GOAL-BASED WEALTH MANAGEMENT, ROBO-ADVISING

ISB | FinTech | 2018

Changes in the Investment Landscape

1. From targeting portfolio value (wealth) to targeting income streams (Dimensional Fund Advisors, Merton).
2. From asset-driven portfolio management to liability-driven investing.
3. No more “policy” portfolios, but goal based investing for individuals, factor-based investing for institutions (smart beta).
4. From Defined Benefit (DB) to Defined Contribution (DC). Individuals need to make their own decisions, despite known research pointing to their inability to do so.
5. Two pieces of the portfolio: (i) liability hedging (including healthcare), and (ii) aspiration seeking.
6. From investment products to investment solutions.

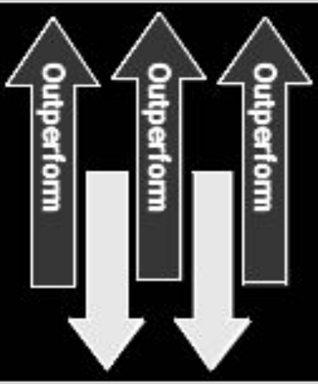
The five Hs:

1. Holdings
2. House
3. Health
4. Human Capital
5. Happiness

Challenges

- Low interest rates: challenging pension liability present values.
- Low equity premium: poor growth and portfolio return.
- Longevity risk.

Risks (Chhabra, JPM 2005)

"Personal" Risk	"Market" Risk	"Aspirational" Risk
		
"Do Not Jeopardize Basic Standard of Living"	*"Maintain Lifestyle"*	*"Enhance Lifestyle"*
• Minimize downside risk • Safety • Accept below-market returns for minimal risk	• Balance risk and return to attain market-level performance from a broadly diversified portfolio	• Maximize upside • Take measured risk to achieve significant return enhancement

Markowitz Mean-Variance Optimization

Minimize: Risk = Portfolio return variance
subject to: a given level of return

or

Maximize: (Mean return) - (Risk Aversion) × (Variance of return)

$$\max_{\mathbf{w}} \mathbf{w}^\top \mu - \frac{\gamma}{2} \mathbf{w}^\top \Sigma \mathbf{w}$$

subject to

$$\mathbf{w}^\top \mathbf{1} = 1, \qquad \mathbf{1} = [1, 1, 1, ..., 1]^\top \in \mathcal{R}^n$$

The solution is:

$$\mathbf{w} = \frac{1}{\gamma} \Sigma^{-1} \left[\mu - \left(\frac{\mathbf{1}^\top \Sigma^{-1} \mu - \gamma}{\mathbf{1}^\top \Sigma^{-1} \mathbf{1}} \right) \mathbf{1} \right] \in \mathcal{R}^n$$

Solution Math

To solve this maximization problem, we set up the Lagrangian with coefficient λ:

$$\text{(A-1)} \qquad \max_{w,\lambda} L = w'\mu - \frac{\gamma}{2} w' \Sigma w + \lambda[1 - w'1].$$

The first-order conditions are

$$\text{(A-2)} \qquad \frac{\partial L}{\partial w} = \mu - \gamma \Sigma w - \lambda 1 = 0,$$

$$\text{(A-3)} \qquad \frac{\partial L}{\partial \lambda} = 1 - w'1 = 0.$$

Note that equation (A-2) is a system of n equations. Rearranging equation (A-2) gives

$$\text{(A-4)} \qquad \Sigma w = \frac{1}{\gamma}[\mu - \lambda 1],$$

and premultiplying both sides of this equation by Σ^{-1} gives

$$\text{(A-5)} \qquad w = \frac{1}{\gamma}\Sigma^{-1}[\mu - \lambda 1].$$

Final solution

The solution here for portfolio weights is not yet complete, as the equation contains λ, which we still need to solve for. Premultiplying equation (A-5) by $\mathbf{1}'$ gives

$$1'w = \frac{1}{\gamma}1'\Sigma^{-1}[\mu - \lambda 1], \tag{A-6}$$

$$1 = \frac{1}{\gamma}[1'\Sigma^{-1}\mu - \lambda 1'\Sigma^{-1}1], \tag{A-7}$$

which can now be solved for λ to get

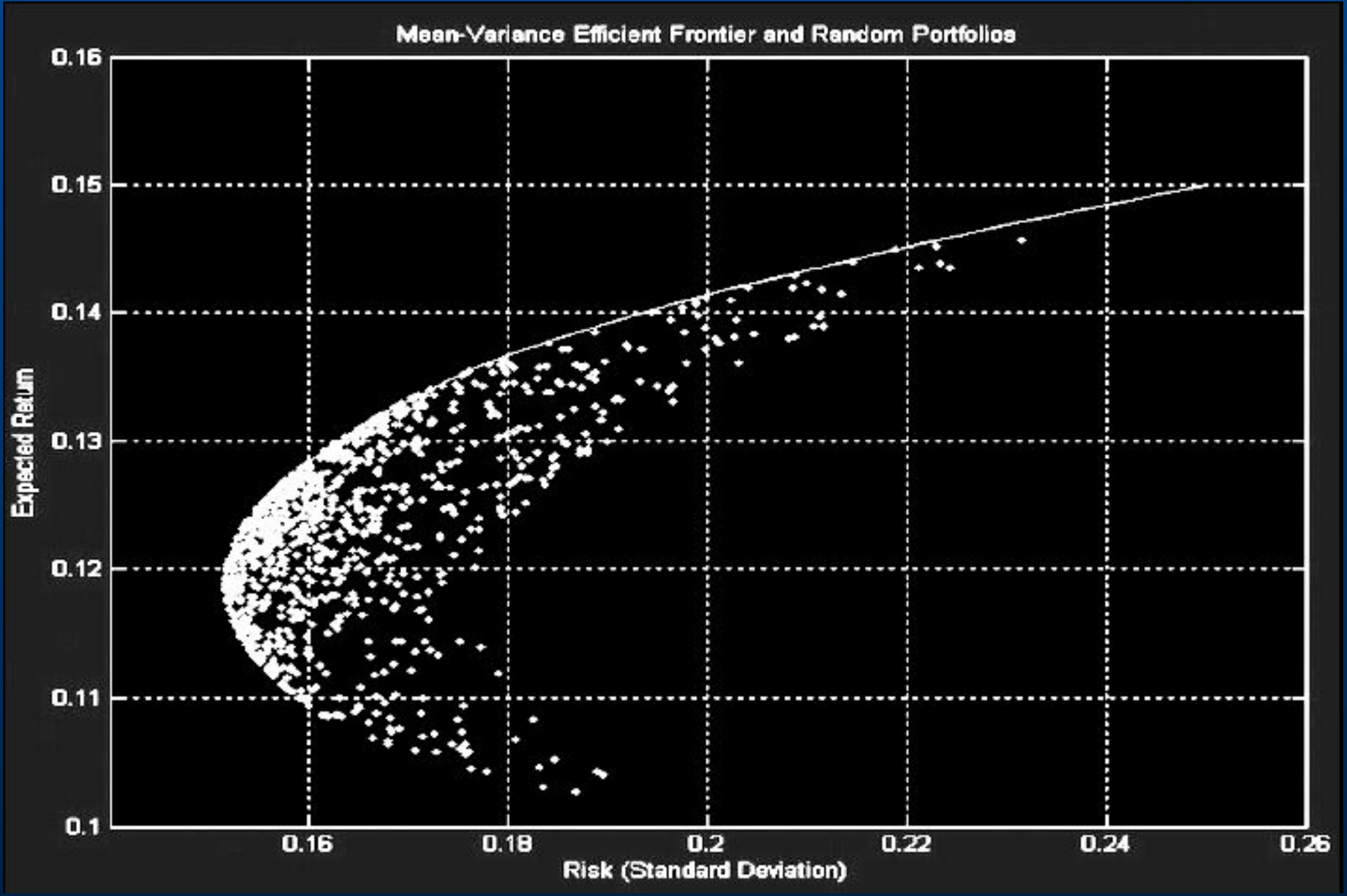
$$\lambda = \frac{1'\Sigma^{-1}\mu - \gamma}{1'\Sigma^{-1}1}. \tag{A-8}$$

Plugging λ back into equation (A-5) gives the closed-form solution for the optimal portfolio weights:

$$\boxed{w = \frac{1}{\gamma}\Sigma^{-1}\left[\mu - \left(\frac{1'\Sigma^{-1}\mu - \gamma}{1'\Sigma^{-1}1}\right)1\right] \in R^n.}$$

This optimal solution w is an n-vector and is easily implemented, given that it is analytical.

