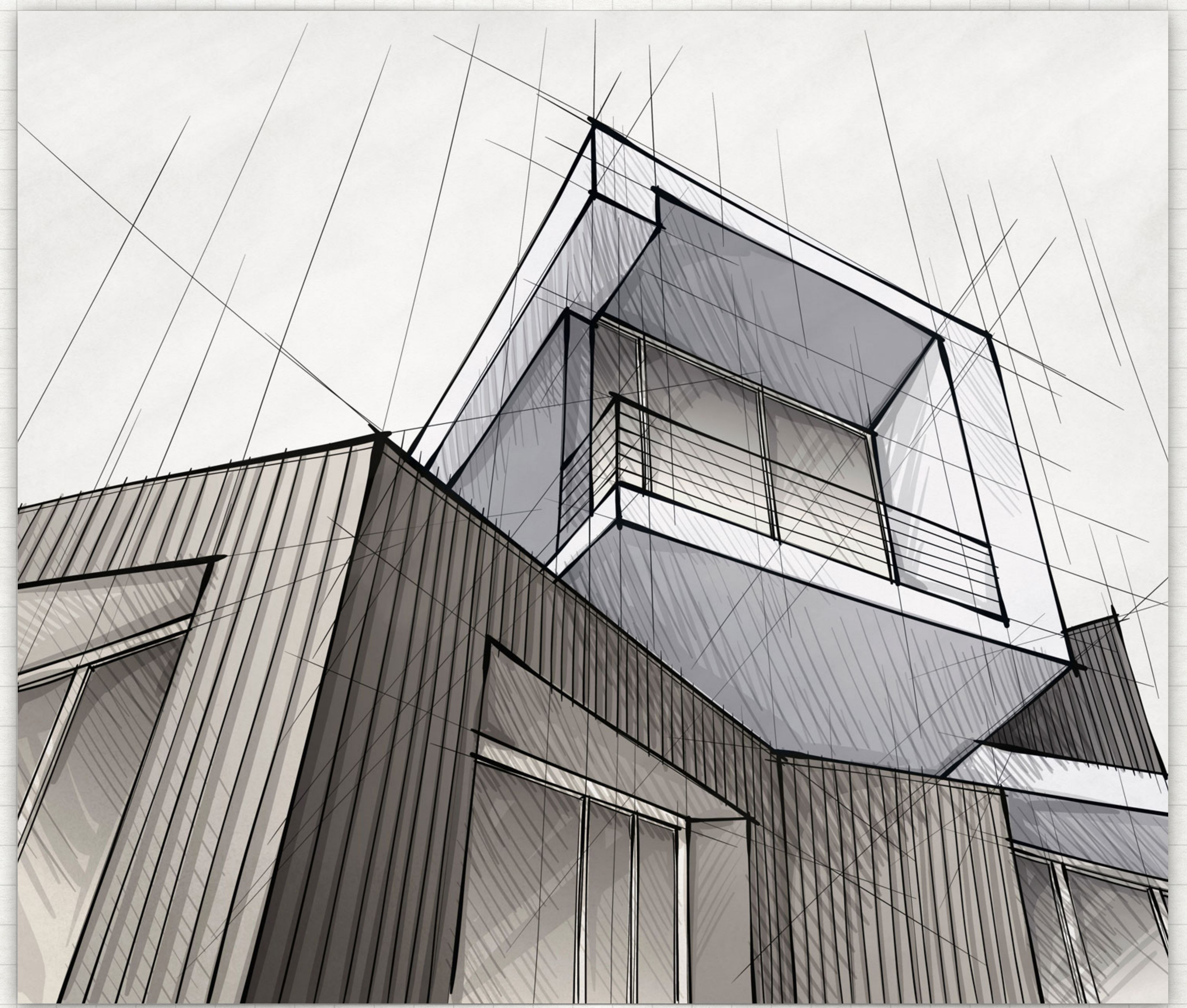
CS 007: SESSION 8

PERSONAL FINANCE FOR ENGINEERS



CS 007

FINANCIAL PLANNING & GOALS

PLANNING

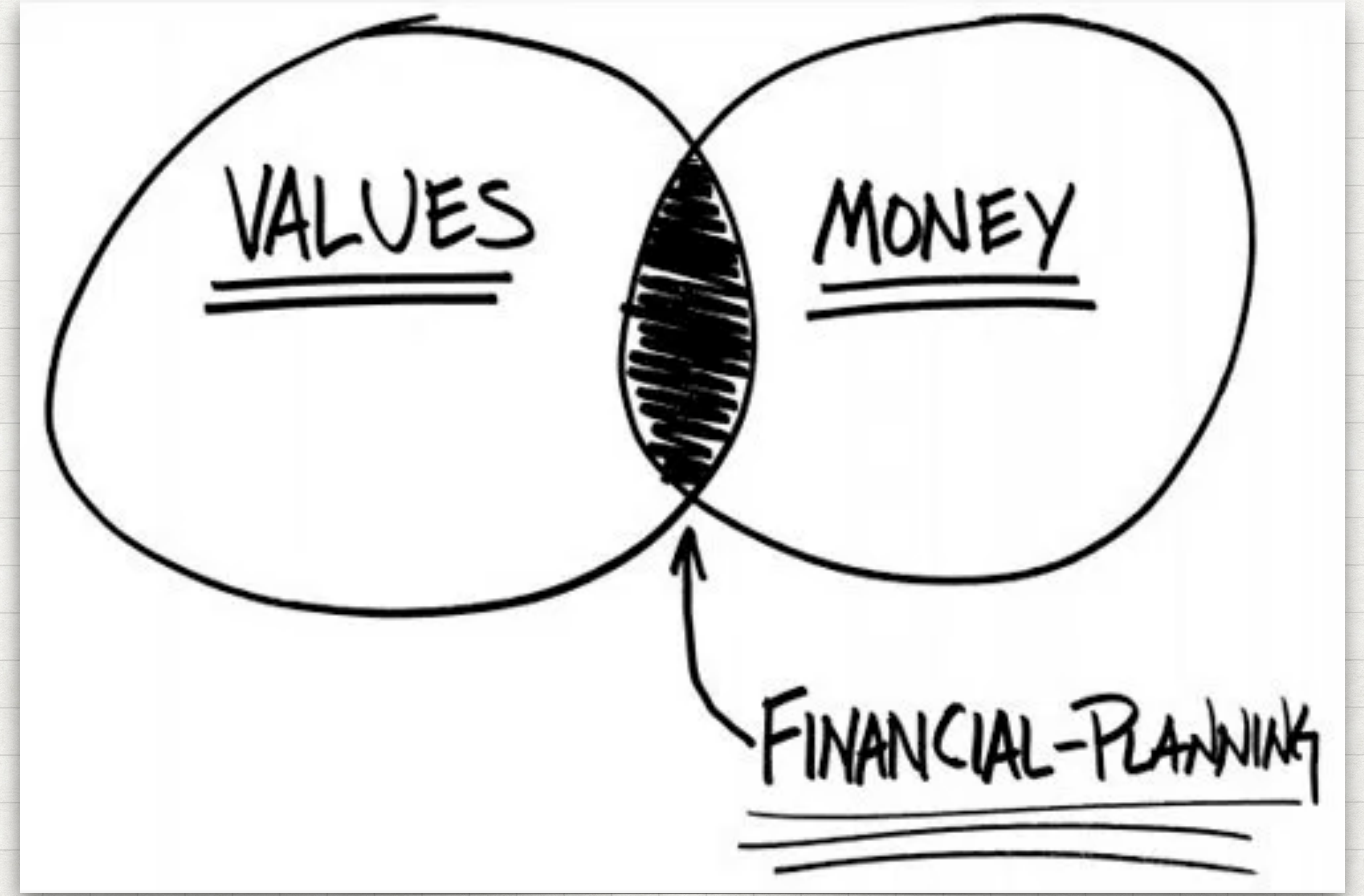
how to set financial goals and meet them

WHAT IS A FINANCIAL PLAN?

- Comprehensive evaluation of current & future financial state.
- *"The process of determining whether and how an individual can meet life goals through the proper management of financial resources"* — CFP Board
- Cash flow, assets, withdrawals.
- Key components
  - Net Worth
  - Cash Flow Analysis
  - Retirement Strategy
  - Risks / Insurance
  - Investment Strategy
  - Tax Strategy
  - Estate Plan

WHY IS FINANCIAL PLANNING NEEDED?

- People tend to spend more than they need to, if they lack sufficient motivation for saving.
- Short term rewards vs. Long term payoff. Need time to build assets.
- Making a financial plan explicit increases likelihood of success
- Extremely important when more than one person involved (couples / families)



WHAT ARE FINANCIAL ADVISORS?

- Term can be used by anyone. Be extremely wary.
- Two accreditations are well respected:
  CFP & CFA.
- Most have a very high variable cost (1%+) and high minimums ($1M+)
- There is evidence that financial planners significantly help people avoid behavioral errors. Vanguard estimates that value at 150 bps! *
- Communication about money is often dysfunctional for couples. Financial advisors force transparency & joint planning, which is essential.
- Industry is rife with conflict of interest & high commissions.
- Will likely be disrupted by personalized, data-driven automated solutions over the next 10 years.

