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How long does savings last when retirees need more money (or less) than conventional wisdom suggests?

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How Long Does Savings Last When Retirees Need More Money (or Less) than Theory Suggests?

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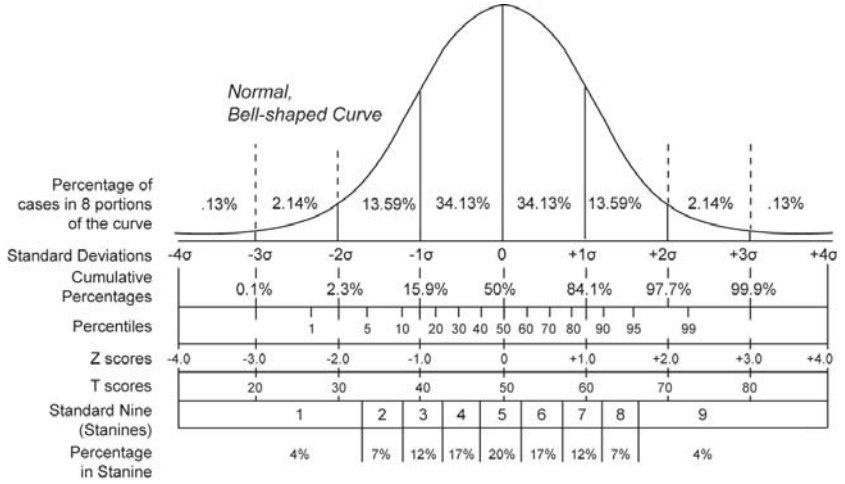
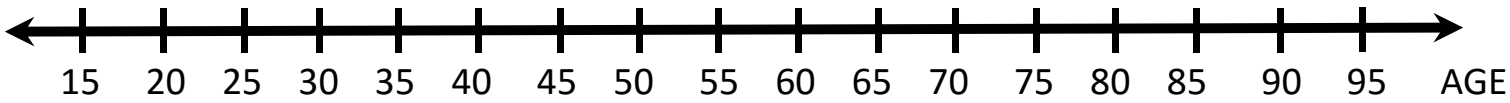
Retiree Risk

- Volatility of investment risk
  - Standard deviation of returns
  - Statistical measurement, academic



- Longevity risk
  - Hard to quantify
  - Not academic

Longevity Risk and Human/Financial Capital



Greater Human Capital

Greater Financial Capital

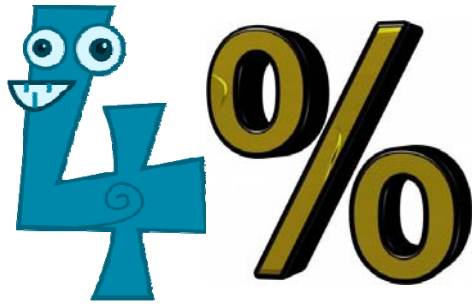
- Life Cycle and the risk/return trade-off
  - *Younger investors*
    - Willing to bear more risk for higher returns
  - *Older investors*
    - Willing to accept lower returns for lower risk

4% Rule Example

- At retirement, you have $1,000,000 in retirement savings
- 1st year of retirement:
  - Withdraw $40,000.00
  - Inflation that year is 2.4%
- 2nd year of retirement:
  - Withdraw $40,000 x 1.024 = $40,960.00
  - Inflation that year is 3.2%
- 3rd year of retirement:
  - Withdraw $40,960 x 1.032 = $42,270.72
  - Continue this procedure indefinitely

The 4% Convention

- Withdraw 4% of retirement funds for the first year of retirement
  - Base withdrawal amount
- Increase the amount annually with inflation
- Savings will normally last for at least 30 years
  - Some exposure to stock is required (40% or more)
- Rule of thumb, very rigid
  - Does not allow for any flexibility
  - Many retirees have unique circumstances
- 4% has been questioned as too high in our low rate environment



More Flexibility

- Withdraw initial amounts varying between 2% and 10%
- Allow for 1 or 2-asset portfolios
  - 10% increments (0-100%)
- Determine how long savings will survive
  - Percentage of portfolios not running out of money
- Check survival rate in 5-year increments
  - 5 years to 40 years
- Use real data from 1934 – 2015