Efficient Frontier



Persona-Based Mental Accounts

1. Investors consider their portfolios not as a whole but as a pyramid of sub-portfolios, arranged by goals.
2. Investors want the highest probability of reaching their goals (retirement, education, bequest).
3. Nonlinear structured products may be better at tuning a portfolio that is goal-based.

Behavioral Portfolio Optimization

JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 45, No. 2, Apr. 2010, pp. 311–334

doi:10.1017/S0022109010000141

Portfolio Optimization with Mental Accounts

Sanjiv Das, Harry Markowitz, Jonathan Scheid, and Meir Statman*

Abstract

We integrate appealing features of Markowitz's mean-variance portfolio theory (MVT) and Shefrin and Statman's behavioral portfolio theory (BPT) into a new mental accounting (MA) framework. Features of the MA framework include an MA structure of portfolios, a definition of risk as the probability of failing to reach the threshold level in each mental account, and attitudes toward risk that vary by account. We demonstrate a mathematical equivalence between MVT, MA, and risk management using value at risk (VaR). The aggregate allocation across MA subportfolios is mean-variance efficient with short selling. Short-selling constraints on mental accounts impose very minor reductions in certainty equivalents, only if binding for the aggregate portfolio, offsetting utility losses from errors in specifying risk-aversion coefficients in MVT applications. These generalizations of MVT and BPT via a unified MA framework result in a fruitful connection between investor consumption goals and portfolio production.

Maximize mean wealth at horizon

Subject to:

Probability of shortfall less than H should be less than alpha

Optimizing Portfolios with Mental Accounts

See the paper by Das, Markowitz, Scheid, and Statman (2010) in the *Journal of Financial and Quantitative Analysis.*

$$\max_{\mathbf{w}} \mathbf{w}^\top \mu, \qquad s.t. \quad \text{Prob}[r \leq H] \leq \alpha$$

For normal returns r, the constraint may be stated explicitly as

$$H \leq \mathbf{w}^\top \mu + \Phi^{-1}(\alpha)[\mathbf{w}^\top \mathbf{\Sigma} \mathbf{w}]^{1/2}$$

Iterative Solution to extract risk aversion

$$H = w(\gamma)'\mu + \Phi^{-1}(\alpha)[w(\gamma)'\Sigma w(\gamma)]^{1/2},$$

$$w(\gamma) = \frac{1}{\gamma}\Sigma^{-1}\left[\mu - \left(\frac{\mathbf{1}'\Sigma^{-1}\mu - \gamma}{\mathbf{1}'\Sigma^{-1}\mathbf{1}}\right)\mathbf{1}\right].$$

Example of BPT/MA

Let's use an example of a portfolio of three securities.

Security	Expected Returns	Standard Deviations
Bond	5%	5%
Low-risk stock	10%	20%
High-risk stock	25%	50%

The correlation between the two stocks is 0.20, and all other correlations are zero.

Assume the investor has separate goals and sub-portfolios:

Goal (subportfolio)	Current allocation	Time Horizon	Annualized Return goal	Total Accumulation goal
Bequest	$200,000	25 years	26.35%	$69,248,625
Education	$200,000	3 years	12.18%	$282,343
Retirement Account	$600,000	15 years	10.23%	$2,586,118

Sub-portfolios and overall portfolio

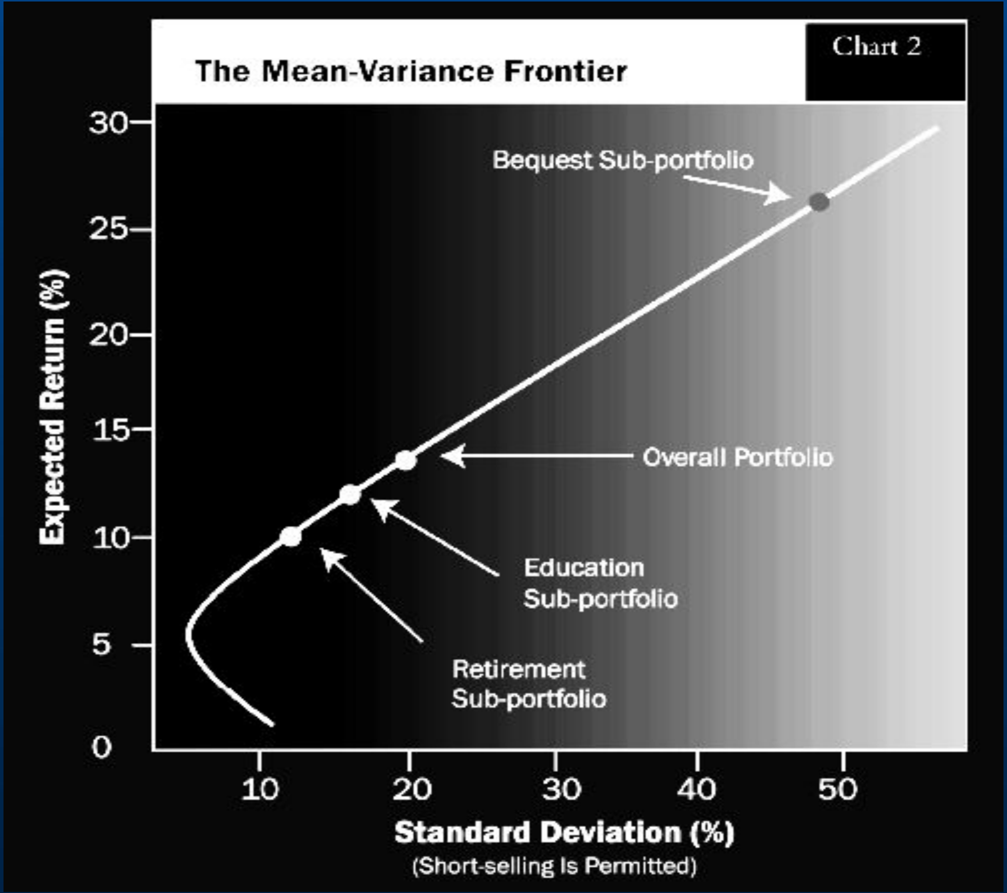
The Three Goal Sub-portfolios and the Overall Portfolio

Assets	Retirement Sub-portfolio	Education Sub-portfolio	Bequest Sub-portfolio	Overall Portfolio
Bond	53.94%	37.87%	(78.90%)	24.16%
Low Risk Stock	26.56%	34.99%	96.20%	42.17%
High Risk Stock	19.50%	27.14%	82.70%	33.67%
Total Weights	100%	100%	100%	100%
Expected Return	10.23%	12.18%	26.35%	13.84%
Std. Deviation	12.30%	16.57%	49.13%	20.32%