* Quantifying Vanguard Advisor's Alpha
https://www.vanguard.com/pdf/ISGQVAA.pdf

WHY DO FINANCIAL ADVISORS CHARGE SO MUCH?

- A financial advisor has a very small client base, typically between 50 - 75 clients.
- A financial advisor has to cover high fixed costs (expensive office) and high variable costs (their salary & support team)
- If an advisor wants to make $100,000, and their business has overhead of $100,000, they need $4,000 per client per year, just to break even.
- The higher quality the advisor, the larger that problem becomes.
- Solution: high minimums, high fees, hidden product placement kickbacks / commissions.

TYPES OF GOALS

e.g. build an emergency fund, retire

WHAT ARE FINANCIAL GOALS?

- Any goal with significant financial requirements (assets / income)
- **Time frame matters.**
  Short-term, medium-term, long-term, indeterminate & conditional goals.
- **Examples**
  - Emergency Fund
  - Get out of Debt
  - Buy a car
  - Buy a house
  - Start a business
  - College
  - Retirement

* http://brokegirlrich.com/doin-it-by-the-decade-the-wealthy-barber-review/

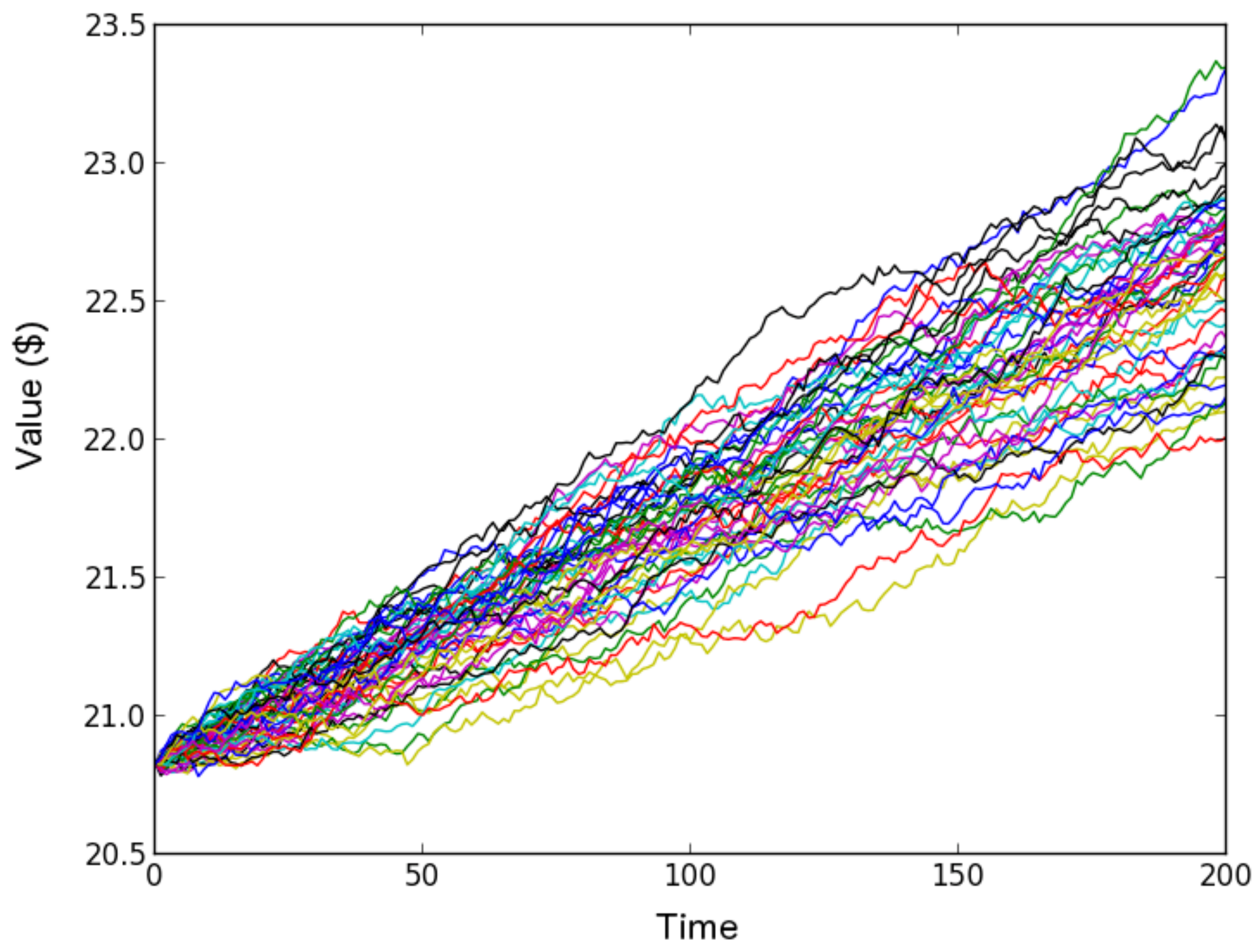
HOW TO PROJECT SAVINGS GOING FORWARD?

