

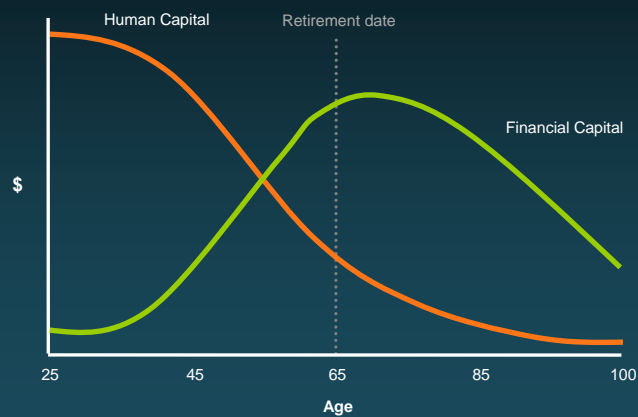




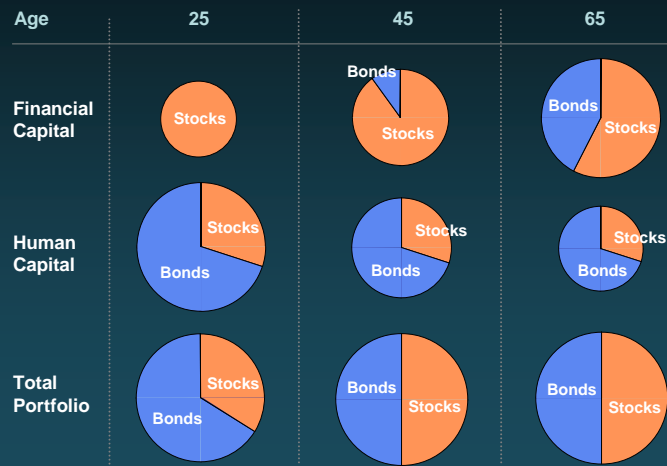
### Accumulation Stage: Asset Allocation, Life Insurance, and Human Capital

- Human capital is the actuarial net present value of future earnings
- Takes into account an investor's
  - Income
  - Savings
  - DB income
  - Social Security

### Typical Life Cycle of Human Capital and Financial Capital



## Accumulation Stage: Financial Capital & Human Capital



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## Human capital, Life Insurance, and Asset Allocation

- Life insurance modeling
  - Human capital (future income)
  - Current financial wealth
  - Preference for family well being
  - Risk tolerance
- Asset allocation modeling
  - Risk tolerance
  - Risk and return
  - Human capital & financial capital
- Correlation between income and market environment

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## Case Profile

Age :	45
Retirement age:	65
Gender:	Male
Financial wealth:	\$500,000
Real income:	\$50,000
Consumption:	\$45,000
Future Social Security Benefit:	\$10,000
Real income growth rate and Standard deviation :	0%; 5%
Income Correlation:	0.5
<small>(Income Growth Rate and Risky Asset Return)</small>	

Other inputs are insurance loading 12.5%, moderate preference for family well being, moderates bequest, and moderate risk tolerance

## Risk, Return and Inflation 1926-2003

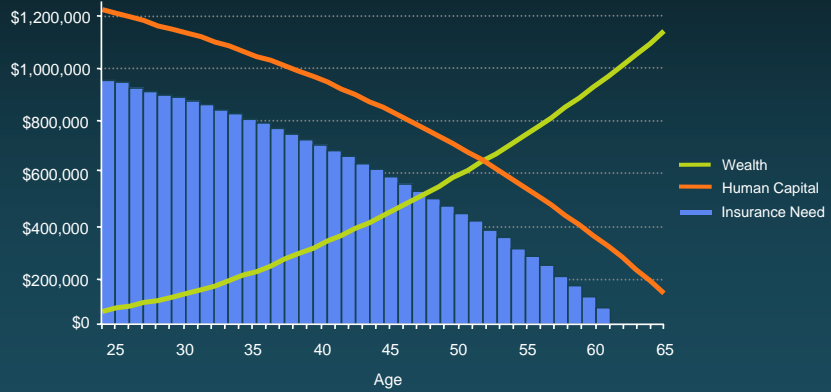
- Equity (S&P 500 total return index)
 

