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Lending, Crowdfunding, and Modern Investing

Course Introduction

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Overview

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What is Robo-advising?

- App that takes the place of a human financial advisor
- Can aggregate your accounts, present your financial situation, facilitate transfers, and in general handle the logistics of your finances
- Key value added by robo-advisors isn't the logistics
  - It's helping to achieve financial goals
    - Directing your savings to the right portfolio
- We will cover the building blocks of robo-advising, focusing on delivering high-impact investment advice at high volume and low cost

How it Used to Be

- Rich people had investment portfolios with investment advisors
- Other people depended on social security and employer pension plans, known as Defined Benefit plans because your pension was set by a formula
- Your employer is making the financial decisions and bearing the risk. You just switch from working for one paycheck to retiring on another.

Downside of DB plans

- Benefit came at a cost
- Depended on the employer to maintain assets sufficient for the liabilities
- Can’t make promises that can’t reliably deliver

Insolvency Everywhere

- Look at what happened in Detroit and other cities that went bankrupt
- Auto workers at GM and Chrysler
- Puerto Rico
  - Pension plans don’t make the risk go away, they just handle it at a higher level, and if the money isn’t there when you retire, it just isn’t there

Now in the Era of Personal Responsibility

- 401(k) plans started in the late 1970s
  - Tax code encouraging DIY retirement savings
  - Pre-tax income, then taxed at retirement
  - Employers match
  - Now standard

Primary Goal of Robo-advisors

- Nice to see all your assets at once, move money around freely, invest with just a click or two
- Crucial to save intelligently for retirement
- Propose an investment plan, help you stick to it
- Show you the range of outcomes you can expect

In This Module

- The theory behind the apps
- The investment products that the apps depend on
- Customizing

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Portfolio Theory

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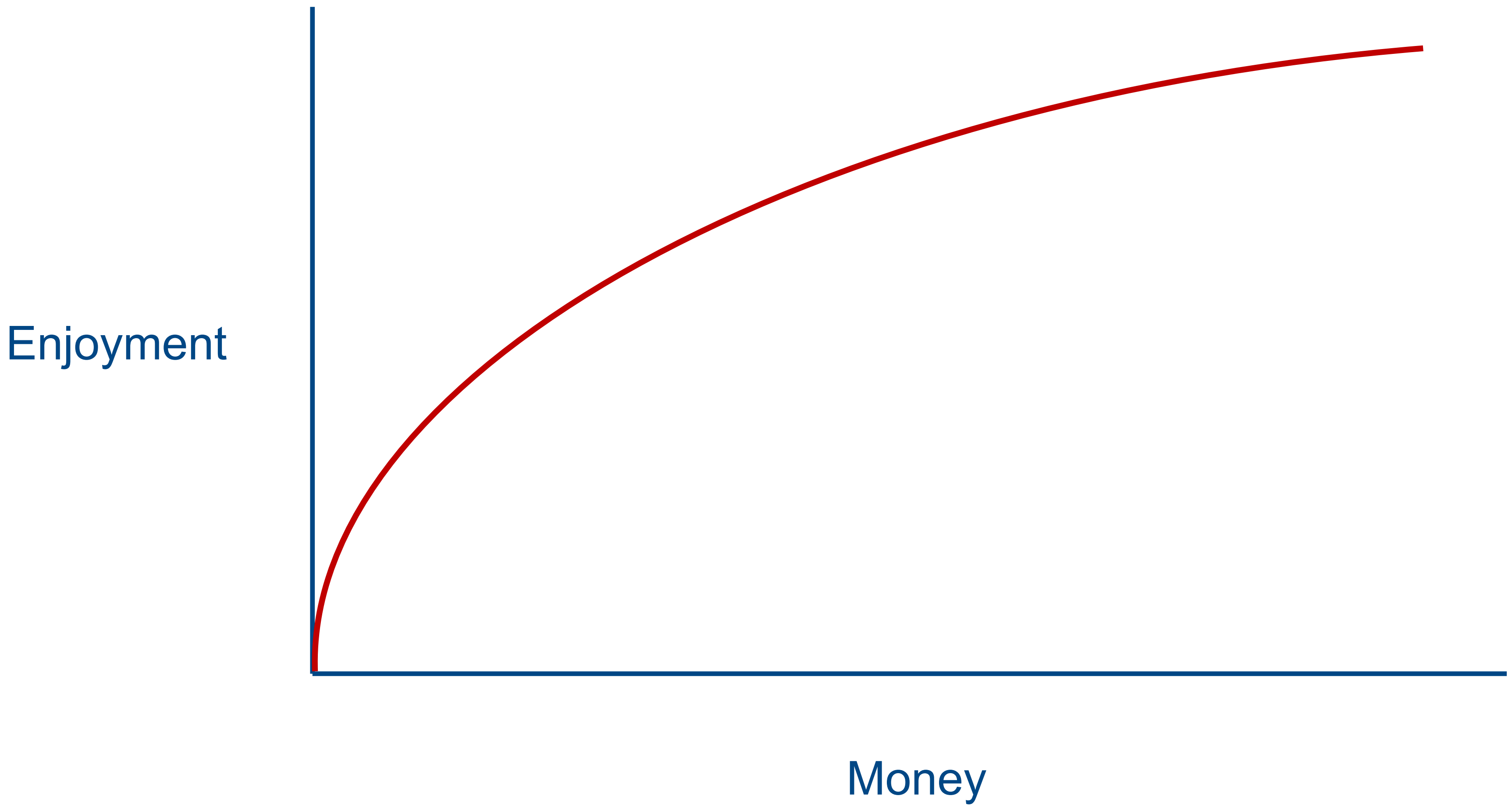
Theory Driving Robo-Advising Apps

