Math Paper Two

Tyler Cosley

 My dearest friends,

I appreciate you reaching out to me and I am honored to be the friend you look to in your hour of need. I am very aware of the many technicalities surrounding interest rates over a period of time, so immediately upon hearing of your current mortgage situation, I got to work in analyzing the ins and outs of what is going on to find a more understandable way to explain it to you. I know it can be very confusing, but that is why I am here to help! Not everyone has been through the highly esteemed Mathematical Modeling of Finance course like I have, so please do not be embarrassed! It was my pleasure to help my dearest friends.

Let me go right on ahead and get into this for you guys! I will make a quick note; I have a special calculator that allows me to determine many of these numbers in a special function called the TVM solver. I can’t take ALL of the credit!

It is my understanding you put a down payment on this house about five years ago. I remember you telling me you put down ten percent of the house’s total $240,000 cost. So you initially, at the age of 28, paid 24,000 dollars. With the down payment paid, the cost of the house went down to $216,000. You guys told me you took out a 30 year mortgage when you paid 10% down, with an interest rate of 5.45% compounded monthly. Factoring all this in for that period of time, assuming you don’t experience any financial “bumps in the road”, you would pay $1,219.66 each month, for 30 years. The product of every monthly payment after the entire 30 years would be $439,077.60. I got this by using the “Total Paid Formula.” Now, by subtracting the cost of the house after your down payment from this total, you will see that your total interest paid comes to $223,077.60. Of course, this is looking way ahead into the future.

Now that you know this, we can address your dilemma. You now have the option to refinance your home, so I will show you my calculations of this option to better explain to you which option is the best to take. Rates have now fallen to 4.15%, because of an unexpected macroeconomic event. This is the reason you now have the option to refinance. With the 4.15% interest rate compounded monthly, you can now take out a new 25 year mortgage to finance your home. To make this change, you will have to pay a $3,000 fee. (This is the bank’s way of getting their money, because it does not help them to give you a lower APR). For this, I will go through a very similar process I did for the first option, but this time, because five years have passed since you took out your 30 year mortgage, I need your current balance. I used a balance function on my calculator to find this. After living in your home for 5 years with the 30 year mortgage and an APR of 5.45%, your balance is $199,582.16. Now looking down the line with the new 25 year mortgage, I will use this new balance to calculate the total amount you will end up paying. At an APR of 4.15%, your new monthly payment would be $1070.07, and this amount over the span of 25 years will total $321,021. Your first five years must be factored into this to get a *final* amount; using the 30 year mortgage monthly payment of $1,219.66 over a five year time span, you get $73,176.60. Add this to the 25 year total ($321,021), and you get $394,197.60. But, keep in mind, to refinance you must pay a $3,000 fee. This would bring your grand total to $397,197.60.

Now you can easily see that in the long run, refinancing will be cheaper for you. Even comparing what you pay in interest, you can see that the initial $223,077.60 in interest is much higher (from the initial 30 year mortgage) than the refinanced mortgage, which is only $181,197.60 in interest. Refinancing is the best way to go, and I hope you can see this now! Here’s a simple chart to better visualize this fact.

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| --- | --- | --- |
| Mortgage options: | 30 year initial option | Refinance option |
| $$$ Totals: | $439,077.60 | $397,197.60 |

Hoping that you are financially secure and that no other unplanned financial events take place, I will assume that that you all are able to invest the amount saved on monthly payments by refinancing in an account where your interest would be 5% compounded monthly. If you can or elect to do this, from the time that the mortgage ends until you (potentially) retire at the age of 65, you can earn $591.93 a month! You began your mortgage at 28 years old, so adding thirty years for the mortgage on to 28 years old, you could potentially earn this monthly payment for a whopping 7 years until you are 65, earning a total of $49,722.12! This sounds great, (and is), but knowing y’all, I want to present another alternative to you. As long as I have known you, you have wanted to travel. My advice, don’t invest ALL that you save by refinancing. Only invest three fourths of it, ($31,410), and use the rest to take a lavish vacation! Go somewhere you have always wanted to go! You will still earn $443.95 a month, totalling $37,291.80. It may seem like a lot of money, but I promise you will not regret it. Life is short, live it well! I always say “you can’t take it with you when you’re gone!”

 I know this letter was heavy with information and we covered a lot, but if you take anything from it, please know that you should refinance your home. You will save a great deal of money! If you have any further questions please do not hesitate to reach out to me. It is my pleasure to help such great friends! We should catch up over dinner soon!

Take care,

Tyler Cosley

(Appendix below)

Appendix:

1. Most calculations made in the TVM Solver
2. Balance function{bal(.....)} on calculator
3. Total Paid Formula = (monthly payment)(12 x number of years)
4. Interest Paid = (Total Paid) - (Principal)