NBA Homebody Advantage?

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Problem Description

For our Stats 100 final project, we set out to answer a deceptively simple question: Which NBA teams get "homebody" schedule advantages—more rest, better body-clock alignment, less routine disruption—and how much does that actually impact outcomes?

We built a custom dataset joining NBA API data with geospatial arena data, computed schedule features for every game, and fit regression models to see which factors predict outcomes after accounting for who's playing at home and who's the better team. We expected schedule factors—rest days, travel distance, timezone shifts, back-to-backs—to explain at least some of the home-court advantage. After all, home teams are usually better rested and don't travel. What we found surprised us: schedule factors explain essentially zero percent of home-court advantage. The only schedule factor that individually matters is back-to-backs, which cost a team roughly 0.66 points of margin per game regardless of venue. Home-court and schedule burden are orthogonal—two independent mechanisms. That's the central insight of this project, and it reframes how we think about both.

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Research Question

Homebody

Which NBA teams get "homebody" schedule advantages (rest, travel, timezone, back-to-backs), and how much does that impact outcomes?

1. Which schedule factors are the strongest predictive factors for game outcomes?

Key design decision

We control for IS_HOME (home-court advantage) and WINPCT_DIFF (team strength) as confounds. The schedule factors are the variables of interest.

Homebody Advantage Index (HAI)

$$HAI_i = \frac{1}{4}\left(z_{\text{travel}_i} + z_{\text{tz}_i} + z_{\text{b2b}_i} + z_{\text{rest}_i}\right)$$

HEAVIEST BURDEN	LIGHTEST BURDEN
GOLDEN STATE WARRIORS	ATLANTA HAWKS BASKETBALL
HAI 1.63	HAI −0.98

NBA Games: Away Team Travel & Timezone Differences
2024-10-22 to 2025-04-13

Away Team Timezone Shift
- 0h timezone difference
- 1h timezone difference
- 2h timezone difference
- 3h timezone difference
○ Away team home city
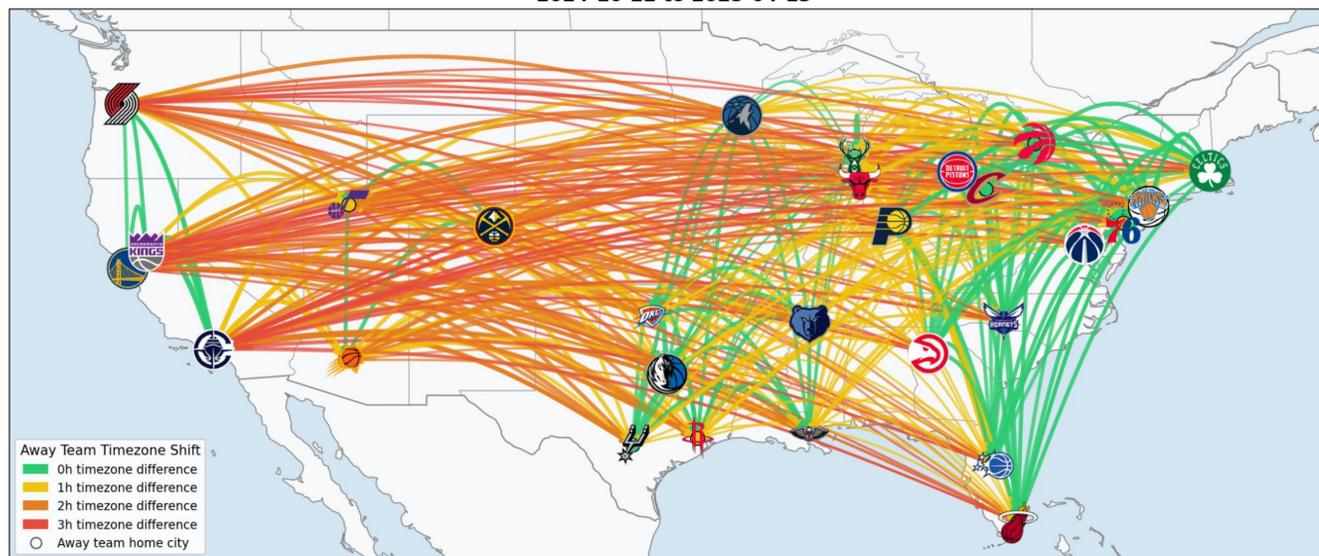
Data Collection