- The founding father of portfolio optimization is still with us, his name is Harry Markowitz
- Won the Nobel prize in 1990 for work he did in the 1950s
- His insight is the engine of robo-advising
  - How to take the least risk for the expected return

Fundamental Axioms of Economics

- Two key assumptions in the study of investing
  1. Prefer more money to less
  2. Get less out of the next dollar when you already have more
     - Decreasing marginal utility

Decreasing Marginal Utility



Risk Aversion

- Give a choice
  - Thousand dollars for sure
  - Half chance of zero, half chance of two thousand dollars
- Expected value is the same
- But decreasing marginal utility pushes us to the sure thing
  - More utility from the first thousand than from the second

Certainty Equivalent

- What sure payment is worth the same as the bet?
  - Say it’s 970. That would be the certainty equivalent as the bet
  - The 3% is information about your risk aversion
  - Useful information for a robo-advising app
- Key point: people are generally going to be risk averse

Portfolio Choice for Risk-averse People

- Want higher expected return, lower risk
  - For a given expected return, want the lowest risk
  - For a given risk, want the highest expected return

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Mean Variance Optimization – Part 1

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Mean-variance Optimization

- Expected return
  - A probability weighted average
- Risk
  - Variance – statistical measure of return dispersion
  - Standard deviation – the square root of the variance
- For given expected return, choose the portfolio with minimum variance, or standard deviation

Efficient Portfolios

- Industry terminology is efficient portfolio
  - Portfolio with the minimum risk, for its expected return
  - Efficient in the sense of bearing only the risk necessary for the expected return
- Different from the other popular use of the word efficient
  - Market is efficient if it accurately reflects information

Inputs

- Expected returns of individual assets that will make up your portfolio
- Variance of each asset, and also their co-variances
    - How much they move together
    - The less they move together, the more you reduce risk when you hold them in a portfolio
- End result is a portfolio with a lot less risk than its components

The Hard Way and Easy Way

- Robo-advising apps can do what Harry Markowitz proposed
- The hard way
  - Take a stand on the expected returns, variances and co-variances of different assets, or groups of assets
  - Calculate the efficient portfolios of those assets
  - Hard because the inputs are hard to know, going to be subjective

Lesson from Decades of Experience

- What is the expected return on Facebook? On Apple? On Walmart, or Ford?
- We know much more about co-movements
    - How much does Facebook move together with Apple, vs Walmart?
- One approach: assume expected returns are the same, and just worry about minimizing risk

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Mean Variance Optimization – Part 2

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The Easy Way

- Take the value-weighted market index to be an efficient portfolio
  - There are actually good economic reasons for taking this approach
    1. The combination of two efficient portfolios is also efficient
    2. If people can borrow or lend at the risk-free rate, then it's optimal for everyone to hold risky assets in the same weights, and then lever up or down
    3. An index is cheaper to trade than individual assets

