

# Are CS2 Maps Balanced? A Deep Dive Into CT/T-Side Bias & Win Rates

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## 1. Introduction

Recently in the Counter-Strike community, there has been considerable discussion about the in-game economy, the state of the map pool, and the overall health and balance of CS2 itself. Articles such as the one from [bo3.gg](https://bo3.gg) [7] have raised concerns about CS2 map types, staleness, issues, and other in-game frustrations related to the economy. Meanwhile, various clips from players, analysts, and content creators—such as this [TikTok](https://www.tiktok.com/@tyleralgigi) [6]—have echoed these sentiments, highlighting negative feelings and dissatisfaction with the current balance of CS2.

As a dedicated Counter-Strike player, I have my own opinions on these topics, but the map pool stands out most. Many of the maps in rotation feel frustrating to play, and I often find myself banning certain maps in Premier Mode. This made me wonder: Why do some maps feel worse than others? Is it merely a matter of player preference, or do certain maps genuinely present balance issues between CT and T sides?

To answer these questions, I decided to conduct a data-driven analysis of CT- and T-side win rates across the most played competitive maps in CS2. By examining win percentages, side dominance, and statistical trends, my goal is to determine whether the current CS2 maps are truly balanced—or whether certain maps heavily favor one side.

In this paper, I will break down:

- How win rates vary across maps and whether they favor CT or T side.
- Which maps are the most balanced and which are the most biased.
- How team performance is affected by side dominance.
- Whether CT- or T-round wins are more influential in overall match success.

Through this analysis, I hope to provide insight into the competitive integrity of CS2 maps and contribute to the ongoing discussion about the game's balance.

## 2. Data Explanation

To describe the current state of teams and maps, I collected the following features. Specifically, I started by gathering all team names that had competed in S-B tier matches in 2024. For each team, I identified the most current roster based on their latest roster change and compiled all matches played by that exact lineup. Any roster that had accumulated at least 150 total rounds played was retained for this analysis. This dataset now includes key performance metrics for teams across different maps, highlighting their win rates, round performance on Terrorist (T) and Counter-Terrorist (CT) sides, and overall game outcomes. These statistics help analyze map balance, team strengths, and potential biases in competitive play.

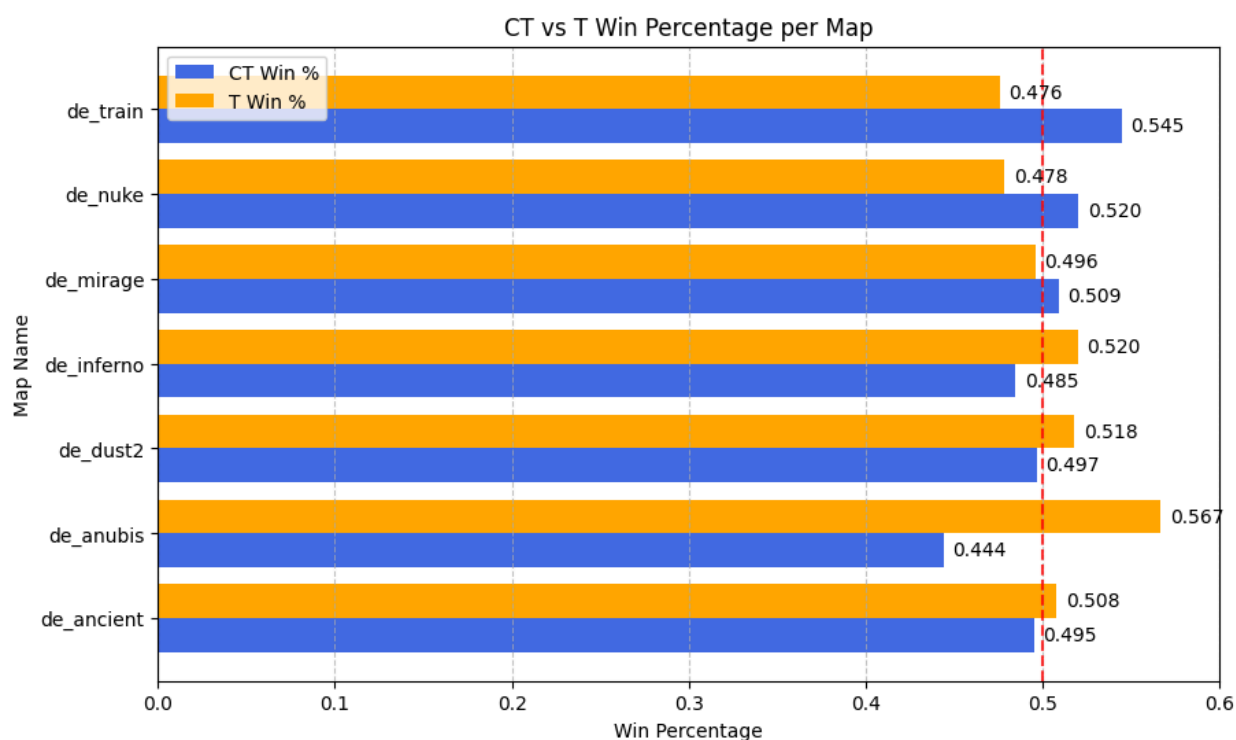
Column Name	Data	Description
team_name	string	The name of the team.
map_name	string	The name of the map played during the match (e.g., de_dust2, de_mirage).
t_round_count	int	The total number of rounds played by the team on the Terrorist (T) side.
t_round_wins_count	int	The number of rounds won by the team while playing as Terrorists.
ct_round_count	int	The total number of rounds played by the team on the Counter-Terrorist (CT) side.
ct_round_wins_count	int	The number of rounds won by the team while playing as Counter-Terrorists.
games_count	int	The total number of games played by the team on a specific map.
games_won_count	int	The number of games won by the team on a specific map.
win_percent	float	The overall win percentage of the team on the map
ct_win_percent	float	The percentage of rounds won by the team while playing as CT
t_win_percent	float	The percentage of rounds won by the team while playing as T
relative_ct_t_percent	float	The difference between CT and T win percentages, indicating map bias (positive means CT-sided, negative means T-sided).

