

Financial Plan for a Young Engineer

Project Proposal

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Project Description

This project aims to provide a brief outline of the financial strategy that an engineer should follow from the time they graduate and enter the workforce at age 25 until they retire at age 65. The research will examine ways to prevent financial scenarios that can destabilize an individual's finances. The plan will cover all the expenses and requirements of the engineer and will examine different investments and budgeting strategies as well as a retirement plan. The overall goal is to provide a balanced and smooth life cycle financial plan that an individual can follow for long-term financial stability.

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Current Situation

Name of Engineer: Jimmy Kamal

1. Current Age

Age – 25 (Beginning of 25th year = End of 24th year), Retirement age = 65 (Beginning of 65th year = End of 64th year), Planning horizon = 40 years, $n = 40 \times 12 = 480$ months

2. Salary

Recently completed master's degree and received a job offer in XYZ company at New Hampshire. He will move to NH (become a resident of NH) and start his job when he is 25 years and 0 months old.

He received a sign-in bonus of \$5000.

He will receive his first salary when he is 25 years and 1 month old. His starting salary is \$7000 in the first month and increases by 5% per year compounded monthly.

3. Retirement fund

5% of his salary goes to the retirement fund. The fund generates an interest rate of 4% per

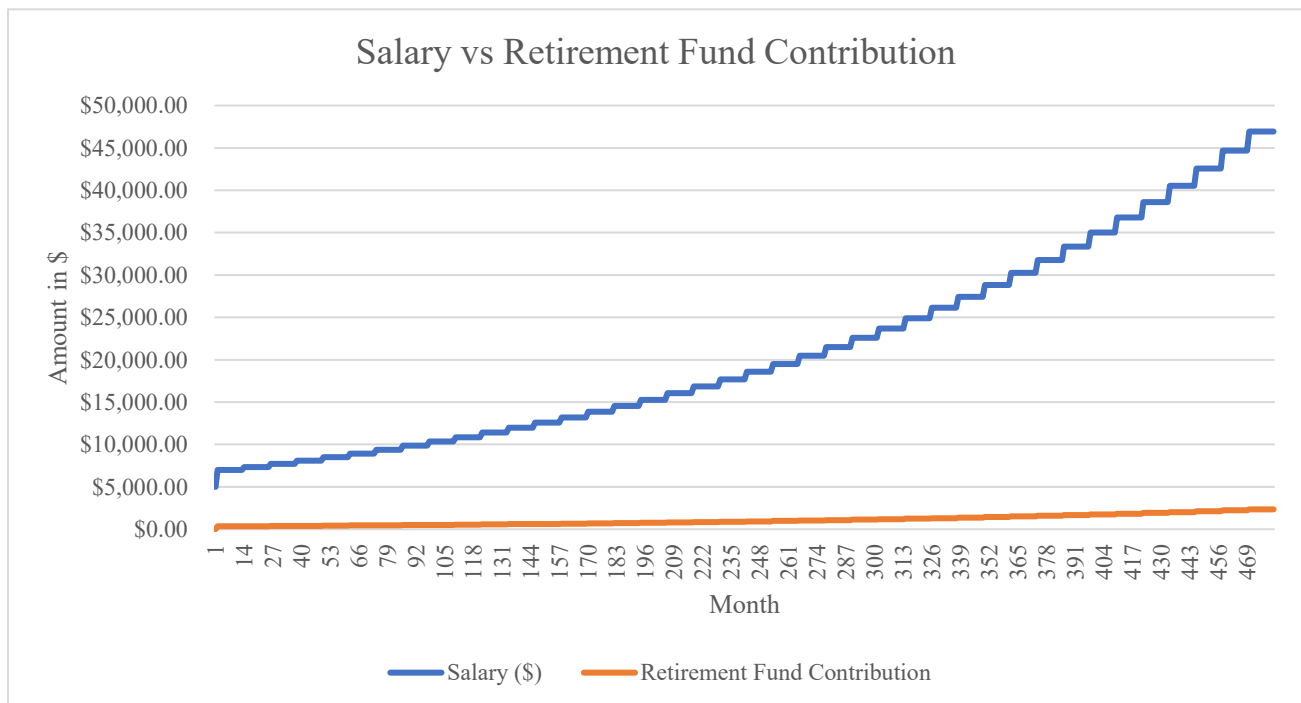


Figure 1: Salary vs Retirement Fund Contribution

4. Tax on salary

He pays 22% tax + 4% = 26% (Federal and state tax) and retirement fund is tax deductible.