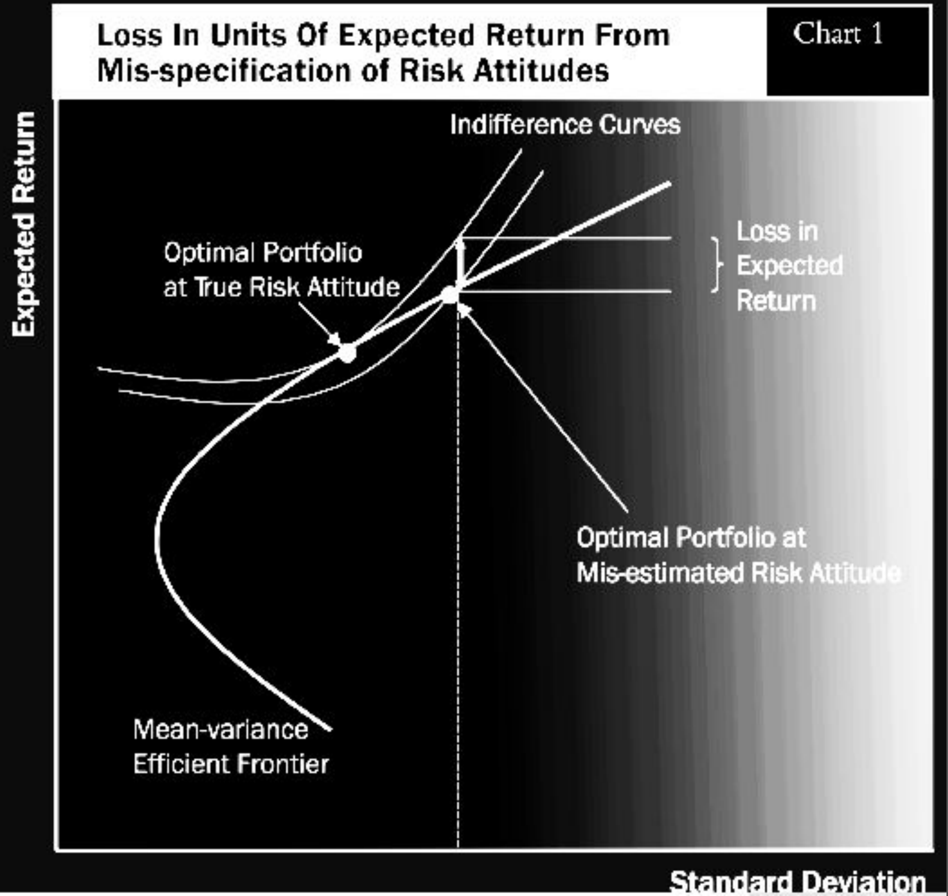
The expected return of the overall portfolio is the weighted average of the expected returns of the sub-portfolios.

The risk of the overall portfolio is *not* the weighted average of the risk of the sub-portfolios.

Mean-Variance Frontier



Loss from mis-estimation of risk attitude



	Mis-specification of risk aversion coefficient		
Risk aversion (γ)	10%	20%	30%
3.7950	2.50	10.94	28.72
2.7063	3.50	15.34	40.27
0.8773	5.29	23.15	44.22

(Numbers in basis points)

Mistakes in ascertaining risk preferences can cost the investor dearly.

Risk as a probability of loss

Sub-portfolio Risk Defined by the Probability of Losses

	Retirement Sub-portfolio	Education Sub-portfolio	Bequest Sub-portfolio
Expected Return	10.23%	12.18%	26.35%
Std. Deviation	12.30%	16.57%	49.13%
Probability-Based Risk Language	No more than a 5% probability of losing more than 10%	No more than a 15% probability of losing more than 5%	No more than a 20% probability of losing more than 15%

Mean-variance problem: Minimize Risk (variance) subject to minimum level of Expected Return.

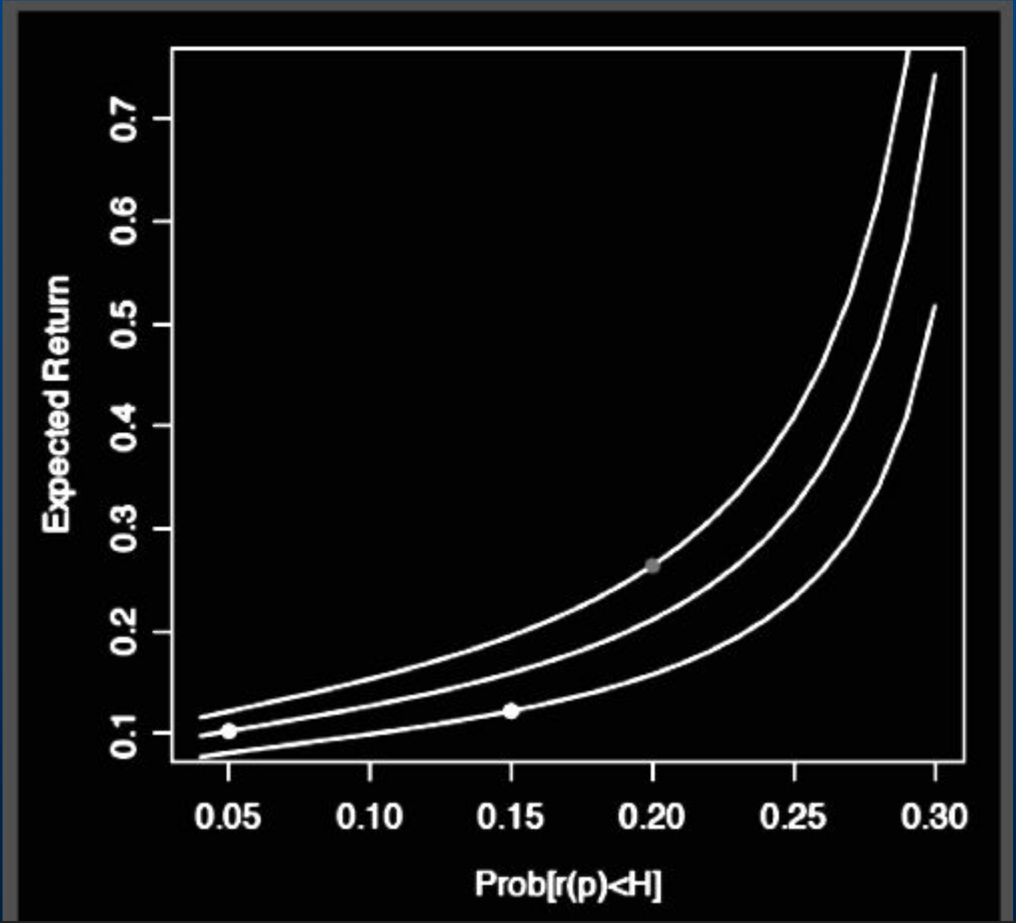
↕

Behavioral portfolio theory: Maximize Return subject to a maximum probability of falling below a threshold.