- Cash accounts, assume FDIC rates for the appropriate time frame.
- For diversified portfolio, use historical rates of return, adjusted for inflation.
- Inflation can be estimated from the difference from US Treasuries to TIPS. (about 1.9%)
- Simple method: **assume annual rate**, divide by 12 for monthly, build out projection month by month.
- More sophisticated: **Monte Carlo** uses statistical projection to estimate a huge number of potential outcomes, and assign probabilities.

Portfolio Return	8%
Wage Increase Rate	3%
Price Inflation	2%

Age	Assets	Savings
25	$ 25,000.00	$ 25,000.00
26	$ 51,500.00	$ 25,250.00
27	$ 79,840.00	$ 25,502.50
28	$ 110,132.90	$ 25,757.53
29	$ 142,498.40	$ 26,015.10
30	$ 177,063.40	$ 26,275.25
31	$ 213,962.46	$ 26,538.00
32	$ 253,338.21	$ 26,803.38
33	$ 295,341.89	$ 27,071.42
34	$ 340,133.82	$ 27,342.13
35	$ 387,883.98	$ 27,615.55
36	$ 438,772.57	$ 27,891.71
37	$ 492,990.63	$ 28,170.63
38	$ 550,740.70	$ 28,452.33
39	$ 612,237.47	$ 28,736.86
40	$ 677,708.57	$ 29,024.22
41	$ 747,395.31	$ 29,314.47
42	$ 821,553.50	$ 29,607.61
43	$ 900,454.32	$ 29,903.69
44	$ 984,385.26	$ 30,202.72
45	$ 1,073,651.10	$ 30,504.75

Simulated paths of the value of an asset using Monte Carlo



SIMPLE GOAL: EMERGENCY FUND

- One of the most important short term goals.
- Priority: Liquidity & Safety
- Typical target: 3-6 months of expenses, in an FDIC-insured bank account.
- Simple projection: monthly savings x number of months.
- Example: $12,000 emergency fund might require $1,000 in savings per month for a year.

MORE COMPLEX GOAL: HOUSE

- US Census: 63.9% homeownership rate (as of Q3 2017)
- Two key components: down payment & income requirement (cash flow)
- Down payment typically 20%. For $1M house, that's $200K. Plus closing costs.
- Common debt / income ratio for banks is 36% (pre-tax). In high cost areas, might stretch to 40% or more.
- Do you have flexible timeline? If so, you likely can afford some level of market risk. If not, stick to cash.
- Houses dramatically lower liquidity (hard to get $ out) and mobility (relocation for work)
- Long term track record for real estate is positive: combination of beating inflation & leveraged investment.

MORE COMPLEX GOAL: COLLEGE

- Very expensive goal. Wealthfront estimates that sending my son to Stanford in 2027 will cost $358,942. Inflation adjusted!
- College costs have increased faster than inflation (Wealthfront uses 1.1% faster than inflation as the long term trend)
- Limited time frame. You have 40-50 years for retirement. 18 years is not a lot of time for compounding to become significant.
- 529 College Savings Plans have significant tax advantages, at the cost of liquidity.
- Layered planning for multiple children rewards over-saving early.

COMPLEX: RETIREMENT

- Extremely complicated goal.
- Four interrelated problems
  - Projecting income for 40+ years
  - Replacing income for 30+ years
  - Tax efficiency
  - Planning for multiple people
- Long term asset allocation (diversified portfolio)
- Asset location (where to put which investments)
- Tax-deferred accounts 401(k), IRA, Roth IRA, etc.
- Beware of the life insurance charlatans

COMPLEX: RETIREMENT

- **Projecting Income**
  Can use wage inflation as a proxy
- **Replacing Income**
  Can use the "4% rule" as a first approximation
- **Tax Efficiency**
  Leverage tax-deferred accounts, like 401(k) plans. Roth accounts have significant advantages for some high income savers.
- **Family Planning**
  Ensure you know the retirement plans of each partner, and have estimated timing for major expenses for children. Look at total household income & assets collectively.