$$\text{Tax} = 0.26 \times (\text{Salary} - \text{Retirement Fund Contribution})$$

2023 Single Filer Tax Brackets

If taxable income is:	The tax due is:
Not over \$11,000	10% of taxable income
Over \$11,000 but not over \$44,725	\$1,100 plus 12% of the excess over \$11,000
Over \$44,725 but not over \$95,375	\$5,147 plus 22% of the excess over \$44,725
Over \$95,375 but not over \$182,100	\$16,290 plus 24% of the excess over \$95,375
Over \$182,100 but not over \$231,250	\$37,104 plus 32% of the excess over \$182,100
Over \$231,250 but not over \$578,125	\$52,832 plus 35% of the excess over \$231,250
Over \$578,125	\$174,238.25 plus 37% of the excess over \$578,125

Figure 2: 2023 Single Filer Tax Brackets [5][6]

5. Education Loan

He took a loan (Direct subsidized loan) of \$200,000 at 4.45% p.a. compounded monthly for undergraduate studies during the age of 19 years and 0 months old (6 years ago = 72 months) and took a loan (Direct subsidized loan) of \$50,000 at 5.28% p.a. compounded monthly for graduate studies when he was 23 years and 0 months old (2 years ago = 24 months) starting the first payment of loan.

He will start paying both the loan amounts starting from when he is 25 years and 1 months old (i.e., after receiving first month salary) for the next 15 years (=180 months) at interest rate of 4.45% and 5.28% per year compounded manually for undergraduate and graduate studies respectively.

$$\text{Monthly payment for Undergraduate loan} = 200000 (F|P 4.45\%/12, 72) (A|P 4.45\%/12, 180) = \$1990.57$$

$$\text{Monthly payment for Graduate loan} = 50000 (F|P 5.28\%/12, 24) (A|P 5.28\%/12, 180) = \$$$

6. Transportation

When he starts work, his dad bought him a car, but he decides to pay him back over a period of 2 years

First car: 10-year-old (used) Toyota Camry (Will obtain it when he is 25 years and 0 months old).

Total Cost = 15500

Down payment: 3000

Loan amount = $15500 - 3000 = 12500$

Loan period = 2 years (24 months)

Interest rate = 0% (His dad paid for it with full cash)

Sales tax = 0

Monthly payment = 12500 (A|P 0%, 24)

Monthly Operations and Maintenance (O&M cost) = \$150 and increase by \$2 every month.

He will use this First car for 5 years (=60 months) and then give it to his younger sibling as a gift (no salvage value)

Second car: Ford Mustang (Will buy when he is 30 years and 0 months old).

Total Cost = 50000

Down payment: 15000

Loan amount = $50000 - 15000 = 35000$

Loan period = 3 years (36 months)

Interest rate

= 5.99% year (Nominal Interest rate (APR)) = $5.99\%/12$ (monthly interest rate)

Sales tax = 0 (buys car in NH) [2]

Monthly payment = 35000 (A|P 5.99%/12, 36)

Monthly Operations and Maintenance (O&M cost) = \$200 and increase by \$3 after every 3 months

He will use this car for 15 years (=180 months) and sell it for \$5000.

Third car: BMW (Will buy when he is 45 years and 0 months old).

Total Cost = 60000

Down payment: 30000

Loan amount = $60000 - 30000 = 30000$

Loan period = 5 years (60 months)

Interest rate

= 8% year (Nominal Interest rate (APR)) = $8\%/12$ (monthly interest rate)

Sales tax = 0 (buys in NH) [2]

Monthly payment = 30000 (A|P 8%/12, 60)

Monthly Operations and Maintenance (O&M cost) = \$300 and increase by \$5 after every 3 months.

