Your Winning Retirement Plan
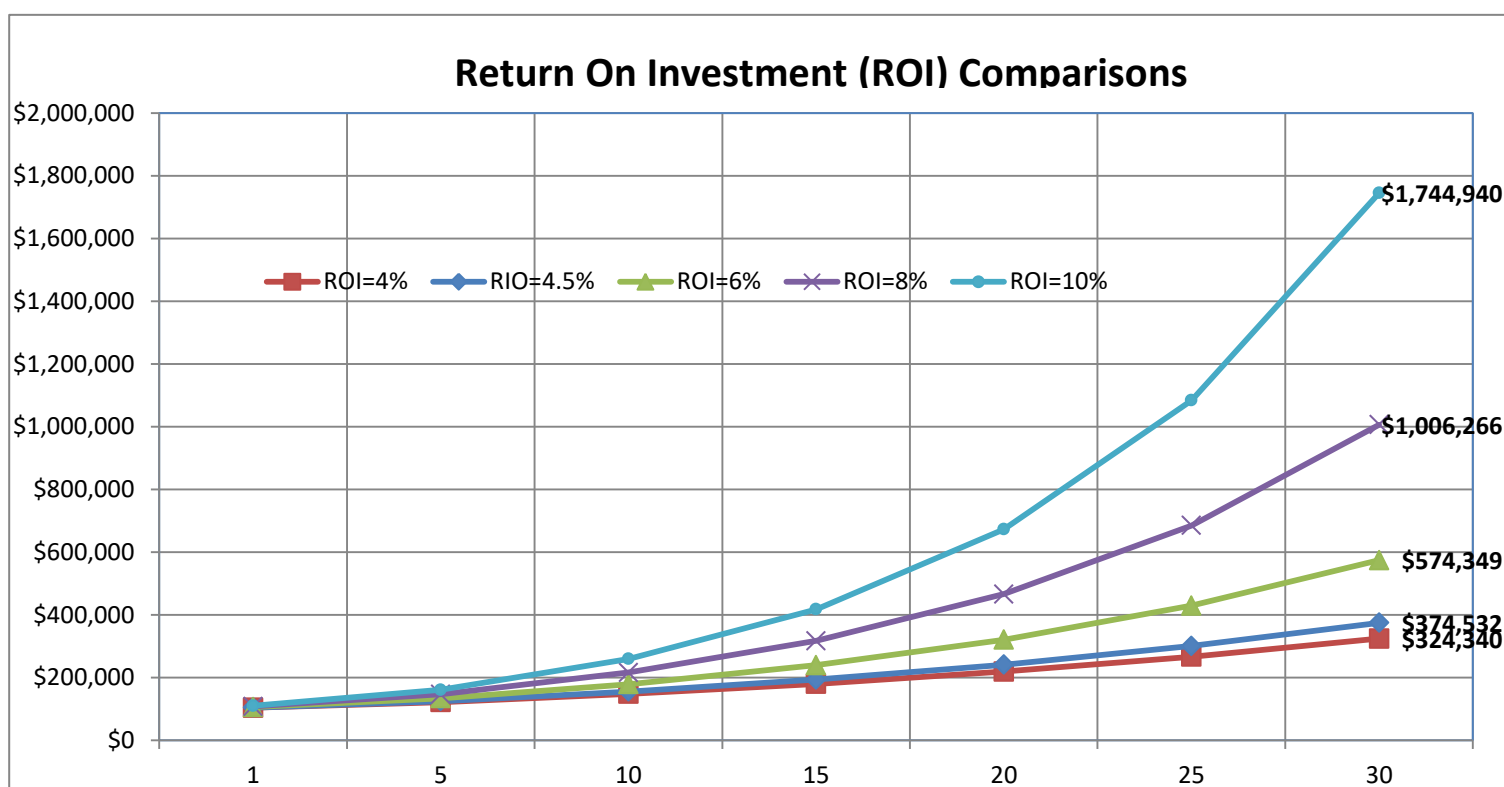Henry K. Hebeler

Chapter 4: Return on Investments

Return on investment (return) is probably the single most important input in calculating future value of your retirement savings and determining how long your assets will last. Small changes to this value can have a dis-proportional impact on calculations so it is vital that the value assigned to the return is accurate as possible.

