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1. Project Description/Problem Statement

1.1 Objective:

Develop a recommended financial plan for an engineer, just starting out in his or her career and under 30 years old. Include budgeting, purchasing plans, investing and saving, and retirement. Look at various financial options or vehicles for some of these items. Include advice on how to stay out of financial trouble and what to do if you get into financial hot water. Cite your sources of advice and guidance.

1.2 Project Outline:

This financial analysis revolves around an individual's life decisions, starting at 25 years old with $55,000 in savings. They begin with a $12,000 salary that increases by 3% annually. 6% of their salary goes into a retirement fund that accrues a compounded monthly interest rate of 7%. Taxes, calculated at 29% (24% federal and 5% state tax for Boston), are levied on their salary, with retirement fund contributions deemed non-tax-deductible.

Additionally, the individual has an outstanding $60,000 education loan, starting repayments at 25, with an interest rate of 12% annually compounded monthly, spanning 5 years (60 months).

Transportation expenses are analyzed, comparing public transport usage until age 60 against purchasing a car every 5 years, with the first car costing $30,000, financed by a $24,000 loan at 5% interest for 5 years, alongside a $6,000 down payment. Subsequent cars are bought using personal savings.

Living costs are assessed based on rental expenses of $1000 with an increment of 6% every year compounded yearly, versus purchasing a house. A 35-year mortgage of $320000 is considered for the house at a 6% annual interest rate compounded monthly with a down payment of $80,000, where the individual resides for 35 years.

Food and miscellaneous expenses are budgeted monthly, with gradual increases over time based on location.

Moreover, individual investments of $1500 have been analyzed monthly in stocks from age 25, aiming for a 35-year investment period with an anticipated return rate of 8% annually compounded monthly against not investing in stocks.

The project aims to determine the individual's total savings at age 59, depositing these savings in a bank account with a 2% annual interest rate compounded monthly.

2. Research

2.1 Alternatives

Cases	House	Mode of Transport	Annual Stock Investment
C1	Rent	No Car	NI
C2	Rent	No Car	$1500
C3	Rent	Car	NI
C4	Rent	Car	$1500
C5	Buy	No Car	NI
C6	Buy	No Car	$1500
C7	Buy	Car	NI
C8	Buy	Car	$1500

We have considered three main alternative cases for financial analysis from age 25 to age 60 for the engineer, which makes up about 8 total cases. We'll be using these to make recommendations to the engineer for his future financial analysis and planning.

3. Assumptions

Location: Boston, MA

Job	**Starting Salary (per month)**	**$12,000**
	Per annum increment in salary	3%
	Signing bonus	$50,000
	Retirement Fund Contribution Monthly	6%
	Retirement Fund Receipt	7%
	Tax	24%
	Boston State Tax	5%
	Total Tax	29%
Masters	Master's Loan	$60,000
	Master's Loan Interest	12%
	nper (months)	72
	Public Transport	($200)
	Increment (year)	0.03
Car	Cost of car	$30,000
	Down Payment of car	$6,000
	nper for car	60
	interest for car loan	5%
	monthly pmt for car	($747.00)

|		
	Resale (After 5 years)	20000
	salvage (after 35 years)	$45000
Renting	Public Transport	$200
	Apartment Rent	$1,000
	Increase in rent annually	6%
Buying	Cost of house	$400,000
	Down payment	($80,000)
	nper for house	420
	interest for house loan	6%
	monthly pmt for house	($1,824.61)
	salvage (after 35 years)	$1,125,544.98
	Appreciation	3%/year
	Food & Leisure Expense	$500
	Increment	3%/year
Stock	Investment	($1,500)
	ROI	8%
		3,440,823
Initial Savings		$55,000.00