**Table 1:** Overview of key performance metrics for teams across different maps, including side-specific (CT and T) round wins, overall games played and won, and calculated win percentages.

### 3. Data Visualizations & Explanations

#### 3.1 Bar Graph Comparison (CT vs. T)

The bar graph in **Figure 1** represents the comparison between CT (blue) and T (orange) side win percentages for each map. Based on these results, the maps considered “even” for both teams are Mirage, Dust 2, Nuke, Inferno, and Ancient, as they all boast a percentage differential of less than 5%. This difference translates to around a 1–2 round swing per half, although some players still *perceive* these maps to be more one-sided. For example, most players consider Nuke slightly CT-sided, but the data in pro play does not strongly support this.



**Figure 1:** Bar graph illustrating the side-by-side comparison of CT (blue) and T (orange) win percentages for each map.

Two notable outliers to this balanced trend are Anubis and Train. Since Train is new to the map pool (added on Jan 8, 2025 after Vertigo was removed) [4], many teams are still developing a consistent playstyle. Typically, when a map is first introduced, it starts out favoring the CT side due to underdeveloped T-side tactics. Over time, as teams refine their Terrorist strategies—defaults, executes, mid-round calls—the side gap often narrows. When, on the other hand, has been in the map pool since CS:GO [5] and still shows the largest side differential at 12.3%, largely due to its design:

- Extremely contestable mid area with few safe positions for CTs unless they use heavy utility.
- Quick rotates from sites through canals for T-side.
- Less effective CT utility, as Anubis lacks natural choke points to slow down T advances, unlike Nuke or Inferno.

### 3.2. CT/T Win Rate Trends Across Maps

Building on our knowledge of total CT vs. T-side win percentage, we next examine Game Win Percentages. Using CT & T side win percentage and overall Game Win Percent for each map, we can generate the scatter plots in **Figure 2**, each equipped with a trendline for CT and T side.

- **Anubis, Inferno, Ancient:** Show a clear relationship between T-side win percentage and game wins.
- **Nuke and Mirage:** Indicate that a higher game win percentage correlates more closely with higher CT-side win rates.
- **Dust 2:** Displays an interesting case where the T-side trendline is generally higher than the CT-side trendline, suggesting teams with stronger T rounds tend to win more games. However, at the very top end of game win percentages, the CT-line briefly converges or surpasses T.
- **Train:** Acts as the opposite of Dust 2, with a higher CT-round win rate typically leading to more match wins, except at the very highest levels of game win percentage. However, Train remains a special case given its relatively recent return to the map pool.

