Financial Services Forum
Reimagine The Future

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Actuaries Institute

Determining the optimal investment and consumption strategy for an Australian retiree

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Agenda

- Current method typically used to advise retirees
- Two significant errors with the standard approach
- How do we overcome these errors?
- Practical demonstration
- Conclusions

Simple Example: Marie Smith

- Female, 67 years old, very healthy, single
- Minimum required spending: $35,000 p.a.
- Would like to spend an additional $20,000 p.a. on discretionary items
- Assets:
  - $300,000 in Super
  - owns her own home ($400,000)
  - personal assets of $35,000
- Receives $17,670 from the age pension p.a.
- Is risk averse

Getting to know Marie

- Marie gets assigned to a conservative investment strategy that invests 70% in bonds and cash and 30% in equities
- The adviser assumes she earns a constant real return of 1%
- Based on her age she has a life expectancy of 20.3 years, but is assumed to live 23 years

Females

Age	l_x	d_x	p_x	q_x	μ_x	$\mathring{e}_x$
65	92,696	575	99.38%	0.62%	0.59%	22.05
66	92,121	628	99.32%	0.68%	0.65%	21.18
67	91,493	688	99.25%	0.75%	0.72%	20.33

Source: Australian Life Tables 2010-12 - Females

4.	How familiar are you with investment markets?	
a.	Very little understanding or interest	10
b.	Not very familiar	20
c.	Have enough experience to understand the importance of diversification	30
d.	Understand that markets may fluctuate and that different market sectors offer different income, growth and taxation characteristics.	40
e.	Experience with all investment sectors and understand the various factors which may influence performance.	50

5.	The greatest tax savings are generally obtained from more volatile investments. Which balance would you be most comfortable with?	
a.	Preferable guaranteed returns, before tax savings	10
b.	Stable reliable returns, minimal tax savings	20
c.	Some variability in returns, some tax savings	30
d.	Moderate variability in returns, reasonable tax savings	40
e.	Unstable, but potentially higher returns, maximising tax savings.	50

6.	What would your reaction be if 6 months after placing your investment you discovered that your investment has decreased by 20%?	
a.	Horror. Security of your capital is critical and you did not intend to take any risks.	10
b.	You would cut your losses and transfer your funds into more secure investments.	20
c.	You would be concerned, but would wait to see if the investments improve.	30
d.	This was a calculated risk and you would leave the investments in place, expecting performance to improve.	40
e.	You would invest more funds to lower your average investment price, expecting future growth.	50

7.	Which of the following best describes your purpose for investing.	
a.	You have an investment horizon longer than 5 years. You understand investment markets and are	50

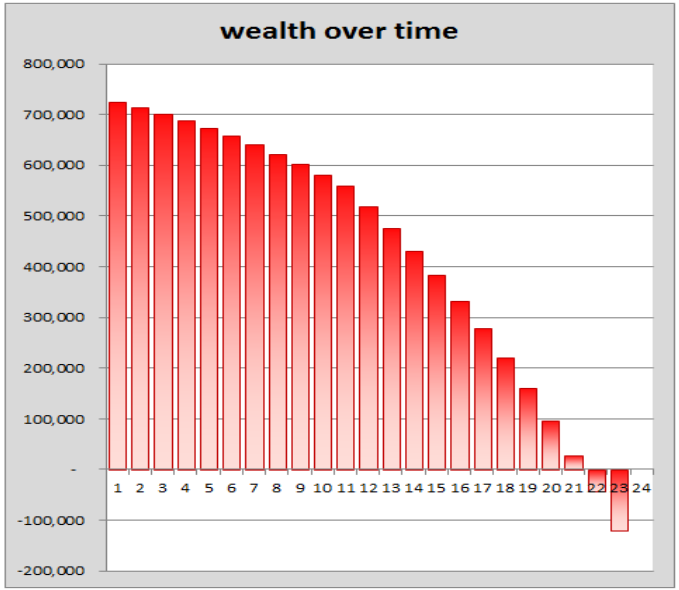
Simple example – determine consumption

What if she spends 100% of her discretionary desires?

CPI	2.50%
real return	1%
real house price growth	1.50%

proportion of discretionary spending
change this number --> 100%

year	financial assets	house	interest	house growth	age pension received	minimum required spending needs	rent if she sells her home	desired discretionary spending	overall wealth
1	325,000.00	400,000.00	11,375.00	16,000.00	17,937.50	35,875.00	-	20,500.00	725,000
2	297,937.50	416,000.00	10,427.81	16,640.00	18,565.31	36,771.88	-	21,012.50	713,938
3	269,146.25	432,640.00	9,420.12	17,305.60	19,215.10	37,691.17	-	21,537.81	701,786
4	238,552.48	449,945.60	8,349.34	17,997.82	19,887.63	38,633.45	-	22,076.26	688,498
5	206,079.74	467,943.42	7,212.79	18,717.74	20,583.69	39,599.29	-	22,628.16	674,023
6	171,648.77	486,661.16	6,007.71	19,466.45	21,304.12	40,589.27	-	23,193.87	658,310
7	135,177.46	506,127.61	4,731.21	20,245.10	22,049.77	41,604.00	-	23,773.72	641,305
8	96,580.72	526,372.71	3,380.33	21,054.91	22,821.51	42,644.10	-	24,368.06	622,953
9	55,770.40	547,427.62	1,951.96	21,897.10	23,620.26	43,710.20	-	24,977.26	603,198
10	12,655.16	569,324.72	442.93	22,772.99	24,446.97	44,802.96	-	25,601.69	581,980
11	559,238.13	-	19,573.33	-	25,302.62	45,923.03	12,544.83	26,241.73	559,238
12	519,404.48	-	18,179.16	-	26,188.21	47,071.11	12,858.45	26,897.78	519,404
13	476,944.51	-	16,693.06	-	27,104.79	48,247.89	13,179.91	27,570.22	476,945
14	431,744.35	-	15,111.05	-	28,053.46	49,454.08	13,509.41	28,259.48	431,744
15	383,685.89	-	13,429.01	-	29,035.33	50,690.44	13,847.14	28,965.96	383,686
16	332,646.69	-	11,642.63	-	30,051.57	51,957.70	14,193.32	29,690.11	332,647
17	278,499.76	-	9,747.49	-	31,103.37	53,256.64	14,548.16	30,432.37	278,500
18	221,113.47	-	7,738.97	-	32,191.99	54,588.06	14,911.86	31,193.17	221,113
19	160,351.34	-	5,612.30	-	33,318.71	55,952.76	15,284.66	31,973.00	160,351
20	96,071.94	-	3,362.52	-	34,484.87	57,351.58	15,666.77	32,772.33	96,072
21	28,128.65	-	984.50	-	35,691.84	58,785.36	16,058.44	33,591.64	28,129
22	- 43,630.46	-	- 1,527.07	-	36,941.05	60,255.00	16,459.90	34,431.43	- 43,630
23	- 119,362.80	-	- 4,177.70	-	38,233.99	61,761.37	16,871.40	35,292.21	- 119,363