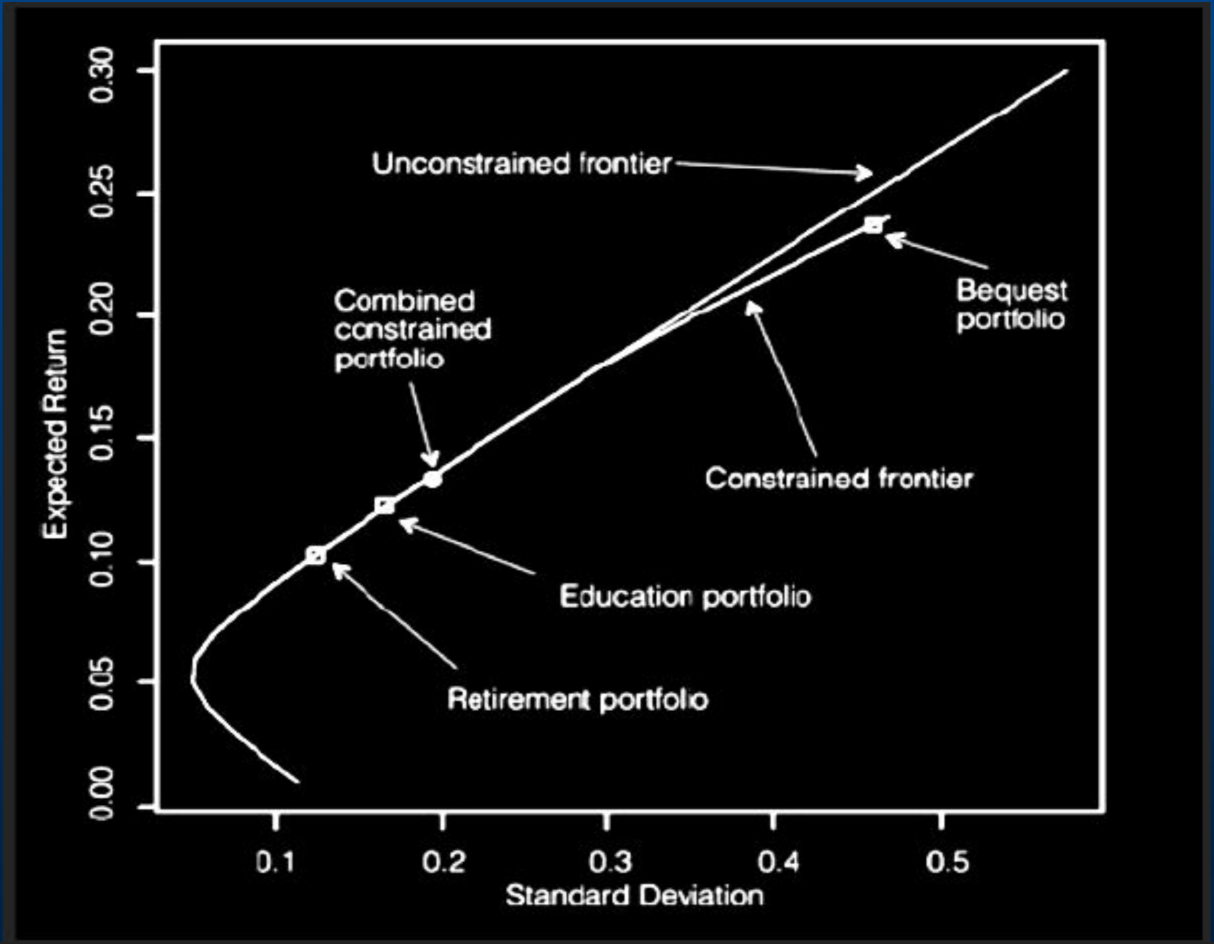
Probability of shortfall

Risk aversion:	$\gamma = 3.7950$	$\gamma = 2.7063$	$\gamma = 0.8773$	60:20:20 mix
	Retirement	Education	Bequest	Aggregate
	Sub-portfolio	Sub-portfolio	Sub-portfolio	Portfolio
Threshold (H)	Prob[$r < H$]	Prob[$r < H$]	Prob[$r < H$]	Prob[$r < H$]
-25.00%	0.00	0.01	0.15	0.03
-20.00%	0.01	0.03	0.17	0.05
-15.00%	0.02	0.05	$\boxed{0.20}$	0.08
-10.00%	$\boxed{0.05}$	0.09	0.23	0.12
-5.00%	0.11	$\boxed{0.15}$	0.26	0.18
0.00%	0.20	0.23	0.30	0.25
5.00%	0.34	0.33	0.33	0.33
10.00%	0.49	0.45	0.37	0.42
15.00%	0.65	0.57	0.41	0.52
20.00%	0.79	0.68	0.45	0.62
25.00%	0.89	0.78	0.49	0.71
Mean return	10.23%	12.18%	26.35%	13.84%
Std. deviation	12.30%	16.57%	49.13%	20.32%

Frontiers in the MA world



MV frontier with short-selling



Python Program Code

Markowitz_MeanVariance_Optimization_BPT.ipynb

Based on Behavioral Finance

- The 2017 Nobel Prize was awarded to Richard Thaler and the ideas in goals-based wealth management emanate from this literature.
- Markowitz Portfolio Theory (1952).
- Prospect Theory (Kahneman and Tversky 1979).
- Behavioral Portfolio Theory (Shefrin and Statman, 2000).
- Disposition Effect (Shefrin and Statman, 1985).
- Mental Accounting Theory (Thaler 1985; 1989).
- MVT and BPT are mapped to each other (Das, Markowitz, Scheid, Statman, 2012).

GBWM - Operationalization

- A clear articulation of investor goals;
- A statement of the probability of achieving the goal that is expected by the investor;
- A loss threshold with a chosen small probability with which the investor is willing to allow a breach of this threshold; and
- A set of preferences for actions to be taken if and when achieving the investor’s goals with the attached probabilities becomes infeasible.

Traditional financial planning is *not* GBWM

GBWM *includes* optimizing risk-return tradeoffs and assessing return relative to a benchmark, but is *much more*.

1. Also assesses performance relative to goals.
2. Allows multiple goals versus a limited single portfolio focus.
3. Treats upside potential and downside risk separately, and does not bundle everything into a single standard deviation number.
4. Emphasizes long-run performance and not just immediate performance against a benchmark.
5. Assesses investor preferences more accurately.
6. Seamlessly brings the discussion of remedial actions to the origination and planning phase.

GBWM - Main Tenets

- Measure performance relative to goals rather than relative to benchmarks.
- Nevins (2004): recognize investor’s preferences and biases.
- Recognize behavior: loss aversion, mental accounting, (advocated by Zwecher 2010).
- Ameliorate biases: overconfidence, hindsight bias, overreaction, belief perseverance, and regret avoidance.
- Brunel (2015): trade-off greed vs fear, dreams vs nightmares.

The Mathematical Underpinnings

We first ask the investor to specify 8 pieces of information:

1) Their time frame (Investment Tenure)
2) Their initial investment (Initial Wealth)
3) Their goal wealth (Target Wealth)
4) The probability they would like to maintain of reaching their goal wealth (Target Probability)
5) The wealth they would not want to end up being below (Loss Threshold)
6) The probability they would like to maintain of ending above the Loss Threshold (Loss Threshold Probability)
7) Selecting one of three options for their investment preferences in good times.
8) Selecting one of three options for their investment preferences in bad times.

The Goals and the Loss Threshold each define parabolas in the risk-return plane.

$$\mu = \frac{1}{2}\sigma^2 + \frac{z_0}{\sqrt{t}}\sigma + \frac{1}{t}\ln\left(\frac{W(t)}{W(0)}\right).$$

Base Case for Goals:

1) Investment Tenure: 10 years.
2) Initial Wealth: $400,000
3) Target Wealth: $500,000
4) Target Probability: 80%