COUPLES

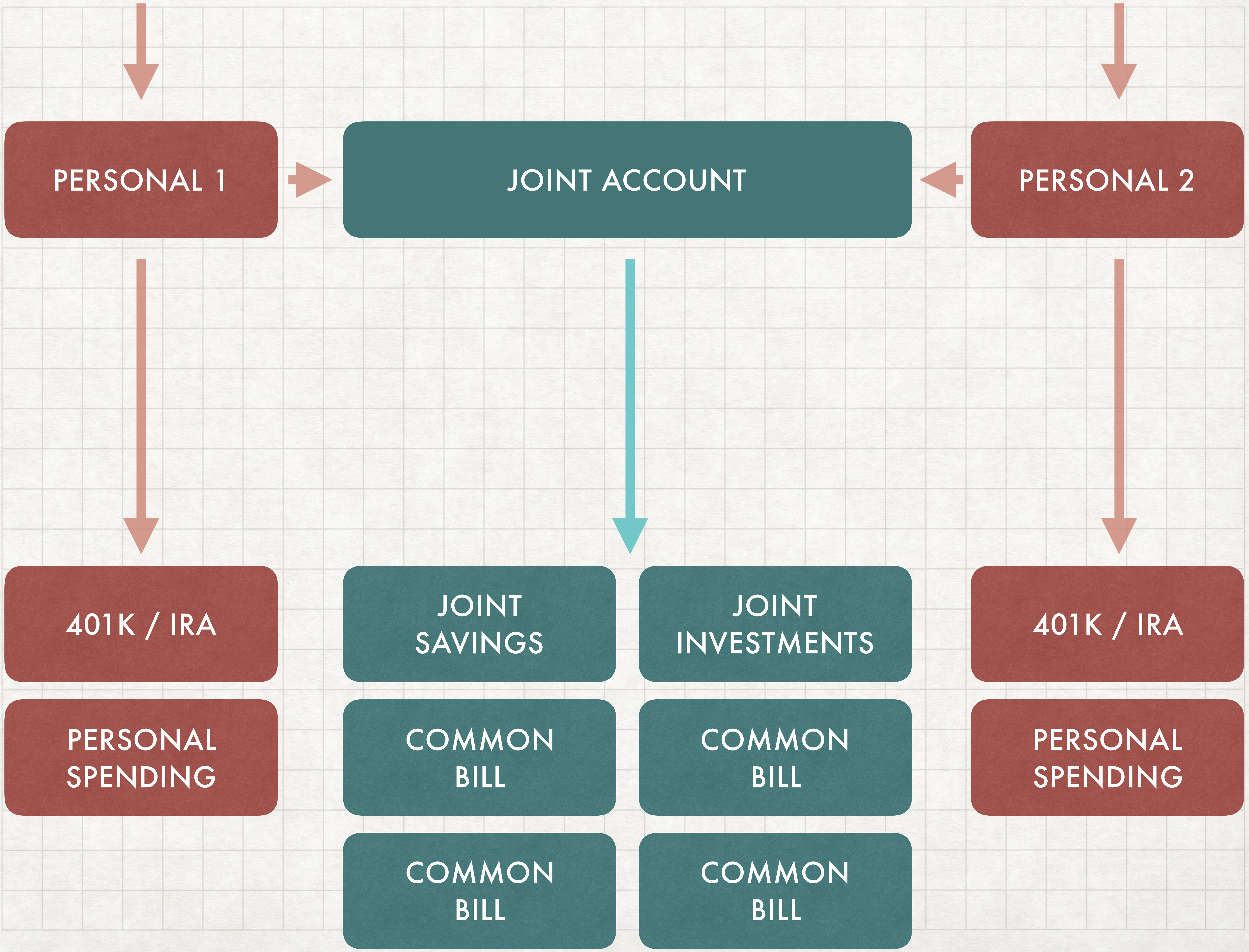
how financial planning changes with a partner

PLANNING FOR TWO (OR MORE)

- Financial planning is difficult. Requires projecting the future & prioritizing choices
- Exponentially harder with couples, because of different timelines, priorities & possibilities.
- Key issues include communication, transparency, relationship & values.
- Money & related issues are some of the most common reasons relationships fail.