Expected return:	10.4%
Standard deviation:	20.4%
- Bond (Long-term government bond)
 

Expected return:	5.4%
Standard deviation:	9.4%
- Inflation rate 3.0%

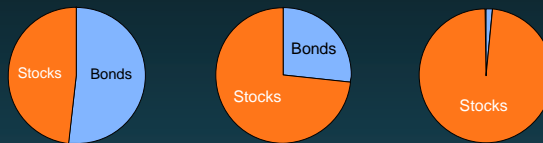
## Life Cycle of Human Capital

Financial Wealth, Human Capital, and Life Insurance

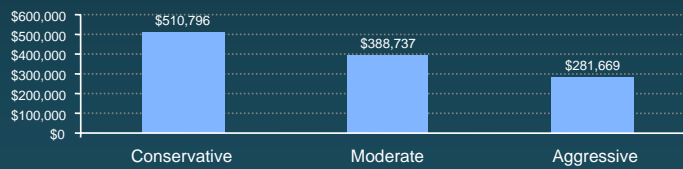


## Risk Tolerance vs. Asset Allocation and Life Insurance Need

Asset Allocation vs. Risk Tolerance



Insurance Need vs. Risk Tolerance



## Life Insurance Needs

- Higher risk aversion → Less risky assets  
→ More insurance
- Higher initial wealth → Less risky assets  
→ Less Insurance
- Higher correlation → Little impact on AA  
between income and investment returns → Less Insurance
- Older → Less risky assets  
→ Less Insurance

## Term vs Whole Life Insurance

- Term Life Insurance (shorter horizon, low tax bracket)
- Whole Life or Variable Life (long horizon, high tax bracket)
- Life Insurance can also be used to reduce estate taxes

## Managing Risks at Different Life Stages

Age 25 65 100



### Retirement Income

- Market Risk → Asset Allocation
- Longevity Risk → Annuities
- Bequest → Life Insurance

## Asset Allocation with Annuities\*

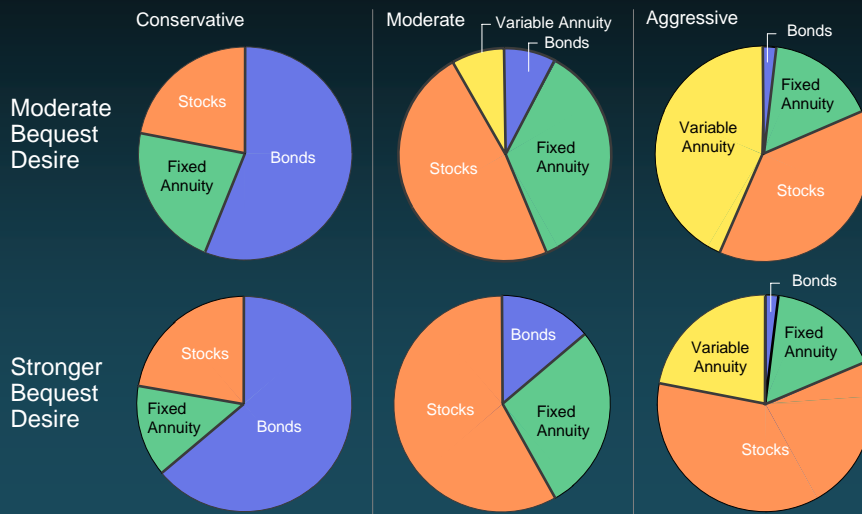
- Mix Between Assets and Annuity Products
  - Income and bequest goals
  - Market and longevity risk
- Optimization with Annuities and Asset Classes