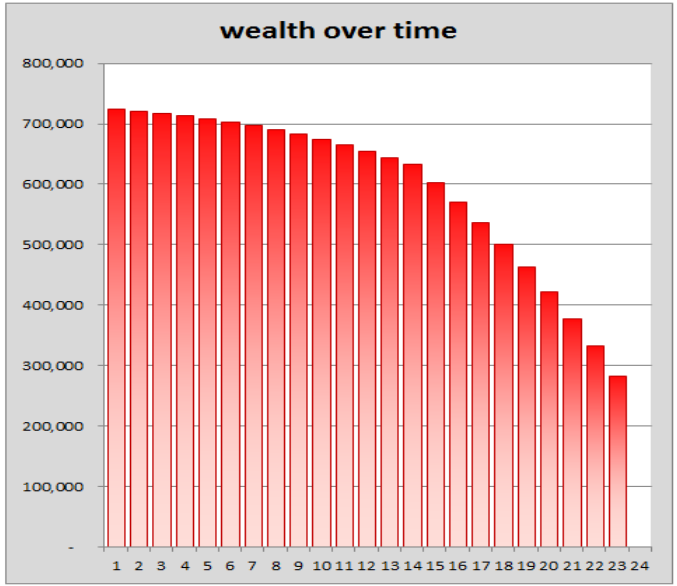
Simple example – determine consumption

What if she spends 60% of her discretionary desires?

CPI	2.50%
real return	1%
real house price growth	1.50%

proportion of discretionary spending
change this number --> 60%

year	financial assets	house	interest	house growth	age pension received	minimum required spending needs	rent if she sells her home	desired discretionary spending	overall wealth
1	325,000.00	400,000.00	11,375.00	16,000.00	17,937.50	35,875.00	-	12,300.00	725,000
2	306,137.50	416,000.00	10,714.81	16,640.00	18,565.31	36,771.88	-	12,607.50	722,138
3	286,038.25	432,640.00	10,011.34	17,305.60	19,215.10	37,691.17	-	12,922.69	718,678
4	264,650.83	449,945.60	9,262.78	17,997.82	19,887.63	38,633.45	-	13,245.75	714,596
5	241,922.03	467,943.42	8,467.27	18,717.74	20,583.69	39,599.29	-	13,576.90	709,865
6	217,796.81	486,661.16	7,622.89	19,466.45	21,304.12	40,589.27	-	13,916.32	704,458
7	192,218.23	506,127.61	6,727.64	20,245.10	22,049.77	41,604.00	-	14,264.23	698,346
8	165,127.40	526,372.71	5,779.46	21,054.91	22,821.51	42,644.10	-	14,620.83	691,500
9	136,463.43	547,427.62	4,776.22	21,897.10	23,620.26	43,710.20	-	14,986.36	683,891
10	106,163.36	569,324.72	3,715.72	22,772.99	24,446.97	44,802.96	-	15,361.01	675,488
11	74,162.07	592,097.71	2,595.67	23,683.91	25,302.62	45,923.03	-	15,745.04	666,260
12	40,392.29	615,781.62	1,413.73	24,631.26	26,188.21	47,071.11	-	16,138.67	656,174
13	4,784.45	640,412.89	167.46	25,616.52	27,104.79	48,247.89	-	16,542.13	645,197
14	633,296.08	-	22,165.36	-	28,053.46	49,454.08	13,509.41	16,955.69	633,296
15	603,595.73	-	21,125.85	-	29,035.33	50,690.44	13,847.14	17,379.58	603,596
16	571,839.76	-	20,014.39	-	30,051.57	51,957.70	14,193.32	17,814.07	571,840
17	537,940.63	-	18,827.92	-	31,103.37	53,256.64	14,548.16	18,259.42	537,941
18	501,807.71	-	17,563.27	-	32,191.99	54,588.06	14,911.86	18,715.90	501,808
19	463,347.16	-	16,217.15	-	33,318.71	55,952.76	15,284.66	19,183.80	463,347
20	422,461.81	-	14,786.16	-	34,484.87	57,351.58	15,666.77	19,663.40	422,462
21	379,051.09	-	13,266.79	-	35,691.84	58,785.36	16,058.44	20,154.98	379,051
22	333,010.93	-	11,655.38	-	36,941.05	60,255.00	16,459.90	20,658.86	333,011
23	284,233.61	-	9,948.18	-	38,233.99	61,761.37	16,871.40	21,175.33	284,234



