's willingness to implement a risky strategy after all other factors are considered.
- **Risk Aversion (λ)**. The inverse of risk tolerance and the term preferred by economists where a low risk tolerance equates to a high level of risk aversion. A subjective measure (λ) is generally applied within expected utility maximization models and represents the marginal rate of change in the slope of an individual's utility function at the current level of wealth (Ang 2014).
- **Loss Aversion.** The term preferred within behavioral finance and prospect theory research to recognize that individuals tend to place greater value on potential losses than potential gains of the same magnitude and often act inconsistently regarding that fact (Kahneman and Tversky 1979).

[1] Brinson, Hood, and Beebower 1986.

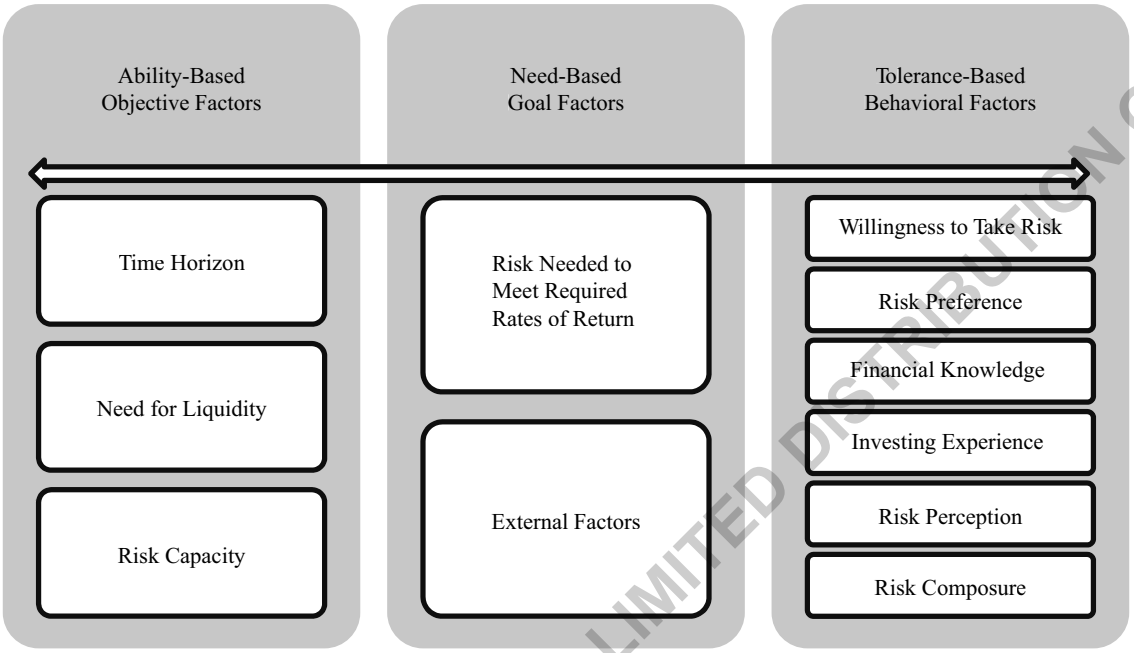
- **Risk Preference.** An individual's general feeling or partiality toward one option (or more than one option) over another. Preference is a rank order of preferred choices. While it is assumed that investors are risk averse, some may have a greater preference for return maximization compared to risk reduction.
- **Risk Perception.** An individual's cognitive assessment of the riskiness of a given situation, regardless of the objective truth. Perception can be heavily influenced by the media, an individual's social environment, and a lack of thorough understanding of financial concepts.
- **Risk Capacity.** Otherwise known as an individual's ability to sustain portfolio volatility without material effect to their standard of living or the ability to meet stated goals.
- **Risk Need.** The magnitude of risk necessary to achieve a financial goal, based on predetermined levels of expected return. Risk need can be adjusted through more saving or less spending.
- **Financial Knowledge.** An individual's financial literacy concerning investing and risk-return dynamics. Higher knowledge is generally associated with higher willingness to take investment risks.
- **Investing Experience.** Related to knowledge but can only be gained by living through various economic cycles, particularly severe economic downturns. Contrary to knowledge, experience can be associated with high or low willingness to take financial risk because an individual's past experiences naturally influence their future perceptions of the riskiness of an investment.
- **Need for Liquidity.** An objective need or desire to hold cash for ongoing current or future expected distribution needs. A high need for liquidity is often related to a short time horizon.
- **Risk Composure.** An individual's past penchant for behaving in a consistent manner. A sample assessment would inquire how an individual responded to the global financial crisis of 2008 and 2009—by selling, holding, or buying more.
- **Time Horizon.** Length of time, generally stated in years, between now and the target goal achievement date. The time horizon generally relates to age, but they are not interchangeable terms.
- **Investment Risk Profile.** The combination of factors about a client that would be expected to affect the level of portfolio risk that would be appropriate for a financial advisor to recommend. In general, an IRP includes all the factors listed here, along with any other investor-unique circumstances, tax and legal considerations, biases, and personality traits.

Within this study, the 11 IRP factors provided to the financial advisor sample respondents are divided into three broad components: ability-based factors, need-based factors, and tolerance-based factors, as illustrated in Exhibit 1. The risk factors defined within each broad component, taken together, can be used to describe that particular facet of an investor's IRP. For example, an investor's ability to assume financial risk is defined by the relevant time horizon, need for liquidity, and capacity to deal with financial loss. Thus, an investor with a long time horizon, a low need for liquidity, and/or a high degree of wealth (or outside sources of income) in relation to daily standard of living needs is considered to have a high ability to take financial risk within the portfolio (Carr 2014, Cordell 2001).

Similarly, an investor's need to assume portfolio risk can be objectively measured by using a present/future value calculation to determine the required rate of return (percent) to meet stated goals (Parker 2014). Often, a potential client may need assistance from a financial advisor in calculating need based on jointly developed assumptions of how long the client will work, how much the client will save, how much the client will spend, and what rate of return the client can expect to earn. For this study, external factors are provided and held constant within the scenarios, where average annual equity returns are 8 percent, average fixed income yield is 2 percent, average cash yield is 0 percent, inflation is expected to be less than 2 percent per year, and tax rates have been and will remain stable over time. However, in practice, these external factors need to be forecast and considered in establishing a risk need.

Both ability-based and need-based risk factors are objective in nature and can be easily calculated from client data, using financial planning software or a financial calculator and the time value of money capabilities. Tolerance-based IRP factors are behavioral in nature

EXHIBIT 1
Investment Risk Profile Factor Components



and are defined in this study as willingness, preference, knowledge, experience, perception, and composure. These factors must be inferred from the administration of a risk tolerance questionnaire, conversations with a client, and/or an examination of a potential client's past asset allocation behavior (Riley and Chow 1992). The majority of professional judgment must be applied to these behavioral factors, for which the widest discrepancy is documented within research. Roszkowski and Grable (2005) find that an advisor's subjective assessment of a client's risk tolerance has a correlation of only 0.4 with the results of a psychometrically validated risk tolerance questionnaire. This outcome suggests that, on average, financial advisors do a poor job of subjectively assessing an investor's risk tolerance.