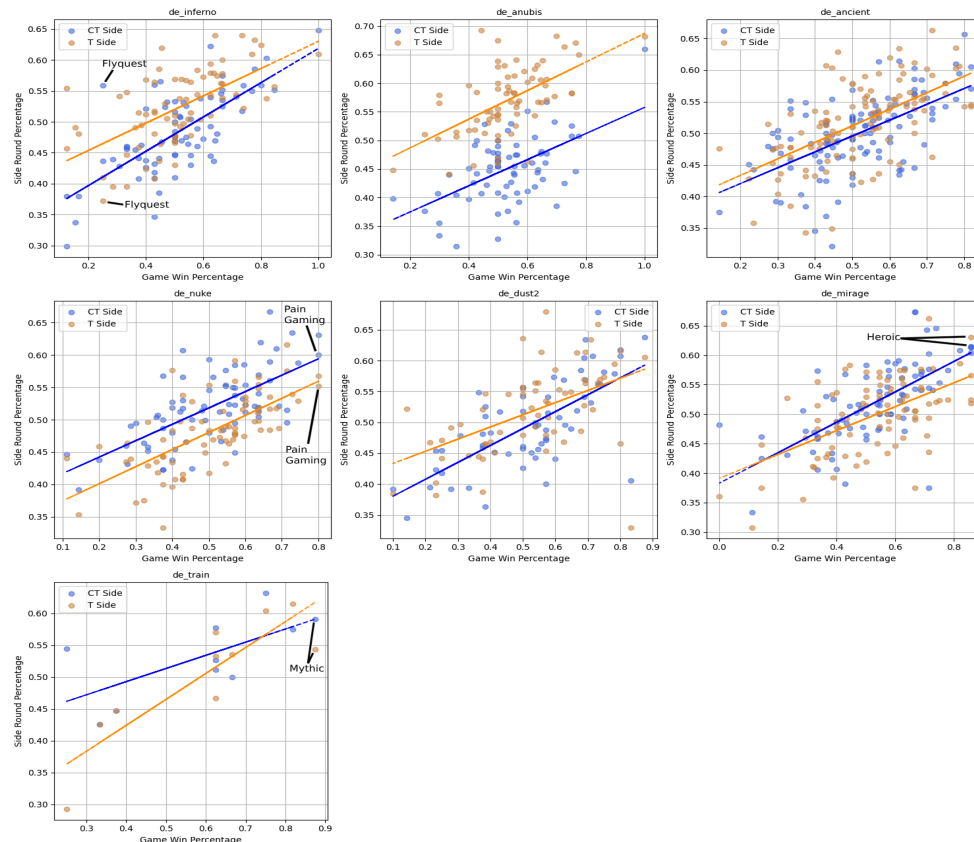


Figure 2. Scatter plots illustrating CT-side and T-side round win percentage in relation to overall game win percentage across various maps, each with its own trendline.

### Sample Team Performances

Team Name	Map Name	Game Win %	T Round W%	CT Round W%
Heroic (#18)	Mirage	85.71%	63.04%	61.53%
Pain Gaming (#13)	Nuke	80%	55.17%	60.00%
Flyquest (#25)	Inferno	25%	37.20%	55.91%
Mythic (#135)	Train	87.5%	54.33%	59.03%

*Table 2: Selected team performance on different maps, comparing overall game win percentage and side-specific (T and CT) win rates.*

Diving deeper into some of these plots and looking at specific data points, we select 4 teams (3 of which are currently ranked in HLTVs top 25 [ref]) to help point out specific win rates and percentages.

**1. Heroic (#18) on Mirage:**

- Dominates with an 85.71% game win rate.
- T-round win rate (63.04%) is slightly higher than CT-round (61.53%).
- Appears near the top of the Mirage scatter plot, confirming strong performance.

**2. Pain Gaming (#13) on Nuke:**

- Strong 80% win rate on Nuke.
- CT-round win rate (60%) is higher than T-round (55.17%), aligning with Nuke's historical CT bias.
- Placed among high game win percentages and strong CT performances in the Nuke scatter plot.