He will use this car for 20 years (=240 months) and sell it for \$7000

7. Cost of living

a. Lives in a rental apartment for the first 13 years (= 156 months)

Rent = 750 per month [1] and increases by 6.04% per year (paid at the beginning of each month), considering he does not change the apartment for the next 13 years)

Buys a house when he is 38 years 0 months old.

Cost of house = \$500,000

Down payment = \$50,000

Loan amount = \$500,000 - \$50,000 = \$450,000

Loan period = 20 years (240 months)

Loan interest = 6.282% / year compounded monthly

Mortgage = 450000 (A|P, 6.282%/12, 240) = \$941.825

Stays in the house for 27 years (324 months).

Household prices increase at an average rate of 4.4% per year.

After 27 years, Book Value = 500,000(F|P, 4.4%, 27) = \$1,599,130

Case 1: He buys a house when he is 38 years 0 months old

Case 2: He stays on rent for the whole time

b. Food + Other Expenses

Monthly = \$600. Considering inflation rate of 3.06% per year, monthly expenses will increase by 3.06% per year

8. Investment in Stock

He invests \$100 every month in stock for the first 5 years and increases the investment to \$200 every month for next 20 years and \$300 for the last 15 years

Expected return from stock (The complete portfolio is sold at the end of the planning horizon (i.e.) at the age of 65) [4]

For the first 9 years 12%/year/monthly

From 11 to 14 years 12%/year/monthly

From 16 to 19 years 24%/year/monthly

From 21 to 40 years 36%/year/monthly

In between, he faces a loss of
 12%/year/monthly in the 10th,
 24% in 15th year,
 36% in the 20th year.

9. Total Savings

Total Savings = Salary – All spending

Total Savings are deposited in a bank that gives an interest rate of 2%/year/monthly.

