Predicting Post-AMNOG Price for a New Product Launch in Germany

HTA20

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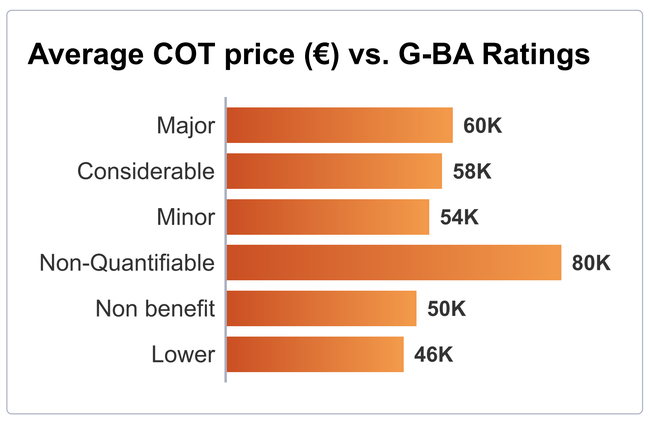
BACKGROUND AND OBJECTIVE

- In Germany, all new innovative medicines are subject to an **early benefit assessment** by the German Federal Joint Committee (**G-BA**) with subsequent **price negotiation** and optional arbitration.
- This study aims to explore the various data-based modeling techniques to **predict post-AMNOG** (Arzneimittelmarkt-Neuordnungsgeset) annual cost of treatment (COT) for **oncology products.**

METHODS

1 DATASET | GERMANY | ONCOLOGY

- Data Source: **NAVLIN Data - EVERSANA's Global Pricing & Market Access database**
- Products launched between **2018 and 2023** that completed the AMNOG process were selected, resulting in **40** products. These products encompassed **71** indications, and the ratings for sub-populations yielded **321** data points.



2 TRAINING AND TESTING

- **One-Way Analysis of Variance (ANOVA)**: G-BA Ratings & Annual COT
- **Input features** – 'GBA Rating' and 'Mean Annual COT for each indication' – were **scaled by z-score**, while **log scale** was applied to the **output feature** (Annual COT).
- Models **trained** on 2018-2020 data, then **tested** on 2021 product launches.

3 ALGORITHMS

- Four Regression methods
- Decision Tree
- k-Nearest Neighbors (k-NN)

4 STATISTICS

Assessing accuracy and reliability of models

- Adjusted R-squared (R-sq)
- Root Mean Squared Error (RMSE)
- Mean Absolute Error (MAE)
- Mean Absolute Percentage Error (MAPE)

RESULTS

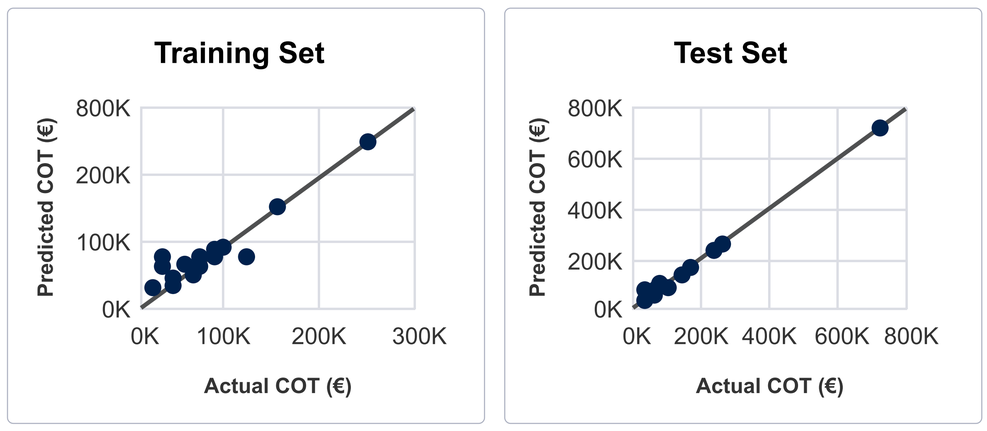
ANOVA test established a relationship between G-BA ratings and post-AMNOG COT