**3. Flyquest (#25) on Inferno:**

- Struggles significantly, with only a 25% win rate (2–6 overall).
- T-side win rate (37.20%) is very low, while CT-side (55.91%) is better.
- Positioned at the lower end of the Game Win % scale in the Inferno scatter plot.

**4. Mythic (#135) on Train:**

- Dominates Train with one of the highest Game Win % rates in the dataset.
- CT-side win rate (59.03%) surpasses T-side (54.33%), consistent with Train's CT-favored design.
- Appears near the top of the Train scatter plot, reflecting its strong performance on this map.

### 3.3. CT/T Performance of the Top 25 Teams

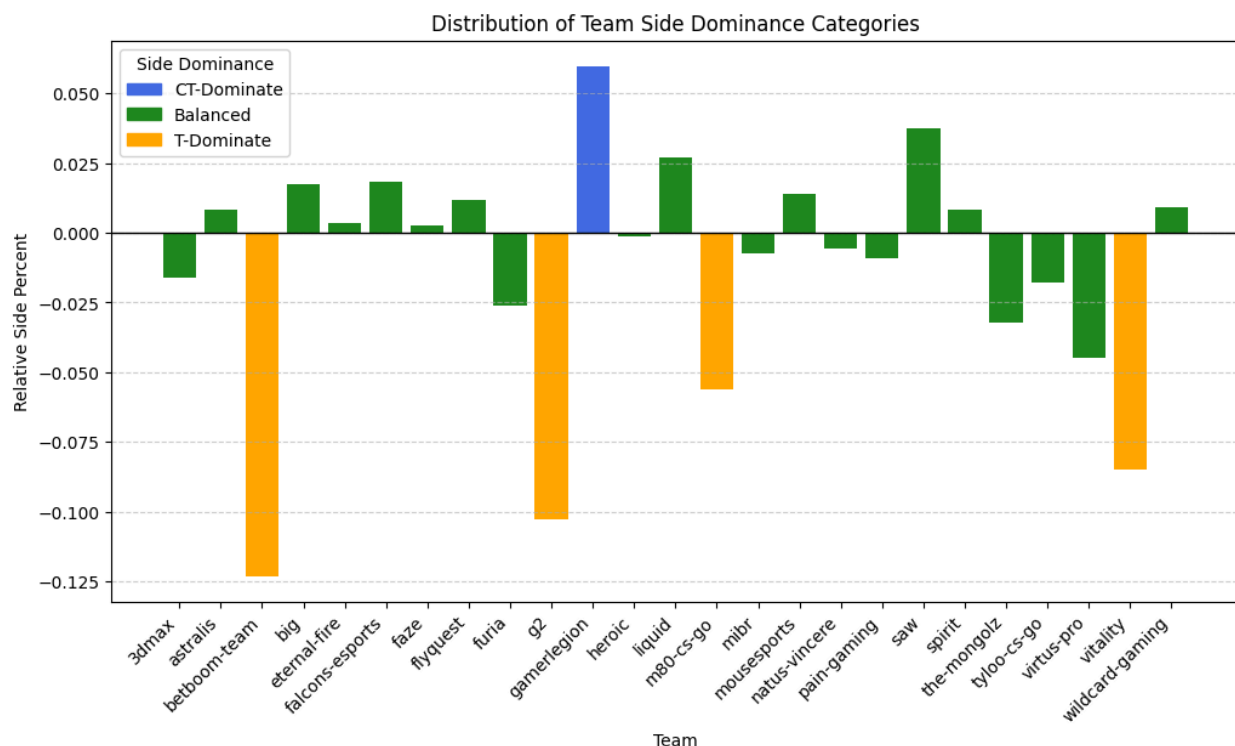
Because the collected dataset includes data from S, A, and B-tier competitions, I wanted to narrow in on the most elite, top 25 teams so far.