Data

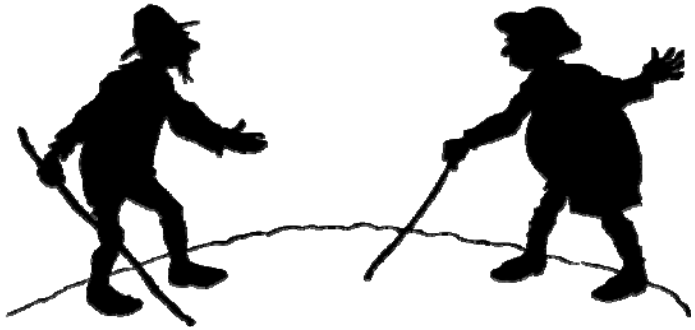
- Small Cap stocks, Midcap stocks, Large cap stocks, T-bonds, T-bills
  - Kenneth French Data Library
  - Federal Reserve Economic Data (FRED)
- Increased withdrawal amount each year using previous year CPI-U
- Data from 1934 – 2015

Methodology

- 1- and 2-asset portfolios of the 5 assets in 10% increments
  - 95 distinct portfolios (e.g. 30% midcaps/70% T-bonds)
- 2 – 10% initial withdrawal amounts
  - Base dollar amount
  - Increased by inflation from previous year
- Rolling 5-, 10-, 15-, 20-, 25-, 30-, 35-, and 40-year periods
  - 78, 73, 68, 63, 58, 53, 48, and 43 rolling periods (1934-2015)
- Determine survival rate
  - Percentage of rolling periods that do not run out of money
- Taxes not considered

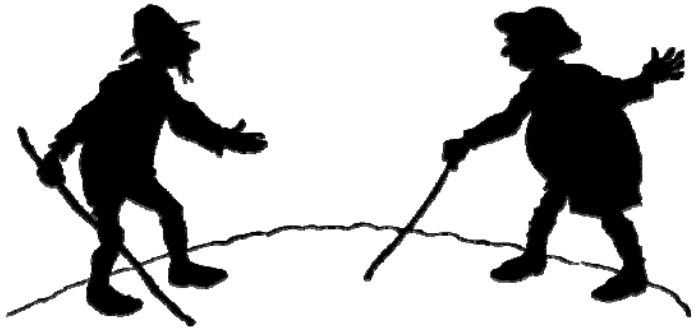
Correlation Matrix

Asset	SmCap	MidCap	LgCap	10yTBond	TBill(Cash)
SmCap	1.0000				
MidCap	0.9309	1.0000			
LgCap	0.8081	0.9467	1.0000		
10yTBond	-0.1978	-0.1143	-0.0557	1.0000	
TBill(Cash)	-0.1413	-0.0901	-0.0470	0.2864	1.0000



Descriptive Statistics

Asset	E(R)	STD. DEV.	CV	SHARPE
SmCap	20.47%	34.99%	1.7091	0.4833
MidCap	15.46%	24.11%	1.5591	0.4936
LgCap	13.01%	19.20%	1.4751	0.4923
10yTBond	5.40%	8.23%	1.5238	0.2233
TBill(Cash)	3.56%	3.15%	0.8837	0.0000



Best Risk-Return (Highest Sharpe) Survival

- 7 (of 95) Portfolios had Sharpe Ratios of >0.5500
- Best was 30% Small Cap, 70% T-bonds (0.5818)
  - E(r) = 9.92% over the 82-year period
- 2-3% withdrawal rates: nearly 100% survival
- 4% withdrawal rate: Acceptable survival at 40 years (95%)
- 5% withdrawal rate: Acceptable survival at 30 years (89%)
- 6% withdrawal rate: Acceptable survival at 20 years (89%)
- 7-10% withdrawal rates: Acceptable only at <= 10 years

2% Withdrawal Rate Survival

- Everything survives for 40 years except combinations of T-bonds and T-bills
- Combinations of T-bonds and T-bills have some probability of failing after 30 years
- Any combination with at least 10% stock survives for the entire period
- No need for a financial advisor for this one
  - If your only goal is to be sure your money survives

3% Withdrawal Rate Survival

- 100% chance of 25-year survival with at least 10% invested in stocks (any-cap)
- 89% chance or greater of 30-, 35-, and 40-year survival with at least 10% invested in stocks
- Some portfolio combinations survived for 40 years
- Not likely to run out of money if you only need 2-3% initial withdrawal rate from your retirement savings