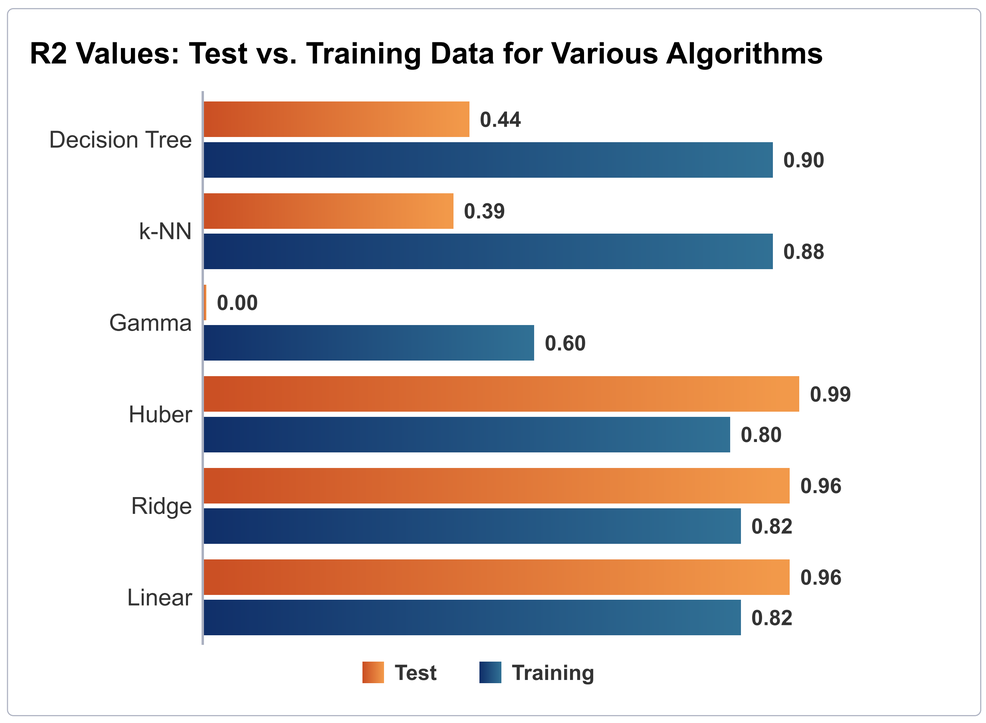
F-value 2.2107 **P-value 0.0419**

Model Metrics - quantifying the quality of predictions for Training and Test datasets

Algorithms	Training Dataset MAE	Training Dataset RSME	Training Dataset MAPE	Test Dataset MAE	Test Dataset RSME	Test Dataset MAPE
Linear Regression	10,632.50	13,674.72	37%	11,424.65	13,340.46	24%
Ridge Regression	10,630.97	13,675.43	37%	11,311.95	13,163.16	24%
Huber Regression	8,777.63	14,736.55	39%	5,086.66	7,829.80	9%
Gamma Regression (GLM)	17,542.98	20,647.73	56%	55,280.15	416,283.28	39%
k-Nearest Neighbors (k-NN)	5,999.43	11,163.41	16%	22,268.93	53,917.86	34%
Decision Tree Regression	4,635.83	10,269.71	11%	19,893.52	51,969.11	28%

Huber Regression Predictions





Key Takeaways

- On training dataset, **Decision Tree model** provided the best adjusted R-sq (0.901) and lowest MAPE (10.6%) scores.
- On test-data (2021-2022), the **Huber regression model** performed the best with adjusted R-sq of 0.987 and MAPE of 8.9%.
- The gamma model had the lowest performance, on both test and training dataset.

CONCLUSION

- ANOVA test results confirmed the **relationship between G-BA ratings and Post-AMNOG prices**, which serves as the basis for the prediction.
- The **Huber Regression model displayed best performance** in predicting post-AMNOG price for products launched in 2021-22.
- This **flexible yet rigorous framework** can be modified to include **more independent variables**, understand their effect on launch prices and evaluate algorithms for predictive modeling of COT.
- **Decision Tree Model** gives a **good fit** on training data but performs poorly on test data. This is a case of **overfitting or high-variance** in the constructed model.

DISCUSSION

Flexible Framework & Generalizability

- Our flexible **framework** has ability to incorporate **additional variables**

Clinical trial data | Economic Factors | Policy changes

Applications

Strategic Pricing | Market Access Planning | Healthcare Policy Impact | Competitive Advantage

Future Research

- Exploring Additional Variables
- Extending Price Prediction to Other Countries
- Refining Modelling Techniques

REFERENCES

1. **NAVLIN Data *(HTA Database)***: (https://data.navlin.com)
2. **G-BA**: Benefit Assessment of Medicines, Available at: https://www.g-ba.de/bewertungsverfahren/nutzenbewertung/

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