

Lifecycle Investing:  
A Finance Theory Perspective  
FINC 450

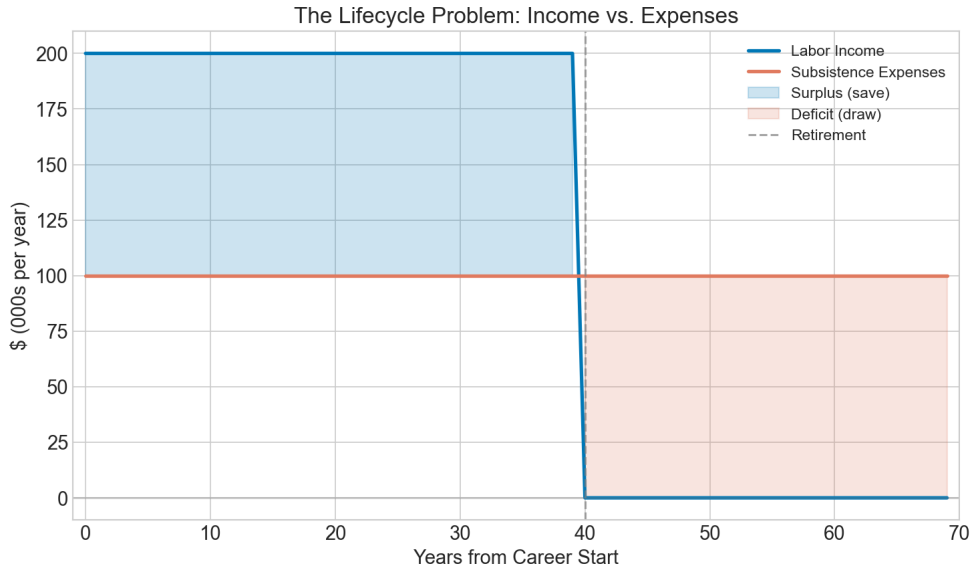
# Today's Lecture

- 1 The Lifecycle Problem
- 2 Your Hidden Balance Sheet
- 3 The Four Gauges
- 4 Why Portfolio Allocation Changes Over Life
- 5 Labor Income Risk Matters
- 6 Duration Matching
- 7 Optimal Consumption
- 8 Summary

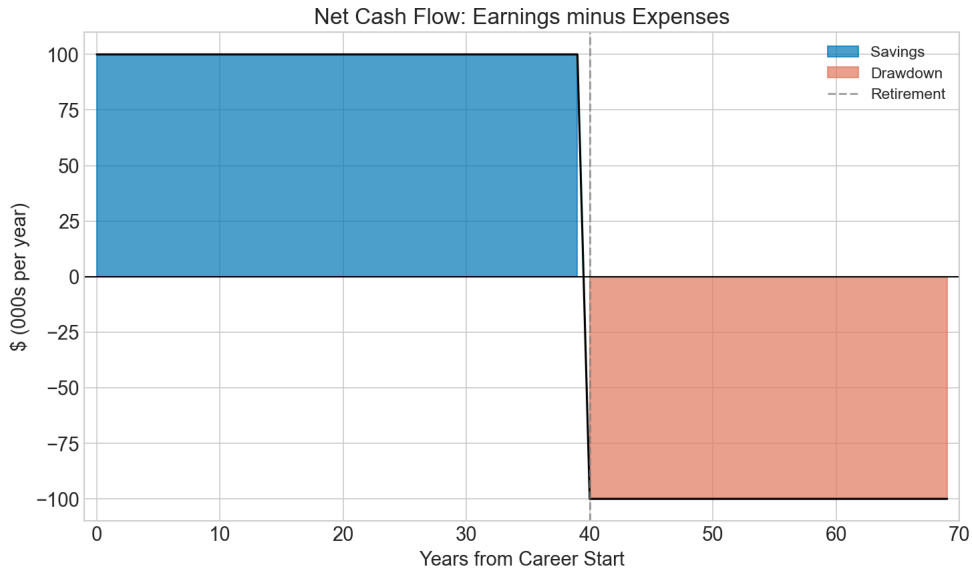
## Income and expenses don't match over time.