MEAN-VARIANCE OPTIMIZATION

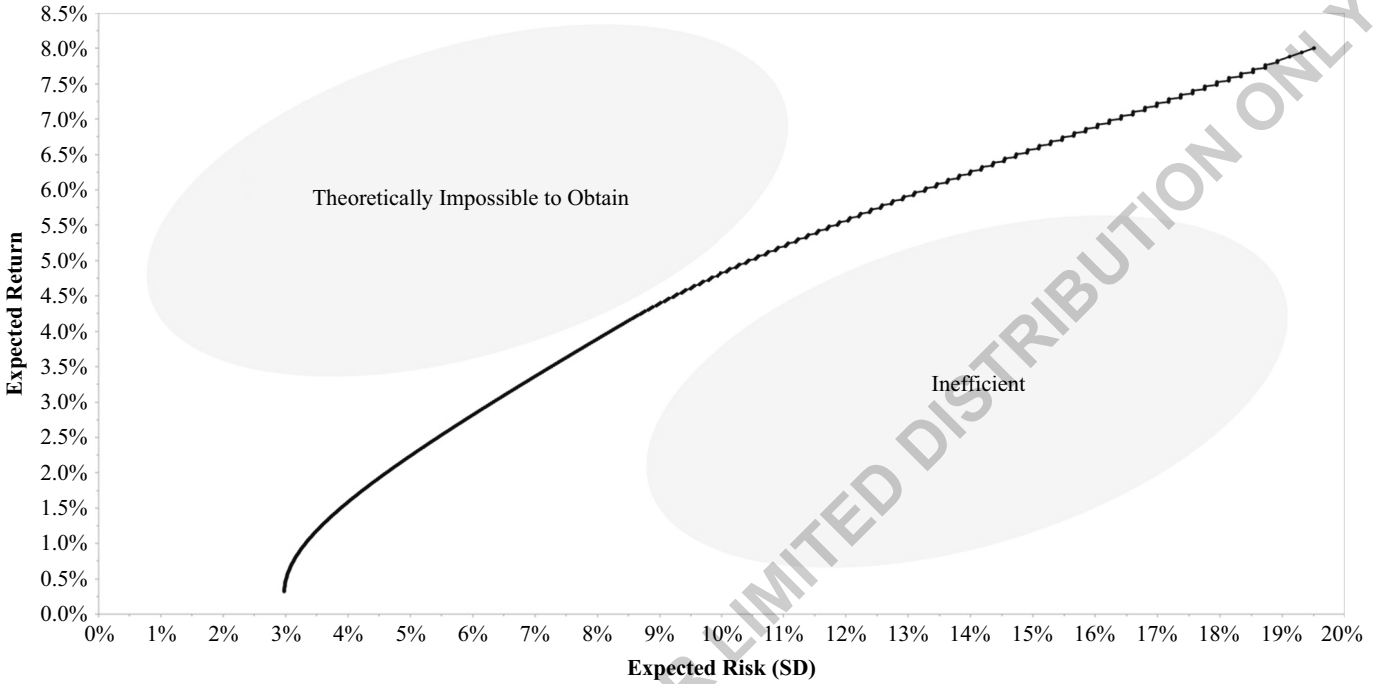
Almost all modern finance textbooks and major professional financial certification bodies teach that optimal investment portfolio selection is broadly, albeit not exclusively, accomplished through mean-variance optimization (MVO). Markowitz (1952) explains the Nobel Prize–winning Modern Portfolio Theory (MPT), the foundational theory that proposes that investors will maximize returns by combining lowly correlated assets along the efficient frontier for a given level of risk, applying MVO. The benefits of diversification are therefore illustrated by the combined risk (as measured by the standard deviation) of a portfolio of assets that is less than the weighted-average risk of the individual assets within the portfolio.

The strict theoretical assumptions and universal applicability of MVO for portfolio selection are not without criticism[2] and should not be considered as the sole way to approach asset allocation decisions. However, for this research, the efficient frontier framework provides a straightforward and illustrative presupposition for evaluating and comparing portfolio recommendations made by the sample of financial advisors. Exhibit 2 shows a graphic depiction, using imposed expected return assumptions, of the efficient frontier model.

Exhibit 2 assumes the combination of only three asset classes (equity, fixed income, and cash); however, in practice, the mean-variance characteristics of every conceivable portfolio combination of assets or asset

[2] Michaud 1989.

EXHIBIT 2
Mean-Variance Efficient Frontier



Source: Originally described in Markowitz, 1952.

classes can be evaluated against each other by using this framework. The goal of the investor or financial advisor is always to select the portfolio that will provide the highest level of investor utility among portfolio choices located along the efficient frontier. In other words, just because a portfolio is mean-variance efficient does not necessarily imply that it is the optimal portfolio choice for a particular client or investor. The prime focus of this study is how financial advisors choose the most appropriate option from an infinite number of theoretically efficient portfolio options, based on a client's objectives and behavioral IRP factors.

MVO initially requires three sets of inputs: returns, risks (standard deviations), and pair-wise correlations for all assets in the opportunity set. To estimate the portfolio expected return and the standard deviation of the portfolio options, historical returns from a benchmark index are typically employed as a proxy. This information is then used to estimate the expected return of all possible portfolio combinations, applying the formula

$$E(R_p) = \sum_{i=1}^{n} E(R_i) * w_i \tag{1}$$

where $E(R_p)$ is the expected return (percent) for portfolio p, $E(R_i)$ is the expected return (percent) for asset class i, and w_i is the proportional weight of portfolio p invested in asset class i.

Next, an estimation of the expected portfolio variance (σ^2) and the standard deviation (σ) of a three-asset (equity, fixed income, and cash) portfolio is made by applying the formula

$$\begin{aligned} \sigma_p^2 &= w_S^2\sigma_S^2 + w_B^2\sigma_B^2 + w_C^2\sigma_C^2 + 2w_S\sigma_S w_B\sigma_B * \rho_{SB} \\ &\quad + 2w_S\sigma_S w_C\sigma_C * \rho_{SC} + 2w_B\sigma_B w_C\sigma_C * \rho_{BC} \\ \sigma_p &= \sqrt{\sigma_p^2} \end{aligned} \tag{2}$$

where w_S is the weight of stocks in the portfolio, w_B is the weight of bonds in the portfolio, w_C is the weight of cash in the portfolio, σ_S is the standard deviation of stocks, σ_B is the standard deviation of bonds, σ_C is the standard deviation of cash, ρ_{SB} is the correlation coefficient between returns on stocks S and bonds B, ρ_{SC} is the correlation coefficient between returns on stocks S and cash C, and ρ_{BC} is the correlation coefficient between returns on bonds B and cash C.

At this point, an efficient frontier can be constructed by plotting the highest expected return (percent) for each incremental unit of risk (σ). By substantially constraining the broad investment universe to only three assets and requiring respondents to only apply a round percentage allocation to each (no decimals), the portfolio set is limited to 5,151 portfolio combination choices. Any portfolio plotted above the efficient frontier is theoretically impossible to obtain whereas any portfolio plotted below the efficient frontier is considered to be theoretically inefficient.