4. Analysis

1. An initial level analysis helps us understand, as the MARR% increases so does the FW value for that subcase.
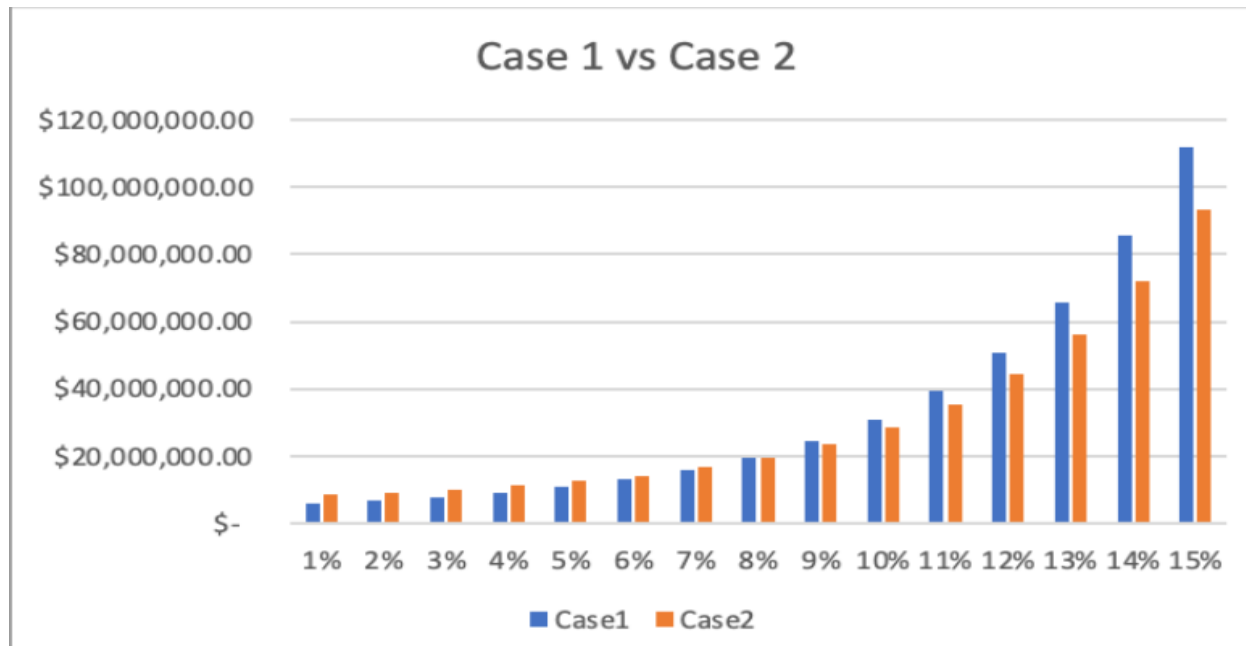
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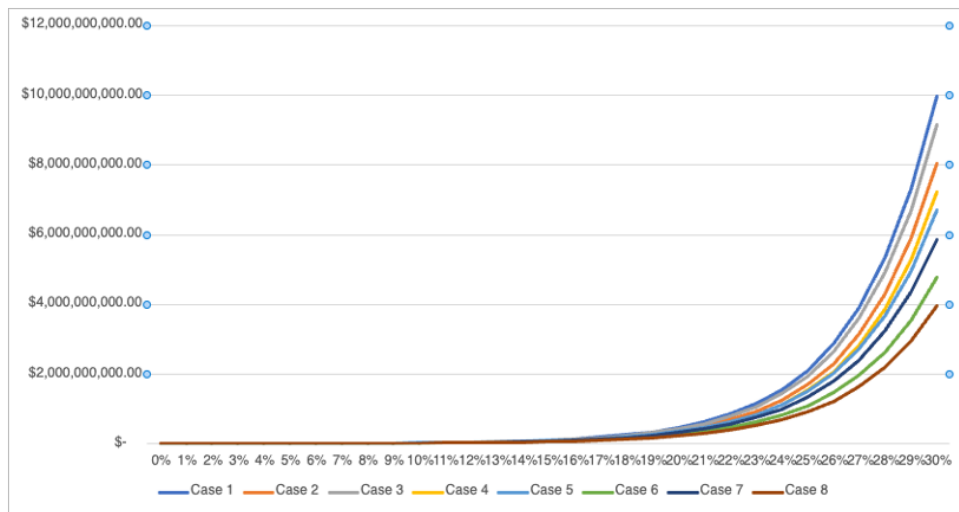
2. We can infer from subcases 1 to 8 that, Investment should be a better option if the MARR is less than or equal to 8%, and buying a house is better alternative than renting a house when MARR is less than 8% , Renting and No Investment is the better option if the MARR is >8%, public transportation in Boston is always better alternative than that of buying a car.