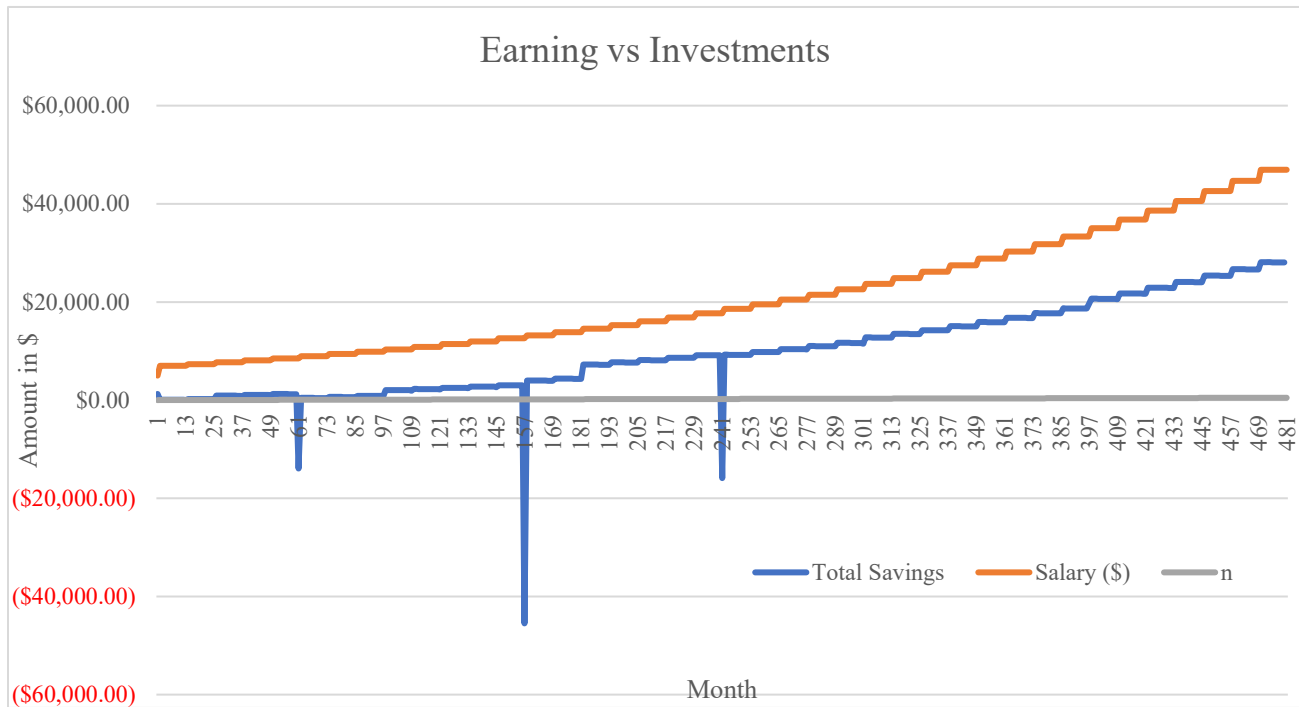


Figure 3: Earning (vs) Investments

Research

Ideal Scenario

Live within your means: It can be tempting to spend all your earnings as soon as you begin to receive them, but it's crucial to do so. Limit your expenditure and make every effort to conserve money.

Create an emergency fund: this is a savings account that you only utilize for unforeseen costs. Three to six months' worth of living expenses should ideally be saved up. An example would be loss of job or a health crisis.

Pay off loans: Be sure to finish paying off any student loans you may have as soon as you can. This will help you prevent interest from building up and raise your credit score.

Future investment: Begin investing as soon as you can, even if it's just a little bit. If your employer offers a 401(k) plan, take it into consideration, or start an IRA. Early investment can aid in long-term wealth accumulation.

Pay attention to your credit score: Getting a loan or a mortgage often depends on your credit score. Pay your expenses promptly, and refrain from opening an excessive number of credit accounts.

Avoid debt: Make every effort to avoid taking on debt. If you do have to borrow money, be careful to do it wisely and pay it back as quickly as you can.

A good rule of thumb to allocate spending categories is to follow the 50-30-20 principle. [\[3\]](#)

- 50% of after-tax income should be used for your needs, such as rent, food, utilities, and other essential expenses.
- 30% of your income should be used for your wants, such as entertainment, dining out, and hobbies.
- 20% of your income should be used for your savings and debt payments, such as paying off loans, building an emergency fund, and investing for your future.

By following this rule, you can balance your spending, prioritize your financial goals, and build a healthy financial foundation for your life.

Alternatives

Stock Investment

Case 1

- Investment of \$100, \$200, \$300 for consecutive 5, 20, 15 years respectively.
- Yield a profit of 12%, 12%, 24%, 36% for the consecutive 9, 4, 4, 19 respectively with 1-year losses in between each streak.
- Faced a loss of 12%, 24%, 36% in the year 10th, 15th and 20th year respectively.
- The stock amount invested in the previous month is reinvested again in the next month.