SAMPLE AND METHODOLOGY

The primary goal of this study is to expand the body of knowledge related to how IRP factors are used (and can be used) by financial advisors to make investment portfolio allocation recommendations. By observing portfolio allocation recommendations made by professional financial advisors across multiple hypothetical scenarios, this research aims to determine whether the dispersion of portfolio allocation recommendations exhibits consistency in how various risk profiling data are amalgamated. Specifically, the study is guided by the following objectives:

- Describe the dispersion of portfolio allocation recommendations provided by the financial advisor respondents across five hypothetical client scenarios.
- Evaluate whether financial advisors use age-based heuristics when making portfolio allocation recommendations.

This study uses a proprietary dataset collected by employing an online survey instrument to solicit financial advisors via email during a 2-month window in late spring 2017. The survey was distributed globally to the email listservs of two large financial planning software firms. The size and identifying information of these listservs were not shared with the research team to ensure corporate privacy and independence and to help retain the anonymity of the respondents. Instead, the link to the survey was provided to the firms, which then distributed the survey link to their proprietary customer listservs. Respondents were also asked to share the survey with additional advisors, applying a snowball sampling technique.

Most respondents are located in North America, with 53.5 percent in Canada and 9.1 percent in the US. While the sample is not designed to be internationally generalizable—and likely represents the dispersion of global clientele for the firms that distributed the survey rather than the concentration of financial advisors as a whole—the sample respondents do closely resemble the characteristics of a "typical financial advisor." The sample is primarily male (73 percent), with an average age of 50, and most of them have been providing financial advice for more than 10 years (69.23 percent). Exhibit 3 illustrates the demographic and professional characteristics of the respondents.

In addition to general demographic variables such as gender, age, location, and education, the survey asks financial advisors multiple questions related to their business models. Because of the wide range of global regulatory frameworks and compensation structures represented, it is necessary to account for these differences. The largest represented business models are Registered Investment Adviser (RIA) firms and financial planning firms, together totaling 66.2 percent. Compensation models are more dispersed, with the largest proportion (43.8 percent) paying via a blend of fees and commissions. Over 90 percent of respondents hold one or more financial services designations.

The survey then presents the respondents with five different hypothetical client scenarios, as shown in Exhibit 4. Each scenario asks respondents to make a portfolio allocation recommendation based on the information provided. All respondents are shown the same five scenarios in the same order and are not allowed to advance to the next scenario or to return to a previous scenario once that scenario is completed. The scenario narrative and the IRP factors are displayed together on the same page. The scores presented for the IRP factors are designed to represent information that would normally be collected during the data-gathering stage of a client engagement by using questionnaires and personal interviews. Most of the factors are presented as a Likert-type 10-point scale to indicate relative factor strength, except for the time horizon, which is expressed in years. All scenarios are designed with long time horizons, with the external environment held constant across all five scenarios. The survey explicitly states that average annual equity returns are 8 percent, average fixed income yield is 2 percent, average cash yield is 0 percent, inflation is expected to be less than 2 percent per year, and tax

Exhibit 3

Survey Respondent Demographics (N = 204)

	Mean (SD)	Frequency (%)
Gender		
Male		149 (73.0)
Female		55 (27.0)
Age	49.92 (11.00)	
Education		
High School		10 (5.2)
Some College		34 (16.7)
Associate's Degree		11 (5.8)
Bachelor's Degree		63 (30.9)
Graduate Degree		73 (38.2)
Compensation Model		
Commission Only		20 (10.7)
Fee Only		28 (15.0)
Fee Based		29 (15.5)
Hourly		5 (2.7)
Fees and Commissions		53 (28.3)
Salary		41 (21.9)
Other		11 (5.9)
Location		
Canada		100 (53.5)
US		17 (9.1)
UK		12 (6.4)
Israel		12 (6.4)
Other		46 (24.6)
Type of Firm		
Bank/Trust Company		21 (10.3)
Registered Investment Adviser		55 (27.0)
Insurance Company		17 (8.3)
Wire House/Brokerage		1 (0.5)
Institutional		3 (1.5)
Mutual Fund Company		8 (3.9)
Financial Planning Firm		80 (39.2)
Other		35 (17.2)
Years Providing Financial Advice		
<1 year		4 (2.2)
1–3 years		6 (3.3)
4–7 years		22 (12.1)
8–10 years		24 (13.2)
11+ years		126 (69.2)
Professional Designations		
CFP®		138 (67.6)
CFA		4 (2.0)
ChFC®		12 (5.9)
CLU®		24 (11.8)
Other		26 (12.7)

rates are and will remain stable over time. Given this information, respondents are asked to recommend an asset allocation among equity, fixed income, and cash. Respondents could only indicate whole percentages, and the total needed to sum to 100 percent.

Note that the IRP factor scores (as seen in Exhibit 4) for Scenarios 1 and 3 are identical. Similarly, the scenario narratives for Scenarios 3 and 5 are identical. These strategic matchings are designed and intended to subtly observe whether financial advisors make portfolio allocation recommendations based only on the narrative (specifically, the client's age) or, as hoped, on a full consideration of the IRP factor scores. As a reminder, the respondents could not go back within the survey after completing each scenario recommendation. This restriction was enforced to ensure that each scenario is evaluated independently. For this reason, statistical comparisons between Scenarios 1 and 3 and Scenarios 3 and 5 are of particular interest to this research.

The survey instrument explicitly provides the expected returns for the three asset classes available for the recommended portfolio allocation: equity, fixed income, and cash. Equities are expected to return 8 percent; fixed income, 2 percent; and cash, 0 percent. These expected returns, while seemingly arbitrary, are chosen within the context of the current economic environment of the timing of the survey (i.e., spring 2017). To estimate the expected portfolio standard deviation, historical annual return data for the S&P 500 Index are acquired from the New York University Stern School of Business public online database, with annual return data dating back to 1928.[3] This value (19.51 percent) is used to proxy the expected standard deviation for equity. Two major assumptions are made: (1) The S&P 500 Index is a good proxy for equity returns; and (2) the historical standard deviation of returns is an appropriate proxy for the expected standard deviation of returns. The same method and assumptions are used for the standard deviation of fixed income returns (7.68 percent), which is proxied by the US 10-year Treasury note, and for cash (3.39 percent), which is proxied by the US 90-day Treasury bill. Annualized historical return data for the US 10-year Treasury note and the US 90-day Treasury bill are obtained from the Federal Reserve Bank of St. Louis

[3] http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histretSP.html.