3. We can infer that the FW of subcase 6(Investment, no car, Buying) is greater than all the other subcases from MARR 0-8% and for MARR>8% subcase 1 is the better alternative.   (No-Investment, No Car, Renting).
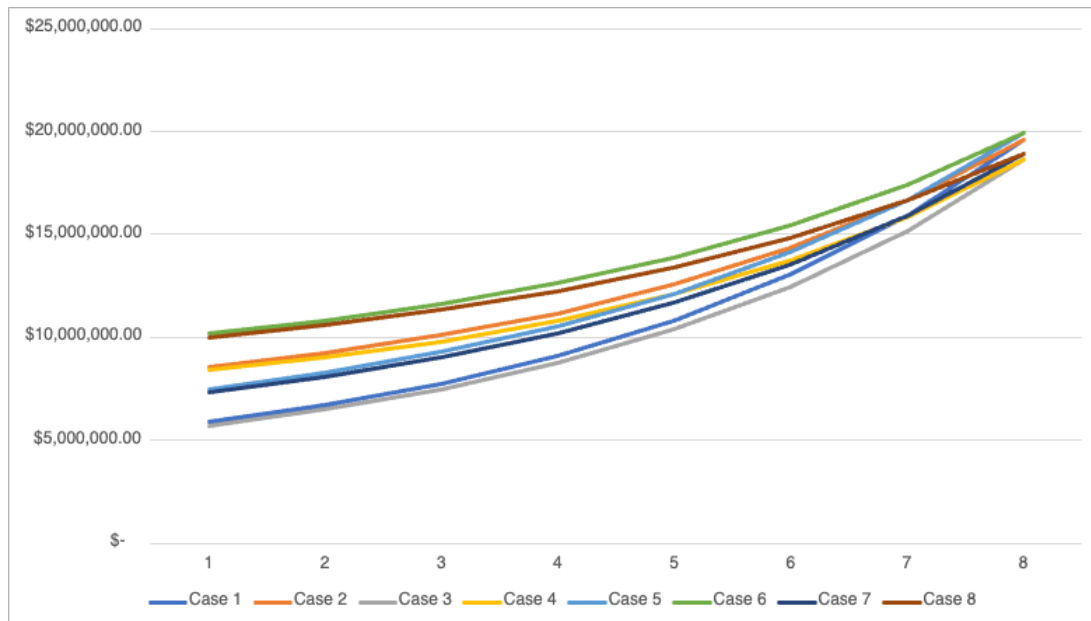
4.1 Investment in Stocks vs Not Investing in Stocks

|				Future Worth									
Cases	House	Mode of Transport	Annual Stock Investment	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
C1	Rent	No Car	NI	$5,208,652.42	$5,873,504.34	$ 6,707,633.06	$7,761,550.64	$9,102,180.13	$10,818,471.03	$13,029,003.02	$15,892,298.57	$19,620,830.83	$ 24,500,077.90
C2	Rent	No Car	$1500	$8,019,476.15	$8,560,378.75	$ 9,237,135.09	$10,090,028.89	$11,172,407.46	$12,555,156.12	$14,332,761.30	$16,631,540.40	$19,620,830.83	$ 23,528,224.92
C3	Rent	Car	NI	$5,069,941.36	$5,700,725.93	$ 6,490,726.65	$7,487,093.34	$8,752,195.96	$10,368,805.81	$12,447,103.89	$15,134,176.95	$18,626,904.52	$ 23,189,473.98
C4	Rent	Car	$1500	$7,880,765.09	$8,387,600.34	$ 9,020,228.68	$9,815,571.58	$10,822,423.28	$12,105,490.90	$13,750,862.18	$15,873,418.78	$18,626,904.53	$ 22,217,621.01
C5	Buy	No Car	NI	$6,825,079.79	$7,480,965.12	$ 8,289,598.39	$9,293,514.05	$10,548,281.79	$12,126,742.65	$14,124,676.64	$16,668,398.85	$19,924,957.56	$ 24,115,846.99
C6	Buy	No Car	$1500	$9,635,903.52	$10,167,839.54	$ 10,819,100.42	$11,621,992.29	$12,618,509.11	$13,863,427.74	$15,428,434.92	$17,407,640.67	$19,924,957.56	$ 23,143,994.00
C7	Buy	Car	NI	$6,686,368.74	$7,308,186.72	$ 8,072,691.98	$9,019,056.74	$10,198,297.62	$11,677,077.44	$13,542,777.52	$15,910,277.23	$18,931,031.26	$ 22,805,243.08
C8	Buy	Car	$1500	$9,497,192.46	$9,995,061.13	$ 10,602,194.01	$11,347,534.98	$12,268,524.94	$13,413,762.52	$14,846,535.79	$16,649,519.05	$18,931,031.25	$ 21,833,390.09