- You earn during working years (ages 25–65)
- You consume throughout your entire life (ages 25–85+)
- This **mismatch** is THE problem lifecycle finance solves

# Income vs. Expenses Over the Lifecycle



# The Cash Flow Pattern



## Finance thinks in present values.

### Assets:

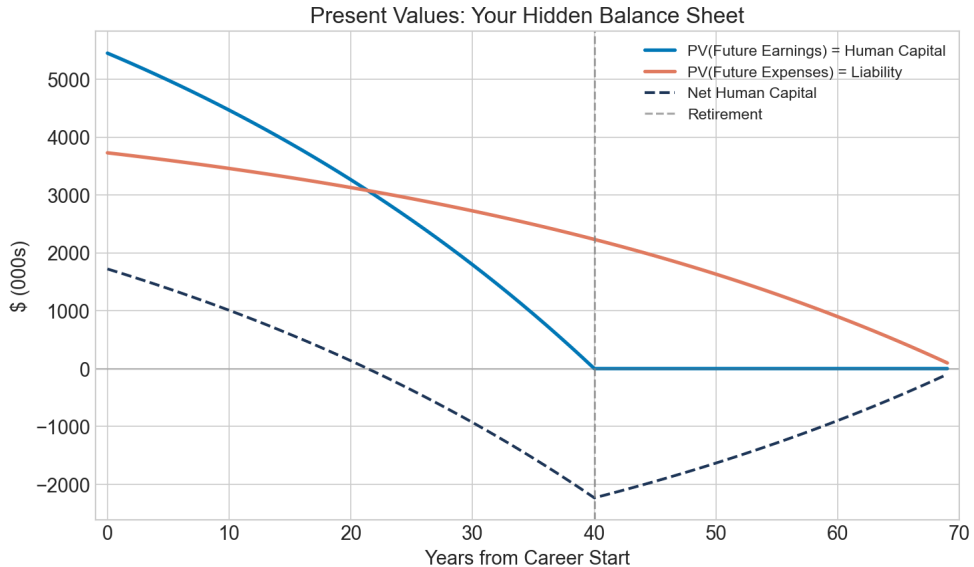
- Financial wealth (savings)
- **Human capital** (PV of future earnings)

### Liabilities:

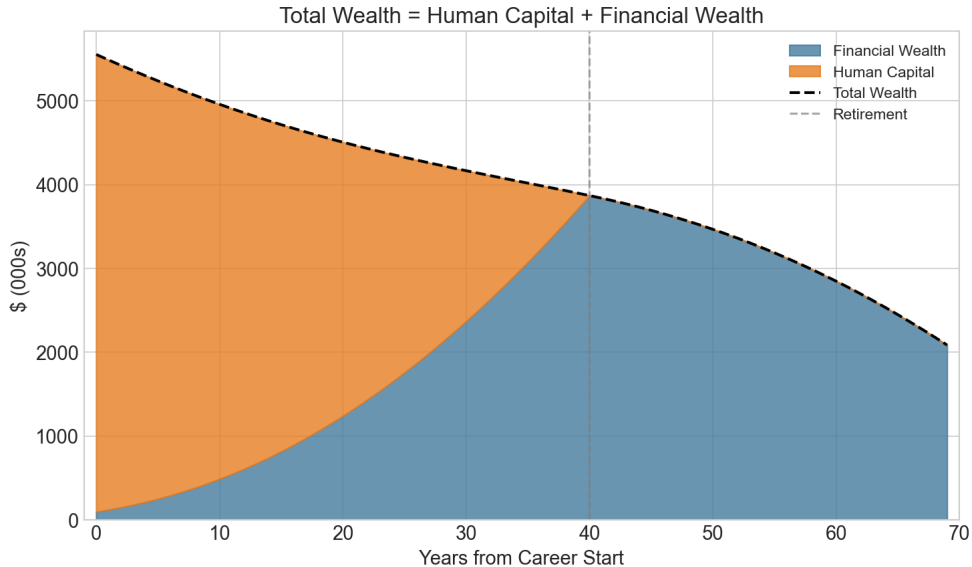
- **Expense liability** (PV of future spending needs)

$$\text{Net Worth} = \text{Human Capital} + \text{Financial Wealth} - \text{PV}(\text{Expenses})$$

# Present Values: Your Hidden Balance Sheet



# Human Capital is Your Biggest Asset (Early On)





### It's not just about your retirement account.

Traditional advice focuses on one number: your savings balance.