- 11 NBA seasons (2013–14 through 2023–24): 13,209 games, 52 box-score columns
- 3 data sources: NBA Stats API, Wikipedia, Basketball Reference tip-off times

Game-Level Data (NBA Stats API[1])
Source & scope
- nba_api Python package, LeagueGameFinder endpoint
- One row per team per game — 26,418 rows total
- Game date(used to compute rest days/b2b), WL, PTS, HOME/AWAY

Travel Distance & Geography(Wikipedia[2])
Method
- Arena locations scraped from Wikipedia, geocoded via Nominatim (OpenStreetMap)
- Travel distances computed using the Haversine formula
  - computes the straight-line distance between two points on a sphere (like Earth) given their latitude and longitude coordinates — accounts for Earth's curvature, unlike simple Euclidean distance

Circadian & Schedule Data (Basketball Reference[3])
Source
- Tip-off times parsed as Eastern Time, converted to each team's home timezone
Derived features
- Circadian misalignment: how far local tip-off deviates from 7 PM home body clock
  - A LA team playing in Boston at 7 PM ET = 4 PM Pacific (LA body clock) → misalignment = |4 − 7| = +3 hrs
- Late-game game indicator - after 9pm eastern time

Models

Linear Regression - predicting points margin
Model specifications:
- Full model: controls + all schedule factors
  - PTS_MARGIN = $\beta_0 + \beta_1 \cdot$IS_HOME $+ \beta_2 \cdot$WINPCT_DIFF $+ \beta_3 \cdot$REST_DAYS $+ \beta_4 \cdot$IS_B2B $+ \beta_5 \cdot$TRAVEL_MI $+ \beta_6 \cdot$TZ_SHIFT $+ \beta_7 \cdot$IS_LATE $+ \varepsilon$

Logistic Regression - predict win/loss
- Predicting win/loss modeled using the same predictors as linear regression

Analysis

Ablation Study
- Drop each schedule factor one at a time
- Compare change in R^2 for linear regression and compare change in accuracy for logistic regression
- Back to Backs only individually significant schedule factor (p < 0.001) — costs ~0.66 pts of margin per game

Feature	ΔR² when dropped	ΔAccuracy when dropped
WINPCT_DIFF	−0.1939	−11.2%
IS_HOME	−0.0097	−0.3%
IS_B2B	−0.0021	−0.07%
TRAVEL_MI	~0	~0
TZ_SHIFT	~0	~0
REST_DAYS	~0	~0
IS_LATE	~0	~0

95% Confidence Interval
- 2,000 resamples to construct 95% confidence intervals
  - Randomly draw ~26,000 rows from the dataset with replacement — so some games appear twice, some not at all
- Used to assess decomposition shrinkage and estimate stability
- IS_HOME coefficient stable when schedule factors added: 4.598 → 4.599
- Bootstrap 95% CI on shrinkage: [−0.41, +0.37] — includes zero
- Schedule factors explain 0% of home-court advantage — orthogonal mechanisms

Betting Edge
- B2B fatigue (~0.66 pts) translates to a ~13% spread adjustment against a typical 5-pt spread

Limitations

- No player-level controls (injuries, roster turnover)
- TZ is a coarse proxy (no flight data, direction, or jet-lag asymmetry)
- Regular season only (no playoffs)

Reference:
[1] Swar, S. (2024). nba_api: An API Client package to access the APIs for NBA Stats. GitHub. https://github.com/swar/nba_api
[2] Wikipedia contributors. (2024). List of NBA arenas. Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/wiki/List_of_NBA_arenas
[3] Basketball Reference. (2024). 2024-25 NBA Schedule. Sports Reference LLC. https://www.basketball-reference.com/leagues/NBA_2025_games.html