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MATH 135-03

Professor Wears

Writing Assignment 1

Dear Friend,

After the conversation we had at dinner the other night, I must admit I’m concerned about your statements regarding your financial future. Despite your limited income until age 40, there are still a few ways that you can start investing now, at age 22. Time is your ally, you need to get ahead of the ball before it picks up speed and tries to run you over Indiana Jones style. Right now, I can think of four different ways you could invest, even with minimal deposits of $275, to your benefit. Even if you only have a limited income right now and for the near future, time that your money has to grow is more important than the size of your investments.

There are of course some limitations in the models I will be using. First of all, both the compound interest model and the future value of an ordinary annuity model assume that the interest rates and compound rate are this favorable and that they remain constant throughout the entire scenario. The second assumption is that all of the monthly investments are both consistently made and are consistently of the same value. These are both important and strong assumptions, and although I might be being a bit broad, these calculations should still be able to show you a good picture of the proper way to invest your money.

The first scenario provides substantial reward. Instead of waiting until 40, it involves investing your money before then. Your investment strategy would begin now at age 22, you invest your $275 every month into an account where interest is 7.5% compounded monthly. If you did this every month for 18 years, until you turned 40 and then stopping the flow of investments, using the formula for the future value of an ordinary annuity, your account will be worth $125,015.15 at age 40. Despite only investing a total of $59,400 you’ll see a growth of $65,615.15 in interest. However, this isn’t where your earnings end. Even if you stopped investing at age 40, the money left in the account will still be earning compound interest. In fact, it will grow to $810,458.27 by the time you turn 65 and retire. That’s $685,443.12 earned in compound interest alone by the time you turn 65. The first investment leg lasted 18 years and, with $59,400 invested, grew to $125,015.15. The second investment leg lasted only 7 years longer, from age 40 to 65 (25 years), and with NO MONEY invested, grew to $810,458.27. That’s massive. It completely outstrips the first investment leg. This scenario isn’t necessarily about the investments from 22-40 and their profits, but more so focuses on how investing earlier in life gives you a leg up for the rest of your life towards retirement. Investing early, even if you invest less, gives your investments more time to grow and gain value in interest.

The second scenario is the one you seemed to initially prefer, waiting until age 40 to begin investing and saving for retirement. Doubling your earlier available payments of $275 a month to $550 a month for 25 years until you turn 65. With an interest rate of 7.5% compounded monthly, using the future value of an ordinary annuity formula, your account balance will equal $482,493.48. Your monthly payments will come to a total investment of $165,000. Your earnings in interest equal $317,493.48. Not bad, but this strategy only earns approximately less than half of the revenue gained in interest alone from the first scenario. This really isn’t a favorable strategy, hopefully you can see here what I tried to tell you using the first scenario. Time is much, much more important than investment value. Investing less over a longer period yields much higher rewards, which is exactly why you should start investing now. If you wanted to match the ending balance of your account in scenario one, but still insisted on only investing from ages 40-65, you would have to almost double the investments in this scenario. Instead of $275 a month from ages 22-40 and letting it grow with interest to 65, you would have to invest $923.85 a month every month from age 40-65 to have a ending balance of equal value to scenario one.

The third scenario is a combination of the previous two. Like in scenario one, you would start by investing $275 every month from age 22 to age 40. With an interest rate of 7.5% compounded monthly, the formula for the future value of an ordinary annuity shows us that, as in scenario one, it will grow with compound interest to $810,458.27 by age 65. However, this time, instead of just stopping the investments, you instead change the payments. So starting at age 40, you change the payments to double what they were before. From $275 a month to $550 a month, for 25 years until you turn 65. Just like in scenario two, using the future value of an ordinary annuity formula, we learn that your account balance will equal $482,493.48. So your total growth in this scenario means your account will be worth $1,292,591.75, your total payments toward this investment equal $224,400, and your total earnings in interest equal $1,068,551.75. So, investing after the age of 40 is not necessarily pointless, but it is critical to note that the investments from 22-40 and the interest they earned by 65 does the majority of the heavy lifting. This is essentially giving you the best of both worlds. But if you wanted to have an account with this balance but only invest from ages 40-65, you would be forced to make monthly payments of $1,473.45. Yikes. Time is important, this number right here shows that, yet again, time to grow with interest is more powerful than what you invest.

The fourth and final scenario assumes that you choose to indulge a bit before retirement. Again, it has you investing $275 a month every month from age 22 to 40 in an account where interest is 7.5% compounded monthly. So, once again, your account will grow with interest to $810,458.27 by age 65. At age 40, the monthly investments change from $275 a month $600 a month for the next 10 years, until age 50. With a compound interest rate of 7.5% compounded monthly, the future value of an ordinary annuity formula shows us that account will be worth $106,758.21, the investments of this leg will be $72,000, and the earnings in interest will be $34,758.21. But it isn’t over quite yet. As I said, we’re going to assume in this scenario that you choose to indulge a bit before retirement. So, at age 50, 55, and 60, we’ll assume that you withdraw $36,000 each to pay for vacations. So at age 50, you make your first withdrawal of $36,000 from the $106,758.21 you invested in from ages 40-50, bringing it down to $70,758.21. However, it will still have 5 years to earn compound interest before the next withdrawal. By age 55, at the second withdrawal of $36,000, the account value will be back up to $102,832.51. After the withdrawal, the balance will be $66,832.51. After another five years of growth through interest, the account will be worth $97,127.31. At age 60, the final withdrawal of $36,000 brings the account’s value down to $61,127.31. The last five years before retirement gives it a little time to grow with interest to $88,835.98. The withdrawals will subtract a total of $108,000, more than you have earned from ages 40-50 by investing, however, through another display of the power of time and compound interest, not only are you able to cover this, you actually come out on top. So, in total, you will have invested $131,400 into this account, your final balance will be $899,294.25, and you will have earned $767,894.25 in interest. Again, the majority of that balance comes from the investments made from 22-40 and given time to grow until age 65, the investments made from ages 40-50 were instead used to fund the vacations. Also, it’s important to note that the $108,000 comes close to the $131,400 you personally invested into the account. The rest of the money is earned, and I still cannot stress this enough, through growth through interest over time. If you wanted to match this by just investing from ages 40-65, you’d have to make monthly payments of $1,025.12. Not so fun.

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| Summary Table | Investment Schedule | Ending Balance | Amount Personally Invested | Earnings in Interest |
| Scenario One | 22-40 | $810,458.27 | $59,400 | $751,058.27 |
| Scenario Two | 40-65 | $482,493.82 | $165,000 | $317,493.48 |
| Scenario Three | 22-40, 40-65 | $1,292,591.75 | $224,400 | $1,068,551.75 |
| Scenario Four | 22-40. 40-50 | $899,294.25 | $131,400 | $767,894.25 |