\*Patent Pending

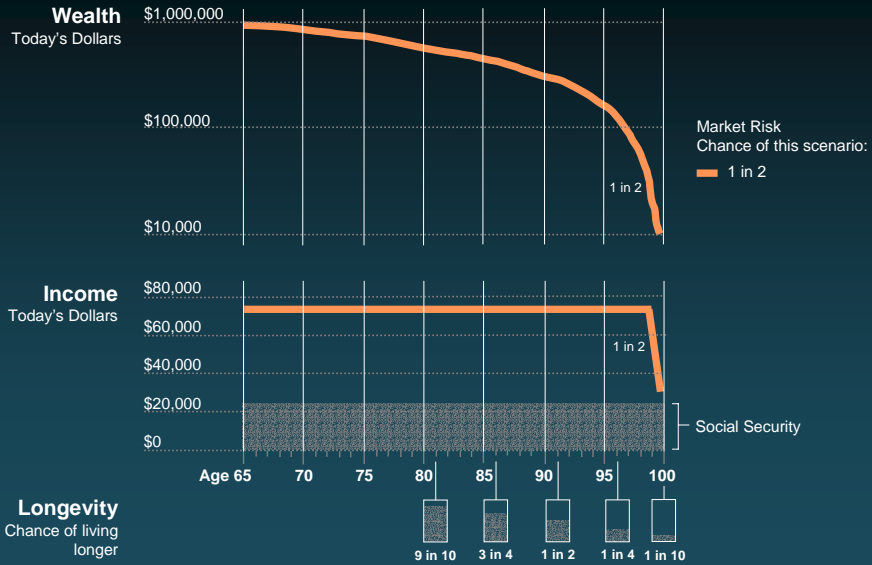
### Inputs to Optimization with Annuities and Asset Classes

- Risks & Returns
- Risk Tolerance
- Desires for Consumption & Bequest
- Probability of Living Beyond Life Expectancy
- Expenses & Fees