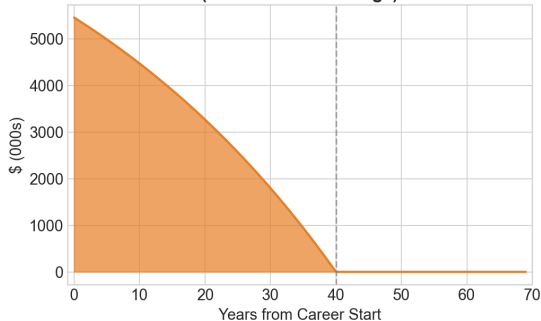
Finance theory says you need to track **four gauges**:

- ① Human Capital (your future earning power)
- ② Financial Wealth (your savings)
- ③ Expense Liability (what you owe your future self)
- ④ Net Worth (assets minus liabilities)

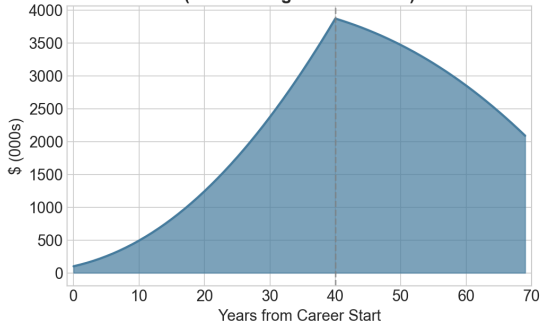
# The Four Gauges of Lifecycle Finance

## The Four Gauges of Lifecycle Finance

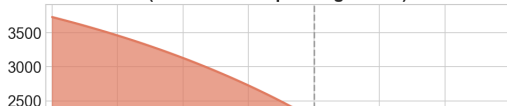
**Gauge 1: Human Capital  
(PV of Future Earnings)**



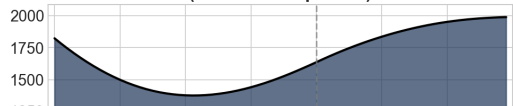
**Gauge 2: Financial Wealth  
(Your Savings/Investments)**



**Gauge 3: Expense Liability  
(PV of Future Spending Needs)**



**Gauge 4: Net Worth  
(HC + FW - Expenses)**



# Why Track All Four?

## **Human Capital (Gauge 1):**

- Depletes as you age
- Affected by career risk
- Has duration (interest rate sensitivity)

## **Financial Wealth (Gauge 2):**

- What you control directly
- Grows through savings + returns
- Must replace HC over time

## **Expense Liability (Gauge 3):**

- Your commitment to future self
- Has duration too!
- Determines “fully funded” status

## **Net Worth (Gauge 4):**

- The bottom line
- Drives consumption decisions
- Should stay positive!

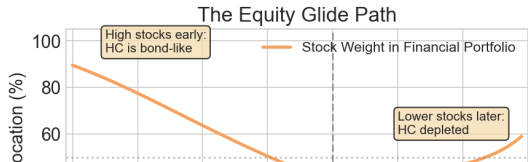
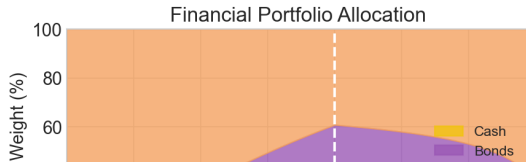
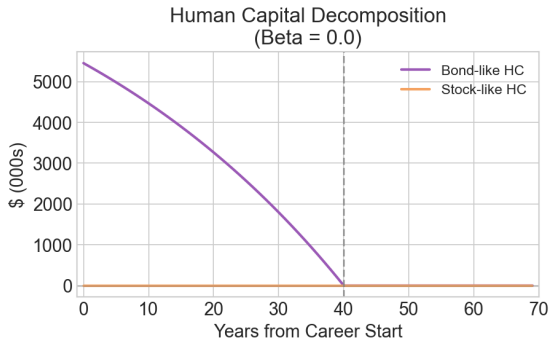
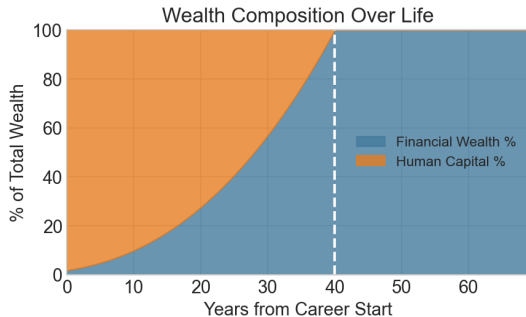
### Human capital is like a bond.