Rank	Team Name	Rank	Team Name
1	Spirit	13	GamerLegion
2	Vitality	14	3DMAX
3	Natus Vincere	15	Furia
4	Eternal Fire	16	MIBR
5	G2	17	Heroic
6	The MongolZ	18	SAW
7	FaZe	19	BIG
7	Mousesports	20	BetBoom
8	Falcons	21	Wildcard
9	Virtus Pro	22	Tyloo
10	Astralis	23	M8
11	Liquid	24	FlyQuest
12	Pain Gaming	25	Complexity

**Table 3:** Ranking of the top 25 teams from HLTV. [3]

By focusing on these elite teams, I can better understand the current meta of competitive Counter-Strike, identify which sides they excel on, and see how round win percentages influence overall performance. This deeper analysis helps differentiate true top-tier consistency from teams that only excel in specific matchups or map pools.

### 3.4. Top 25 Teams - Side Dominance Analysis



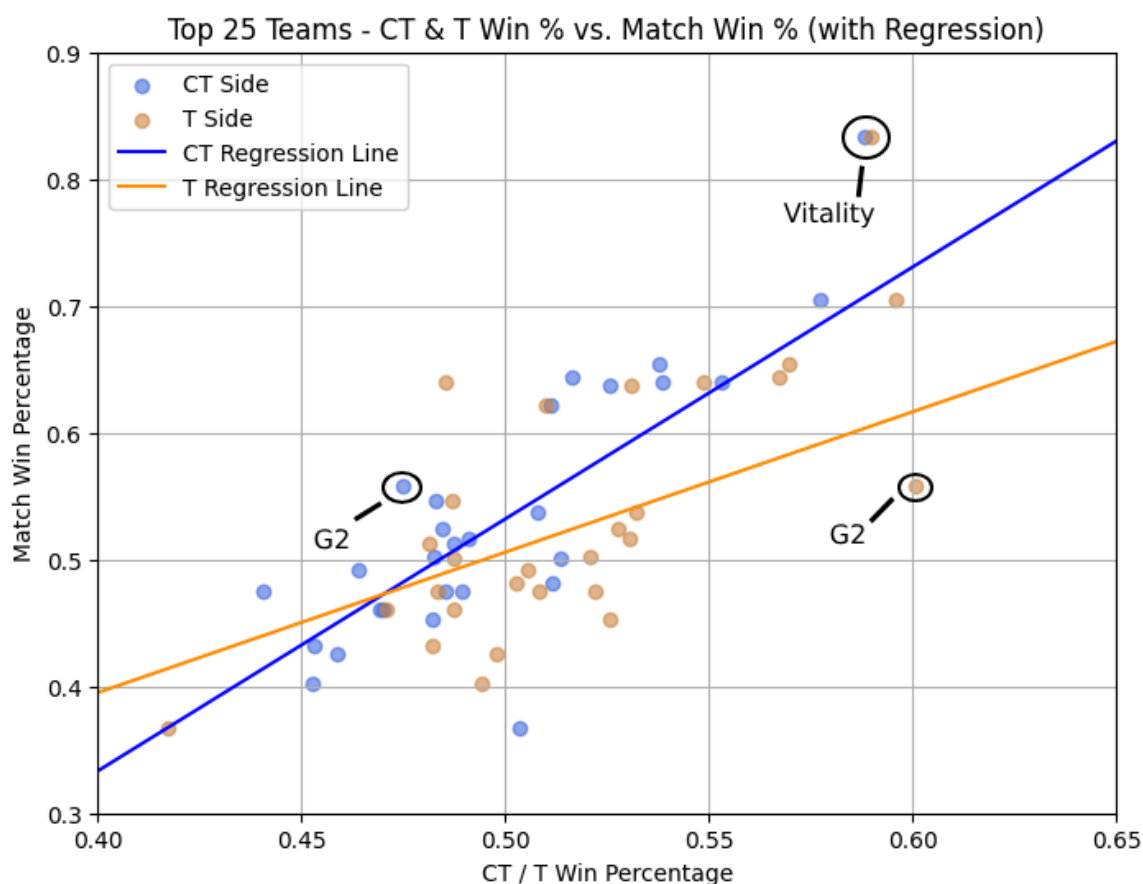
**Figure 3:** Chart illustrating side dominance (CT vs. T performance) for the top 25 HLTV teams. [3]

In **Figure 3**, a bar chart shows the different types of teams that make up the top 25 ranked on HLTV. Using CT and T win round percentages, we created a relative win percentage (Figure 4) to classify teams:

1. **CT-Dominant Team:** Relative percentage  $\geq +0.05$
2. **Balanced Team:** Relative percentage between -0.05 and +0.05 (inclusive)
3. **T-Dominant Team:** Relative percentage  $\leq -0.05$

For example, the world's #1 team, Spirit, is categorized as balanced with a 0.008 relative value. Meanwhile, Vitality, currently challenging for that #1 rank, holds a -0.085 relative value, labeling them T-dominant. Since conducting this research, Zywoo and his squad have won back-to-back events (ESL One Katowice 2025 and ESL Pro League), achieving two of the three events in the ESL Triple Crown. Could their T-side dominance be fueling this success?