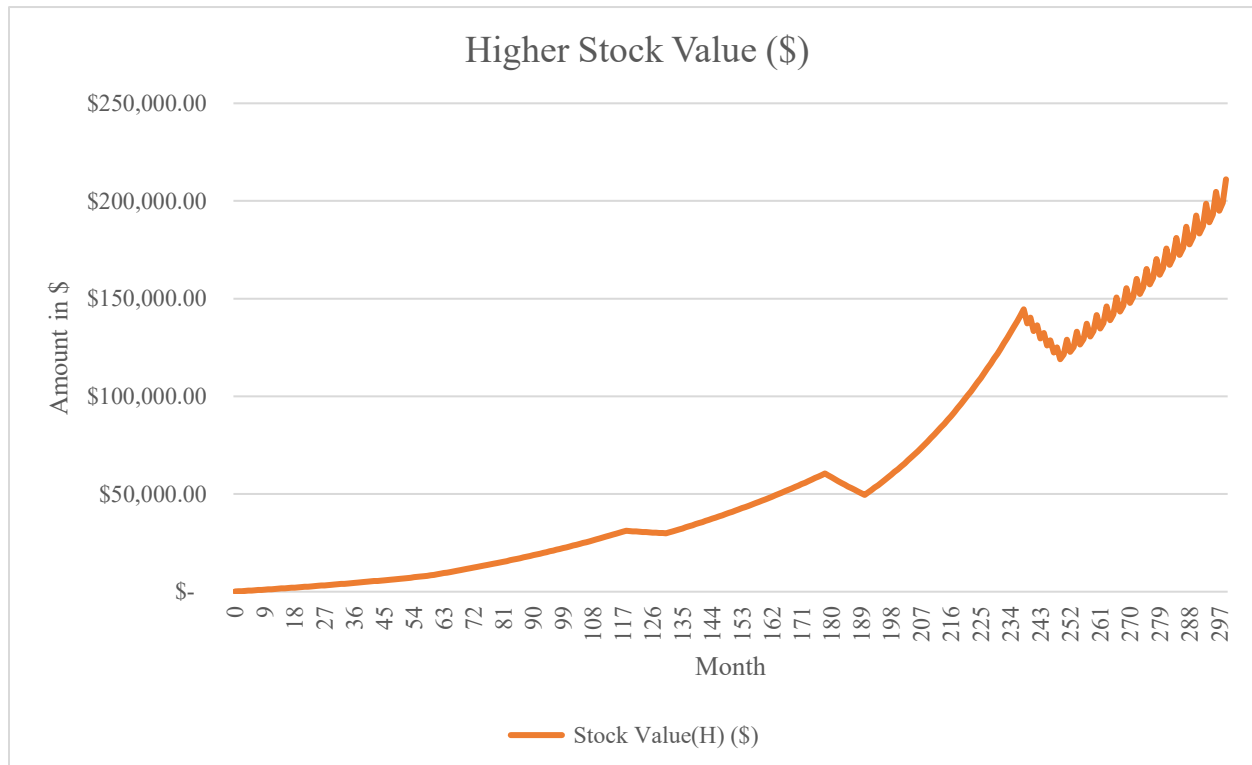


Figure 4: Stock investments with higher value

Case 2

- In this case, no stock investment was made throughout the lifetime.

Transportation

Case 1:

- Car 1 for 5 years. Purchase at 25, sell at 30.
- Car 2 for 15 years. Purchase at 30, sell at 45.
- Car 3 for 20 years. Purchase at 45, sell at 65 (retirement).

Case 2:

Keep the second car for 20 years (5 more years than in the previous case), then purchase the third car.

- Car 1 for 5 years. Purchase at 25, sell at 30.

- Car 2 for 20 years. Purchase at 30, sell at 50.
- Car 3 for 15 years. Purchase at 50, sell at 65 (retirement).

Note: In both cases, it is assumed that the same cars will be purchased at the same price and the same loan plans will be followed for the respective cars.