Return on Investment Comparisons

| Line	Annualized ROI	Initial Value	ROI	Year						
				1	5	10	15	20	25	30
1	4% per year	$100,000	4.0%	$104,000	$121,665	$148,024	$180,094	$219,112	$266,584	**$324,340**
2	4.5% per year	$100,000	4.5%	$104,500	$124,618	$155,297	$193,528	$241,171	$300,543	**$374,532**
3	6% per year	$100,000	6.0%	$106,000	$133,823	$179,085	$239,656	$320,714	$429,187	**$574,349**
4	8% per year	$100,000	8.0%	$108,000	$146,933	$215,892	$317,217	$466,096	$684,848	**$1,006,266**
5	10% per year	$100,000	10.0%	$110,000	$161,051	$259,374	$417,725	$672,750	$1,083,471	**$1,744,940**

Return On Investment (ROI) Comparisons

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Chapter Summary

This chapter is focused on the concept of Return on Investment (ROI) aka Returns. This may be the single most important input in your retirement planning and execution, so it is vital you understand how it works and how important it is to try to get as accurate measure and estimate of this value to be used in your calculations. This chapter also covers how to measure performance of your investments to determine if a new strategy is in order.
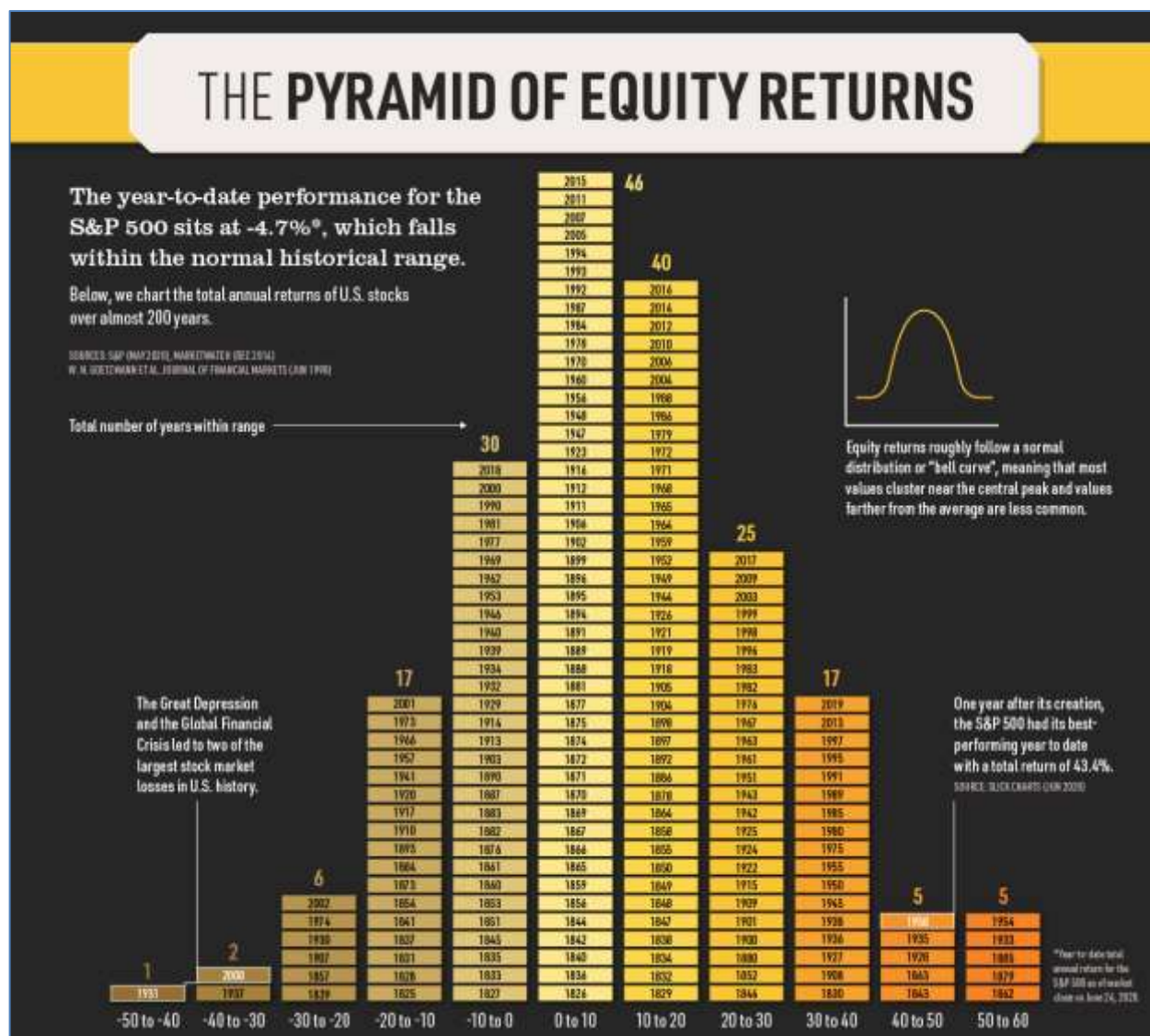
References and Resources