We can infer that the FW of subcase 2 is greater than subcase 1 until MARR<8%. This is primarily because we are investing $1500 each month in subcase 2, which gives us a return of 8%/year as compared to subcase 1 where we made no investment, thereby allowing us to generate a better return from subcase 2. Investing money in funds is a suitable option as it offers a better return than the bank (MARR <=8%) and No-investment in the stocks is the better alternative for MARR >=8%. At MARR 8%.

4.2 Buying/Renting a House

Cases	House	Mode of Transport	Annual Stock Investment	Future Worth									
				0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
C1	Rent	No Car	NI	5,208,652.42	$ 5,873,504.34	$ 6,707,633.06	$ 7,761,550.64	$ 9,102,180.13	$10,818,471.03	$13,029,003.02	$15,892,298.57	$19,620,830.83	$24,500,077.90
C2	Rent	No Car	$1500	8,019,476.15	$ 8,560,378.75	$ 9,237,135.09	$10,090,028.89	$11,172,407.46	$12,555,156.12	$14,332,761.30	$16,631,540.40	$19,620,830.83	$23,528,224.92
C3	Rent	Car	NI	5,069,941.36	$ 5,700,725.93	$ 6,490,726.65	$ 7,487,093.34	$ 8,752,195.96	$10,368,805.81	$12,447,103.89	$15,134,176.95	$18,626,904.52	$23,189,473.98
C4	Rent	Car	$1500	7,880,765.09	$ 8,387,600.34	$ 9,020,228.68	$ 9,815,571.58	$10,822,423.28	$12,105,490.90	$13,750,862.18	$15,873,418.78	$18,626,904.53	$22,217,621.01
C5	Buy	No Car	NI	6,825,079.79	$ 7,480,965.12	$ 8,289,598.39	$ 9,293,514.05	$10,548,281.79	$12,126,742.65	$14,124,676.64	$16,668,398.85	$19,924,957.56	$24,115,846.99
C6	Buy	No Car	$1500	9,635,903.52	$10,167,839.54	$10,819,100.42	$11,621,992.29	$12,618,509.11	$13,863,427.74	$15,428,434.92	$17,407,640.67	$19,924,957.56	$23,143,994.00
C7	Buy	Car	NI	6,686,368.74	$ 7,308,186.72	$ 8,072,691.98	$ 9,019,056.74	$10,198,297.62	$11,677,077.44	$13,542,777.52	$15,910,277.23	$18,931,031.26	$22,805,243.08
C8	Buy	Car	$1500	9,497,192.46	$ 9,995,061.13	$10,602,194.01	$11,347,534.98	$12,268,524.94	$13,413,762.52	$14,846,535.79	$16,649,519.05	$18,931,031.25	$21,833,390.09

Cases	House	Mode of Transport	Annual Stock Investment
C4	Rent	Car	$1500
C8	Buy	Car	$1500