EXHIBIT 4
Portfolio Development Scenarios

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	Your client is a married couple. Partner 1 is 45 years old. Partner 2 is 57 years old. They are both employed professionally and have a high combined family income. They own their own home and have a net worth in excess of $1 million. They would like to build a retirement portfolio consisting of taxable and tax-advantaged investments.	Your client is a 35-year-old single male. He is employed as a high school teacher. He owns a home and has a modest net worth. The client regularly saves between $5,000 and $7,000 per year into a tax-deferred account for retirement.	Your client is a married couple. Partner 1 is 68 years old. Partner 2 is 66 years old. They are both retired. They own their own home and have a net worth of about $1.5 million.	Your client is a 75-year-old single female. She is a retired widow with a net worth of approximately $800,000. Her retirement portfolio is her only asset. She has been taking retirement distributions for 13 years. She would like to leave a bequest to her only daughter.	Your client is a married couple. Partner 1 is 68 years old. Partner 2 is 66 years old. They are both retired. They own their own home and have a net worth of about $1.5 million.
Factor	**Score for Scenario 1**	**Score for Scenario 2**	**Score for Scenario 3**	**Score for Scenario 4**	**Score for Scenario 5**
Client's perception of the riskiness of the stock market: *1 = Very Risky; 10 = Not at All Risky*	9	5	9	4	7
Client's financial knowledge: *1 = Not at All Knowledgeable; 10 = Very Knowledgeable*	4	8	4	2	6
Client's investment experience: *1 = Very Little; 10 = Extensive*	3	4	3	4	8
Client's level of risk needed to achieve financial goal: *1 = Very Low; 10 = Very High*	3	7	3	3	3
Time horizon for achieving financial goal	20 years	30 years	20 years	15 years	15 years

(continued)

EXHIBIT 4 *(continued)*
Portfolio Development Scenarios

Factor	Score for Scenario 1	Score for Scenario 2	Score for Scenario 3	Score for Scenario 4	Score for Scenario 5
Client's Need for Liquidity: *1 = Very Low; 10 = Very High*	8	2	8	8	3
Client's Capacity to deal with a financial loss: *1 = Very Low; 10 = Very High*	9	5	9	1	4
Client's willingness to take financial risk: *1 = Not at All Willing; 10 = Very Willing*	6	6	6	3	9
Client's history of holding positions when faced with a loss: *1 = Sell Immediately; 10 = Buy More*	2	3	2	5	8
Client's preference for holding risky assets: *1 = Maximize Safety; 10 = Maximize Return*	2	4	2	5	9

Note: External environmental factors (expected returns, taxes, and inflation) are held constant across scenarios.

database,[4] Federal Reserve Economic Data (FRED). The use of these specific indexes for proxy returns is chosen based on professional standards and the need for reliable and replicable long-term time series data. The annualized historical return (geometric mean) and standard deviation data are summarized in Exhibit 5, with pair-wise correlation coefficients between asset classes presented in Exhibit 6.

The information in Exhibits 5 and 6 is then used to estimate an expected return and standard deviation for all possible portfolio combinations, as expressed in Equations (1) and (2), and to construct a mean-variance

EXHIBIT 5
Annualized Asset Class Returns and Standard Deviations, 1928–2017

Asset Class	Expected Return (%)	Historical Return (%)	Historical SD (%)
Equity: S&P 500 Index	8.00	9.65	19.51
Fixed Income: 10-Year UST Note	2.00	4.88	7.68
Cash: 90-Day UST Bill	0.00	3.39	3.04

[4] https://fred.stlouisfed.org/.

EXHIBIT 6

Pair-Wise Correlations between Asset Class Returns, 1928–2017

	Equity	Fixed Income	Cash
Equity	1.00		
Fixed Income	–0.03	1.00	
Cash	–0.03	0.30	1.00

efficient frontier. Each recommended portfolio allocation made by the sample of financial advisors could then be observed and evaluated against each other for consistency and relative portfolio efficiency along the efficient frontier.

A preliminary study by Grable, Hubble, and Kruger (2018) addresses Scenarios 1 and 3, using the same dataset, and observes that average recommended equity allocations appear to follow a 100-minus-age heuristic rule. However, their study does not empirically test this phenomenon across all five scenarios. To empirically test whether the 100-minus-age rule is significantly exhibited across all five scenarios, a two-tailed hypothesis test of the mean is performed. For each of the five scenario samples, the hypothesis is that the true mean of the recommended equity allocations is equal to 100 minus the reported age of the hypothetical client. When two ages are presented for a married couple, the couple's average age is used in the test. By testing whether the mean equity allocation differs significantly from the heuristic expectation, it could be inferred whether financial advisors, on average, are unconsciously relying on heuristic age-based demographic information rather than the IRP data presented.

RESULTS

The first research objective of this study is to describe the dispersion of portfolio allocation recommendations provided by the financial advisor respondents for the five hypothetical client scenarios. Exhibit 7 summarizes the equity [EQUITY], fixed income [FI], and cash [CASH] allocation recommendations made for each of the five scenarios posed to the financial advisor respondents. The variable inputs needed to construct an efficient frontier for each scenario (based on expected return and expected standard deviation) are calculated based on the mean equity, fixed income, and cash allocations recommended by the financial advisor

EXHIBIT 7

Descriptive Summary of Financial Advisor Recommended Portfolio Allocations, by Scenario

Variable	N	Mean	SD	Min	Max
Scenario 1					
S1_EQUITY (%)	107	48.87	17.55	10	100
S1_FI (%)	107	40.88	15.47	0	75
S1_CASH (%)	107	10.24	9.34	0	50
S1_ER (%)	107	4.73	1.15	1.60	8.00
S1_SD (%)	107	10.31	2.76	4.26	19.51
Scenario 2					
S2_EQUITY (%)	91	68.30	14.20	30	100
S2_FI (%)	91	26.65	14.23	0	70
S2_CASH (%)	91	5.06	6.63	0	40
S2_ER (%)	91	6.00	0.89	3.80	8.00
S2_SD (%)	91	13.56	2.54	7.90	19.51
Scenario 3					
S3_EQUITY (%)	89	36.98	15.95	0	85
S3_FI (%)	89	50.28	16.84	0	100
S3_CASH (%)	89	12.74	10.00	0	50
S3_ER (%)	89	3.96	1.02	1.80	6.90
S3_SD (%)	89	8.61	2.13	5.29	16.59
Scenario 4					
S4_EQUITY (%)	83	27.50	15.13	0	60
S4_FI (%)	83	58.35	17.25	0	100
S4_CASH (%)	83	14.14	11.97	0	60
S4_ER (%)	83	3.37	0.99	1.70	5.50
S4_SD (%)	83	7.55	1.74	4.17	11.99
Scenario 5					
S5_EQUITY (%)	83	53.77	15.07	15	85
S5_FI (%)	83	38.10	15.20	0	80
S5_CASH (%)	83	8.13	8.72	0	60
S5_ER (%)	83	5.06	0.97	2.80	7.10
S5_SD (%)	83	11.08	2.39	6.69	16.61