- CalculatorSoup: Investment Calculator
  - Future Value Formula Derivation
- Calculator.net: Return on Investment (ROI) Calculator
- Macrotrends: Stock Indexes Charts and data
- Historic Stock Market Performance Chart - almost 200 years
- Investopedia: Bucket Strategy vs Systematic Withdrawals: Knowing the Difference

Terms and Concepts

- Dollar Cost Averaging – An investment strategy in which an investor purchases a fixed dollar amount of stock at set interval over a period of time. As the price of the stock may vary over time the number of shares that are purchased with the same dollar amount will vary. Ultimately this technique tends to provide the investor with slightly better returns than the overall average performance of the stock over the period of time.

- Inflation Adjusted Returns – Return on Investment that takes into account Inflation. Also known as Real Return.

- Real Return – Return on Investment that takes into account Inflation. Also known as Inflation Adjusted Returns.

- Return on Investment ROI – aka Return; The growth realized on an investment over a period of time.

- Reverse Dollar Cost Averaging – The process of liquidating a set dollar amount of shares at regular intervals over a period of time. This is typically performed in retirement for income. The problem with this technique is that as the price of shares varies, the number of shares required to obtain the same amount of funds from the sale will change. This has the exact opposite result of Dollar Cost Averaging, where this technique will lead to slightly lower performance of stock over time since more shares are sold when the price of the stock is at a lower price.

What is Return on Investment?

Return on Investment (return) is the same as the growth of an investment. Performance of funds and other financial instruments often quote the Return on Investment aka ROI over a given time period. It is important to remember the value supplied represents accumulated return over the time period as opposed to representing the actual variations year to year of that investment. Calculating the ROI for an investment is easily done using an online calculator where the initial amount, length of time and final value is input, the ROI is calculated.

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Calculating a Return – Historic returns for a given year is performed in this book on a yearly basis:

$$(Return\ of\ Investment) = \frac{(Year\ end\ balance) - (Start\ of\ year\ balance)}{(Start\ of\ year\ balance)}$$

Return values provided in this book are calculated for each year using the above equation; this does not represent the compounded rate of returns over a time period of more than one year. Further adjustments to the returns are made to incorporate the inflation for the year in question. Furthermore, these calculations include all dividends and interest that may be realized over the year.

Are Your Investments Good Choices or Dogs?

Utilize the equation below to get a rough estimate of your Return on Investment for a given year. This equation takes into account deposits and withdraws.

$$(Actual\ Return\ of\ Investment) = \frac{(Year\ end\ balance) - (Start\ of\ year\ balance) - Deposits + Withdraws}{(Start\ of\ year\ balance) + (0.5 * Deposits) - (0.5 * Withdrawals)}$$

Use the spreadsheet for this chapter for your own calculations. Note that using this equation does not include external cost, for example you may be paying an investment manager a 1% fee from your wages, in such a case you would need to take the calculated return and subtract the fee for the actual performance.