### 3.5. Top 25 Teams - Side Win Percent Comparison



**Figure 5:** Scatter plot comparing the top 25 teams' average CT- and T-side win percentages across all played maps (x-axis) to their overall game win percentage (y-axis), with Vitality and G2 highlighted to illustrate contrasting performance trends.

In **Figure 5**, we have a scatter plot similar to the earlier ones, except that each team's CT and T win percentages have been averaged across **all** maps in the pool (excluding any map that a team has not played). Each data point is then plotted along the x-axis for side win percentage and along the y-axis for the team's overall game win percentage. Two examples:

- **Vitality:** Occupies the top-right quadrant with a strong 0.833333 game win percentage and balanced CT/T round win rates (about 0.588077 CT vs. 0.589939 T). This equilibrium—coupled with their formidable firepower—makes them dominant in recent tournaments.
- **G2:** Has a decent 0.557937 game win percentage, primarily carried by an excellent T-side success rate (0.600692) but a weaker CT side (0.474794). If G2 can strengthen their CT setups and retakes, they may start vying for championships again.



4. Correlation

To further understand the trends observed so far, I performed correlation analyses to see whether winning more rounds on a specific side correlates with a team’s overall win percentage.

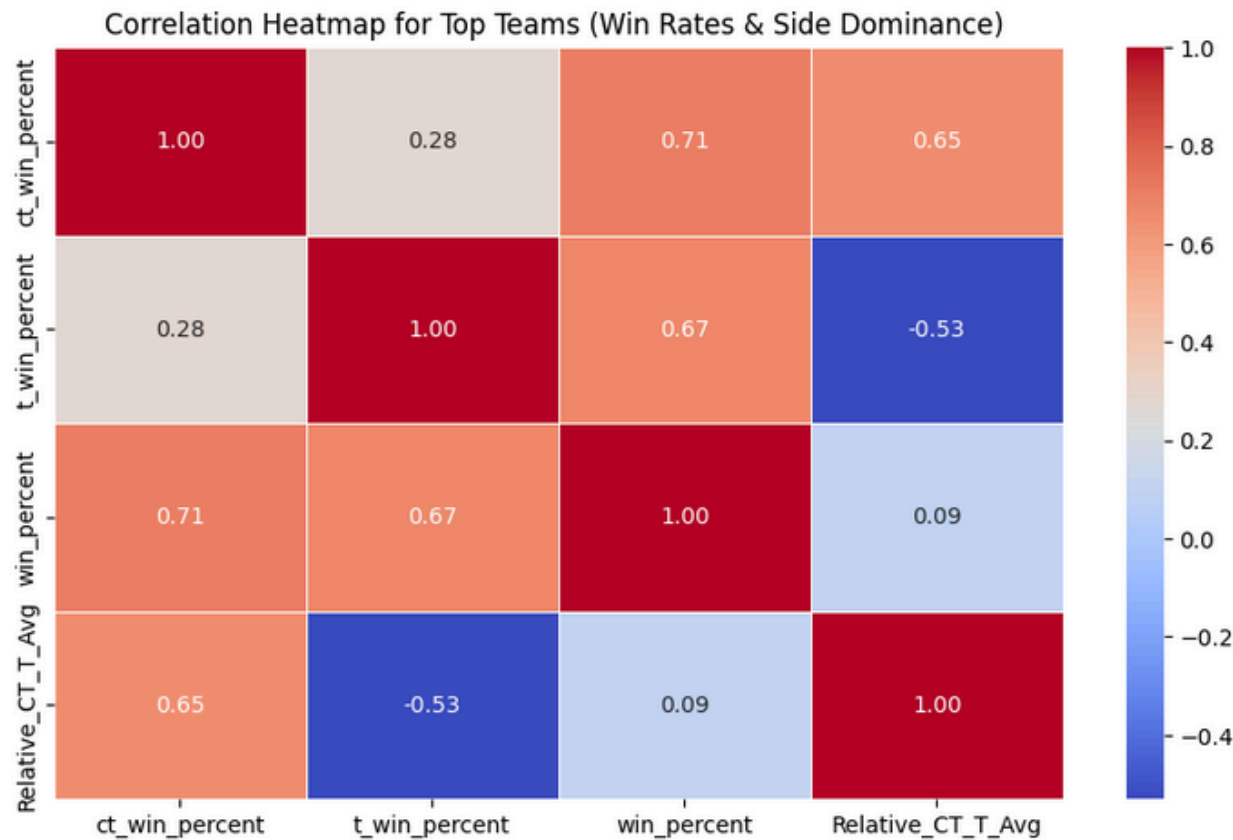


Figure 6. Heatmap illustrates correlations among CT Win %, T Win %, Overall Win %, and Side Dominance.