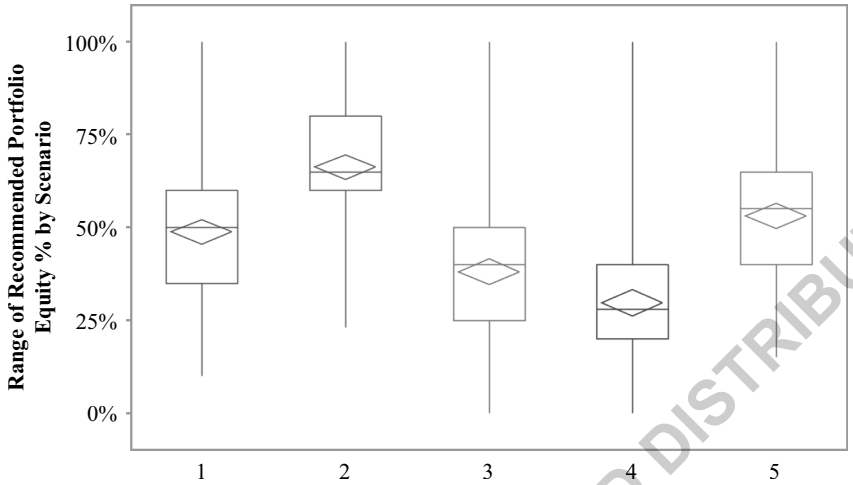
Note: The sum of the mean allocations does not always total 100%.

respondents. The expected returns [ER] for equity are given as 8 percent, with 2 percent for fixed income and 0 percent for cash; these are held constant across the scenarios. The expected portfolio standard deviation [SD] is calculated by using the historical index return data of the S&P 500 for equity, the 10-year US Treasury note data for fixed income, and the 90-day US Treasury bill data for cash (see Exhibit 5 and the pair-wise correlations in Exhibit 6).

As evidenced in the descriptive summary in Exhibit 7 and the corresponding box plots in Exhibits 8 through 10, the range of responses observed in recommended percentage allocations to equity (as shown in Exhibit 8),

EXHIBIT 8

Percentage Distribution of Recommended Equity Allocation, by Scenario



fixed income (as shown in Exhibit 9), and cash (as shown in Exhibit 10) are all unexpectedly wide, in some cases ranging all the way from 0 to 100 percent in the case of fixed income for Scenarios 3 and 4. The standard deviations of asset class allocation percentages are extremely high, particularly for equity and fixed income, with the lowest standard deviation at 14.2 percent for Scenario 2 equity and the highest standard deviation at 17.55 percent for Scenario 1 equity.

Cash allocations have less variance in comparison to equity and fixed income allocations, but the relatively high mean portfolio cash allocations observed across all scenarios are unexpected given that cash is stated explicitly, that expected return is 0 percent, and that each scenario specifies a long investment time horizon. One justification for a high cash allocation could be the relatively high risk factor score of 8 for the client's need for liquidity in Scenarios 1, 3, and 4 (as shown in Exhibit 4), where, on average, respondents report higher average cash allocations compared to those in Scenarios 2 and 5.

Especially curious are the differences observed in the average recommended portfolio allocations between Scenarios 1 and 3. It is worth noting again that the IRP factor scores for Scenarios 1 and 3 are identical; the only difference is the short demographic client description that specifies the client's age and employment status. Since all other relevant IRP information is the same, a reasonable expectation is that financial advisors would, on average, recommend similar portfolios for Scenarios 1 and 3. However, apparently the financial advisors placed heavier mental weighting toward age—rather than time horizon, and employment status—rather than risk capacity—by recommending, on average, higher equity allocations to the younger employed couple (relative to Scenario 3). It is also apparent after examining Exhibits 7 through 10, that consistent portfolio allocation recommendations are not observed across financial advisors.

For each of the five scenarios (shown in Exhibits 11 through 15), the individual financial advisor's recommended portfolio (sum of equity, fixed income, and cash allocation percentages) is plotted for comparison against the recommended portfolios of the other financial advisor respondents along the mean-variance efficient frontier. Since all expected return assumptions were held constant across all five scenarios, the single efficient frontier (illustrated in Exhibits 11 through 15 as a light gray line) is superimposed for reference.

The efficient frontier graphs in Exhibits 11 through 15 represent one of the corresponding five hypothetical client scenarios posed to the financial advisor respondents, and serve to illustrate the distribution of recommended risk-adjusted returns of the recommended portfolios for each scenario. Portfolios which lie on the efficient frontier (gray line) are theoretically mean-variance efficient, where portfolios which fall below the gray line are theoretically mean-variance inefficient, meaning another portfolio combination exists which offers the same level of expected return, but with lower standard deviation. Again, it's important to note—that

EXHIBIT 9

Percentage Distribution of Recommended Fixed Income, by Scenario

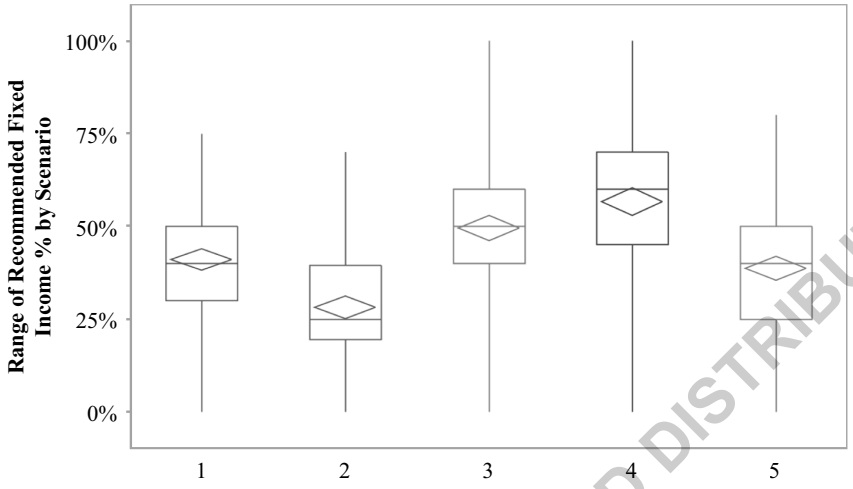
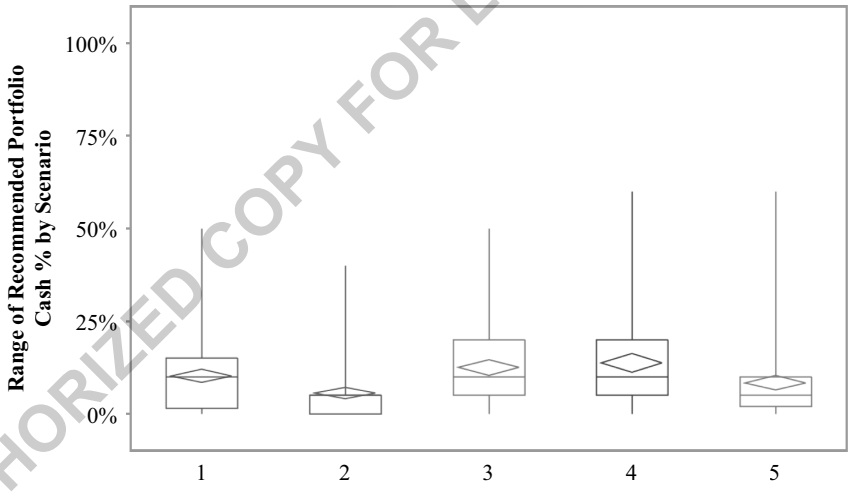