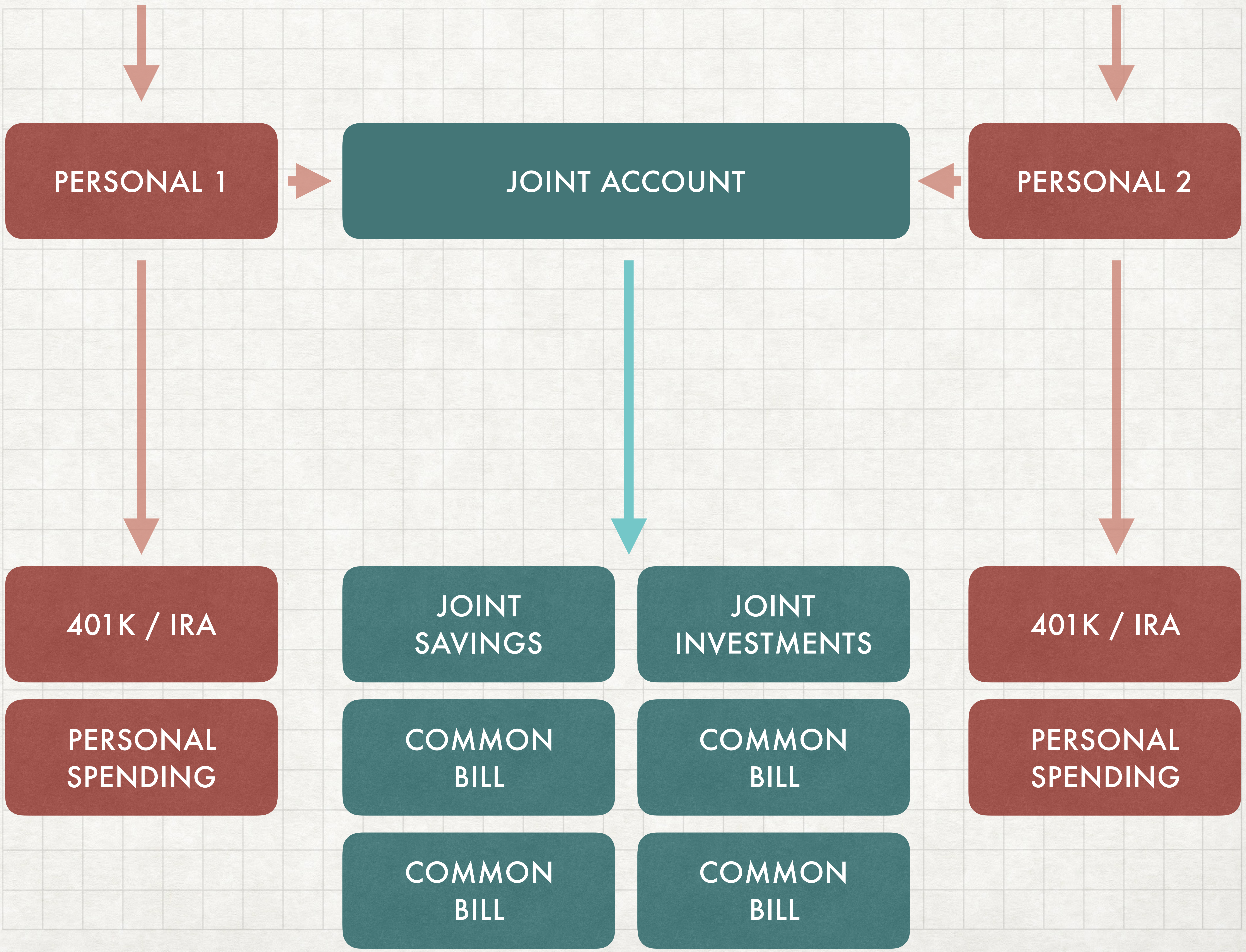
COUPLES: BUDGETS & SPENDING

- How to manage budgeting / spending with two people?
- One account approach: one joint account, fully shared.
- Two account approach: separate accounts, coordination on bill paying.
- Three account approach: two personal accounts & one joint account.
- None of these tactics solve the core problem: communication & values.
- "magic" number for size of expense to discuss
- **Warning**: Joint liability for credit is a serious commitment. Not to be taken lightly.



COUPLES: SAVING & INVESTING

- Retirement accounts (401k & IRA) are individual.
- Brokerage accounts can be individual or joint. Equity compensation is individual.
- Social security can be individual or joint, depends on how you claim.
- Varying incomes, careers, time lines and complicate savings rates.
- Quality of benefits at different companies can vary significantly (e.g. Google 401(k) vs. a startup 401(k))
- Likely needs to be revisited as situations adapt / change.