Figure X (Heatmap) visually displays how CT Win %, T Win %, Overall Win %, and Side Dominance correlate with one another, with each colored cell reflecting a correlation ranging from -1 to +1. Deeper reds signal stronger positive relationships, while deeper blues indicate stronger negatives. Light colors near the center imply minimal correlation. While the heatmap offers a quick overview of potential patterns, Pearson and Spearman correlation tests are used to determine which correlations are statistically significant.

## 4.1. Correlation Tests

### Pearson (r)

Pearson's correlation coefficient ( $r$ ) is the ratio of the covariance between two variables to the product of their standard deviations. [1] Lower or higher values of  $r$  indicate weaker or stronger linear relationships, respectively.

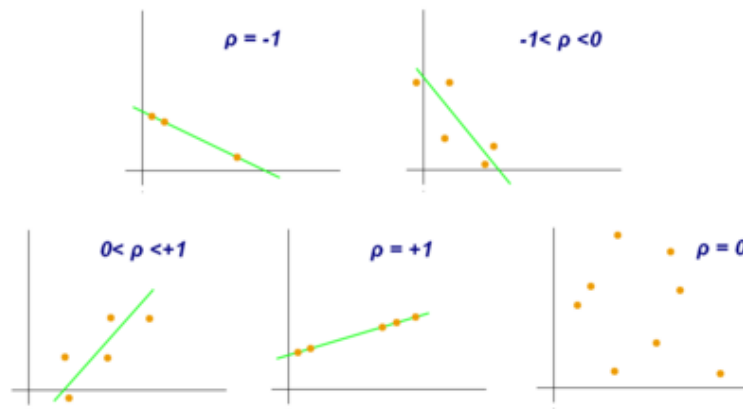


Figure 7: Examples of scatter plots illustrating varying correlation coefficient ( $\rho$ ) values. [1]

### Spearman Rank Correlation ( $\rho$ )

Spearman's rank correlation ( $\rho$ ) is a nonparametric measure of the statistical dependence between the rankings of two variables. [2] It assesses how well the relationship between them can be described using a monotonic function.

By analyzing these correlations, we can determine whether CT- or T-side performance is more influential in match success.

### Null Hypothesis ( $H_0$ )

The default assumption that there is no *real* relationship between two variables.