Benefits of this approach

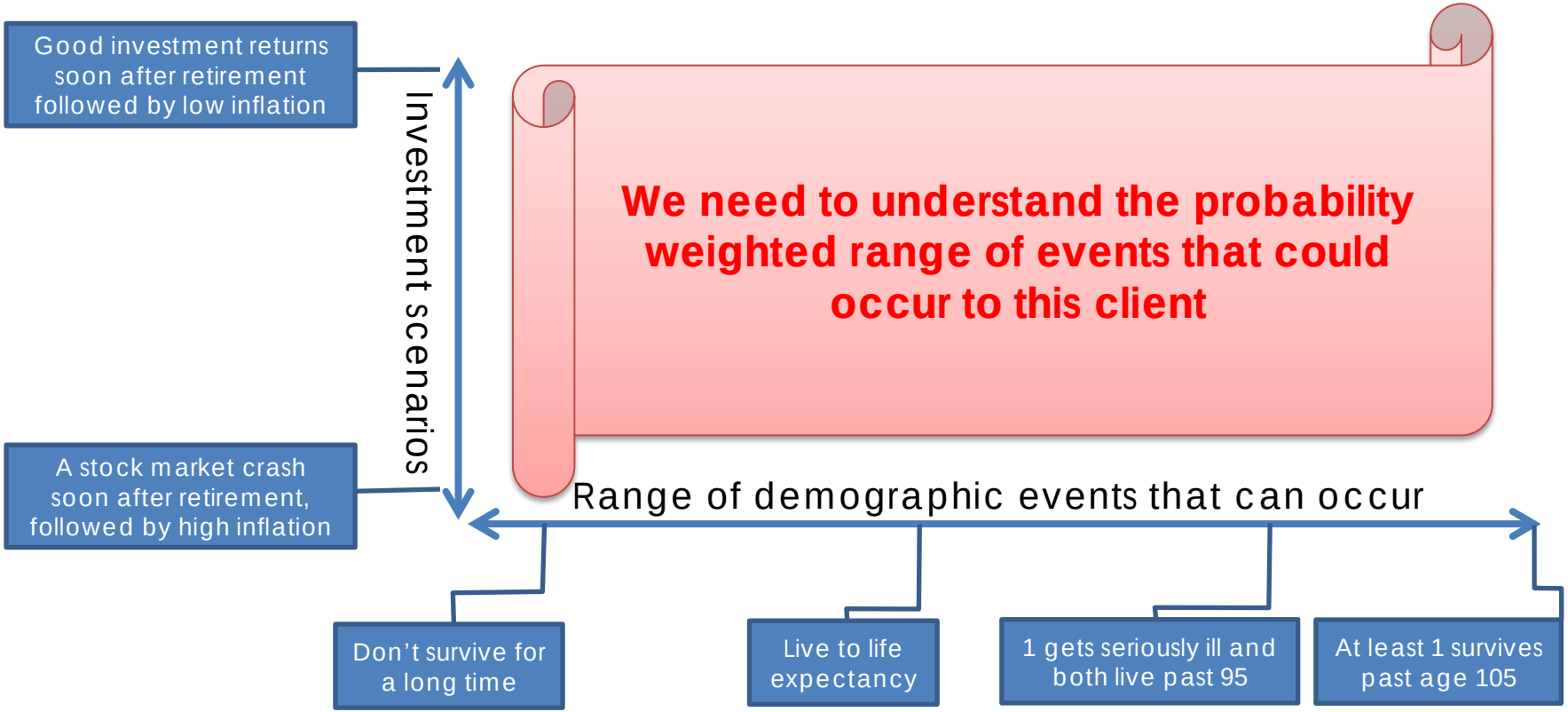
- We've considered the client's needs
- It appears as though we've conservatively estimated:
  - investment returns
  - life expectancy (by adding 3 years)
- Can be easily audited and externally reviewed
- Is reasonably simple to explain to the client

Concerns with the current approach

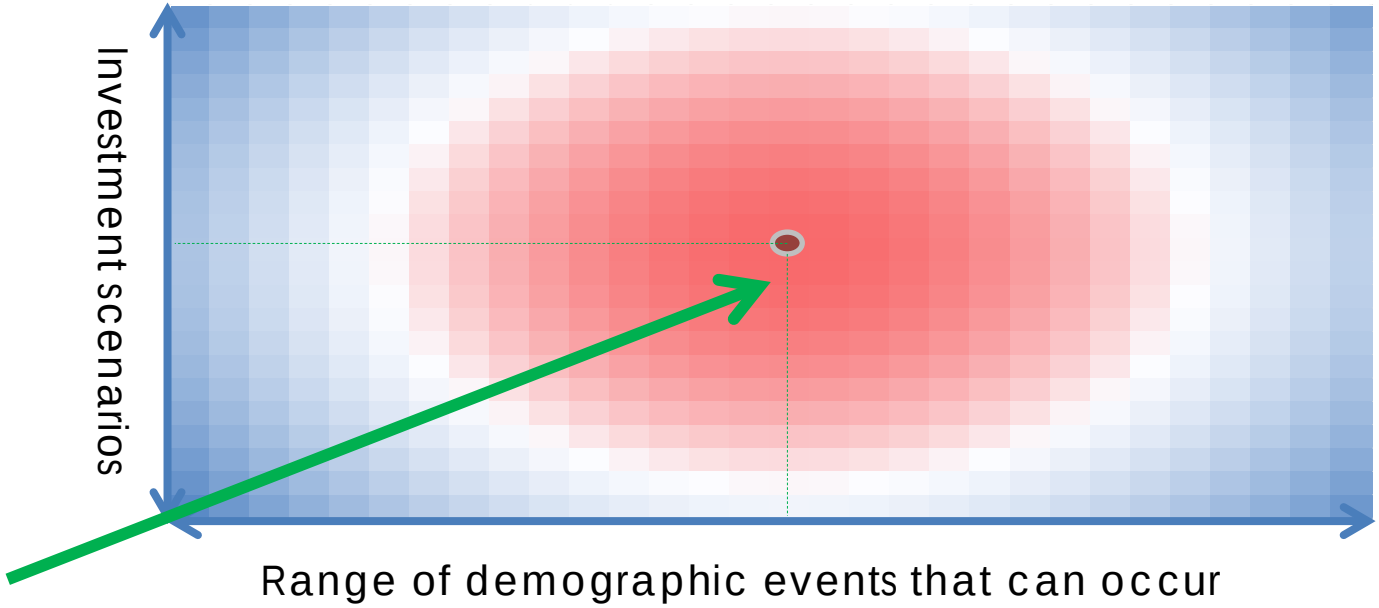
1. Investment and consumption strategies are not independent
2. Tail risks (investment returns and longevity) have been ignored