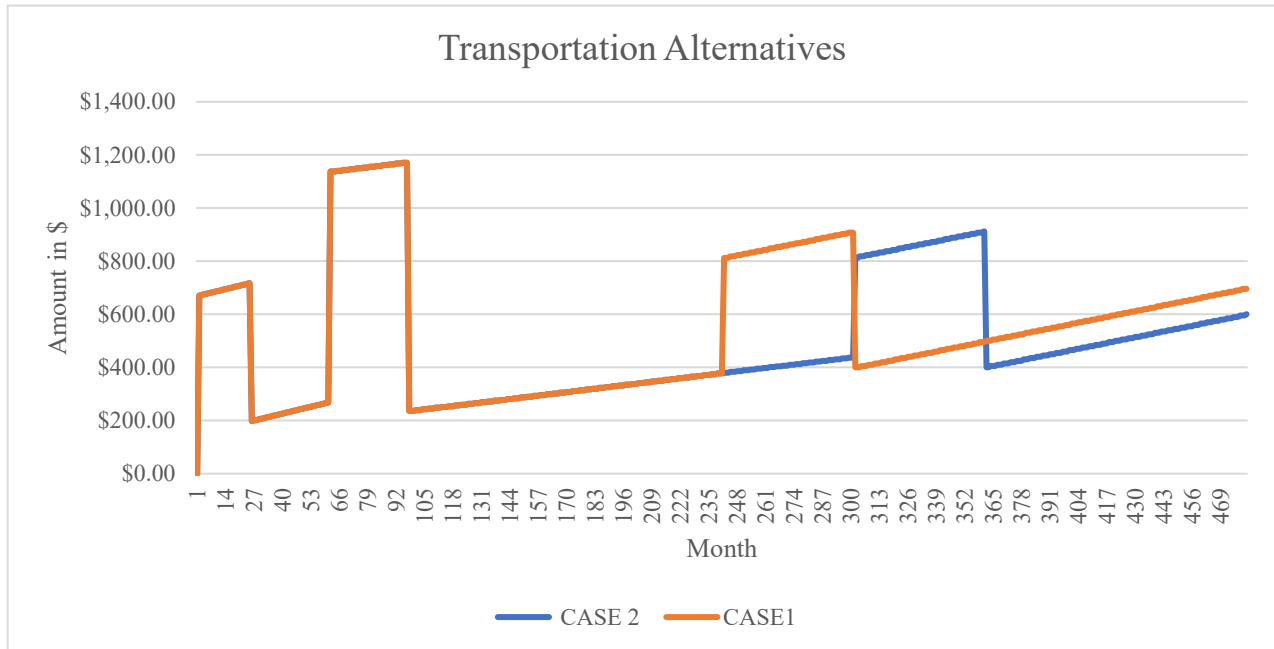


Figure 5: Transportation Alternatives - Case 1 & Case 2

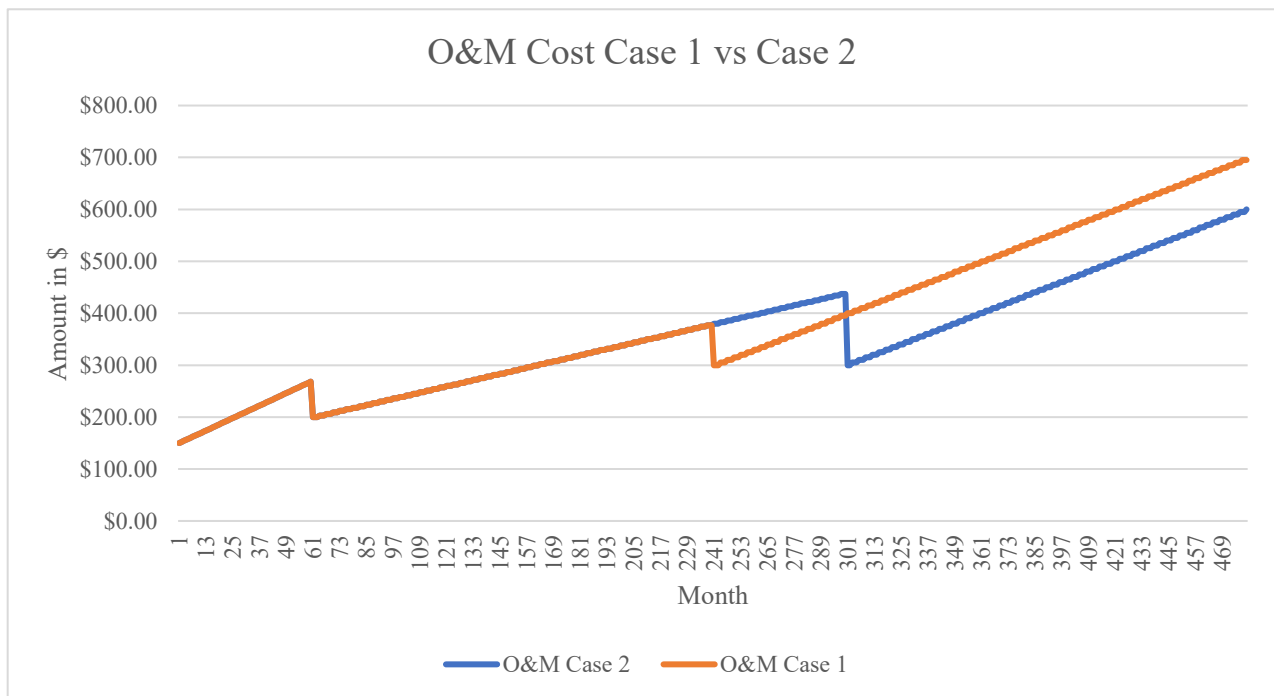


Figure 6: O&M Cost Case 1 (vs) Case 2

Cost of living

Case 1:

- Renting a house for 12 years.
- Purchase a house at 38 years 0 months old.
- Location: New Hampshire.