Figure 4.2

Calculate Your Own Return (Figure 4.2)			
Line	**Item**	**Value**	**Comments**
1	Year-end balance		
2	Starting balance		
3	Ending balance divided by starting balance		Line 1 divided by Line 2
4	Deposits		
5	Withdrawals		
6	Net Deposits		Line 4 minus Line 5
7	Net deposits divided by starting balance		Line 6 divided by Line 2
8	**Calculated Return**		Ref Figure 4.3 using Line 3 and Line 7

Figure 4.3

Are Your Returns As High As They Should Be?

Row 3 from Figure 4.2	Net Deposits Divided by Initial Balance (Row 7 from Figure 4.2)															
	-0.10	-0.08	-0.06	-0.04	-0.02	0.00	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
0.70	-19%	-21%	-23%	-25%	-28%	-30%	-32%	-35%	-37%	-40%	-42%	-45%	-47%	-50%	-53%	-56%
0.73	-16%	-18%	-20%	-22%	-24%	-27%	-29%	-31%	-34%	-36%	-39%	-41%	-44%	-46%	-49%	-52%
0.77	-13%	-15%	-17%	-19%	-21%	-23%	-26%	-28%	-30%	-33%	-35%	-38%	-40%	-43%	-45%	-48%
0.80	-10%	-12%	-14%	-16%	-18%	-20%	-22%	-24%	-27%	-29%	-32%	-34%	-37%	-39%	-42%	-44%
0.83	-6%	-8%	-10%	-12%	-15%	-17%	-19%	-21%	-23%	-26%	-28%	-30%	-33%	-36%	-38%	-41%
0.87	-3%	-5%	-7%	-9%	-11%	-13%	-15%	-18%	-20%	-22%	-25%	-27%	-29%	-32%	-34%	-37%
0.90	0%	-2%	-4%	-6%	-8%	-10%	-12%	-14%	-16%	-19%	-21%	-23%	-26%	-28%	-31%	-33%
0.93	3%	1%	-1%	-3%	-5%	-7%	-9%	-11%	-13%	-15%	-18%	-20%	-22%	-25%	-27%	-30%
0.97	6%	4%	3%	1%	-1%	-3%	-5%	-7%	-10%	-12%	-14%	-16%	-19%	-21%	-23%	-26%
1.00	10%	8%	6%	4%	2%	0%	-2%	-4%	-6%	-8%	-11%	-13%	-15%	-17%	-20%	-22%
1.03	13%	11%	9%	7%	5%	3%	1%	-1%	-3%	-5%	-7%	-9%	-11%	-14%	-16%	-19%
1.07	16%	14%	12%	10%	9%	7%	5%	3%	1%	-1%	-4%	-6%	-8%	-10%	-12%	-15%
1.10	19%	17%	16%	14%	12%	10%	8%	6%	4%	2%	0%	-2%	-4%	-7%	-9%	-11%
1.13	22%	21%	19%	17%	15%	13%	11%	10%	8%	6%	4%	1%	-1%	-3%	-5%	-7%
1.17	25%	24%	22%	20%	18%	17%	15%	13%	11%	9%	7%	5%	3%	1%	-1%	-4%
1.20	29%	27%	25%	24%	22%	20%	18%	16%	14%	13%	11%	9%	6%	4%	2%	0%
1.23	32%	30%	28%	27%	25%	23%	22%	20%	18%	16%	14%	12%	10%	8%	6%	4%
1.27	35%	33%	32%	30%	28%	27%	25%	23%	21%	19%	18%	16%	14%	12%	10%	7%
1.30	38%	37%	35%	33%	32%	30%	28%	27%	25%	23%	21%	19%	17%	15%	13%	11%
1.33	41%	40%	38%	37%	35%	33%	32%	30%	28%	26%	25%	23%	21%	19%	17%	15%
1.37	44%	43%	41%	40%	38%	37%	35%	33%	32%	30%	28%	26%	24%	22%	21%	19%
1.40	48%	46%	45%	43%	42%	40%	38%	37%	35%	33%	32%	30%	28%	26%	24%	22%

FIGURE 4.3 Find your return for the year.