Figure 2: The Dependence of Goal Probability Level Curves on Probability Levels

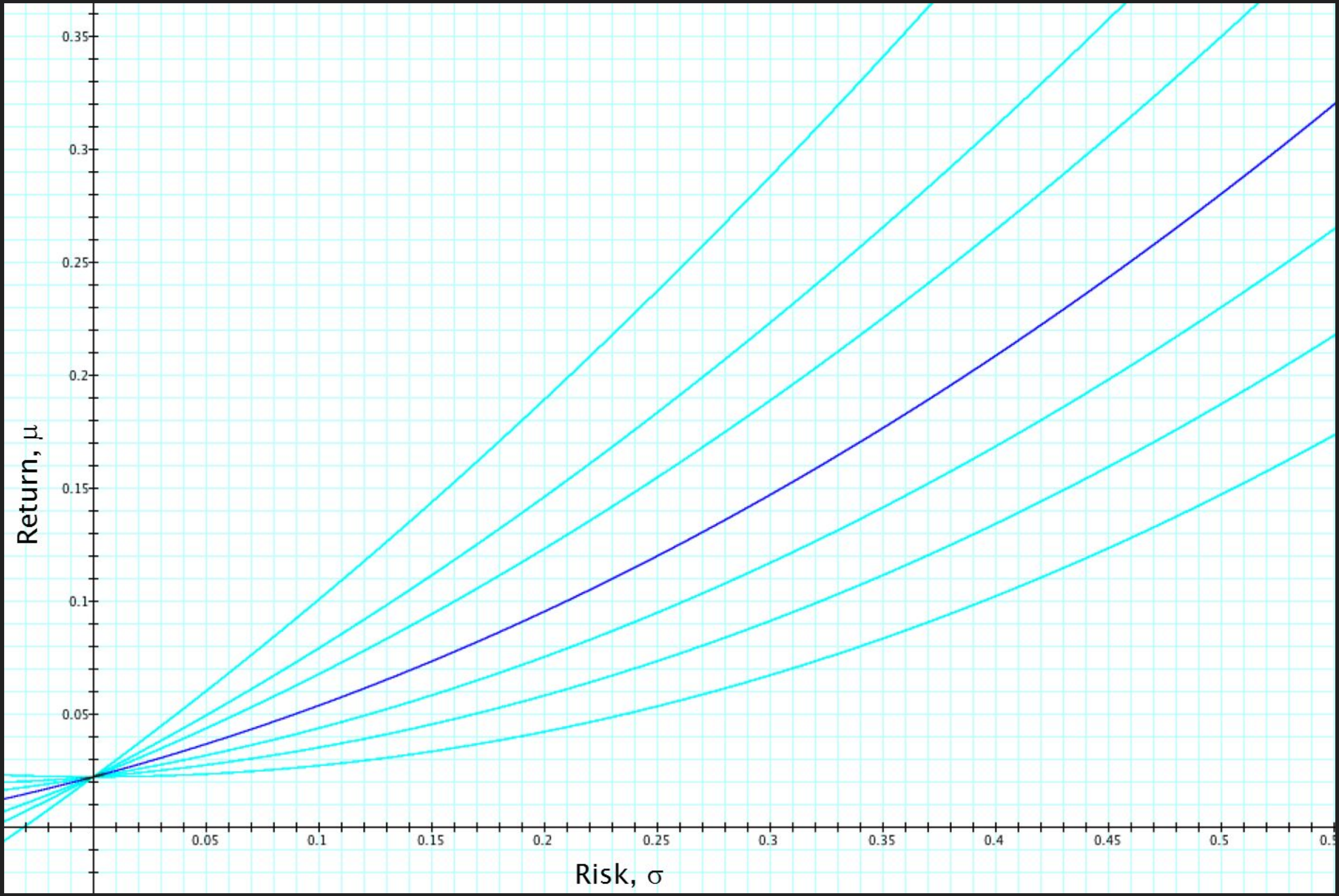
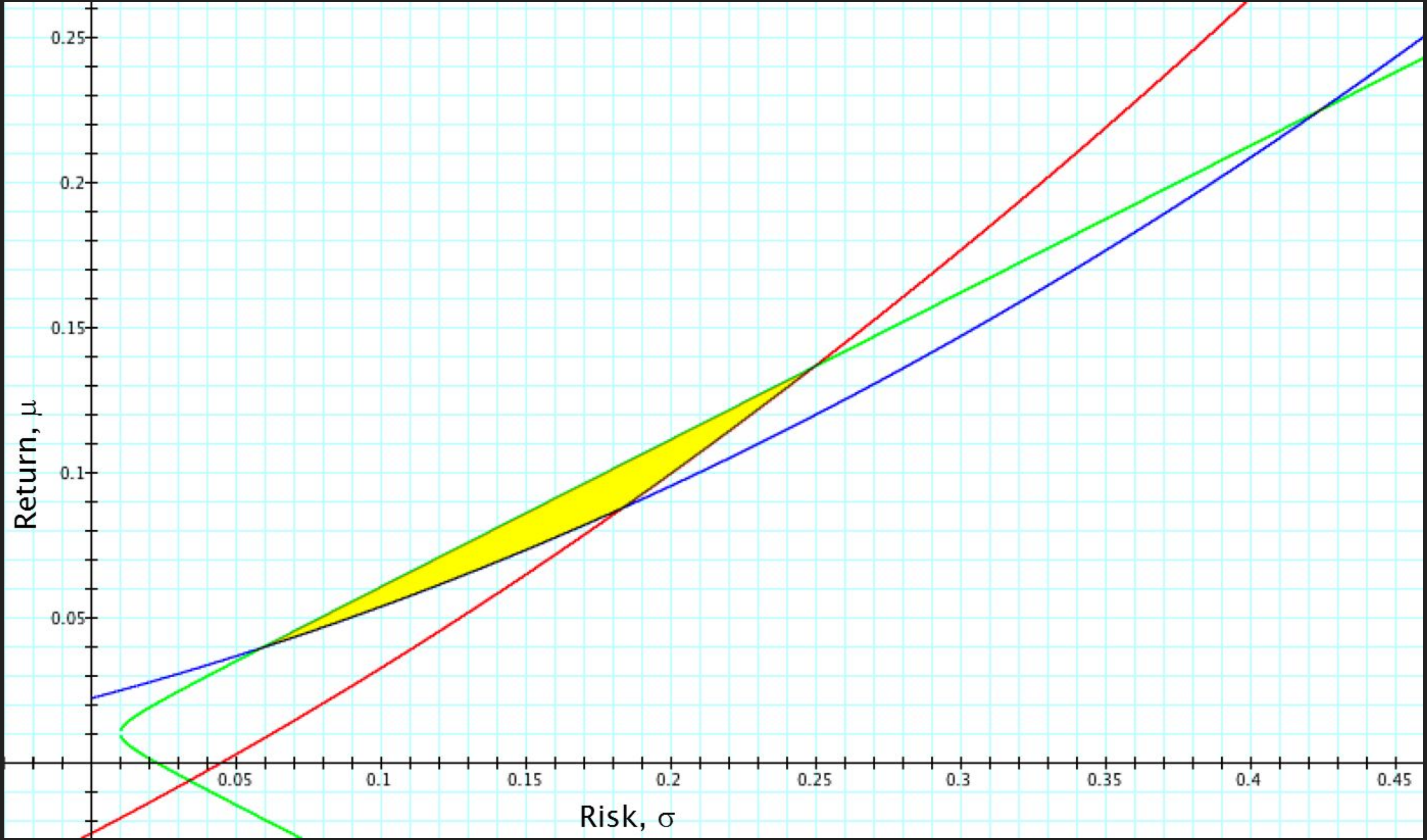


Figure 4: Feasible Portfolios that Satisfy the Investor's Goals and Loss Threshold



Metrics - Upside

Assume that we have created a portfolio using the model structure described in the previous section. For example, suppose we wanted the portfolio return (r) to be at least $H\%$ return per year with probability p, and to not lose more than $L\%$ a year with q probability. Our portfolio construction results in $P = \int_{H}^{\infty} f(r)\, dr \geq p$, and $Q = \int_{-\infty}^{L} f(r)\, dr \leq q$, where $f(r)$ is the density function for portfolio returns.

We define the following three metrics.

Upside, defined as

$$\frac{U}{P}$$

where

$$U = \int_{H}^{\infty} (r - H) f(r)\, dr$$

Barring a discounting term, this expression describes the value of a call option on the rate of return with strike rate *H*. We usually denote such options on rates as caps. Next we define

Metrics - Downside & Performance

Downside, defined as

$$\frac{D}{Q}$$

where

$$D = \int_{-\infty}^{L} (L - r) f(r) \, dr$$

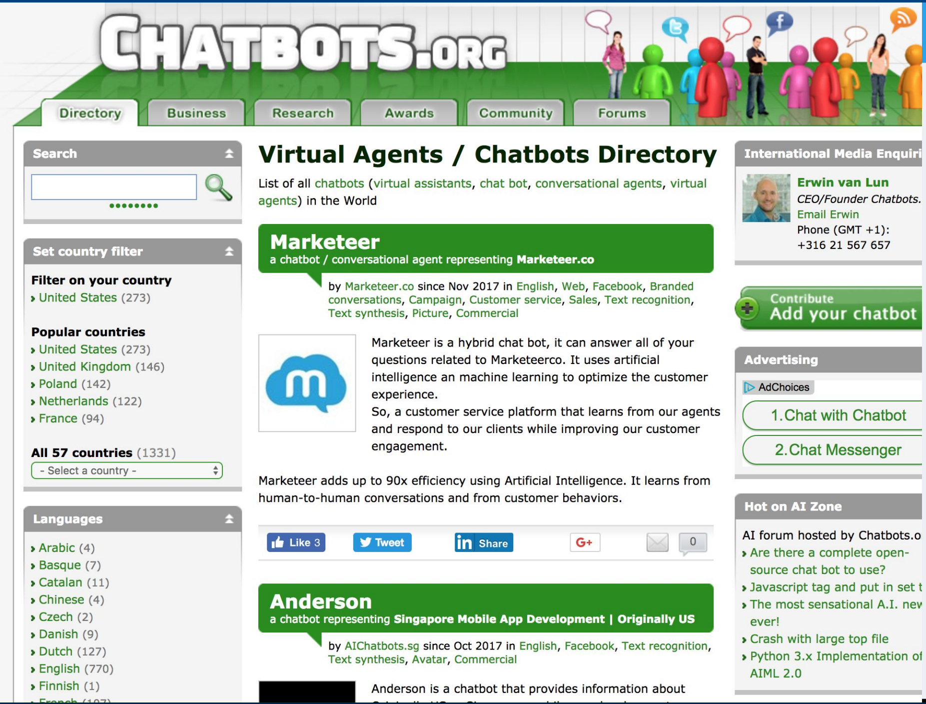
This is akin to a put option on the rate of return, i.e., a floor. This is a measure of downside risk and is the return-based analog to the widely used dollar risk measure of expected shortfall. Finally we present

