DAT 520 Milestone Three

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The decision tree that I created provides a framework to help a homeowner decide whether to hire a professional or to do it themselves when undertaking a bathroom remodeling project. If the homeowner knows how much the project would cost to do it themselves and the amount of years they intend to remain in their home, the tree will determine if they are best off hiring a professional or doing it themselves, in which case it also recommends if they should obtain a permit for the renovation. The following tree shows the results for someone who is planning to remain in their home for 15 years and looking to undertake a remodel that would cost $1500 to do it themselves.

In this case, the decision tree recommends that this homeowner should hire a professional for this project. The expected value of hiring a professional is $586.13 and the expected value of doing it themselves is $119.01.

Timeline

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Diagram

Description automatically generated

Following the root node which contains the decision between hiring a professional and doing it yourself, there is a sequential decision node regarding whether or not to obtain a permit for the project. This decision only exists for DIY projects, because a permit is required when hiring a professional. The decision tree then continues with two event/chance nodes. The first concerns the quality of construction, whose likelihoods are tied to the 3 prior paths of hiring a professional, DIY with a permit, and DIY without a permit. The second event node concerns the potential for changes in the real estate market, whose likelihoods are tied to the amount of years the individual intends to remain in the home. The greater number of years that will pass before the homeowner sells the home, the more likely there is to be growth in the real estate market. The parameters that I estimated to determine the aforementioned likelihoods and the terminal branch payoffs are shown below:

Table

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The general structure of the decision tree and the current setup of the estimated parameters show a standard effect as the cost of the project and the years intended to remain in the home increase. As these variables increase, the recommendations of the model progress from DIY without a permit -> DIY with a permit -> hire a professional. This makes sense as an increase in the inputs raises the complexity of the project and increases the utility that the homeowner will directly recognize from living in the home post-remodel. For example, as shown in the decision trees at the end of this report, the homeowner would be best off obtaining a permit to do it themselves if they only intended to remain in the home for 4 years after the same $1500 remodel, and if, in the same case of 4 years, the homeowner instead pursued only a $200 remodel, they would be best off by doing it themselves without obtaining a permit.

The main diagnostic strategy that I performed on the decision tree is a form of sensitivity analysis called threshold analysis. I tested various combinations of the two input variables to see how and when they caused the recommendation of the decision tree to change, and I adjusted my parameter estimates so that those thresholds made sense within the scope of the project. My main finding from this threshold analysis is that the recommendation is to hire a professional any time that the homeowner intends to remain in the home for 5 or more years. This result makes sense according to my calculations of the terminal branch payoffs that include recouping a constant 3% of the cost of the project per year remaining in the home in utility. However, even if the homeowner intends to live in the home for more than 5 years, there are probably situations where they are better off doing it themselves if the project is more straightforward and less costly. This issue could potentially be remedied and the decision tree could be stronger if the percent of utility recouped per year declined over time. The benefit of living in the home 1 year after the remodel is greater than the benefit of living in the home 10 years after the remodel. The other finding from my threshold analysis pertains to the situations where the homeowner intends to only remain in the home for 4 or fewer years and the decision tree recommends that they do the remodel themselves. In the case of living in the home for 4 years, the threshold between being better off obtaining a permit and not obtaining a permit is $207. This makes sense because a small bathroom remodel that costs only $207 or less might only consist of things like replacing a vanity cabinet or painting the walls. It is optional to obtain a permit for these types of remodels, and the decision tree recommends that the homeowner should not do so.

Cost: $1500

Years: 4

Recommendation: DIY with a permit

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Description automatically generated

Graphical user interface

Description automatically generated with medium confidence

Cost: $200

Years: 4

Recommendation: DIY without a permit

A picture containing timeline

Description automatically generated

A picture containing diagram

Description automatically generated