Using Returns to Give Your Investments a Tune-Up – You should divide up your investments into fixed income and equities. You should then determine your return on both for last year. Compare your results with what the market performed for both categories. If your results differ significantly lower than the market you should consider changes that may be needed to rectify this problem.

Accounting for Inflation: Real Returns – Discussion on how to calculate the Real Return over a period of time. This can be easily done by using the spreadsheet for this chapter in the Figure 4.1 tab.

Figure 4.1

Calculate Real Return Over time (Figure 4.1)			

Line	Item	Value	Comments
1	Starting balance		
2	Number of Years		
3	Yearly Growth		
4	Yearly Inflation Rate		
5	**Real Return** (Inflation Adjusted Returns)		

Using Real Returns in Your Retirement Planning

As mentioned earlier getting the estimate your returns as accurate as possible is vital to a successful retirement plan. One should generally expect returns on investments to be higher before retirement and lower after retirement due to reverse dollar cost and the disproportional influence inflation has on items and serves required in retirement.

Preretirement Returns – Download chapter 4 excel spreadsheet, and utilize the 4.4 tab to calculate your real returns. The following columns need to be filled in:
- Security – You can add additional columns for fine tuning of the types of securities listed.
- Investment Value – Current market value for the identified security.
- Representative Real Returns – Estimated historical values have been provided for some of these columns. Feel free to update for your particular situation, if unique. Historic return
  - Stocks – S&P 500 index historical data used.
  - Bonds – Long term corporate bond rates used.
  - Growth Stocks – Small Stock index used.
  - Money Markets.... – Treasury indexes used.

Figure 4.4

Calculate the Real Return for Your Plan (Figure 4.4)

Line	Security	Investment Value	% of your Investments	Representative Real Returns	Real Return	Comments
1	Stocks			6.7%		
2	Growth Stocks			9.0%		
3	Other Equities					
4	Bonds			2.4%		
5	Other Fixed Income Investments					
6	Money Markets, T-Bills, Short Term CDs, etc.			0.8%		
7	Net deposits divided by starting balance					
8	**Totals**					
9	Estimated Cost (For Funds, brokers, etc.)					
10	Net Real Return					

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Theory versus Reality in Preretirement Planning – Figure 4.6 compares the performance of a 5.7% constant rate of return compared to real world performance starting at 1939 and 1949. This demonstrates how in the real world variations in the stock market can throw off your retirement projections. We see the importance of re-evaluating every year and making adjustments accordingly, it also points out the fact that you can always delay your retirement if needed.
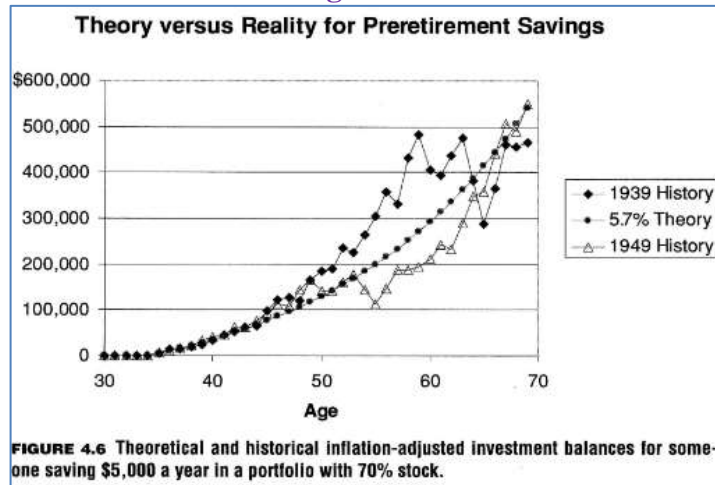
Figure 4.6

FIGURE 4.6 Theoretical and historical inflation-adjusted investment balances for someone saving $5,000 a year in a portfolio with 70% stock.

