g) Because firstly when we use the linear model, the consequence of R square is not that good, which means the linear model cannot describe the relationship between tenure and profit well. And also, from the perspective of economic, Limbach et al. (2015) hypothesized, and

demonstrated an inverted U-shape relationship between CEO tenure and firm performance. I believe the relationship between tenure of manager and client and firm performance also follows that relationship. This is because in the first period of time of tenure, with the tenure increasing, the experience of workers accumulates. In this case, the financial performance becomes better because people are more efficient in the management and execution part. As the tenure reaches some point, it's hard for the workers to have a better working experience continuously, which means the managers and the clients have formed some routine of work and follow one's routine even though the tenure increases. And this will lead to no changes or extremely gentle changes in terms of financial performance. When it comes to the workers with even longer tenure than that value, with the tenure increasing, people tend to avoid the changes in working and fail to keep pace with the cutting-edge technology during the work. As a result, the financial performance will even be worse in this period. Therefore, this is why the tenure and financial performance in an inverted U-shape relationship.

In this condition, considering the inverted U-shape, I use the quadratic model of square component of tenure. And I added the location factors so that both the R square and adj R square increases (R square from 0.237 to 0.7045, adj R square from 0.1934 to 0.6583)

1. fit5=lm(Profit~MTenure+I(MTenure\*\*2)+CTenure+I(CTenure\*\*2)+Pop+Comp+Visibility+PedCount+Res+Hours24,data=data2)
2. summary(fit5)
3. ################################# RESULT
4. Residuals:
5. Min 1Q Median 3Q Max
6. -93706 -29284 -7132 35856 124337
7. Coefficients:
8. Estimate Std. Error t value Pr(>|t|)
9. (Intercept) -24181.491 62263.640 -0.388 0.69903
10. MTenure 1732.548 312.207 5.549 5.88e-07 \*\*\*
11. I(MTenure^2) -4.830 1.443 -3.348 0.00137 \*\*
12. CTenure 2460.359 974.711 2.524 0.01409 \*
13. I(CTenure^2) -16.901 10.376 -1.629 0.10826
14. Pop 3.475 1.397 2.487 0.01550 \*
15. Comp -25455.638 5136.143 -4.956 5.56e-06 \*\*\*
16. Visibility 19761.671 8750.212 2.258 0.02734 \*
17. PedCount 39140.913 8486.859 4.612 1.96e-05 \*\*\*
18. Res 62707.989 38571.379 1.626 0.10891
19. Hours24 56375.901 18193.912 3.099 0.00289 \*\*
20. ---
21. Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1
22. Residual standard error: 52260 on 64 degrees of freedom
23. Multiple R-squared: 0.7045, Adjusted R-squared: 0.6583
24. F-statistic: 15.26 on 10 and 64 DF, p-value: 1.744e-13
25. fit6 = lm(Profit~MTenure+I(MTenure\*\*2)+CTenure+I(CTenure\*\*2), data = data2)
26. summary(fit6)
27. ################################# RESULT
28. Residuals:
29. Min 1Q Median 3Q Max
30. -180663 -45858 -4786 48345 182214
31. Coefficients:
32. Estimate Std. Error t value Pr(>|t|)
33. (Intercept) 221974.581 18865.982 11.766 <2e-16 \*\*\*
34. MTenure 1176.432 457.871 2.569 0.0123 \*
35. I(MTenure^2) -2.688 2.058 -1.306 0.1958
36. CTenure 1279.223 1384.874 0.924 0.3588
37. I(CTenure^2) -4.843 13.996 -0.346 0.7304
38. ---
39. Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1
40. Residual standard error: 80290 on 70 degrees of freedom
41. Multiple R-squared: 0.237, Adjusted R-squared: 0.1934
42. F-statistic: 5.436 on 4 and 70 DF, p-value: 0.000719

h) Since we only focus on the change of manager tenure(MTenure), we consider the other parameters as a constant. Therefore, we actually optimize the maximum value of the component related to MTenure, which is the function below:

1. fit5=lm(Profit~MTenure+I(MTenure\*\*2)+CTenure+I(CTenure\*\*2)+Pop+Comp+Visibility+PedCount+Res+Hours24,data=data2)
2. profit\_func3 = function(p){
3. return(fit5$coefficients[['MTenure']]\*p+p\*\*2\*fit5$coefficients[['I(MTenure^2)']])
4. }## the profit function is Y = 1732.548X - 4.83025X\*\*2

Then with this function related only to MTenure, we do the optimization:

1. optimize(profit\_func3, c(min(data2$MTenure),max(data2$MTenure)),tol = 0.01, maximum = T)## 179.3435

And by comparing the value with X equals to 179 and 180, we find that when MTenure achieves 179, an extra month will lead to lower profit.