EXHIBIT 10

Percentage Distribution of Recommended Cash Allocation, by Scenario

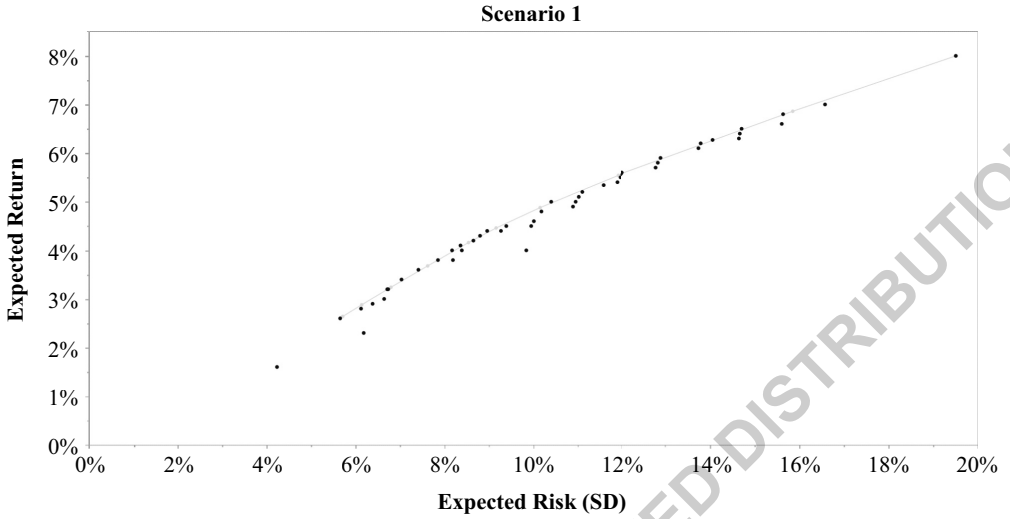


while all optimal portfolios are mean-variance efficient, not all mean-variance efficient portfolios are optimal for an individual client.

The wide dispersion in portfolio risk-adjusted returns observed in Exhibits 11 through 15 is puzzling considering that each professional financial advisor received exactly the same risk profile information as a basis for making their portfolio recommendations. This enigma is illustrated most strongly in Scenario 2, as shown in Exhibit 12. Almost all of the financial advisor respondents riskier portfolios located higher along the efficient frontier. This result is likely due to the relatively young age (age 35) of the client described in Scenario 2, which apparently prompted some financial advisors to recommend portfolios with substantially more risk than the client's IRP would otherwise dictate.

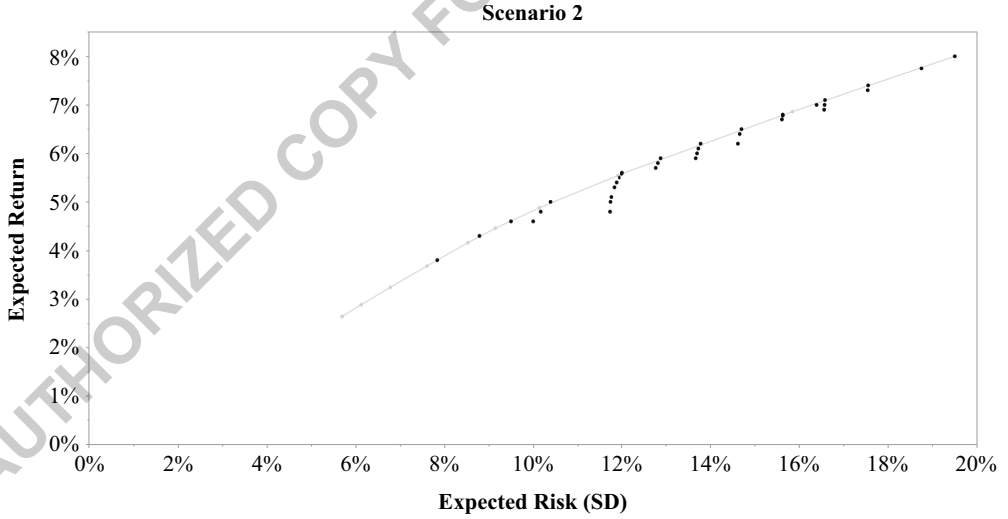
The second research objective of this study is to evaluate whether financial advisors use age-based heuristics when making portfolio allocation recommendations. Specifically, this study tests whether financial advisors use the often-cited 100-minus-age heuristic rule. This rule states that an appropriate percentage allocation to

Exhibit 11
Scenario 1 Mean-Variance Efficient Frontier



*Note: * Mean recommended portfolio expected return and standard deviation summarized in Exhibit 7.*

Exhibit 12
Scenario 2 Mean-Variance Efficient Frontier

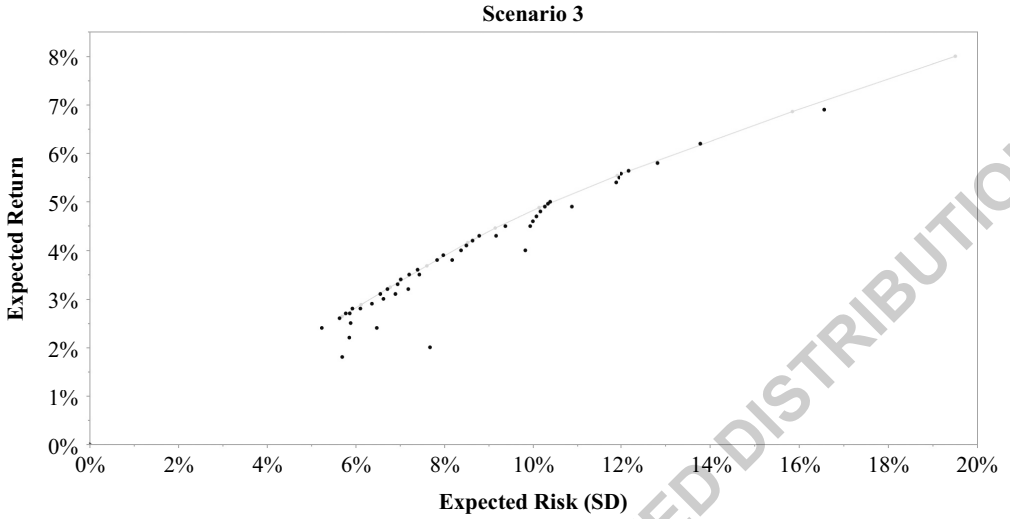


*Note: * Mean recommended portfolio expected return and standard deviation summarized in Exhibit 7.*

risky assets, such as equities, should equal 100 minus the investor's current age. The rule assumes that an investor should start with a 100 percent equity allocation at birth and reduce equity exposure by 1 percent each year until reaching 100. To test the hypothesis that the average recommended equity allocation equals 100 minus the age of the scenario client, a two-tailed hypothesis test of the means is performed. The results of these hypothesis tests are presented in Exhibit 16.