4% Withdrawal Rate Survival

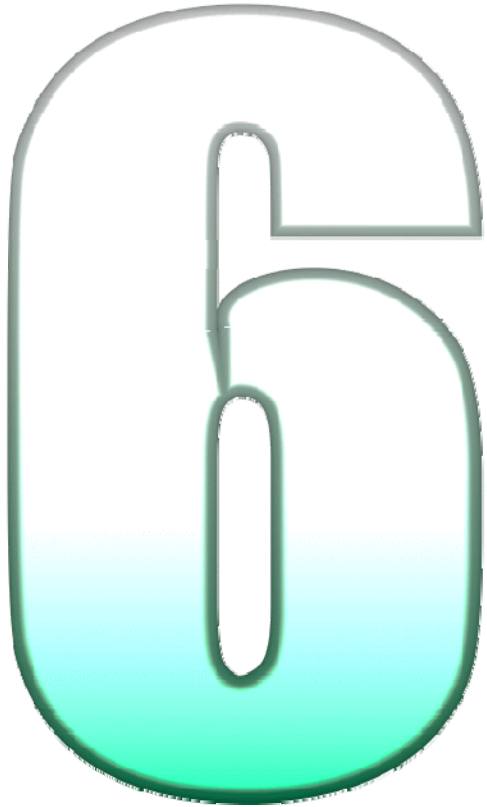
- This is the conventionally recommended rate
- 4 portfolio combinations that survive for 30 years 100% of the time
  - 30-40% small cap stocks, 70-60% T-bills
  - 30-40% midcap stocks, 70-60% T-bills
- No 100% guarantees at 35- or 40-year horizons
- Stocks are necessary to include in retirement portfolio if 4% or more initial withdrawal rate is desired and assets expected to last for more than 20 years
- If retirement savings survival of 30 or more years is required, the 4% convention seems to reflect reality

5% Withdrawal Rate Survival

- Survival rates with withdrawal rates ≥ 5% get more complex
- Some 100% survival rates at 15-year horizon
- Many >90% survival rates at 20-year horizon
- Some portfolio combinations had >90% survival rates for 25-, 30-, 35-, and 40-year horizons
  - 70% small cap stocks / 30% T-bonds survived for 40 years 95% of the time
- Many all-stock portfolios survive longer than those with bonds, but some portfolios with bonds did well

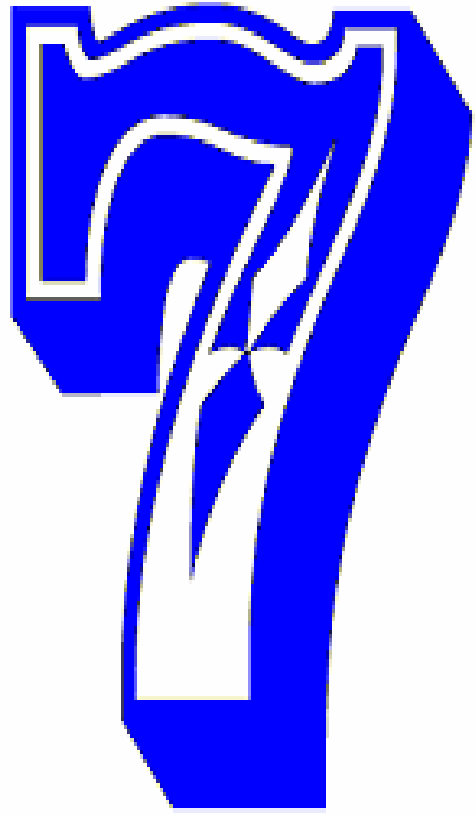
6% Withdrawal Rate Survival

- Stock component is necessary for an acceptable probability of a >20 year survival rate
  - All-bond combinations survived <30% of the time
- Best combinations
  - 20 Years: 60% SmCap/40% T-bonds (97%)
  - 25 Years: 80% SmCap/20% T-bonds, or
    90% SmCap/10% T-bills (95%)
  - 30 Years: 90% SmCap/10% T-bonds or T-bills (93%)
  - 35 Years: 90% SmCap/10% T-bonds (92%)
  - 40 Years: 80-100% SmCap/0-20% T-bonds or T-bills (88%)
    - 5 Combinations