Case 2:

- Rent house for the entire life.
- Location: New Hampshire.

Financing Options

Loan Payments

- Education loan – 4.45% UG – 5.28% Grad.
- Car loan 1 (2nd car) – 5.99% APR (DCU) [\[2\]](#).
- Car loan 2 (3rd car) – 8% APR (Future predicted).
- Vehicle Purchase location – New Hampshire (sales tax – 0%).
- Housing Mortgage – 6.282% per year compounded monthly.

Sensitivity Analysis

Plan	Stock Investment	Cost of Living	Means of Transport: Life for car 2	Future Worth (FW)						
				MARR = 0%	MARR = 0.5%	MARR = 2%	MARR = 5%	MARR = 10%	MARR = 20%	MARR = 30%
1	Yes (High return)	Buying	Shorter Period	\$8,738,948.56	\$9,006,631.61	\$9,962,768.00	\$12,881,934.90	\$24,345,249.50	\$208,059,904.13	\$3,986,660,115.07
2	Yes (High return)	Buying	Longer Period	\$8,752,688.56	\$9,022,196.91	\$9,985,462.85	\$12,929,954.29	\$24,504,320.00	\$209,509,989.30	\$3,998,034,935.39
3	Yes (High return)	Renting	Shorter Period	\$6,170,522.02	\$6,400,421.70	\$7,229,204.81	\$9,815,470.56	\$20,384,121.77	\$200,781,906.21	\$4,008,305,326.28
4	Yes (High return)	Renting	Longer Period	\$6,184,262.02	\$6,415,987.00	\$7,251,899.66	\$9,863,489.96	\$20,543,192.27	\$202,231,991.38	\$4,019,680,146.59
5	No	Buying	Shorter Period	\$7,553,162.20	\$7,830,573.43	\$8,824,287.49	\$11,881,673.43	\$24,108,491.19	\$229,926,383.03	\$4,678,277,624.78
6	No	Buying	Longer Period	\$7,566,902.20	\$7,846,138.74	\$8,846,982.35	\$11,929,692.82	\$24,267,561.69	\$231,376,468.20	\$4,689,652,445.10
7	No	Renting	Shorter Period	\$4,984,735.66	\$5,224,363.52	\$6,090,724.30	\$8,815,209.09	\$20,147,363.46	\$222,648,385.11	\$4,699,922,835.98
8	No	Renting	Longer Period	\$4,998,475.66	\$5,239,928.83	\$6,113,419.16	\$8,863,228.49	\$20,306,433.96	\$224,098,470.28	\$4,711,297,656.30

Figure 7: Sensitivity Analysis based on different MARR values

Assuming a 4.4% return on purchasing a house property and a 22.154% return on buying stocks, it can be deduced that the optimal strategy for Minimum Acceptable Rate of Return (MARR) values of 0%, 0.5%, 2%, 5%, and 10% is plan 2 (investing in high-return stocks, buying the house, and using the car for a longer period). This is because the returns on the house and stocks are much higher than the MARR, making plan 2 a viable choice for the engineer to consider. Plan 7, which involves not investing in stocks, renting a house, and using the car for a shorter period, is deemed the least favorable option due to the absence of stock returns and monthly rental payments. As a result, the engineer should exclude plan 7 from consideration.