The problem of inter-dependence

Ignoring Tail Risks

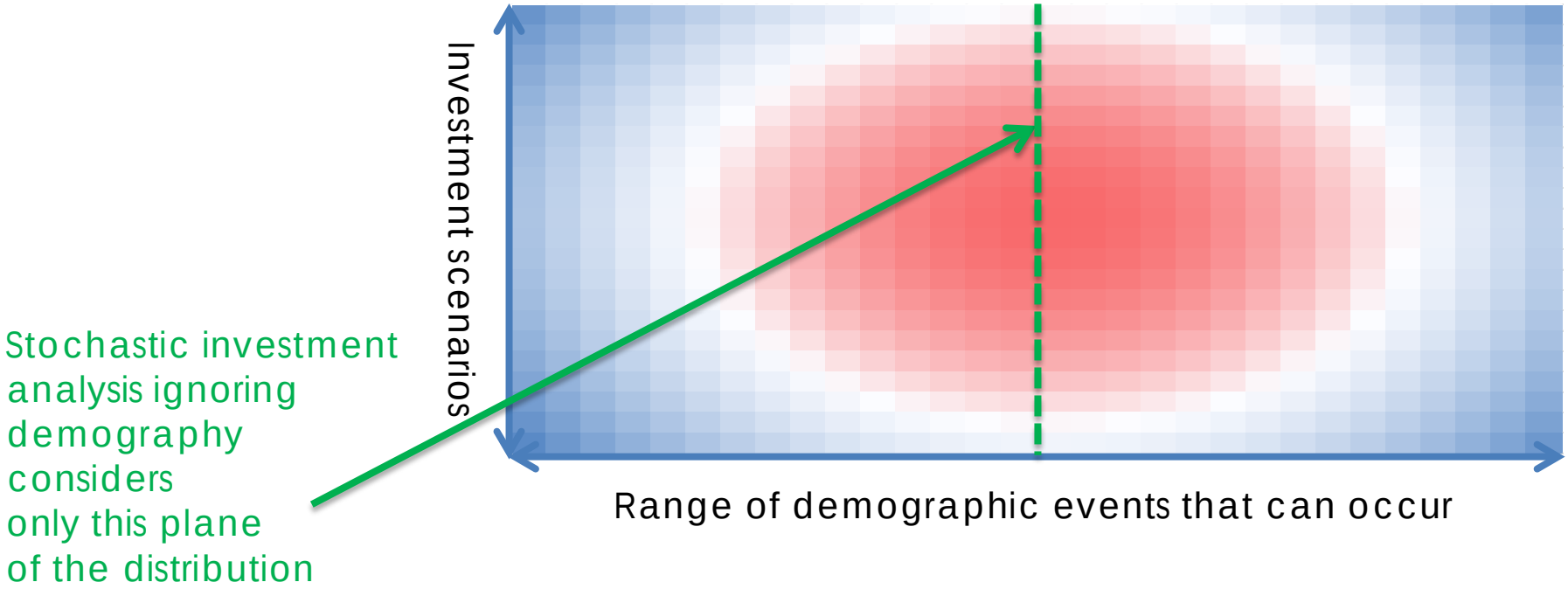


Concerns with the standard methodology

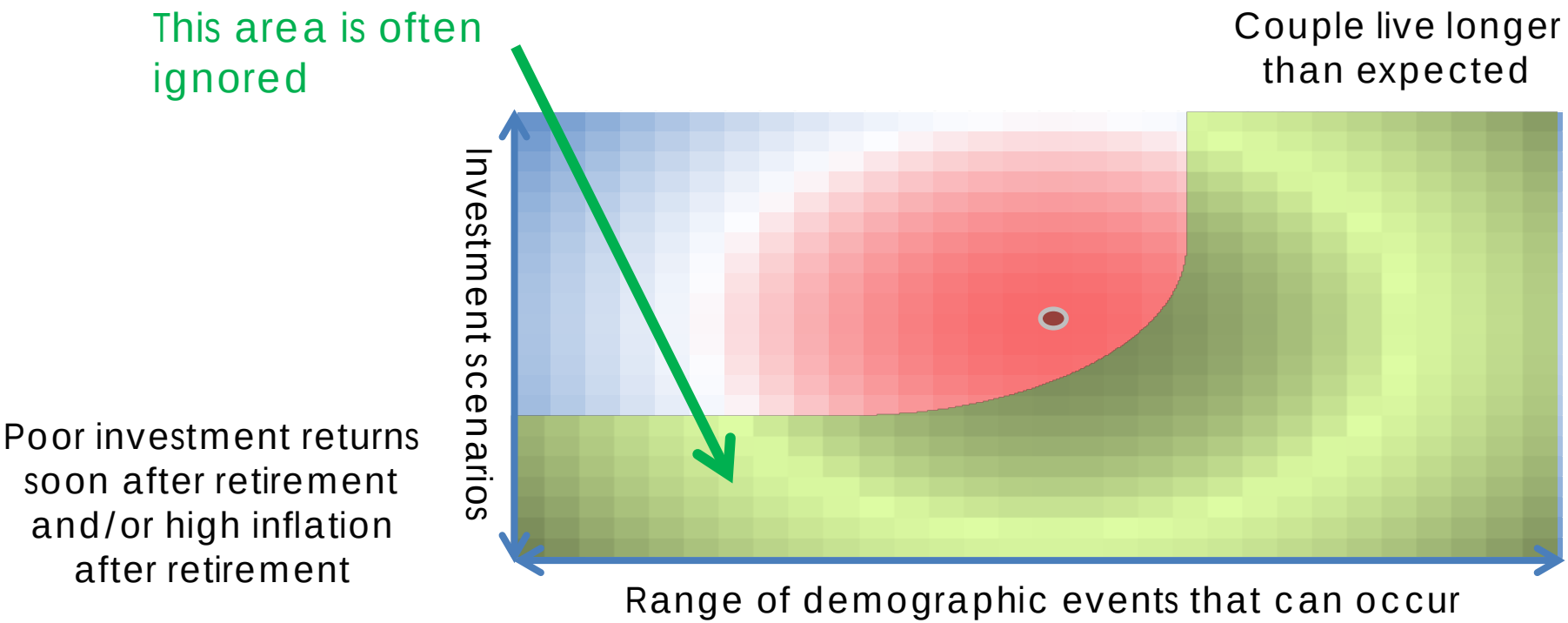


Most advisers only consider this point in the distribution

Concerns with the standard methodology



Concerns with the standard methodology



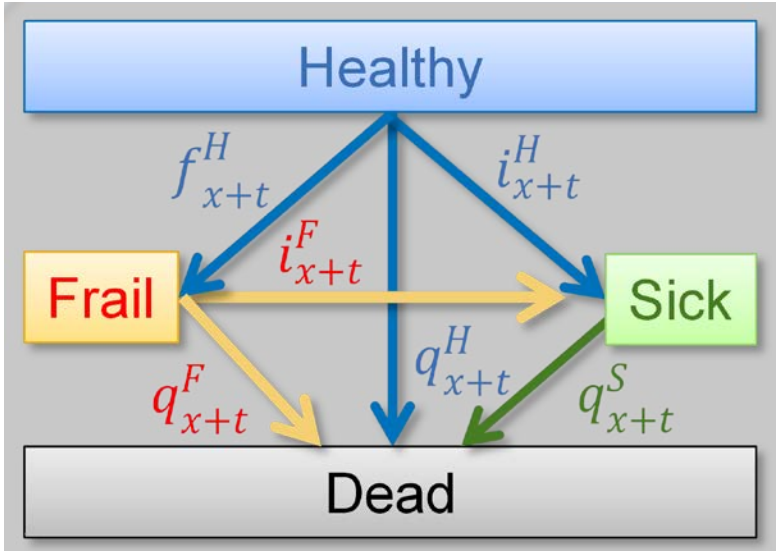
RECOMMENDATION

Levers available to a retiree

- ~~Retire to work~~
- Change the way you invest
- Change the amount you consume
- Purchase post retirement products
- Release equity from your primary residence
- ~~Be nice to your kids~~