- Stable, predictable income stream (for most people)
- Has **duration**: sensitive to interest rates
- Beta to stock market  $\approx 0$  for professors, consultants
- Beta  $> 0$  for entrepreneurs, tech workers

**Implication:** To maintain target total risk, financial portfolio must adjust as HC depletes.

# Why Portfolio Allocation Changes Over Life

## Why Portfolio Allocation Changes Over Life



# The Logic of the Glide Path

## Young investor (age 25):

- Total wealth = 90% Human Capital + 10% Financial Wealth
- HC is bond-like  $\Rightarrow$  already have implicit bond position
- Financial portfolio should be **100% stocks** to balance

## Retiree (age 70):

- Total wealth = 0% Human Capital + 100% Financial Wealth
- No implicit bond position from HC
- Financial portfolio should match **target allocation** (e.g., 50/50)

**This is WHY target-date funds have a “glide path”!**

## Your job's riskiness matters.

### Low Beta ( $\beta \approx 0$ ):

- Tenured professor
- Government employee
- Doctor, lawyer

HC is bond-like

⇒ Hold **more** stocks

### High Beta ( $\beta \approx 1$ ):

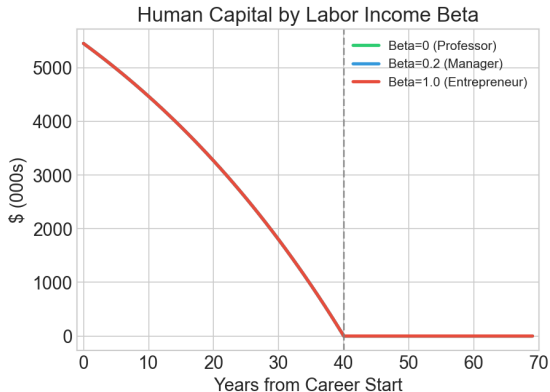
- Tech startup founder
- Investment banker
- Sales (commission-based)

HC is stock-like

⇒ Hold **fewer** stocks

# Effect of Labor Income Risk on Portfolio Choice

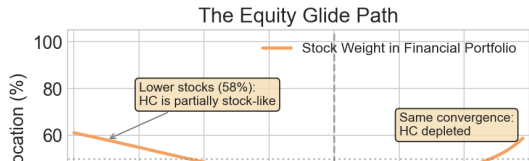
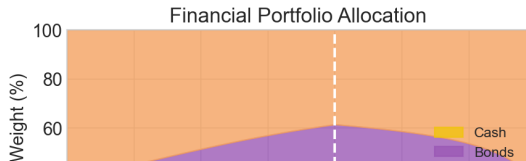
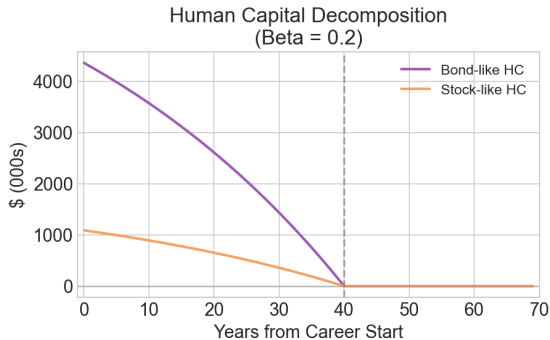
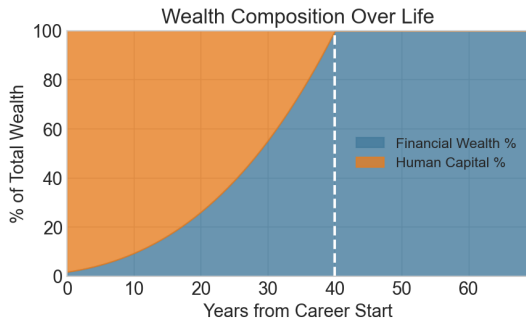
Effect of Labor Income Risk on Portfolio Choice