Figure 4.5

Amount of Stock Largely Determines Real Returns

Stock as % of Investments	Portfolio Description				Long-Term Real Return Excluding Costs
	Large Co. Stock	Growth Co. Stock	Long-Term Corp. Bonds	Treasury Bills	
90%	50%	40%	0.0%	10%	7.0%
80%	50%	30%	10.0%	10%	6.4%
70%	50%	20%	20.0%	10%	5.7%
60%	50%	10%	30.0%	10%	5.1%
50%	50%	0%	40.0%	10%	4.4%
40%	40%		50.0%	10%	4.0%
30%	30%		60.0%	10%	3.5%
20%	20%		70.0%	10%	3.1%
10%	10%		80.0%	10%	2.7%
0%	0%		90.0%	10%	2.3%

FIGURE 4.5 By calculating the percentage of stock in your portfolio, you may find a representative real return listed that you can use for retirement planning. Remember to subtract investment costs before using the real return in your plan.

Remember, this represents percentage of stock representing the overall stock market. If I were to own 90% of a single or basket of individual stocks in my portfolio (systematic risk) my performance could be totally different from what is indicated in this table (ie 100 % of the stock was Enron, I would be bankrupt now, 100% TESLA, I would be a multi millionaire).

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Theory versus Reality in Postretirement Planning – In the figures below we begin have the following initial conditions:
- One million dollars in assets.
- Funds should last until the retiree is 85 years old.
- Allocation of investments is s is 50% stocks, 40% bonds, 10% T bills
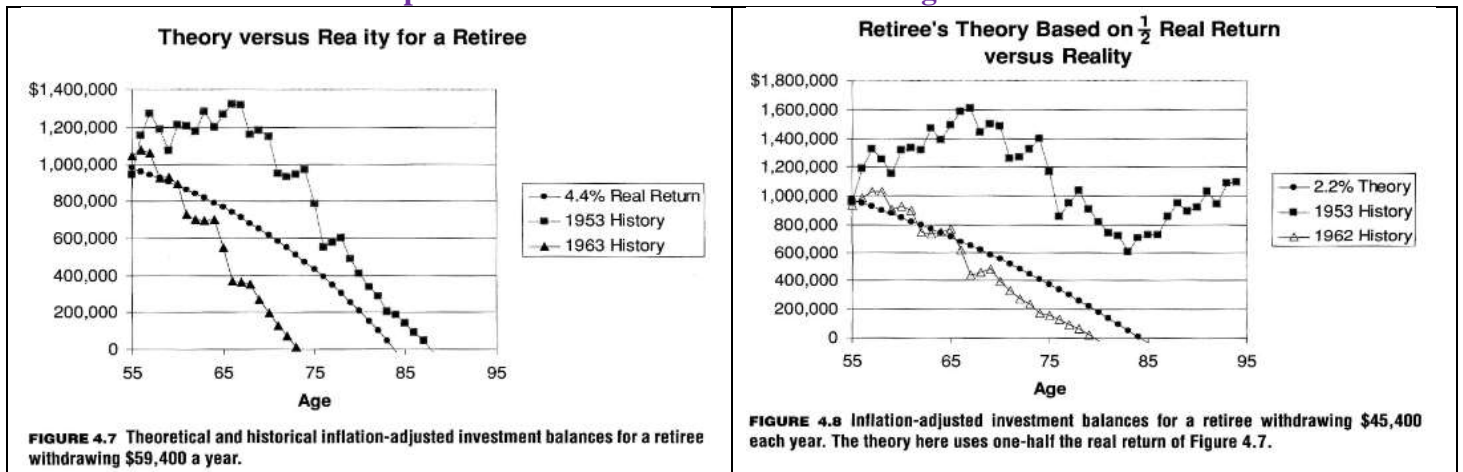
For Figure 4.7 we assume a 4.4% Return and observe:
- The retiree is told they can withdraw $59,400/year for funds to last until they are 85 years old.
- There is a 50% chance of the retiree running out of funds before reaching the age of 85.
- In the 1963 retirement scenario we see the funds run out at age 73, 12 years earlier than the desired age of 85.