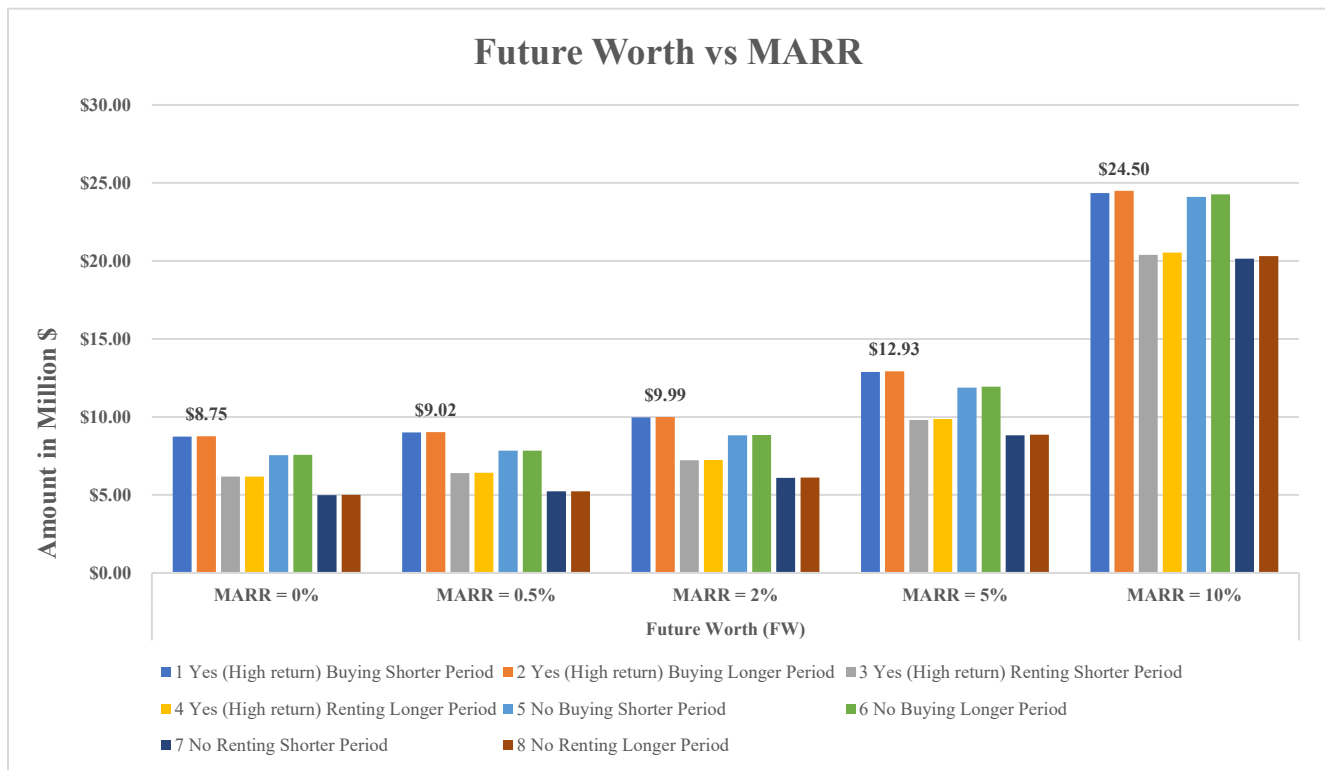


Figure 8: Graph showing Future worth for all the financial plans with different MARR values

When considering high MARR values such as 20% and 30%, the best and worst plans differ from those for lower MARR values. Plan 6 is the best option for MARR 20%, with no stock investment, buying the house, and long-term use of the car, while plan 3 is the worst option with stock

investment, renting the house, and short-term use of the car. For MARR 30%, plan 8 is the most favorable option with no stock investment, renting the house, and longer use of the car. Conversely, Plan 1 becomes the worst choice with stock investment, buying the house, and short-term use of the car. The chart displayed depicts the visual illustration of the Future Worth against MARR, and it indicates that Plan 2 is the most favorable choice for all MARR values.

MARR Analysis

We have selected 8 different scenarios for MARR where each case has a significant impact on the outcome.

- Firstly 0% MARR shows what would be the FW in case the money is kept in a current account earning 0% interest each year, which makes sense.
- 0.5% has the similar reason but is taken into consideration because some banks do give minimal interest on current account savings.
- 2% is the median interest rates offered on savings account by majority of banks in United States
- 5% is an indicator of an opportunity where bonds come into picture.
- 10%, 20% and 30% are instances with different investment opportunities which can earn high returns.

Now in real life it is difficult to obtain investment schemes with more than 10% return and 0 risk factor, so ideally 2-5% is what an engineer should consider as MARR while making financial decisions. And according to that Plan 2 comes out to be the best option.

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