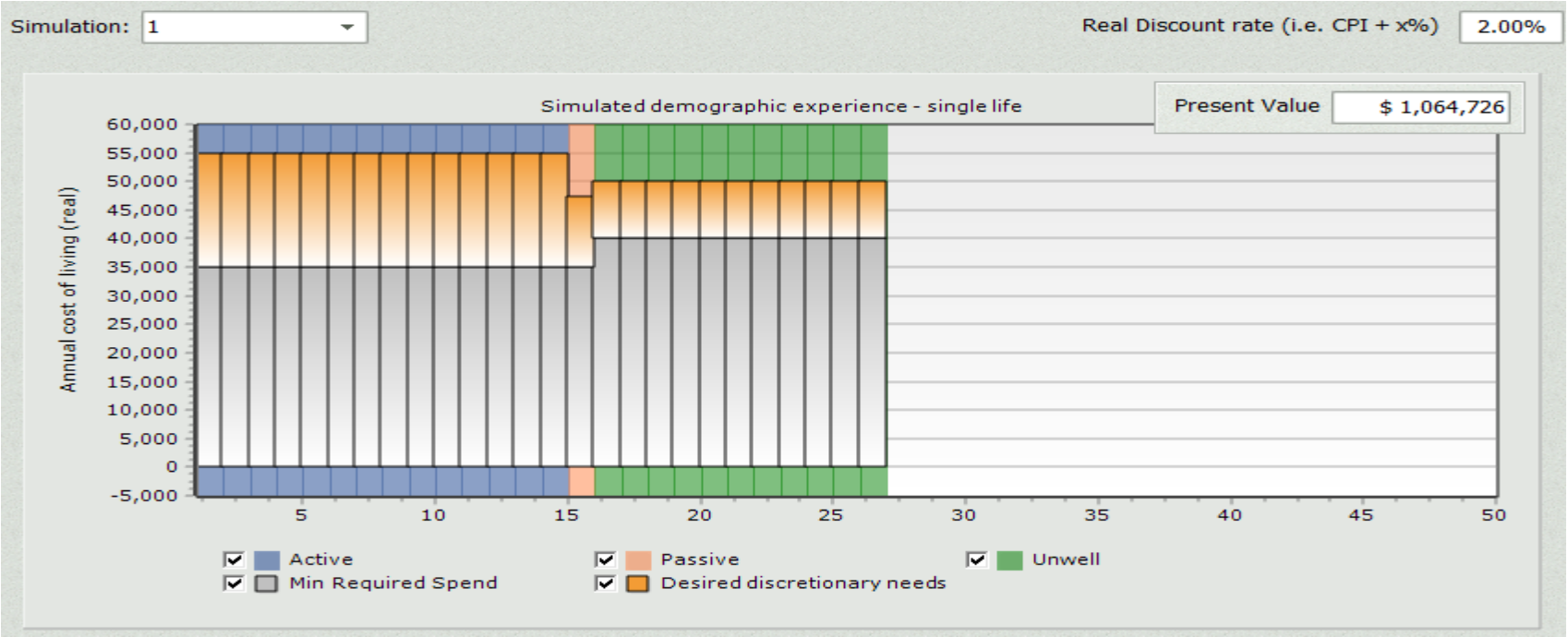
Stochastically simulate demography

1,000 stochastic demographic simulations are generated

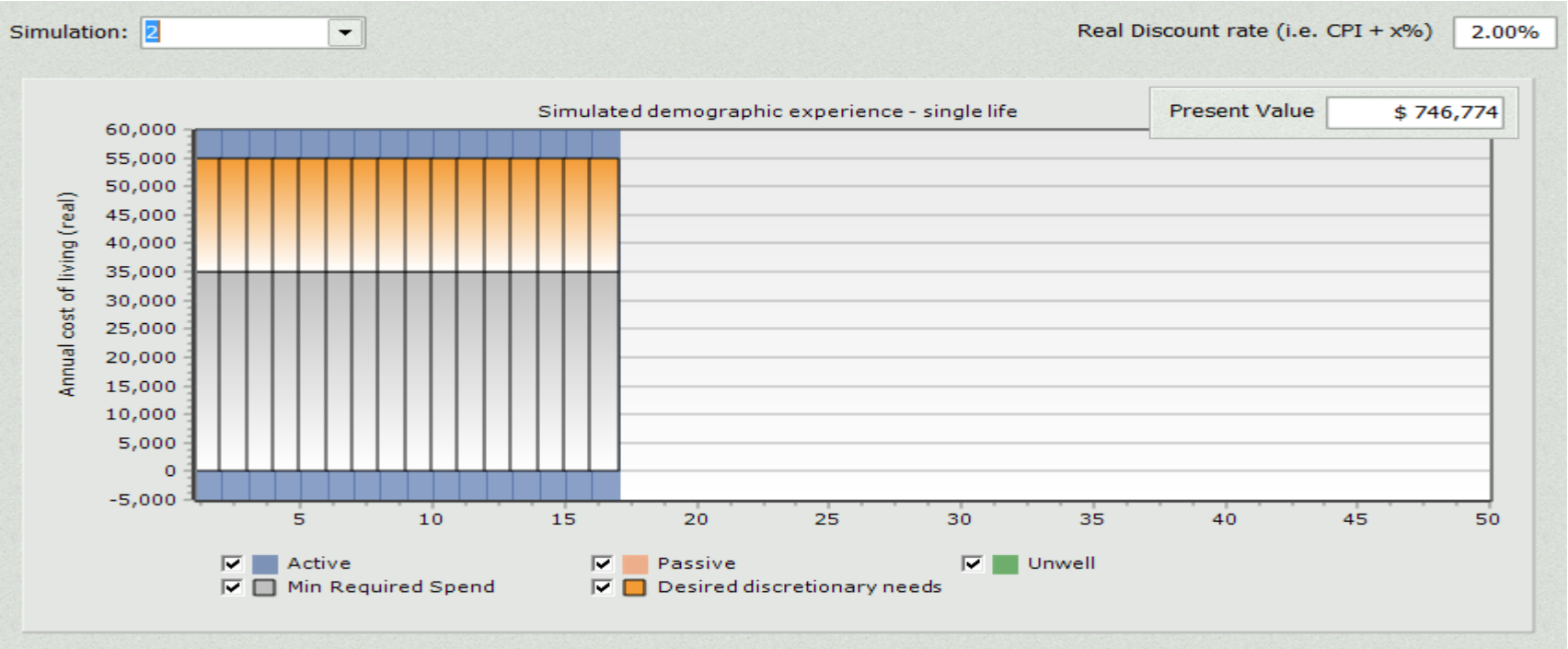


Annual spending needs	Health status		
	Active	Passive	Unwell
Minimum required needs	35,000.00	35,000.00	40,000.00
Desired discretionary needs	20,000.00	12,500.00	10,000.00
Total annual needs	**$55,000**	**$47,500**	**$50,000**