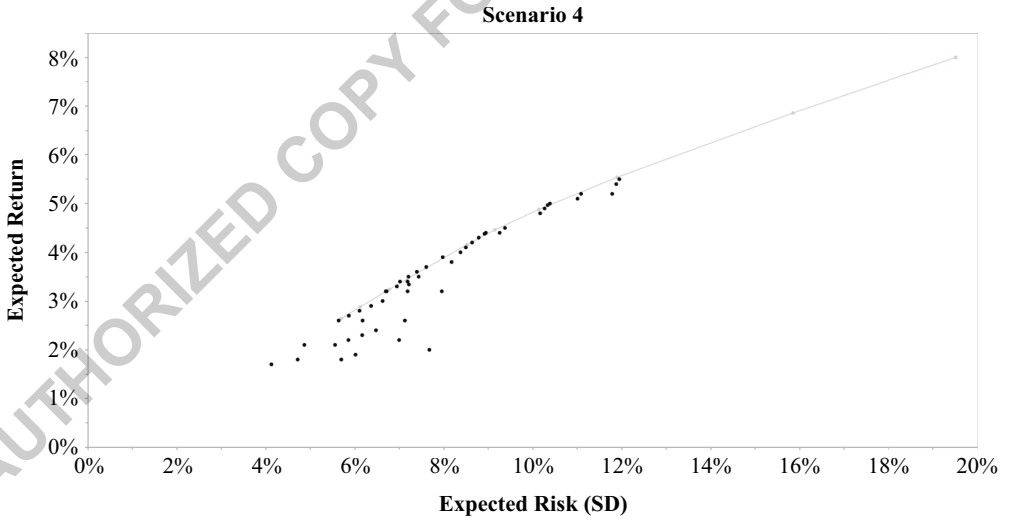
The results in Exhibit 16 show that the average recommended equity allocation differs significantly from 100 minus the client's age only in Scenario 5, at the

EXHIBIT 13
Scenario 3 Mean-Variance Efficient Frontier



*Note: * Mean recommended portfolio expected return and standard deviation summarized in Exhibit 7.*

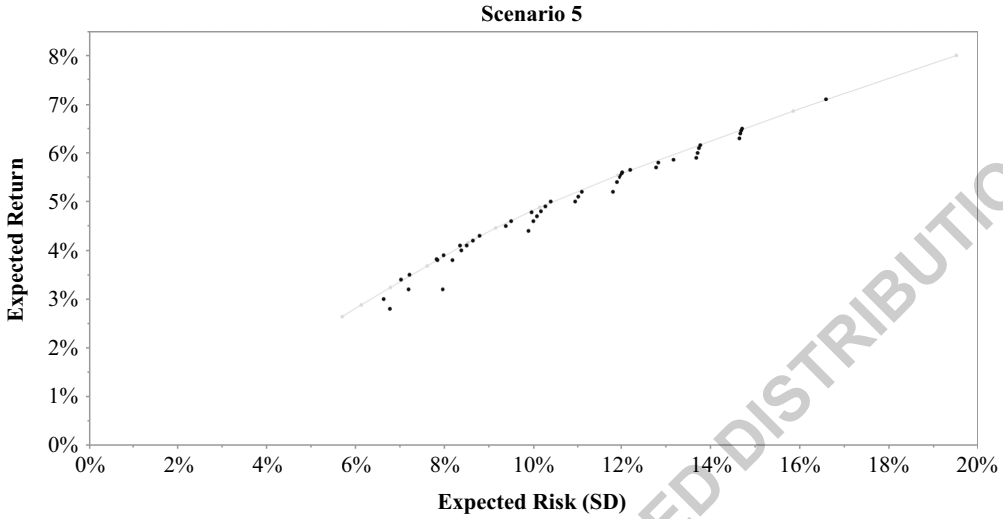
EXHIBIT 14
Scenario 4 Mean-Variance Efficient Frontier



*Note: * Mean recommended portfolio expected return and standard deviation summarized in Exhibit 7.*

0.01 level of significance. Scenarios 1 and 4 do not differ significantly from the hypothesized value of 100 minus age, and Scenarios 2 and 3 are statistically different at the 0.05 level of significance, albeit still numerically close (within 4 years). The quantitative magnitude of the difference, or effect size, as measured by *Cohen's d*, is presented in the last column of Exhibit 16. The interpretation of the small effect sizes for Scenarios 1, 2, 3, and 4 (compared to Scenario 5) is equivalent to a z-score, or the number of standard deviations between the estimate and the heuristic age value. As illustrated by the large effect size, Scenario 5 appears to be the only

EXHIBIT 15
Scenario 5 Mean-Variance Efficient Frontier



*Note: * Mean recommended portfolio expected return and standard deviation summarized in Exhibit 7.*

EXHIBIT 16
Results of 100-Minus-Age Two-Tailed Hypothesis Test of the Mean

Scenario	Client Age	100−Age	Est.	Diff. (Years)	t	Cohen's d
1	51	49	48.87	0.13	–0.07	0.01
2	35	65	68.30	–3.30	2.22*	–0.23
3	67	33	36.98	–3.98	2.35*	–0.25
4	75	25	27.50	–2.50	1.51	–0.17
5	67	33	53.77	–20.77	12.54***	–1.38

*Note: *$p < 0.05$; ***$p < 0.001$.*

scenario where the heuristic age value does not appear to influence the financial advisors' equity allocation recommendations. This result is noteworthy considering that the descriptive narratives in Exhibit 7 for Scenarios 3 and 5 are identical, yet the recommended equity recommendations are largely different: 36.98 percent versus 53.77 percent, respectively.

DISCUSSION OF RESEARCH FINDINGS

This study can be categorized into two unique outcomes. The first outcome is the wide dispersion of portfolio allocation recommendations observed across the hypothetical client scenarios presented. For example, the 49 percent mean recommended equity allocation seen in Scenario 1 has a corresponding standard deviation of 17.55 percent around the mean, with a range of 10 to 100 percent (as noted in Exhibit 7). This observed range of 90 percent is not exclusive to Scenario 1, nor even to equity allocations. In fact, the sample of financial advisors tested in this study recommends portfolio allocations for fixed income that range from 0 to 100 percent in both Scenarios 3 and 4. Cash allocations are also unexpectedly high, reaching a maximum of 60 percent in both Scenarios 4 and 5. This outcome is especially surprising given the long time horizon and expected cash return assumption of 0 percent, held constant across all scenarios.

The inconsistency of recommendations across financial advisors is puzzling given that each financial

advisor received the same information with which to make a portfolio allocation recommendation for each scenario. It is therefore reasonable to conclude that the amalgamation of professional judgments exhibited among international financial advisors is not consistent. A client would be understandably confused by receiving vastly different recommendations from two financial advisors, both claiming to act in that client's best interest. The difference in annual expected returns (between 2 and 8 percent), especially when compounded over a long time horizon, also is potentially a great cause for concern and problematic for regulators, who may soon be tasked with evaluating whether a financial advisor is truly acting in the best or "most optimal" interest of clients.

The second outcome of this study illuminates the surprising level at which financial advisors, on average, appear to rely on the basic demographic descriptions of the client, rather than the relevant IRP factors provided in each scenario, when making portfolio recommendations. On average (at least for Scenarios 1, 2, 3, and 4), financial advisors seemingly rely on age-based heuristic intuition rather than a more deliberate evaluation of the relevant IRP information. This phenomenon is especially pronounced when considering that the only distinctions between Scenarios 1 and 3 are the stated differences in age and employment status for the relative scenario clients.