For Figure 4.8 we assume a 2.2% Return and observe:
- The retiree is told they can withdraw $45,400/year for funds to last until they are 85 years old.
- There is still a 20% chance of running out of fund before retirement.
- In the 1963 retirement scenario we see the funds run out at age at about 80 years old.
- In the 1953 retirement scenario the retiree never runs out of funds.

Figure 4.7 and Figure 4.8

Impact of Return Estimates on How Long Assets Last

FIGURE 4.7 Theoretical and historical inflation-adjusted investment balances for a retiree withdrawing $59,400 a year.

FIGURE 4.8 Inflation-adjusted investment balances for a retiree withdrawing $45,400 each year. The theory here uses one-half the real return of Figure 4.7.

A few observations to take away from this information:
- Assuming overly optimistic expectations for returns can have disastrous impacts in your retirement.
- Variations in stock market performance or Inflation can also cause devastation.
- An additional mechanism is needed to help the retiree to make adjustments in retirement to help compensate for these risks. This is where life expectancy factor in, this will be handled later in the book.
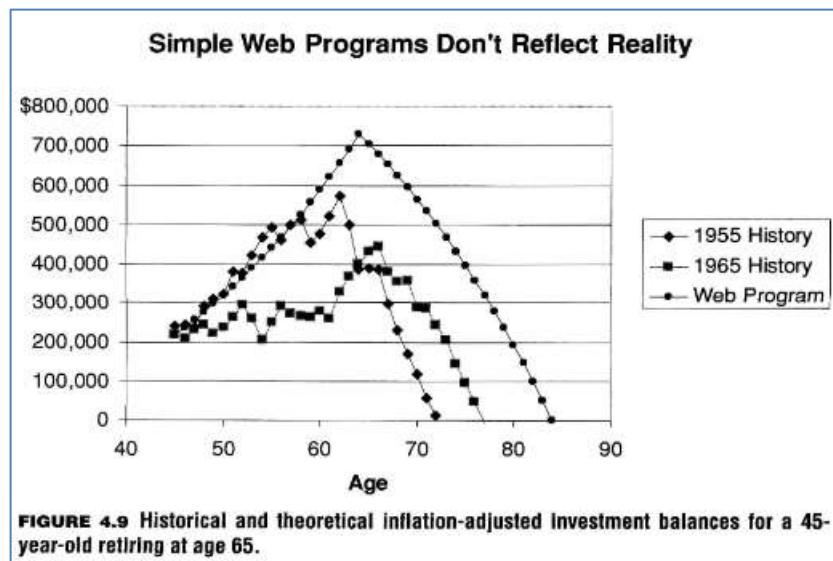
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Using the Web or a Commercial Computer Program? Be Careful! – Most programs are overly optimistic on expected returns, under estimate inflation for retirees, investment fees, forget to account for taxes and don't take into account reverse dollar cost averaging. Finally, the estimates they provide you are based on a based on a 50% probability that you won't run out of funds which means there is a 50% probability that you will run out of funds. Figure 4.9 is an example of a typical program with the typical assumptions:

- Tax deferred accounts.
- $200,000 starting balance at age 45.
- $10,000 contribution each year (Inflation Adjusted).
- A conservative portfolio of 50% Large Caps with 1.5% cost, 40% Long term bonds with 1% cost, 10% Money Markets with 0.3% cost.
- Federal and State taxes of 16%
- 7% Return
- 3% Inflation

Figure 4.9

FIGURE 4.9 Historical and theoretical inflation-adjusted investment balances for a 45-year-old retiring at age 65.

We can see in the program funds reaching $700,000 at retirement of age 65 and dropping to zero at age 85 in a smooth curb. When historic values from 1955 and 1965 are calculated we can see the real world results are much worst.