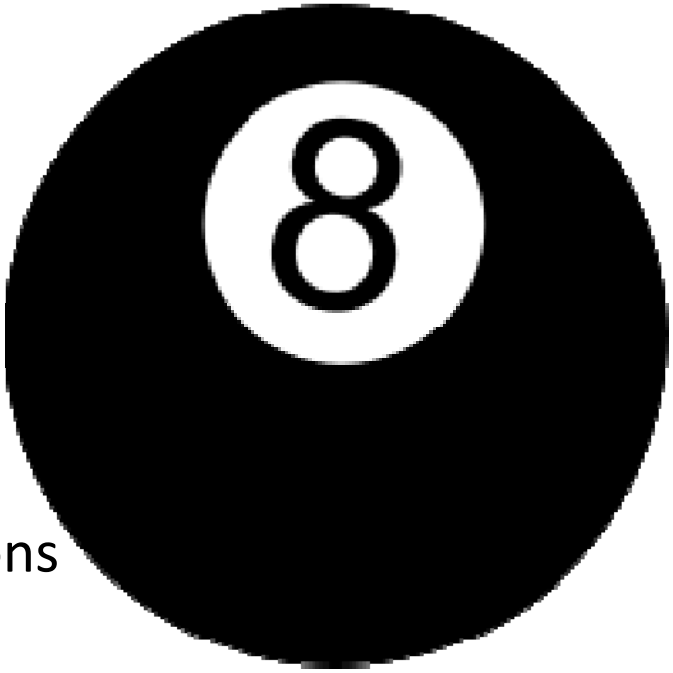


7% Withdrawal Rate Survival

- Many 15-year survival rates are good (>90%)
- The best 20-, 25-, 30-, and 35-year survival rates are 80-90%, which is starting to get risky
  - All of the best survival rates had allocations to small cap stocks of at least 50%, but mostly higher
- The best 40-year survival rate was 79%
  - All had a 60-100% allocation to small cap stocks
- Portfolios with large portions of bonds and bills rarely survived 15 years



8% Withdrawal Rate Survival



- 10-year survival rates are mostly good (>90%)
- 15 and 20-year survival rates may be acceptable (>85%) for the best portfolio combinations
- Survival rates for portfolio combinations with horizons of 25 years or more are only around 80% (+/- 3%)
  - 25 Years: 80% SmCap/20% Large Caps (83%)
  - 30 Years: 90% SmCap/10% Midcaps or Large caps (77%)
  - 35 Years: 100% SmCap; or 90% SmCap/10% T-bills (79%)
  - 40 Years: 100% SmCap (79%)

9% Withdrawal Rate Survival

- No portfolios had 100% survival rates at 10 years
  - Best combinations at 10 years: 30-50% small cap stocks combined with 70-50% T-bills
    - Survived 95% of the time and included a large chunk of T-bills
    - Relatively short time horizon
- Best portfolio combinations at other time horizons:
  - 15 years: 50-80% SmCap/20-50% other stocks or T-bonds (85%)
  - 20 years: 70% SmCap/30% Large Caps (79%)
  - 25 years: 100% Small Cap stocks (71%)
  - 30, 35, and 40 years: 90-100% SmCap/0-10% Midcap or LargeCap (64-65%)
    - 80% small caps and 20% midcaps also tied for best at 35 years
- Consider delaying retirement if horizon >15 years

10% Withdrawal Rate Survival

- Not all 5-year horizons survived (but almost all)
- 10- and 15-year horizons may be acceptable
  - Best survival rates are 89% for 10 years and 79% for 15 years
  - 40-70% SmCap/60-30% T-bonds (best 10-year portfolios)
  - 90% SmCap/10% LargeCap (best 15-year portfolio)
- Survival rates for portfolios of 20 years or more were all lower than 2/3 chance of survival
  - 1 in 3 chance of failure
  - All of the best portfolios had large allocations to small cap stocks
- NOT recommended for horizons longer than 10 years under normal circumstances, or 15 years under extraordinary circumstances

General Recommendations

- If you only need 2-4% withdrawal rate, your unlikely to run out of money as long as you have some allocation to stocks
- For 5-6% withdrawal rates, a significant allocation to stocks is necessary if you time horizon is longer than 15 years
- For 7-10% withdrawal rates, a delayed retirement is a good option if possible. If not, careful allocations and high tolerance to risk (volatility of returns) are necessary for longer time horizons
- Small cap stocks are important in all of the higher withdrawal rates
  - A combination of a small cap ETF and microcap ETF would approximately replicate this portfolio
- Retirees must balance the risk of investment volatility with the risk of running out of money too soon

Caveat & Future Directions

- This study shows past performance and survival rates
  - The future may be different... However...
    - Never underestimate the past

Future Avenues of Research (Things I didn't do)

1. Increase the potential portfolio choices to include three-, four-, or five-asset portfolios.
2. Include international assets, corporate bonds, and/or high-yield bonds as potential choices for the portfolio.
3. Look at variable withdrawal scenarios, including increasing withdrawal rates and declining withdrawal rates throughout retirement.

Thank you!