**Regression Analysis for Combat Win Percentage**

Now that **Win Percentage** is your **dependent variable**, your regression model will analyze how **Turns Survived, Initiative, and Damage Dealt** impact the likelihood of winning a combat.

**Expected Relationships Between Variables**

Your model will be:

* **Turns Survived (+)**: Expected **positive** relationship → The longer a character survives, the more likely they are to win.
* **Damage Dealt (+)**: Expected **positive** relationship → Characters who deal more damage should have a higher win rate.
* **Initiative (?)**:
  + If **higher initiative** allows characters to act first and control fights, expect a **positive** relationship.
  + If **initiative doesn’t matter much**, this variable may have a weak effect (low or insignificant coefficient).

**Ideal Regression Results**

| **Metric** | **Optimal Range / Expected Interpretation** |
| --- | --- |
| **R² (Model Fit)** | **0.5 - 0.8** (Moderate to high predictive power; combat is somewhat random) |
| **Adjusted R²** | Close to R² (Indicates variables meaningfully contribute) |
| **p-value (F-Test for Model Significance)** | **< 0.05** (Model is significant) |
| **p-value for Turns Survived** | **< 0.05** (Surviving longer significantly increases win rate) |
| **p-value for Damage Dealt** | **< 0.05** (Dealing more damage increases win rate) |
| **p-value for Initiative** | **< 0.05** if initiative is important; otherwise, it may be > 0.05 |
| **Coefficient for Turns Survived** | **Positive** (Each extra turn increases win rate) |
| **Coefficient for Damage Dealt** | **Positive** (Higher damage output leads to more wins) |
| **Coefficient for Initiative** | **Positive if significant, close to 0 if not** |
| **VIF (Multicollinearity Check)** | < **5** (Ensures independent variables aren’t too correlated) |
| **Residuals Normality (Histogram/Q-Q Plot)** | **Should be normally distributed** |

**Possible Unexpected Results and Fixes**

* **Low R² (< 0.3)**  
  🔍 **Combat is too random or missing key factors**  
  ✅ Consider adding more variables (e.g., AC, HP, attack accuracy).
* **Negative Damage Dealt Coefficient**  
  🔍 **Might suggest glass-cannon characters deal high damage but die often.**  
  ✅ Add an interaction term: **Turns Survived × Damage Dealt** to check if survivability influences damage effectiveness.
* **Initiative Not Significant (p > 0.05)**  
  🔍 **Initiative may not directly affect winning.**  
  ✅ Consider testing initiative’s impact on other variables (e.g., "Does high initiative lead to more damage per round?").
* **High Multicollinearity (VIF > 5)**  
  🔍 **Turns Survived and Damage Dealt might be too strongly correlated.**  
  ✅ Try removing one variable to see if the model improves.