Another Virtue of Indexing: Transaction Costs

- Dr. George Ackerlof
  - “The Market for Lemons”
    - The idea that one person knows more information about the asset
- For individual stocks, this can be big
  - Other side of the trade worries you know something about the stock
  - Charges a transaction costs
    - Bid ask spread – The difference between the highest price a buyer is willing to pay and the lowest price that a seller is willing to accept to sell
- Not a problem when you’re buying the index
  - Other side is not so worried that you know something

Hybrid Approach

- Find the efficient portfolio of indices
  - Industries
  - Countries
  - Asset classes: not just stocks and bonds, precious metals, oil, other commodities
- Get some diversification benefit
- Keep transactions costs down

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Exchange Traded Funds & Mutual Funds

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To Summarize Thus Far

- Mean variance optimization
- Portfolio choice starts from the premise of decreasing marginal utility
- Efficient portfolios
- The hard way and the easy way
- Leads to risk aversion
- Key math problem for robo-advising app to solve
  - Some inputs are more solid than others
  - Argument for just using VW index instead
  - Hybrid approach, optimize over indices

Two Asset Types

- Mutual funds
- Exchange Traded Funds, (ETFs)

Mutual Funds

- Originally created on March 21, 1924
- An investment program funded by shareholders that trades in diversified holdings and is professionally managed
- Active management
  - Pay one percent a year, maybe two percent, for the manager to pick the stocks your money goes in
- Index funds
  - Fund simply gives you access to a defined index
  - Not paying for stock picking, just the logistics of getting the index return

Investing in Index Mutual Funds

- Trading directly with the fund
  - If you invest $10,000, your money goes into the fund, making it trade
- One trading time a day
- Can access from only some platforms
- Minimum investment (maybe a few thousand dollars)

Investing in ETFs

- Buying shares on the open market
  - Your money goes to the person selling shares
  - Your trade doesn't directly affect the fund at all, doesn't make it trade
  - Pay the market transactions cost
- Trade any time the market is open
- Minimum is just 1 share (maybe a hundred dollars)
- Access from any brokerage account

Optimize over ETFs

- Robo-advisor app can optimize over ETFs with low fees
  - Can be extremely low, a tenth of a percent or even less
  - Transactions costs are also very low
- Robo-advising client pays fees on fees, but they don’t have to add up to much
- Wide range of asset classes available
  - Over two hundred new ETFs rolled out each year

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Target Date Funds

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Lifecycle Investing

- Robo-advisors customize portfolios for clients
- Customization in the lifecycle
  - How many years until you retire?
  - Where are you in the lifecycle?
- Investing pattern
  - More risk is more appropriate when you are younger