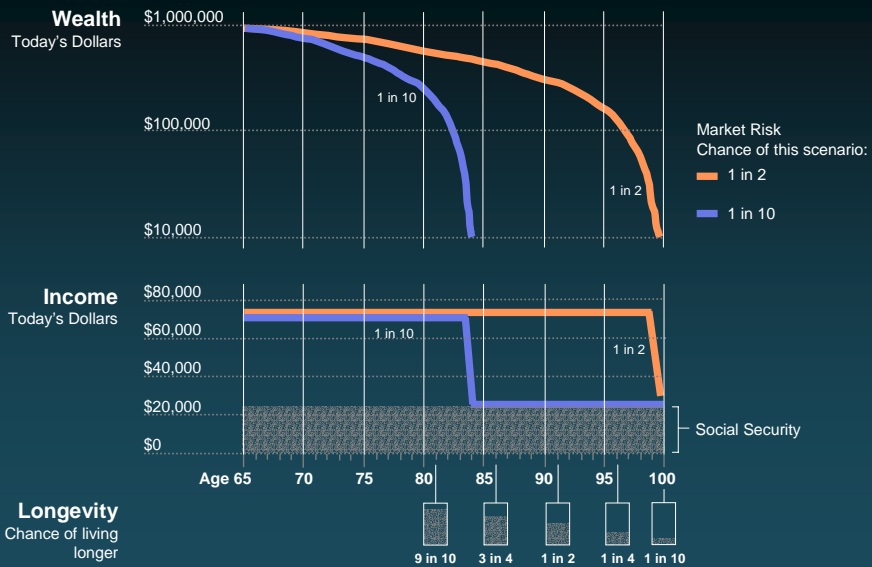
### Couple at 65 - Including Annuities



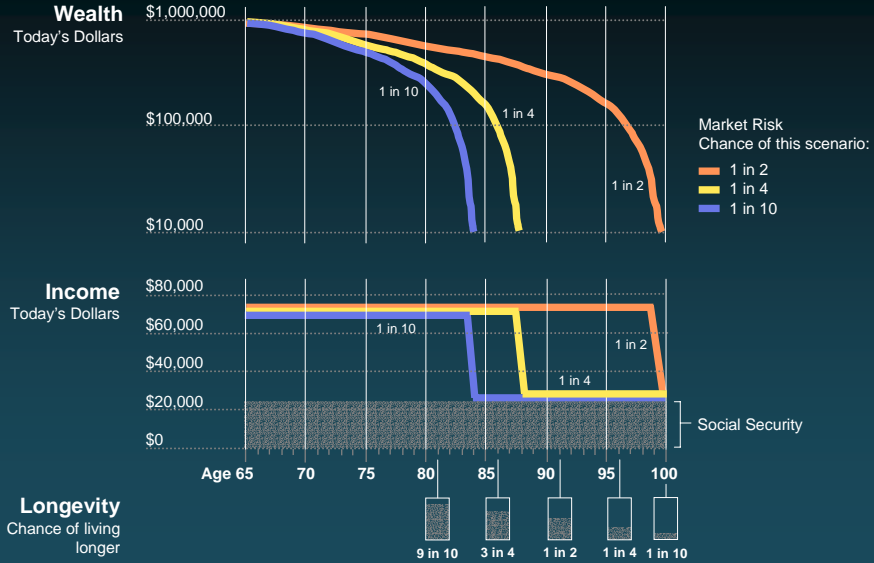
### Couple at 65 - No Annuities



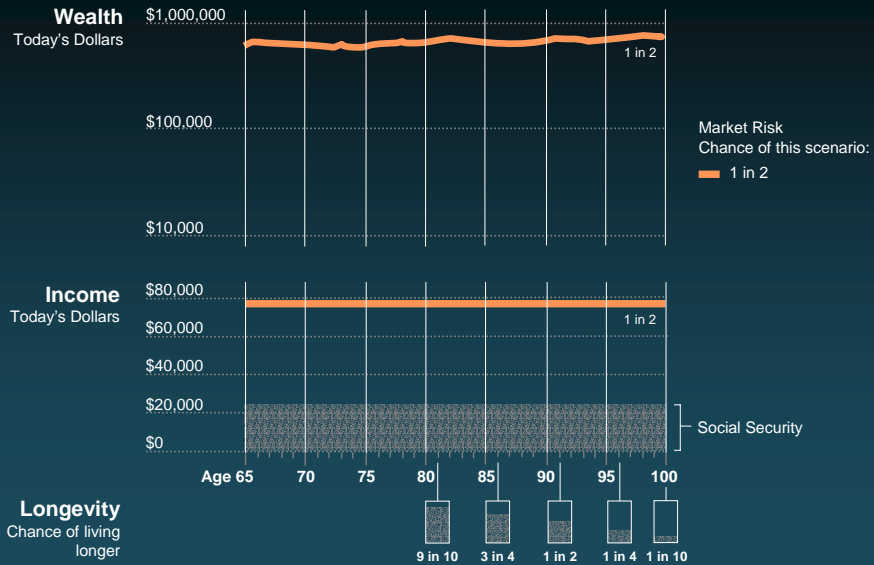
### Couple at 65 - No Annuities



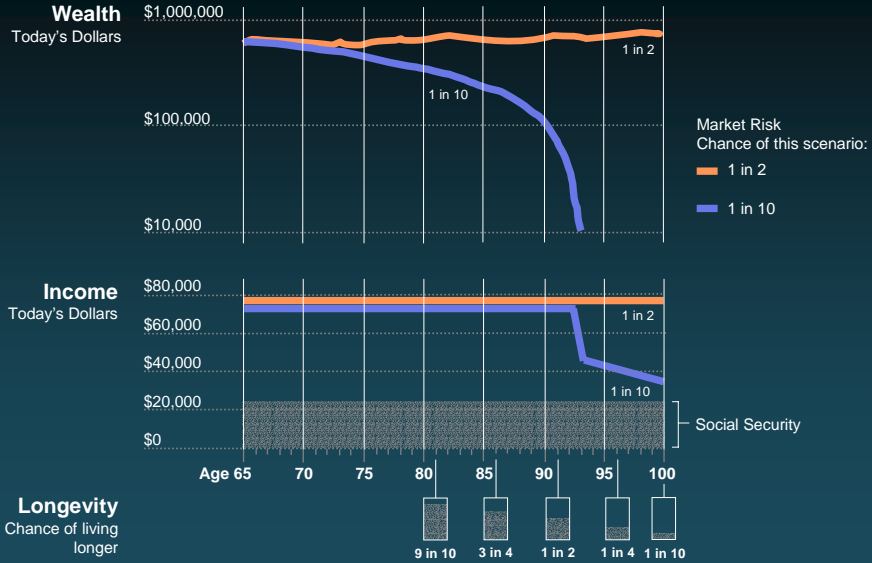
### Couple at 65 - No Annuities



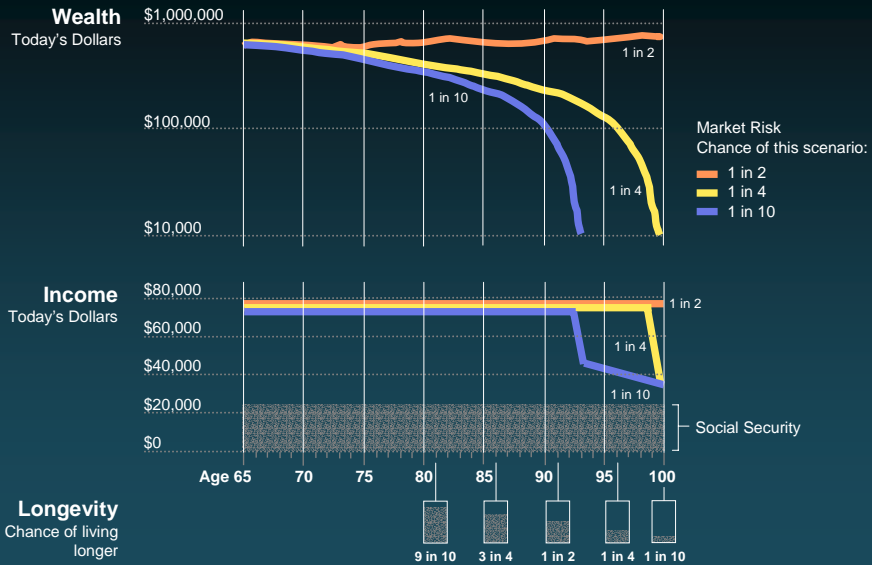
### Couple at 65 - Including Annuities (moderate bequest)



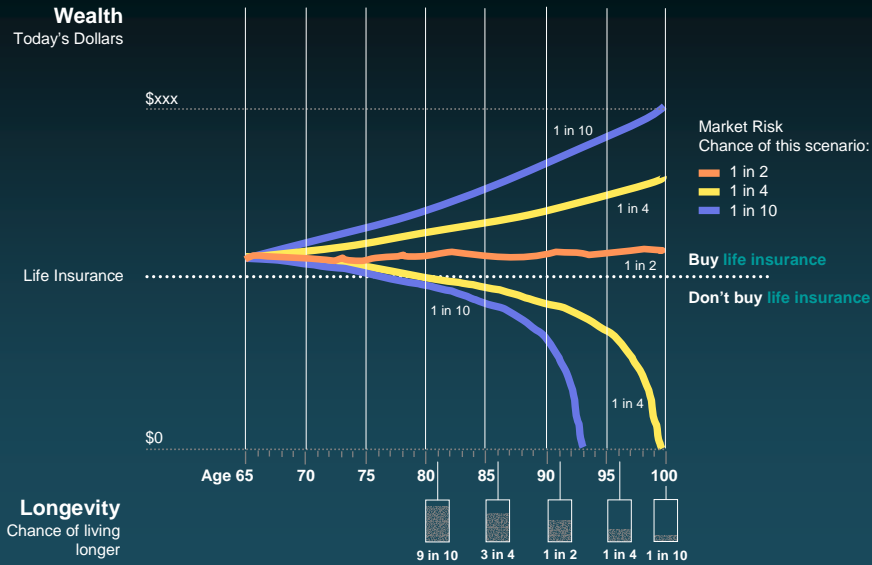
### Couple at 65 - Including Annuities (moderate bequest)



### Couple at 65 - Including Annuities (moderate bequest)



## Couple at 65 - Including Annuities (moderate bequest)



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## Summary

- Accumulation Stage (25-65)
  - Market risk, mortality risk, & savings
  - Asset allocation, life insurance, & savings rates
- Retirement Stage (65-100)
  - Market risk, longevity risk, & bequest
  - Asset allocation, annuities, & life insurance
- Financial Models Provide Lifetime Advice
  - Optimal allocations across all products
  - Human & financial capital, risk & returns, correlations, and risk tolerance

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