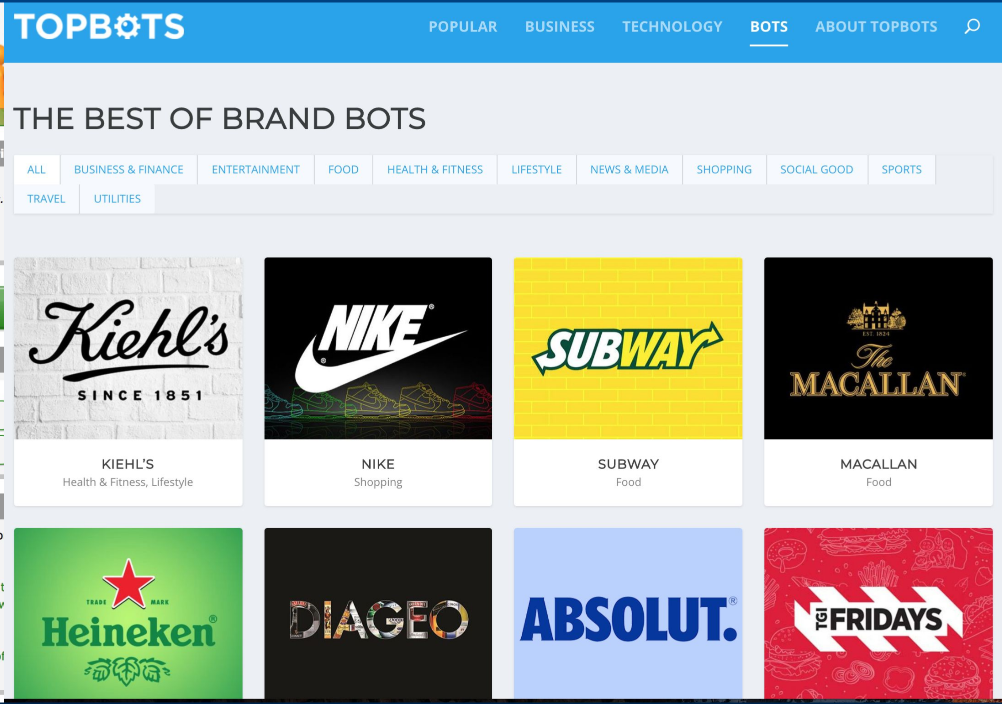
Omega, i.e.,

$$\Omega = \frac{U}{D}$$

Intuitively, Ω tells us *how many units of excess return over the goal was earned for every unit of expected shortfall below the loss threshold*. It is an interesting goal versus risk trade-off for GBWM.

Using Bots


CHATBOTS.ORG
Directory
Business
Research
Awards
Community
Forums
Search
Set country filter
Filter on your country
United States (273)
Popular countries
United States (273)
United Kingdom (146)
Poland (142)
Netherlands (122)
France (94)
All 57 countries (1331)
- Select a country -
Languages
Arabic (4)
Basque (7)
Catalan (11)
Chinese (4)
Czech (2)
Danish (9)
Dutch (127)
English (770)
Finnish (1)
Virtual Agents / Chatbots Directory
List of all chatbots (virtual assistants, chat bot, conversational agents, virtual agents) in the World
Marketeer
a chatbot / conversational agent representing Marketeer.co
by Marketeer.co since Nov 2017 in English, Web, Facebook, Branded conversations, Campaign, Customer service, Sales, Text recognition, Text synthesis, Picture, Commercial
Marketeer is a hybrid chat bot, it can answer all of your questions related to Marketeerco. It uses artificial intelligence an machine learning to optimize the customer experience.
So, a customer service platform that learns from our agents and respond to our clients while improving our customer engagement.
Marketeer adds up to 90x efficiency using Artificial Intelligence. It learns from human-to-human conversations and from customer behaviors.
Like 3
Tweet
Share
G+
0
Anderson
a chatbot representing Singapore Mobile App Development | Originally US
by AIChatbots.sg since Oct 2017 in English, Facebook, Text recognition, Text synthesis, Avatar, Commercial
Anderson is a chatbot that provides information about
International Media Enquiri
Erwin van Lun
CEO/Founder Chatbots.
Email Erwin
Phone (GMT +1):
+316 21 567 657
Contribute
Add your chatbot
Advertising
AdChoices
1.Chat with Chatbot
2.Chat Messenger
Hot on AI Zone
AI forum hosted by Chatbots.o
Are there a complete open-source chat bot to use?
Javascript tag and put in set t
The most sensational A.I. new ever!
Crash with large top file
Python 3.x Implementation of AIML 2.0


TOPBOTS
POPULAR
BUSINESS
TECHNOLOGY
BOTS
ABOUT TOPBOTS
THE BEST OF BRAND BOTS
ALL
BUSINESS & FINANCE
ENTERTAINMENT
FOOD
HEALTH & FITNESS
LIFESTYLE
NEWS & MEDIA
SHOPPING
SOCIAL GOOD
SPORTS
TRAVEL
UTILITIES
Kiehl's SINCE 1851
KIEHL'S
Health & Fitness, Lifestyle
NIKE
NIKE
Shopping
SUBWAY
SUBWAY
Food
The MACALLAN
MACALLAN
Food
Heineken
DIAGEO
ABSOLUT.
TGI FRIDAYS

Using Derivatives to sharpen goal-targeting

Options and Structured Products in Behavioral Portfolios, (with Meir Statman), 2013, *Journal of Economic Dynamics and Control*, 37(1), 137-153. http://algo.scu.edu/~sanjivdas/JEDC_FINAL_PROOF.pdf

Puts are needed when the threshold return is high

Panel C: $H = -5\%, \alpha = 0.05$

	LowRisk	MedRisk	HighRisk	LongPut		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No put	0.6964	0.2008	0.1028	0.0000	0.0498	0.0806	0.0793	0.0000	0.0000
0.8	0.6986	0.1998	0.1016	0.0000	0.0491	0.0803	0.0788	0.0008	-0.0010
0.9	0.6982	0.2002	0.1016	0.0000	0.0491	0.0803	0.0788	0.0003	-0.0002
1	0.6971	0.2000	0.1028	0.0001	0.0495	0.0805	0.0792	0.0011	-0.0005
1.1	0.6962	0.2000	0.1035	0.0003	0.0496	0.0806	0.0793	0.0032	0.0000
1.2	0.6977	0.1994	0.1029	0.0000	0.0495	0.0805	0.0792	0.0000	0.0000

Panel D: $H = 0\%, \alpha = 0.05$

	LowRisk	MedRisk	HighRisk	LongPut		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No put	Infeasible: No solution								
0.8-1.1	Infeasible: No solution								
1.2	0.0488	0.7996	0.0043	0.1473	0.0495	0.0433	0.0688	2.4538	6.5319
1.3	0.2459	0.6007	0.0104	0.1430	0.0495	0.0446	0.0422	2.4319	8.7183

For high thresholds the investor cannot get an acceptable portfolio without puts.

Raising the threshold further ….

Panel E: $H = 1\%, \alpha = 0.05$									
	LowRisk	MedRisk	HighRisk	LongPut		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No put	Infeasible: No solution								
0.8-1.2	Infeasible: No solution								
1.3	0.0489	0.7514	0.0043	0.1954	0.0495	0.0372	0.0431	3.6502	16.0972

Panel F: $H = 2\%, \alpha = 0.05$									
	LowRisk	MedRisk	HighRisk	LongPut		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No put	Infeasible: No solution								
0.8-1.3	Infeasible: No solution								
1.4	0.0497	0.7015	0.0012	0.2476	0.0496	0.0329	0.0228	6.0207	46.3634

….. Leads to more puts being required.