- **Failed to reject  $H_0$  ( $p > 0.05$ ):** Indicates no statistically significant relationship.
- **Reject  $H_0$  ( $p < 0.05$ ):** Indicates a statistically significant relationship between the two variables.

```

•[27]: import seaborn as sns
      from scipy.stats import pearsonr, spearmanr
      import json

      # Compute correlation matrix for top teams
      correlation_matrix_top_teams = average_df[["ct_win_percent", "t_win_percent", "win_percent", "Relative_CT_T_Avg"]].corr()

      # Plot correlation heatmap for top teams
      plt.figure(figsize=(10, 6))
      sns.heatmap(correlation_matrix_top_teams, annot=True, cmap="coolwarm", fmt=".2f", linewidths=0.5)
      plt.title("Correlation Heatmap for Top Teams (Win Rates & Side Dominance) ")

      # Pearson correlation between CT/T dominance & match win rate
      pearson_corr_ct, pearson_p_ct = pearsonr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])
      pearson_corr_t, pearson_p_t = pearsonr(average_df["t_win_percent"], average_df["win_percent"])

      # Spearman correlation (in case relationships are not linear)
      spearman_corr_ct, spearman_p_ct = spearmanr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])
      spearman_corr_t, spearman_p_t = spearmanr(average_df["t_win_percent"], average_df["win_percent"])

      # Print correlation results
      correlation_results = {
        "Metric": ["CT Win % vs Match Win %", "T Win % vs Match Win %", "Side Dominance vs Match Win %"],
        "Pearson Correlation": [pearson_corr_ct, pearson_corr_t, pearsonr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])[0]],
        "Pearson p-value": [pearson_p_ct, pearson_p_t, pearsonr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])[1]],
        "Spearman Correlation": [spearman_corr_ct, spearman_corr_t, spearmanr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])[0]],
        "Spearman p-value": [spearman_p_ct, spearman_p_t, spearmanr(average_df["Relative_CT_T_Avg"], average_df["win_percent"])[1]]
      }

      # print(correlation_results)
      print(json.dumps(correlation_results, indent=4))

```

Figure 8. Python code used to generate Heatmap and calculate correlations.

### Pearson Correlation Values & p-Values

The Pearson correlation values and P-Value for CT Win %, T Win %, and Side Dominance vs Game Win % are as follows:

- **CT Win % vs. Match Win %** →  $r = 0.092$ ,  $p = 0.203$ 
  - Failed to reject  $H_0$  ( $p > 0.05$ ) → No significant relationship.
- **T Win % vs. Match Win %** →  $r = 0.675$ ,  $p = 2.90 \times 10^{-27}$ 
  - Rejected  $H_0$  ( $p < 0.05$ ) → Significant relationship.
- **Side Dominance vs. Match Win %** →  $r = 0.092$ ,  $p = 0.203$ 
  - Failed to reject  $H_0$  ( $p > 0.05$ ) → No significant relationship.

Because  $2.90 \times 10^{-27}$  is far below the 0.05 threshold, T Win % vs. Match Win % is strongly significant, indicating that winning more T-side rounds is a robust predictor of match success.

### Spearman Correlation ( $r_s$ ) & p-Values

- **CT Win % vs. Match Win %** →  $\rho = 0.062$ ,  $p = 0.389$ 
  - Failed to reject  $H_0$  ( $p > 0.05$ ).
- **T Win % vs. Match Win %** →  $\rho = 0.621$ ,  $p = 3.73 \times 10^{-22}$ 
  - Rejected  $H_0$  ( $p < 0.05$ ).
- **Side Dominance vs. Match Win %** →  $\rho = 0.062$ ,  $p = 0.389$ 
  - Failed to reject  $H_0$  ( $p > 0.05$ ).

The Spearman test's p-value ( $3.73 \times 10^{-22}$ ) for T Win % vs. Match Win % again confirms a statistically significant relationship between T-side performance and overall team success. Meanwhile, neither CT Win % nor Side Dominance showed a significant association with game outcomes under either correlation test.

These findings suggest that, contrary to the common perception of certain maps being heavily CT-sided, a strong T-side appears to be a more reliable predictor of match victories. In other words, the ability to secure rounds on the T side can have a stronger impact on a team's final result than the conventional wisdom around CT advantages might imply.

## 5. Conclusion

A statistically significant correlation exists between T-side round win percentage and game win percentage. Teams with strong T-side performance tend to secure more match victories, whereas CT dominance alone shows little to no correlation with overall success. A prime example might be a team that excels on the CT side but struggles to close out matches due to a weak T side, resulting in lost series against more balanced opponents.

It is crucial to note that Counter-Strike is a complex game involving mechanical skill, strategy, teamwork, and adaptability. While this analysis focused on CT/T-side balance, one major factor that was *not* included here is the in-game economy. A team's ability to manage their economy—buying the right weapons, saving at opportune times, and leveraging round momentum—can drastically affect outcomes.

Still, these findings highlight the importance of T-side strategy in CS2's current meta, raising questions about how economic factors might further amplify or mitigate side advantages. Further research into how economy interacts with side dominance could offer deeper insights into why T-side performance remains so pivotal in CS2.

## 7. References

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