# Detailed View: Risky Human Capital ( $\beta = 0.2$ )

## Portfolio Allocation with Risky Human Capital ( $\beta = 0.2$ )



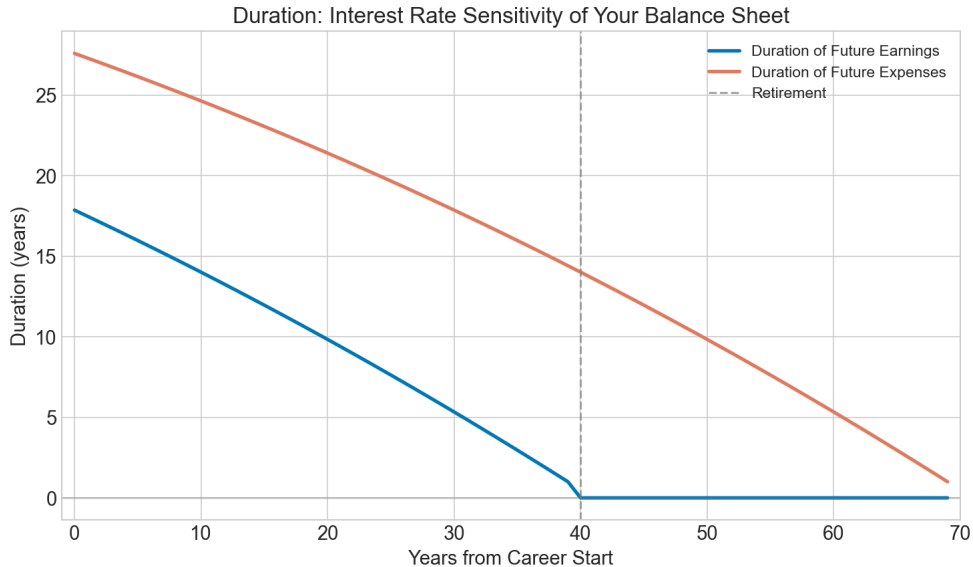
### **If your income is stable (professor, government):**

- You can afford more risk in your portfolio
- 100% stocks early in career is reasonable
- Your human capital provides diversification

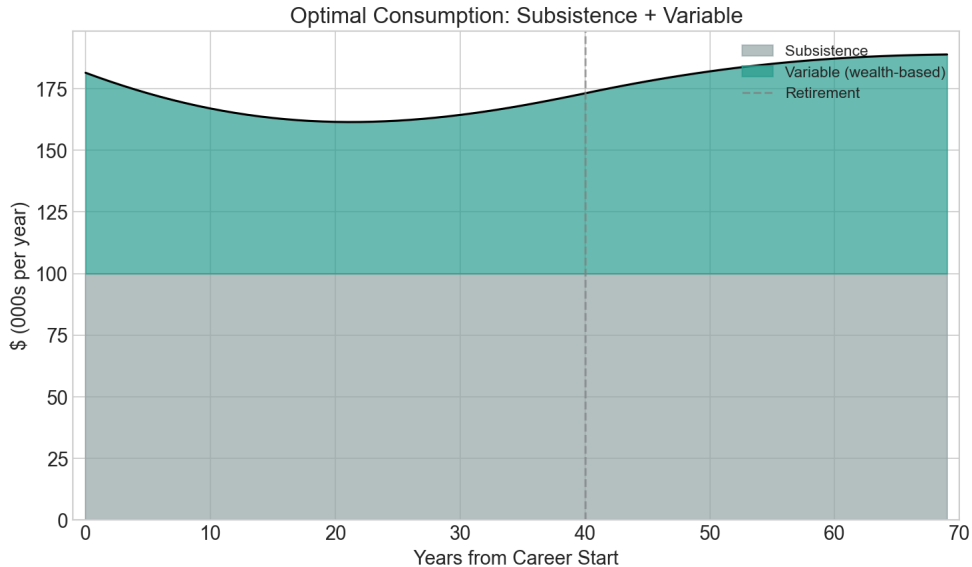
### **If your income is risky (entrepreneur, tech):**

- Be more conservative in your portfolio
- Don't double down on market risk
- Consider your company stock exposure carefully!

# Interest Rate Risk on Your Balance Sheet



# Consumption Smoothing



# Key Takeaways

- ① **The Problem:** Income and expenses don't match over time
- ② **Human Capital:** Your biggest asset early in life (but invisible)
- ③ **Four Gauges:** Track HC, FW, Expenses, and Net Worth—not just your 401(k)
- ④ **Glide Path Logic:** HC is bond-like  $\Rightarrow$  young people should hold more stocks
- ⑤ **Labor Risk Matters:** Risky job  $\Rightarrow$  more conservative portfolio
- ⑥ **Duration:** Match asset and liability durations to manage interest rate risk

## Optimal portfolio allocation:

$$w^* = \frac{1}{\gamma} \Sigma^{-1} \mu$$

where:

- $\gamma$  = risk aversion coefficient
- $\Sigma$  = covariance matrix of asset returns
- $\mu$  = vector of expected excess returns

## Key extension for lifecycle:

- Human capital is an implicit asset in your portfolio
- Financial portfolio adjusts to reach total wealth target
- As HC depletes, financial portfolio converges to  $w^*$

# Questions?