Calls give better portfolios

	LowRisk	MedRisk	HighRisk	LongCall		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No Call	0.5871	0.2052	0.2077	0.0000	0.0498	0.1018	0.1226	0.0000	0.0000
0.8	0.7419	0.0027	0.1524	0.1030	0.0496	0.1081	0.1296	0.1186	-0.1196
0.9	0.7968	0.0008	0.1005	0.1019	0.0496	0.1063	0.1395	0.3934	-0.1643
1	0.6978	0.1000	0.1498	0.0514	0.0496	0.1072	0.1403	0.4424	0.0592
1.1	0.7954	0.0032	0.1483	0.0531	0.0497	0.1043	0.1546	0.9297	1.0514
1.2	0.5948	0.1995	0.2017	0.0040	0.0495	0.1019	0.1244	0.0817	0.0479

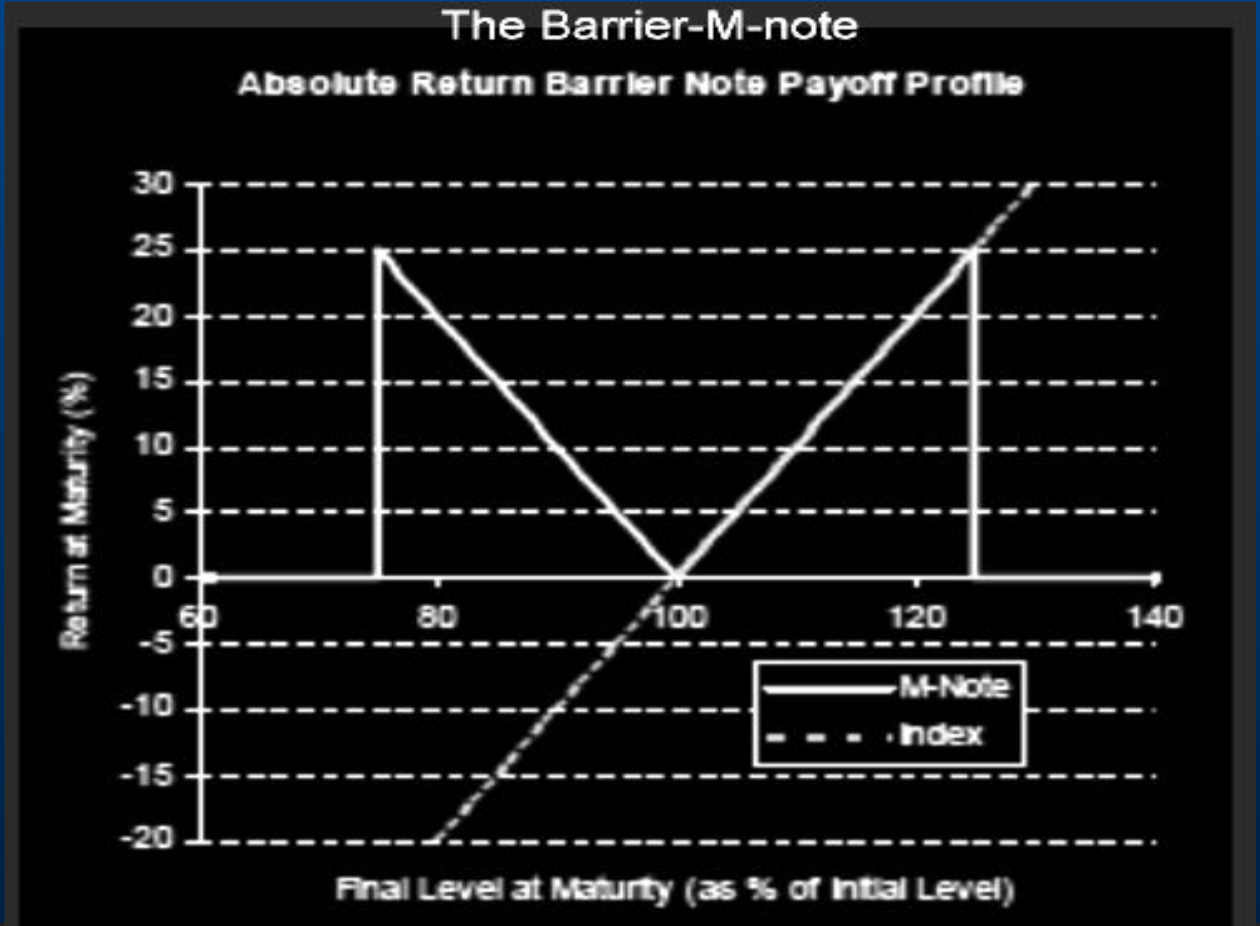
Panel B: $H = -10\%, \alpha = 5\%$

Improvement is greater than 60 bps !

Using collars

	$H = -10\%, \alpha = 0.05$							
	LowRisk	MedRisk	HighRisk	Collar	Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	Mean	Std Dev	Skewness	Kurtosis
No collar	0.5871	0.2052	0.2077	-	0.1018	0.1226	0.0000	0.0000
$K_c = 1.0, K_p = 1.0$	0.5986	0.1998	0.2001	0.0015	0.1035	0.1241	0.0000	0.0000
$K_c = 1.05, K_p = 0.95$	0.5991	0.1983	0.2002	0.0015	0.1027	0.1234	0.0069	0.0078
$K_c = 1.0, K_p = 0.8$	0.7984	0.0014	0.1494	0.0507	0.1060	0.1363	0.3236	0.1361
$K_c = 0.9, K_p = 0.7$	0.6880	0.1007	0.1551	0.0562	0.1062	0.1302	0.1630	-0.0727
$K_c = 0.8, K_p = 0.7$	0.7354	0.0068	0.2039	0.0539	0.1056	0.1225	0.0215	-0.0148

Barrier M-note



Parsing the M-note

$$r_4 = \begin{cases} |r_2| & \text{if } |r_2| \leq 0.25 \\ 0 & \text{if } |r_2| > 0.25 \end{cases}$$

	$H = -10\%, \alpha = 0.05$								
	LowRisk	MedRisk	HighRisk	Long Note		Portfolio Return Moments			
Strike	w_1	w_2	w_3	w_4	$Pr[r < H]$	Mean	Std Dev	Skewness	Kurtosis
No note	0.5871	0.2052	0.2077	-	0.0498	0.1018	0.1226	0.0000	0.0000
Barrier: ±0.25	0.0009	0.0426	0.2635	0.6929	0.0495	0.1237	0.1405	0.0131	0.0048

Return pick-up greater than 250 bps!

$$CON_{call}[\text{Strike} = 1 + M] = e^{-rT} N \left[\frac{\ln(1/(1+M)) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \right]$$

$$CON_{put}[\text{Strike} = 1 - M] = e^{-rT} N \left[-\left(\frac{\ln(1/(1-M)) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \right) \right]$$

Underfunded Portfolios

See: Das, S., Kim, S., Statman, M., (2014). "Coming up Short: Managing Underfunded Portfolios in an LDI-ES Framework" (*Journal of Portfolio Management*).

Four remedies:

- Cash infusions from sponsors (W).
- Increase horizons, postpone terminal date (T).
- Increase shortfall tolerance, i.e., take more risk (K).
- Reducing targets (H).

Sample remedies

Here, we consider an investor standing at time $j = 4$ with a beginning-of-period wealth equal to 44% of his desired threshold of \$1,000,000 (i.e., $W_{j-1}/H = 0.44$). The expected return on the risky asset each period is $\mu_j = 0.07$, with a standard deviation of $\sigma_j = 0.20$, and the risk-free rate of $r_f = 0.03$ per annum.

Remedy	Change	K	H	K/H	N	W_{j-1}	W_{j-1}/H	w_j^*
Panel A: Original K/H = 15%, Original N = 20 years								
Do nothing	—	\$150,000	\$1,000,000	15%	20	\$440,000	0.4400	infeasible
Increase W_j	\$33,000	\$150,000	\$1,000,000	15%	20	\$473,000	0.4730	0.1465
Increase N	3	\$150,000	\$1,000,000	15%	23	\$440,000	0.4400	0.2077
Increase K	\$39,300	\$189,300	\$1,000,000	18.93%	20	\$440,000	0.4400	0.1959
Decrease H	\$55,100	\$150,000	\$944,900	15.87%	20	\$440,000	0.4657	0.1589
Panel B: Original K/H = 10%, Original N = 20 years								
Do nothing	—	\$100,000	\$1,000,000	10%	20	\$440,000	0.4400	infeasible
Increase W_j	\$75,300	\$100,000	\$1,000,000	10%	20	\$515,300	0.5153	0.0953
Increase N	5	\$100,000	\$1,000,000	10%	25	\$440,000	0.4400	0.0762
Increase K	\$89,300	\$189,300	\$1,000,000	18.93%	20	\$440,000	0.4400	0.1959
Decrease H	\$125,500	\$100,000	\$874,500	11.44%	20	\$440,000	0.5031	0.1104

Underfunded portfolios: lessons

- A conversation about shortfalls must be undertaken in good times to put in place a plan for bad times.
- Unless investors have very stringent shortfall risk thresholds, LDI-ES rebalancing does better for them than fixed-proportion rebalancing.
- Portfolio infusions are not as effective in resolving underfunded situations as other measures, such as increasing risk, cutting back on target liabilities/goals, and extending portfolio horizon.