More Risk at Longer Horizons

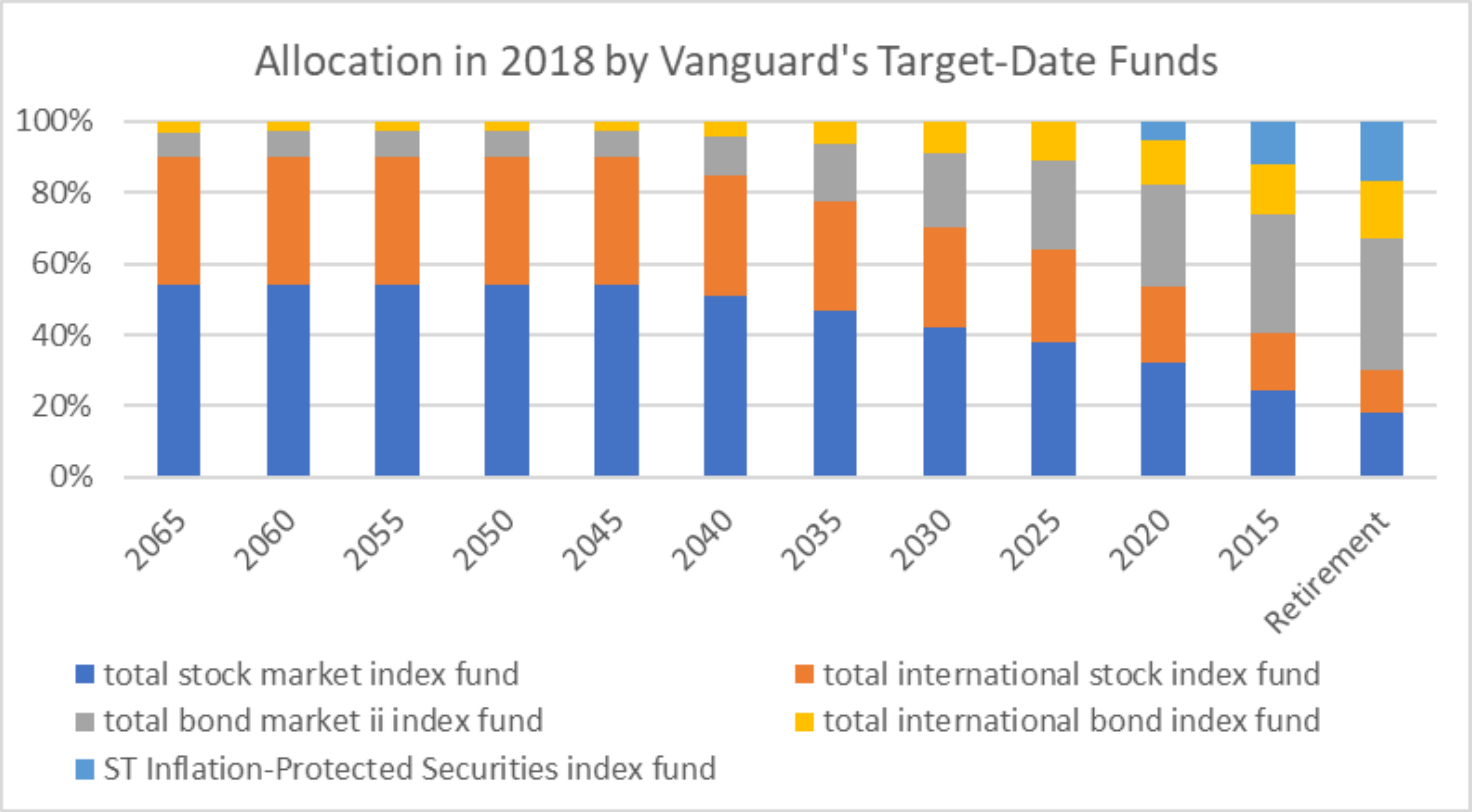
- Advice given fifty years ago
  - 100 minus your age = percentage of equity allocation
  - Out of college, close to eighty percent in stocks
  - Near retirement, more like forty percent
  - Over your career, gradually tilting stocks to bonds
- Still pretty much the conventional wisdom
  - Risky but risk is likely to average out over the long run

Target Date Funds

- Target date funds are the hottest thing in retirement investing
- All-in-one package: start your job, guess which year you'll retire in, and choose a target-date fund for that year

Target Date, Not Amount

- Notice what these funds do, and don't do, for you
- Fund will rebalance your investment for you
  - Start out risky, tilt toward lower risk
- That's it
  - Not targeting a particular ending balance
  - Some confusion about this during the financial crisis


Allocation in 2018 by Vanguard's Target-Date Funds
100%
80%
60%
40%
20%
0%
2065
2060
2055
2050
2045
2040
2035
2030
2025
2020
2015
Retirement
total stock market index fund
total international stock index fund
total bond market ii index fund
total international bond index fund
ST Inflation-Protected Securities index fund

Tilting from Stocks to Bonds

- The easy approach
  - Equity portfolio is 60% domestic, 40% international
  - Just altering the weight on this equity-market portfolio and a bond portfolio

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Customization

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Robo-Advisors Add Dynamic Readjustment

- Target date fund: one and done decision-making
  - One click when you start a job, and then walk away
  - One input: your age
- Robo-advisors can customize more upfront, and then follow up
  - Gauge your risk tolerance
  - Takes into account other closer-term financial goals
  - Do you already own a house?
    - Can report home equity
      - What are the current rates?
      - Should you refinance your mortgage, or pay it down?
    - Should you refinance your student loan? Should you enter income-driven repayment?

Using Big Data

- Robo-advising apps can see:
  - When you use it
  - Current events that trigger usage
  - When do others log in?
  - Where you click
  - Where other people are clicking
    - Can use this data to help investment suggestions

Social Impact

- Robo-advisors will apply any preferred ethical guideline screens
  - Can stay away from certain industries
  - Look for or avoid certain behaviors
- Can optimize over indices that apply these screens that you are comfortable with

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