It should be noted that no age-based heuristic is observed in Scenario 5. Possibly, as the financial advisors progress through the survey, they become more deliberate and pay closer attention to the IRP scores presented when compared to their approach in Scenario 1, or possibly only the more committed financial advisors complete the survey in full (survivorship bias). Since financial advisors could not return to a previous survey section and change their previous responses, it is also possible that they learn with experience to evaluate each IRP score more deliberately when making portfolio allocation recommendations.

An important clarifying point is that the sample respondents' observed reliance on a client's age is not inherently wrong. On the contrary, in most cases, age serves as a close proxy for time horizon, which is arguably the most important factor in determining a client's ability to assume portfolio risk. However, the discounting of other relevant but conflicting IRP component factors can lead to suboptimal portfolio recommendations—to the long-term detriment of client investment goals.

LIMITATIONS OF CURRENT STUDY

The dataset used in this study (from the sample of financial advisor respondents) has some limitations that may influence interpretations of the data. First, the survey was developed originally for another study, is not explicitly designed for the purpose or objectives of the current study, and therefore does not include any "extreme" IRP scores or variations in time horizons. How financial advisors combine conflicting information between two partners and/or gender differences is also not well observed within the data. The objectives of this study therefore are constructed around the already presented scenarios, relevant IRP factors included, and sample respondent demographics profiled within the data.

While the study is still exploratory, only 83 respondents complete all five scenarios in full, so a larger and more globally representative sample size would be preferable. Although the nature of the data analysis does not explicitly require the respondents to fully complete all the scenarios, the completion rate of 41 percent is potentially problematic. The presumption is that the length and complexity of the survey instrument, coupled with a lack of incentive offered for completion, lead to the lower-than-optimal completion rate.

In addition, the sample is not globally generalizable, and the countries are not representative of the concentration of global financial advisors. The handful of countries represented within the sample is not intentionally selected by the researcher for this study, but it can be assumed that the responses are indicative of the global clientele of the firms that distributed the survey. While attempts are made to hold external environmental factors constant, the behavioral and geographic bias inherent in both the financial advisor respondents and the hypothetical scenario clients could not be directly observed. This limitation can potentially pose a threat to the generalizability of the sample and the findings.

CONCLUSION

The results of this study indicate that the mental amalgamation of IRP factors is not consistent across financial advisors, even when constrained to only a broad asset class selection of equity, fixed income, and cash. Second, the study finds that, on average, financial advisors rely on stereotypical age-based heuristics when recommending portfolio equity exposure.

While in some ways the results of this study are disappointing in terms of the relative inconsistency exhibited by financial advisors when making portfolio recommendations, the results are unsurprising given the similar results of past research (e.g., Brunel 2006; Canner, Mankiw, and Weil 1997; Michaud 1989).

Inconsistent global educational standards and regulatory expectations for risk profiling may also play a role in the problematic nature of professional-judgment-driven portfolio optimization. A study of economists by Gordon and Dahl (2013) finds that, in general, expert economists have a much higher deviation in consensus opinion on topics that are not well represented within academic literature, suggesting that if a topic is not taught formally, wide deviations of opinion and practice occur. In Canada, the US, and Europe, financial regulatory bodies do not provide prescriptive guidance about how these risk factors are to be measured, and they do not impose consistent educational requirements about who can register as a financial advisor. This lack of policy guidance calls into question the legitimacy of "professional judgment" when applied to such a broad definition of competence.

Informed by the results and practical implications of the current study, a more thorough framework for evaluating an investor's risk profile for asset allocation should be developed for use by financial advisors. All-in-one risk scores and comprehensive MVO models (e.g., Barsky et al. 1997, Carr 2014, Grable and Lytton 1999, Hanna and Lindamood 2004) historically fail to provide a consistent means that financial advisors can use to select an optimal portfolio. The results of this study therefore serve to confirm the need for regulatory guidance on how an IRP should be measured and interpreted within fiduciary contexts.

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ADDITIONAL READING

Risk Tolerance, Projection Bias, Vividness, and Equity Prices

John Grable, Ruth H. Lytton, Barbara O'Neill, So-Hyun Joo, and Derek Klock

The Journal of Investing
https://joi.pm-research.com/content/15/2/68

ABSTRACT: *This article examines two hypotheses. First, investor risk tolerance fluctuates in part due to changes in the investment markets, and, second, investors tend to project stock market closing price data into the formation of risk-tolerance attitudes. Regression tests were conducted to determine the role of projection bias and vividness in the formation of risk attitudes among a convenience sample of internet survey respondents (N = 1,355). It was found that individuals who own securities tend to use recent and vivid stock market data when establishing risk attitudes. Further, risk attitudes, on average and in the aggregate, were found to fluctuate based on closing stock prices the previous week. Financial planners are cautioned that risk tolerance should not be used as a static input within asset allocation models.*

How Sub-Optimal—If at All—Is Goal-Based Asset Allocation?

Jean L. P. Brunel

The Journal of Wealth Management
https://jwm.pm-research.com/content/9/2/19

ABSTRACT: *Following the success enjoyed by goal-based allocation over the last several years, the author investigates what the focus away from traditional finance and toward behavioral finance may be costing, if anything, in terms of traditional investment efficiency. The author starts with a review of the modern portfolio theory framework and offers a hypothesis as to how the demonstrated inability of individuals to stick to a single optimal portfolio might be interpreted. He then goes on to review the behavioral solution of a hypothetical case study and compares the outcome with a traditional optimization. His analysis suggests that, once goal based allocation is re-formulated to allow some focus on the total portfolio trade-off between risk and return, the cost in terms of theoretical sub-optimality may be viewed as trivial. He does however concede that this experiment is unlikely to close the debate between the two branches of finance, as the analysis allows each side to claim some form of victory.*

Quantifying Downside Risk in Goal-Based Portfolios

Franklin J. Parker

The Journal of Wealth Management
https://jwm.pm-research.com/content/17/3/68

ABSTRACT: *In this article, an alternate paradigm for quantifying downside risk for the retail investor is proposed. It is the goal of this paradigm to provide concrete tools to the retail financial advisor and investor that can be used to understand portfolio risks within a financial planning context. Rather than utilizing general risk metrics, which can be difficult to communicate and make specific, this article proposes risk metrics which are made specific to an investor's portfolio and understood in the context of the investor's financial plan. The objectives of this proposed paradigm are fourfold: 1) to provide a required rate of return for a portfolio within the context of a financial planning goal; 2) to create an expectation for a range of portfolio returns over time; 3) to calculate a maximum sustainable loss for a portfolio, defined as the amount of portfolio losses which would cause material change to the investor's plan; and to develop a strategy for hedging away those excessive losses identified. Also proposed are tools for achieving these objectives: 1) the Modified Required Rate of Return; 2) the Maximum Sustainable Loss; and 3) a Range of Returns by Portfolio Allocation table.*