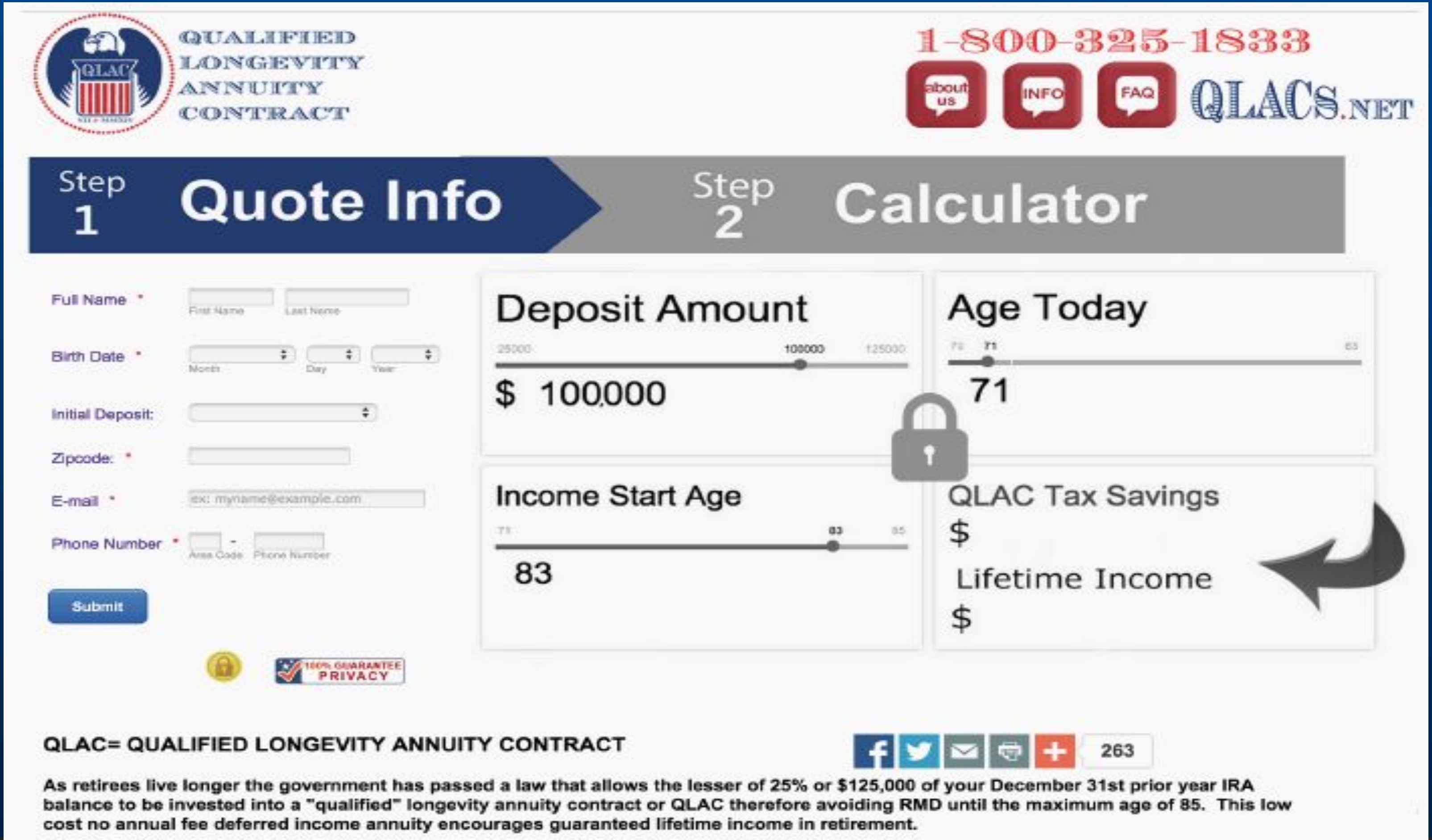
Tax-optimized investing

(Das, Ding, Newell, Ostrov (JIS 2017)

An investor has a portfolio with a stock and cash position that can be traded periodically. The stock is subject to the American taxation system. The portfolio has a given time horizon of T years.

- Basic question: What fraction, f, of the portfolio should be in stock?
- More specifically: What is the optimal static interval [L,U] in which to dynamically maintain f over the portfolio's time horizon?

Managing Longevity Risk



QLAC Pricing

If you made a lump sum payment of $125,000		*Annual income amount based on income start age Life Annuity income type									
		67		70		75		80		85	
		male	female	male	female	male	female	male	female	male	female
Contract Issue Age	55	$14,345	$13,264	$17,918	$16,368	$27,205	$24,234	$44,828	$38,823	$83,643	$70,291
	60	$11,902	$11,030	$14,962	$13,672	$22,923	$20,381	$38,213	$32,923	$72,400	$60,318
	65	$ 9,565	$ 8,925	$12,133	$11,147	$19,045	$16,943	$32,133	$27,601	$61,786	$51,129
	68	N/A		$10,555	$ 9,753	$16,792	$15,001	$28,624	$24,623	$55,537	$45,913
	70	N/A		N/A		$15,063	$13,546	$26,303	$22,712	$51,360	$42,545
	72	N/A		N/A		$13,580	$12,314	$23,953	$20,826	$47,152	$39,257
	75	N/A		N/A		N/A		$19,966	$17,663	$40,738	$34,382

QLACS.NET

Reverse Mortgages

SATURDAY, OCTOBER 10, 2015

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HUD > Program Offices > Housing > Single Family > HECM > Top Ten Things to Know if You're Interested in a Reverse Mortgage

Frequently Asked Questions about HUD's Reverse Mortgages

The Home Equity Conversion Mortgage (HECM) is FHA's reverse mortgage program, which enables you to withdraw some of the equity in your home. The HECM is a safe plan that can give older Americans greater financial security. Many seniors use it to supplement Social Security, meet unexpected medical expenses, make home improvements and more. You can receive additional free information about reverse mortgages in general by contacting the National Council on Aging at (800) 510-0301. It is smart to know more about reverse mortgages, and decide if one is right for you!

1. What is a reverse mortgage?

A reverse mortgage is a special type of home loan that lets you convert a portion of the equity in your home into cash. The equity that you built up over years of making mortgage payments can be paid to you. However, unlike a traditional home equity loan or second mortgage, HECM borrowers do not have to repay the HECM loan until the borrowers no longer use the home as their principal residence or fail to meet the obligations of the mortgage. You can also use a HECM to purchase a primary residence if you are able to use cash on hand to pay the difference between the HECM proceeds and the sales price plus closing costs for the property you are purchasing.

2. Can I qualify for FHA's HECM reverse mortgage?

To be eligible for a FHA HECM, the FHA requires that you be a homeowner 62 years of age or older, own your home outright, or have a low mortgage balance that can be paid off at closing with proceeds from the reverse loan, have the financial resources to pay ongoing property charges including taxes and insurance, and you **must** live in the home. You are also required to receive consumer information free or at very low cost from a HECM counselor prior to obtaining the loan. You can find a **HECM counselor online** or by phoning (800) 569-4287.

3. Can I apply for a HECM even if I did not buy my present house with FHA mortgage insurance?

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Summary

- The investment landscape is changing on account of low interest rates, low equity premium, longevity, and high volatility.
- Targeting wealth at retirement is being replaced with targeting an income stream, through the lens of Liability-Driven Investing (LDI).
- This is embodied in Goal Based Investing where sub-portfolios for each goal may be optimized, exploiting Mental Accounts in Behavioral
- Portfolio Theory, consistent with Mean-Variance Optimization. Structured Products and Annuities / Reverse Mortgages are gaining significant attention and should be part of an investor portfolio, as part of the move from selling Products to selling Solutions.