This is why it is important to use conservative values when providing inputs into these types of programs.
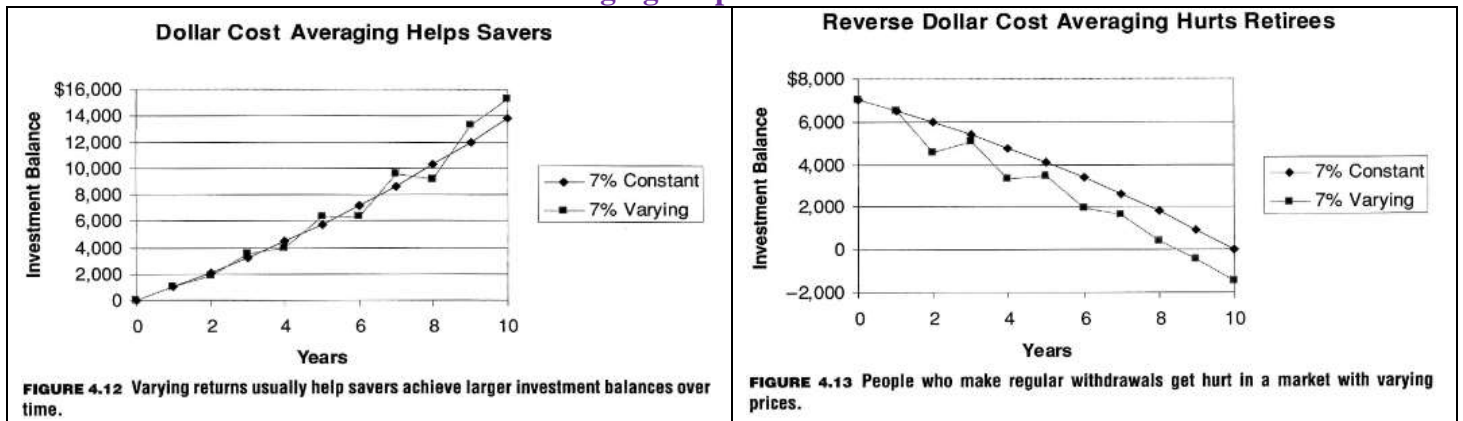
Reverse Dollar Cost Averaging

Dollar averaging is when equities are purchased or sold at regular intervals. The amount of money involved in the transaction is to remain constant over each cycle, but the amount of stocks purchased or sold will vary due to the fluctuations of the price of the stock. When purchasing shares the net result is better performance then the average return over the period. When selling stocks the opposite is the case, and performance will be lower than the average since you will have to sell more shares when stock prices drop to obtain the same amount of money.

 Note that in this example when purchasing shares results in a real world return of 9% compared to the 7% average. When selling shares the real world performance is 4.8% return compared to the 7% average.

Figure 4.12 and Figure 4.13
Dollar Cost Averaging Helps Savers and Hurts Retirees

FIGURE 4.12 Varying returns usually help savers achieve larger investment balances over time.

FIGURE 4.13 People who make regular withdrawals get hurt in a market with varying prices.

Using the Bucket approach, one may help extend ones savings by minimalizing liquidation of stocks in down years. Something not really covered too much in this book, that may be worth working into your retirement plans.

Be Wary of Compound Growth Projections!

Hebeler points out that most sales pitches are dishonest in that the growth projections the often provide are often over estimated and their projections leave out critical elements that would lower their projections including inflation, Fees, and actual performance due to compounding. He walks through a typical sales pitch where $1,000 grows to $100,000 in forty years. Hebeler then points out the impact if these other factors would be considered, and the actual return to expect in that forty year period would probably be more in the range of $3,400.

Finally the example of a roman depositing a penny with a 3% growth would be worth 470×10^{21} in 2,000 years, but with 3% inflation, that penny would be worth a penny today. Pointing out the importance of taking into account these other factors.

Chapter Closing Thoughts

In addition to pointing out the importance of taking as many factors as possible in determining ROI, the concept of Dollar Cost Averaging, and how it can benefit the investor is introduced. It is also pointed out that Reverse Dollar Cost Averaging has an equally detrimental impact on the real returns a retiree may experience when tapping into their retirement portfolio.