LIFE INSURANCE

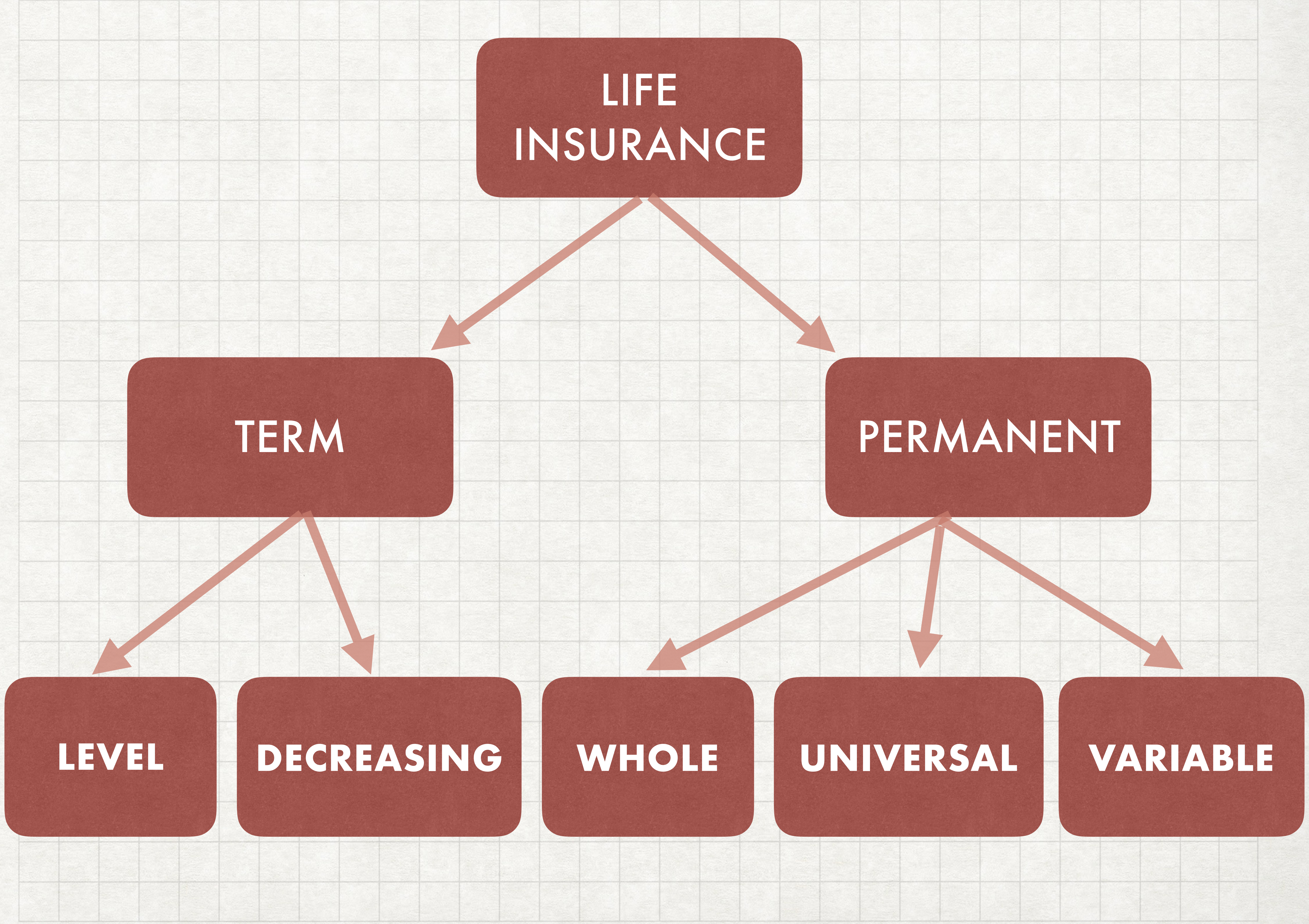
how does it work? when does it make sense?

LIFE INSURANCE: WHY DOES IT EXIST?

- **Death Insurance**
- There are costs associated with death.
- People with dependents need a way to provide for them after death.
- Retirement plans often take decades to execute. Life insurance can replace income that was never received due to death.
- There is a fundamental economic benefit to pooling risk around uncertainty. When a person will die is the original actuarial case for adding value this way.
- Life insurance has several tax benefits. The owner is not taxed on the potential benefit size, and the beneficiary is not taxes on receipt.

