

CFRM 507

Final Project Presentation

Customized Retirement Advice

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Project Summary

- > Six clients: provide advice to maximize expected utility
- > Current account balance, contribution, until retirement
- > Dynamic programming and backward recursion
- > Stage (age), state (balance, mix), decision (portfolio mix)

$$V(t, Bal, Mix) = \max_i \left\{ \frac{1}{N} \sum_{n=1}^N V(t+1, Bal * (1 + \text{return}(i, n) - \text{fee}(Mix)) + \text{Contribution}(t), i) \right\}$$

- > Stochastic programming: rate of return (log normal distribution), generate scenario tree for mix return



Project Summary

- (1) Step 1: build tables to record account balances, utility and decision (mix) and make decision for current mix
- (2) Step 2: adaptive decision description for future wealth and model robustness testing
- (3) Scenarios: 10,000; balance range: [0, 10,000], step =20

	Mix			
	1	2	...	8
Balance	(utility, decision)			
Bal_1				
Bal_2				
\vdots				
Bal_b				
\vdots				
Bal_n				



Current Mix Analysis

Amy	Bob	Carla	Darrin	Eric	Francine
1	1	1	1	1	3

- > Client Amy - Francine: older
- > Mix 1-8: return decreases and the risk decreases
- > Young client: prefer risky mix to accumulate quickly
- > Old client: aggressive (far from target); conservative (sufficient wealth)



Future wealth and allocations

Client	Amy	Bob	Carla	Darrin	Eric	Francine
Future wealth	2811	2031	1258	2698	1623	1772
Prob > target	57.61%	35.26%	7.63%	61.4%	13.29%	12.41%

- > The average of future wealth indicate that only Amy and Darrin will have an expected future wealth at age 67, which is larger than target (2079.2).
- > The probability is the percentage of times which the expected account balance is larger than the target in the experiment.
- > Additional advice for them

Client	Amy	Bob	Carla	Darrin	Eric	Francine
rate	0.033	0.055	0.099	0.025	0.108	0.135

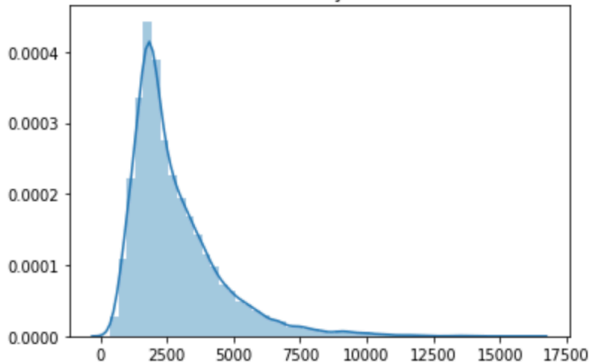
Required rate to reach target



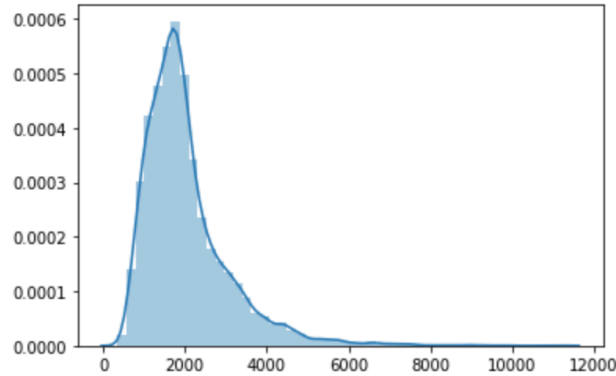
Future wealth and allocations



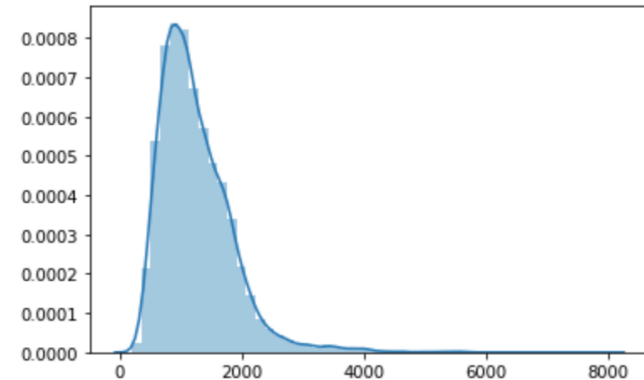
client 1: Amy Abram



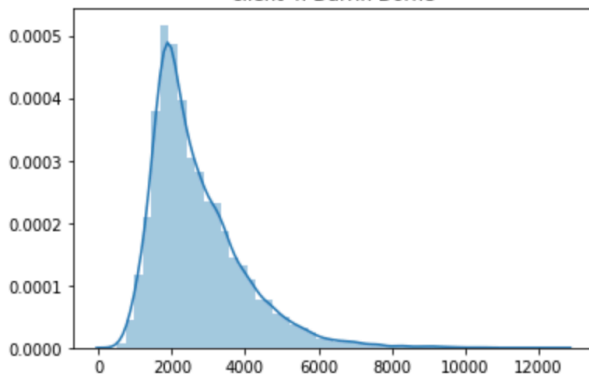
client 2: Bob Brown



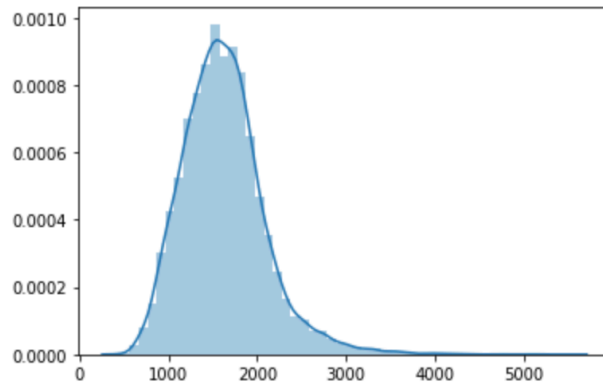
client 3: Carla Clausen



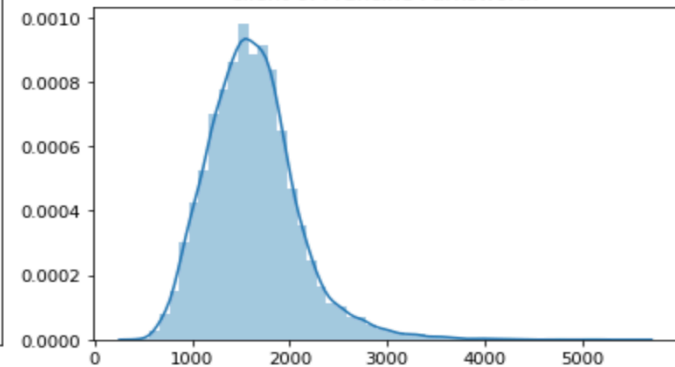
client 4: Darrin Dorne



client 5: Eric Evans



client 6: Francine Farnsworth



The extreme numbers have a great influence on average account balance.



Model Robustness and additional insight

- > Important variables in step 1: the number of scenarios, the range of account balances, step of account balances
- > Important variables in step 2: the number of scenarios
- > In sample: linear interpretation, fast, increasing utility function
- > Out of sample: maximum or minimum of the sample
- > Time consuming: matrix operation, avoid for loop, matrix indexing, slowest speed (3 min)
- > Model modification: define a class for backward recursion