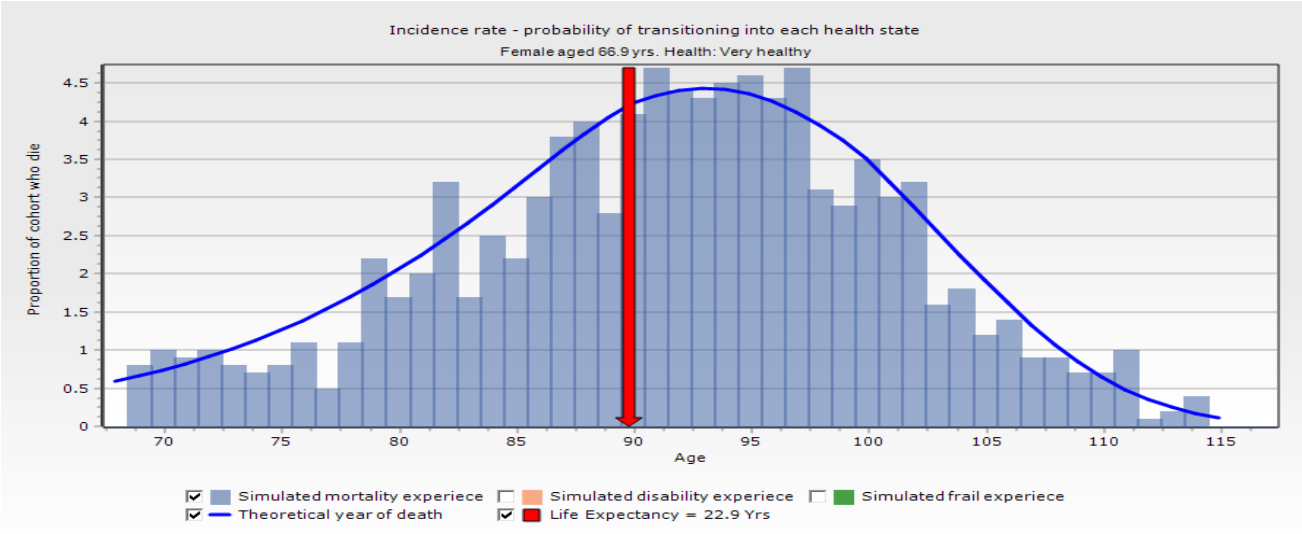
A single demographic simulation



Another demographic simulation



Simulated demographic experience

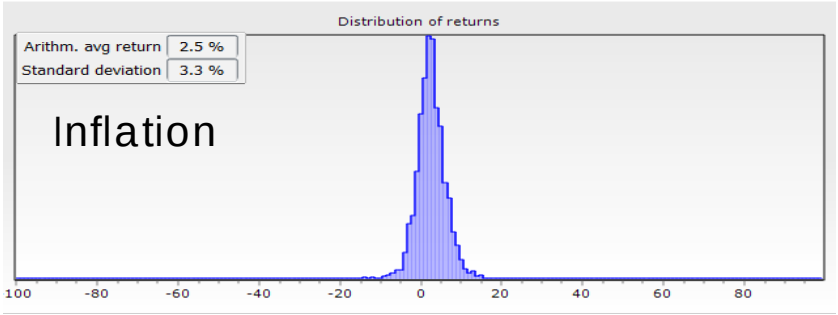


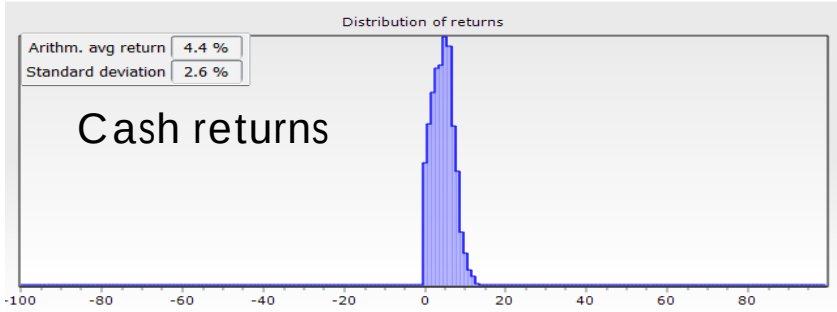
Range of demographic events that can occur

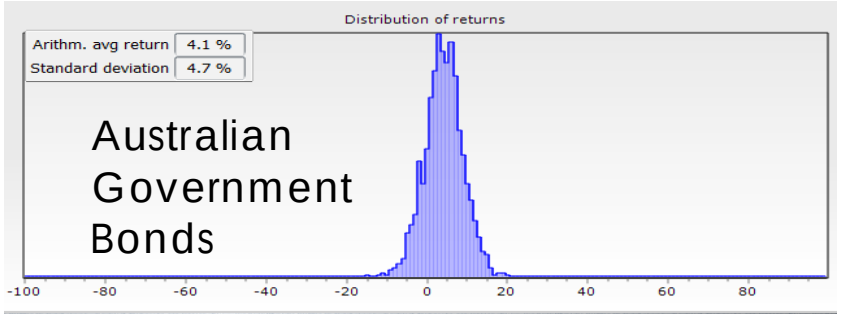
- Don't survive for a long time
- Live to life expectancy
- 1 gets seriously ill and both live past 95
- At least 1 survives past age 105

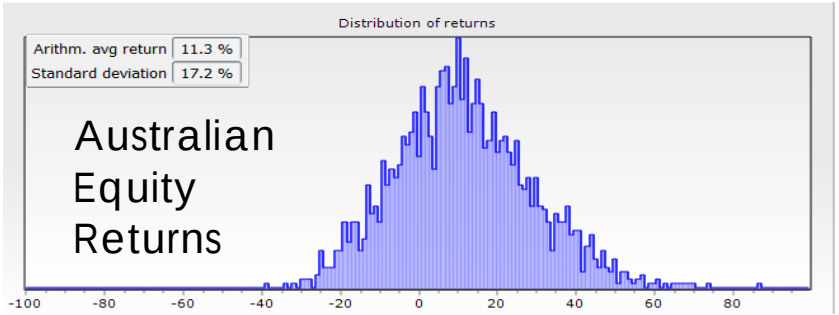
Stochastically simulate investment returns