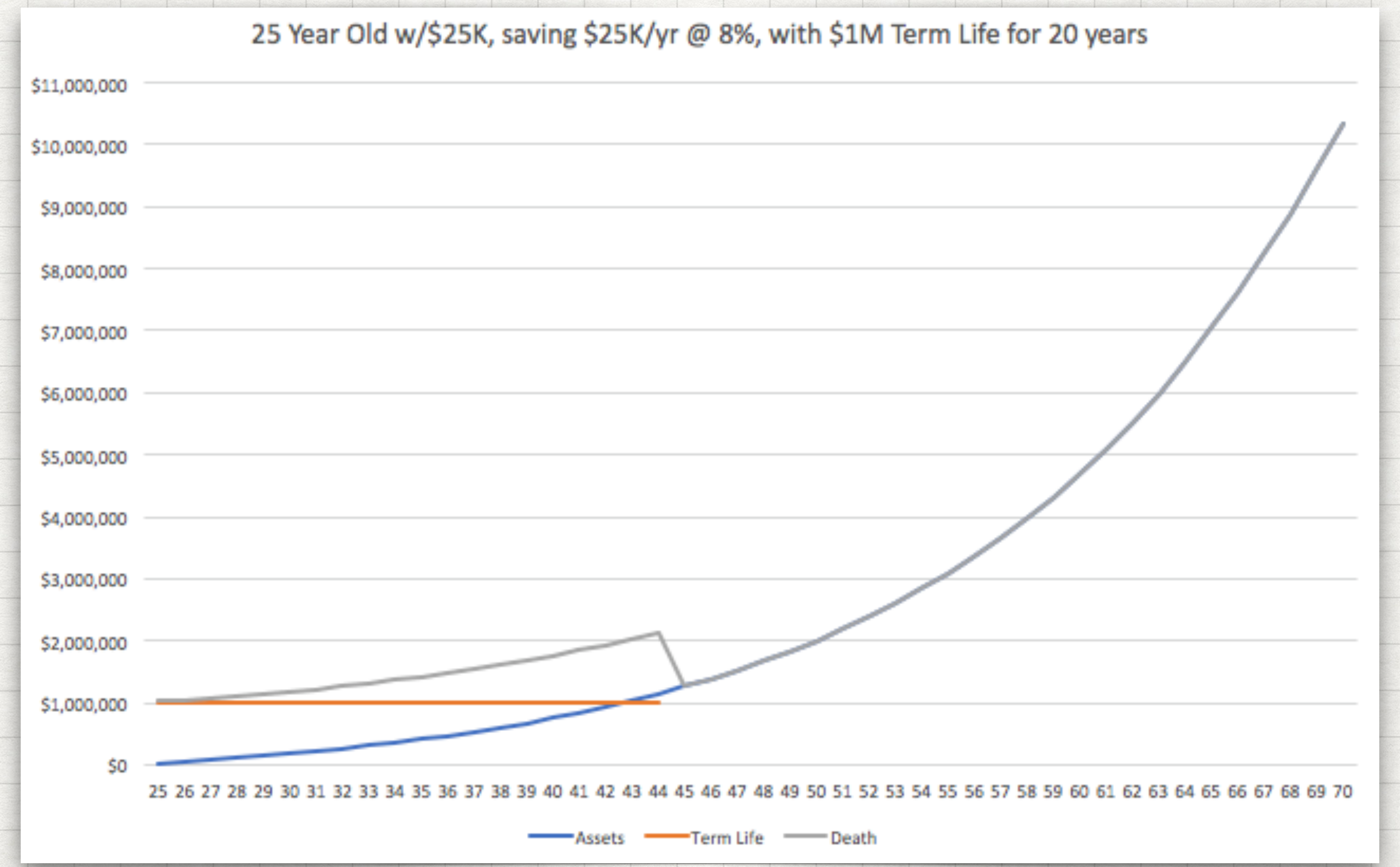
LIFE INSURANCE: WHAT TYPES ARE THERE?

- Term Life Insurance is the plain vanilla variety. You pay monthly for a time period to ensure payment to a beneficiary if you die. Payout can be level or decreasing.
- Whole Life Insurance provides a death benefit no matter how old you are. AKA "permanent" life insurance.
- Universal Life Insurance is similar to whole, but with greater flexibility to change death benefit & cash value.
- Variable Life Insurance has fixed premiums and death benefit can increase based on rate of return of the cash value.
- Every combination you can imagine has been tried. This is a $2 Trillion industry in the US.
- High expenses & fees, with punitive clauses for exiting agreements makes life insurance a poor financial product choice for long term investment. **Stick with term life insurance.**



LIFE INSURANCE: HOW MUCH DO YOU NEED?

- Think of costs associated with death.
- Think of dependents and expenses that require your income for funding. **House. College. Retirement.**
- Think about the time frame before you will have accumulated the assets to pay those costs out of pockets.
- Costs are non-linear because probability of dying increases with age. 30 year policy is not just 3x a 10 year policy.
- Very inexpensive for young people.
- Typically purchased at marriage or during planning for a child.



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QUESTIONS