Case 4 vs Case 8
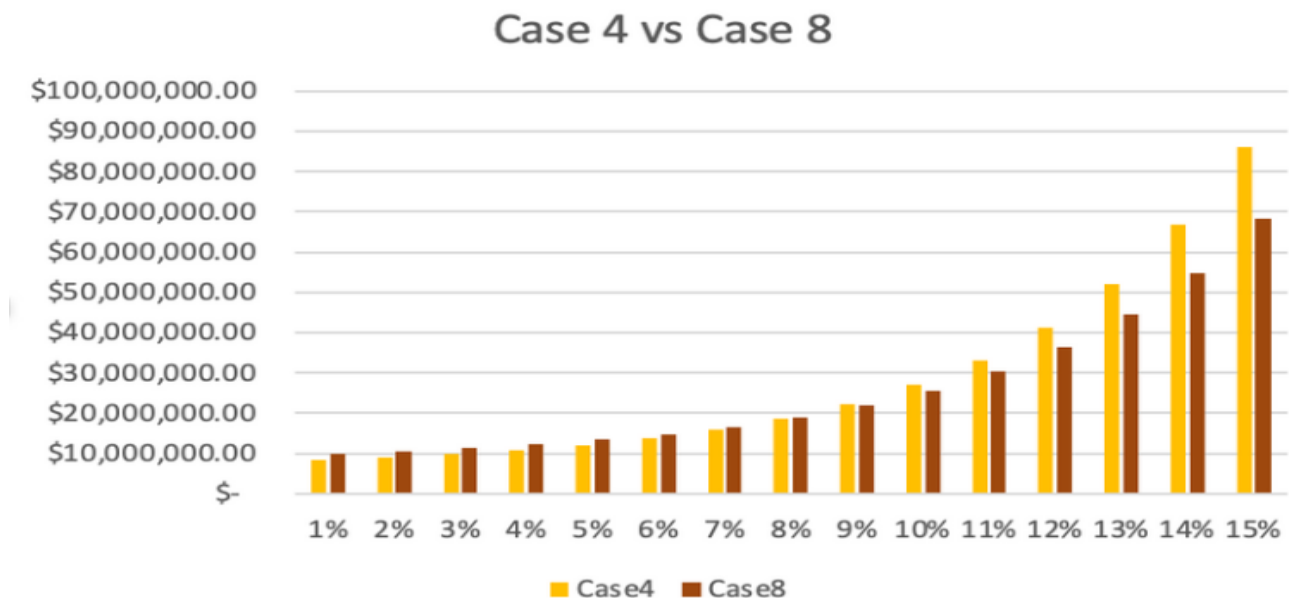
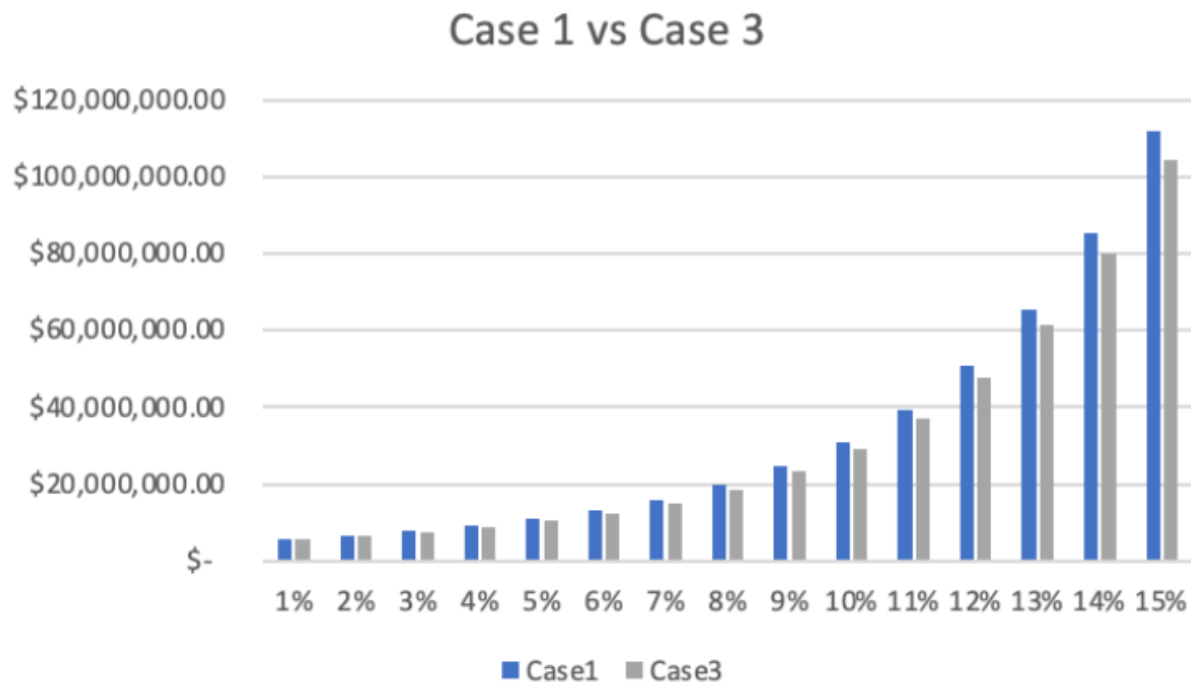We can infer that the FW of subcase 8 is greater than subcase 5 until MARR<9%. This implies that buying a house is better if MARR <9%. If MARR > 9% renting a house would be better.