Investment scenarios









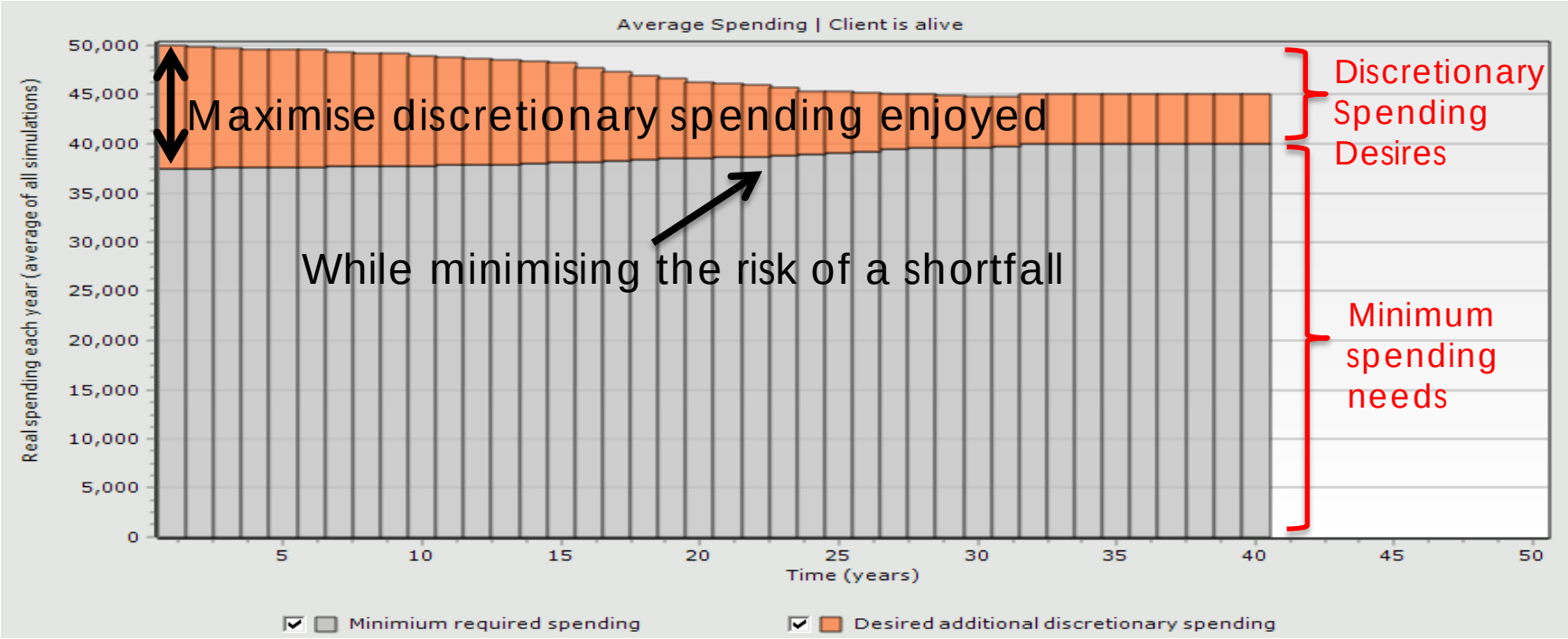
Mathematical formulation

- Consumption needs/desires:
  - a minimum consumption requirement
  - a desired level of discretionary income
- Consumption varies by health state (Healthy, Sick or Frail)
- The retiree has 4 decisions each year
  1. Investment strategy
  2. Consumption strategy
  3. Purchase post-retirement products
  4. Release of equity from their home

Our goal:
Find the strategy that *maximises*
- the amount a retiree can spend on discretionary items

whilst *minimising*
- the risk of ruin,
- short term risk of capital loss, and
- consumption volatility

Graphical representation



Approach used

Select a consumption, investment and product purchase **strategy**.

Then analyse how the strategy performs, given the (**probability weighted**) range of events that could happen to a retiree

Repeat this process until we find a strategy that best meets the retirees needs

Investment scenarios

Range of demographic events that can occur

Classes of strategies

1. **Static**
   - e.g. Maintain current investment strategy and consume 100% of discretionary desires p.a.
   - Allocate 40% of super/non-super assets to growth asset classes
2. **Time varying**
   - e.g. Reduce growth allocation over time, reduce discretionary spending % over time, slowly purchase an annuity from age 75
3. **Wealth varying**
   - Spend such that one's personal funding level remains at 100%
   - Sell your personal home once one's funding level falls below a threshold
4. **Adaptive**
   - Respond to conditions as they unfold by varying growth allocation and consumption as time (age) rises and funding levels change

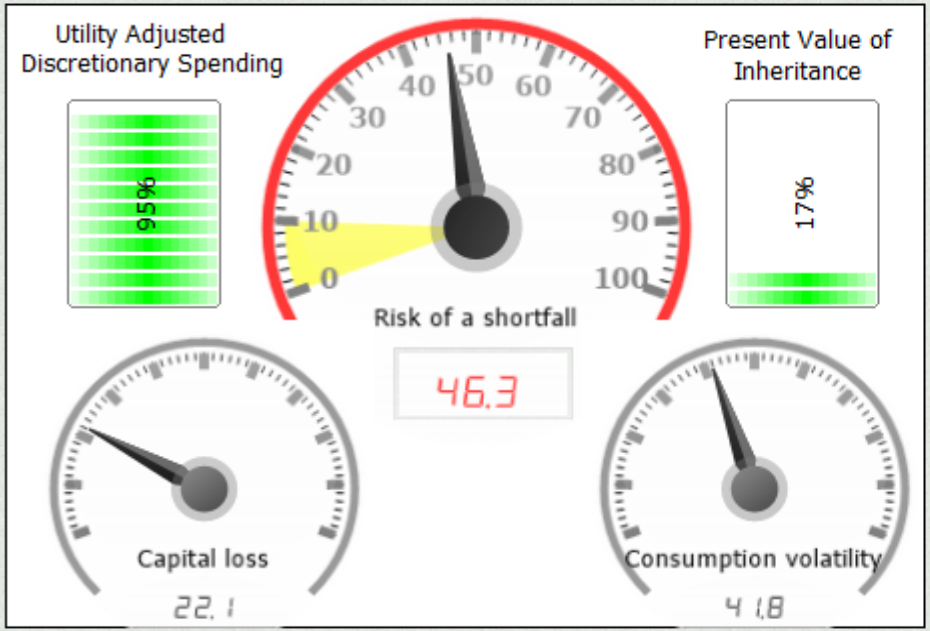
Computational Challenge

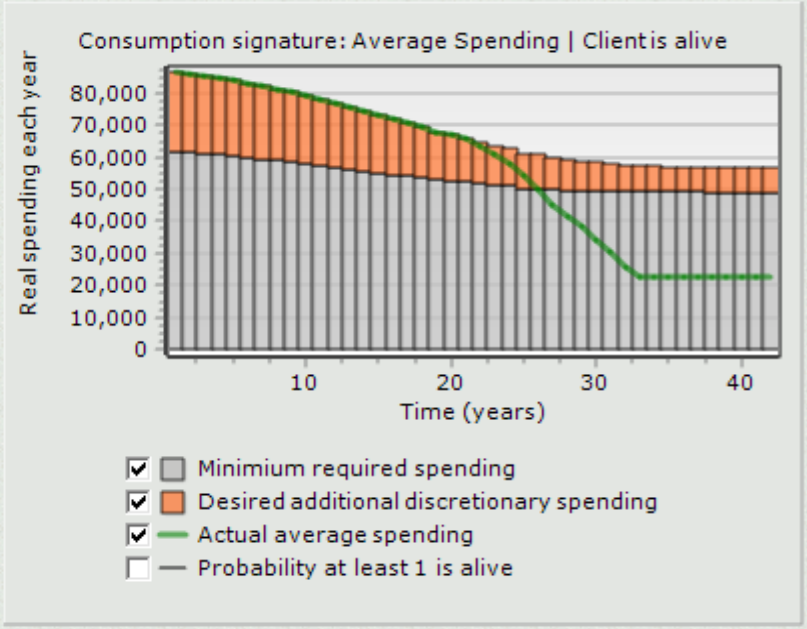
- 1,000 stochastic demographic simulations
- 2,000 investment simulations per year
- Over 50 years
- ~1,000 calculations p.a. (age pension, tax, rebalancing)
  - 100,000,000,000 calculations per strategy tested

    or 10E10 calculations
- To test all practical consumption, investment and product purchase strategies would require 10E24 calculations

Dashboards and Objective Function

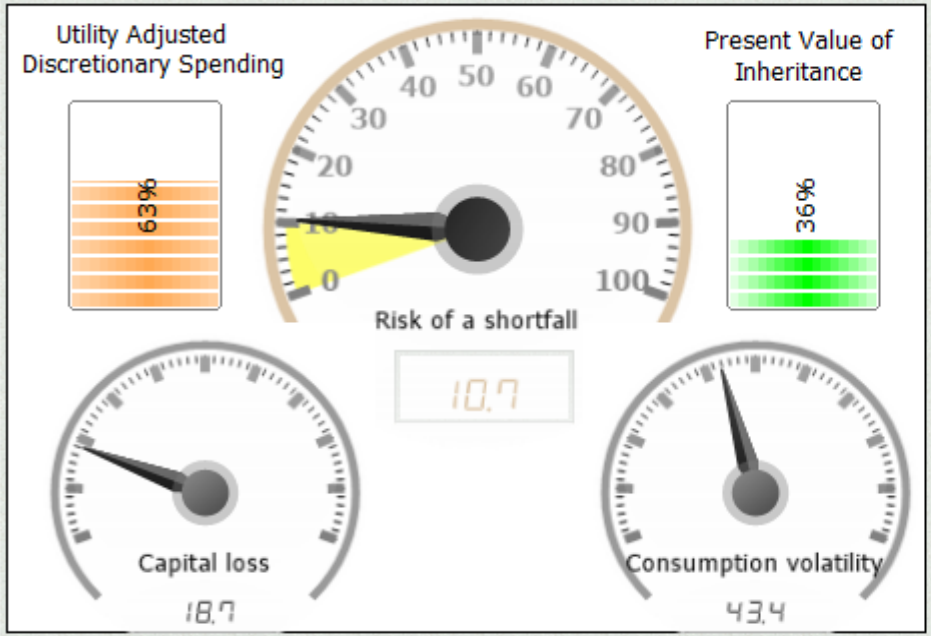
Results: maintain current investment strategy and the couple consumes all their discretionary desires

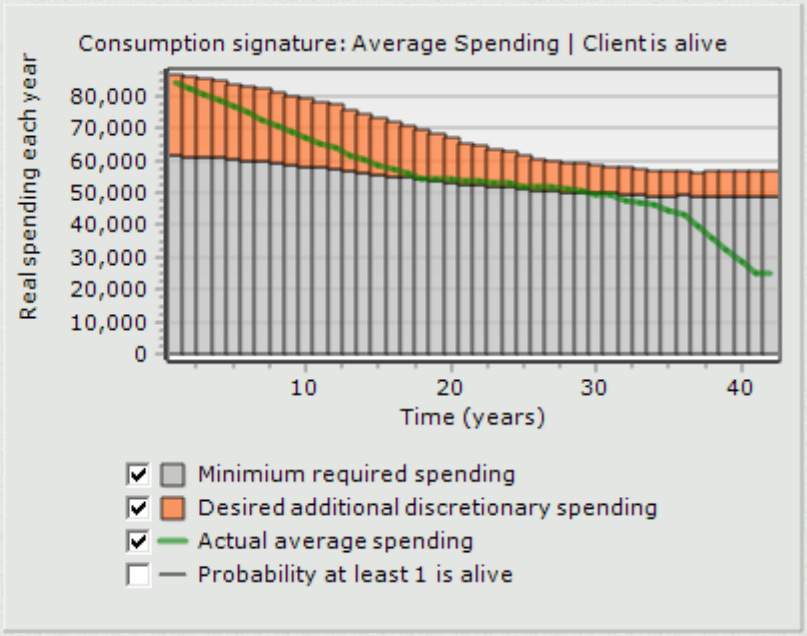




Impact of reducing consumption

Another strategy: Consume 90% of discretionary desires, reducing by 5% p.a., and maintain the investment strategy





SOFTWARE DEMONSTRATION

Conclusions

- The standard approach of using:
  - –risk tolerance questionnaires which map onto model portfolios
  - –expected (deterministic) returns for each asset class
  - –assuming clients live to their life expectancy

  Results in a finding that may be overly optimistic, as tail risks are ignored
- Similarly simplistic rules (like the 4% rule) tend to be overly pessimistic
- In general, the selection of a consumption strategy is far more important than the chosen investment strategy
- It's crucial for retirees to understand the trade-off and tension between their consumption/investment strategy and the risk of a shortfall

QUESTIONS