4.3 Buying a Car vs Public Transport

Cases	House	Mode of Transport	Annual Stock Investment	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	
C1	Rent	No Car	NI	$5,208,652.42	$5,873,504.34	$6,707,633.06	$7,761,550.64	$9,102,180.13	$10,818,471.03	$13,029,003.02	$15,892,298.57	$19,620,830.83	$ 24,500,077.90	$
C2	Rent	No Car	$1500	$8,019,476.15	$8,560,378.75	$9,237,135.09	$10,090,028.89	$11,172,407.46	$12,555,156.12	$14,332,761.30	$16,631,540.40	$19,620,830.83	$ 23,528,224.92	$
C3	Rent	Car	NI	$5,069,941.36	$5,700,725.93	$6,490,726.65	$7,487,093.34	$8,752,195.96	$10,368,805.81	$12,447,103.89	$15,134,176.95	$18,626,904.52	$ 23,189,473.98	$
C4	Rent	Car	$1500	$7,880,765.09	$8,387,600.34	$9,020,228.68	$9,815,571.58	$10,822,423.28	$12,105,490.90	$13,750,862.18	$15,873,418.78	$18,626,904.53	$ 22,217,621.01	$
C5	Buy	No Car	NI	$6,825,079.79	$7,480,965.12	$8,289,598.39	$9,293,514.05	$10,548,281.79	$12,126,742.65	$14,124,676.64	$16,668,398.85	$19,924,957.56	$ 24,115,846.99	$
C6	Buy	No Car	$1500	$9,635,903.52	$10,167,839.54	$10,819,100.42	$11,621,992.29	$12,618,509.11	$13,863,427.74	$15,428,434.92	$17,407,640.67	$19,924,957.56	$ 23,143,994.00	$
C7	Buy	Car	NI	$6,686,368.74	$7,308,186.72	$8,072,691.98	$9,019,056.74	$10,198,297.62	$11,677,077.44	$13,542,777.52	$15,910,277.23	$18,931,031.26	$ 22,805,243.08	$
C8	Buy	Car	$1500	$9,497,192.46	$9,995,061.13	$10,602,194.01	$11,347,534.98	$12,268,524.94	$13,413,762.52	$14,846,535.79	$16,649,519.05	$18,931,031.25	$ 21,833,390.09	$

Cases	House	Mode of Transport	Annual Stock Investment
C1	Rent	No Car	NI
C3	Rent	Car	NI

Case 1 vs Case 3

We can infer that the FW of subcase 1 is greater than subcase 3 throughout. It is true for the remaining cases as well. This is primarily because public transportation cost is always going to be more efficient than buying a car at any point in life.

5. Use of Engineering Economy:

Time Value of Money concepts was utilized in determining the following:
- FV of Retirement Fund
- NPV of Graduate Loan, to calculate the AW of interest payment
- Annual payment (PMT) of Car Loan
- Annual payment (PMT) of House Loan
- FV of House
- Salvage Value of Car
- FV of Investment Fund

6. Summary:

From our analysis following were the conclusions:
- If MARR <8%, Case 6 (Buy House, Public Transport, Invest) is the favored decision to make as it returns the highest future worth.
- If MARR >8%, Case 1 (Rent, Public Transport, No Invest) is the favored decision
- All the cases favored taking public transport

7. Recommendations:

- Buying a house is a better option than renting a house for MARR<8% and renting is the better alternative for MARR>8%.
- Investing in stocks is better than no investment in stocks from 0- 8% and no investment is better than investment above 8% - 30%
- Public transport is a better option than buying a car in Boston.

8.   Conclusion:

- To create financial estimates and analyze each person's financial situation, we adjusted and controlled a variety of cash flows.
- Examined and assessed many economic scenarios in cases and made thoughtful judgments that would provide financial stability.
- Time value of money principles was applied to cash flows to determine the future worth of investments.

9. References:

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- *Cost of Car:* https://caredge.com/guides/new-car-price-trends-in-2023
- *Boston Apartment rent*: https://www.apartments.com/88-howard- ave-boston-ma/3x7phfg/
- *Cost of house in Boston*: https://www.zillow.com/homedetails/808- E-3rd-St-1-South-Boston-MA-02127/71332504_zpid/
- *Boston Subway fares*: https://www.mbta.com/fares/subway-fares
- *Boston House appreciation:* https://www.noradarealestate.com/blog/boston-real-estate-market/