



2018 **FAST CAMPUS**

DATA SCIENCE SCHOOL PROJECT(1)

REGRESSION ANALYSIS

TEAM: FORTUNTELLER

DATA SCIENCE SCHOOL

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1. Introduce

Walmart Recruiting II : Sales in Stormy Weather



Objective

- Predict how sales of weather - sensitive products are affected by snow and rain

Data Set

- Weather: 2012.01.01 - 2014.10.31의 각 station날씨
- Key: Store와 Weather Station간의 관계 Mapping
- Train: 2012.01.01 - 2014.10.31의 각 Store, Item 별 Units Data (test날짜 제외)
- Test: 2013.04.01 이후 Weather Event가 발생한 전후 3일

1. Introduce (Continued)

Walmart Recruiting II : Sales in Stormy Weather



Rules

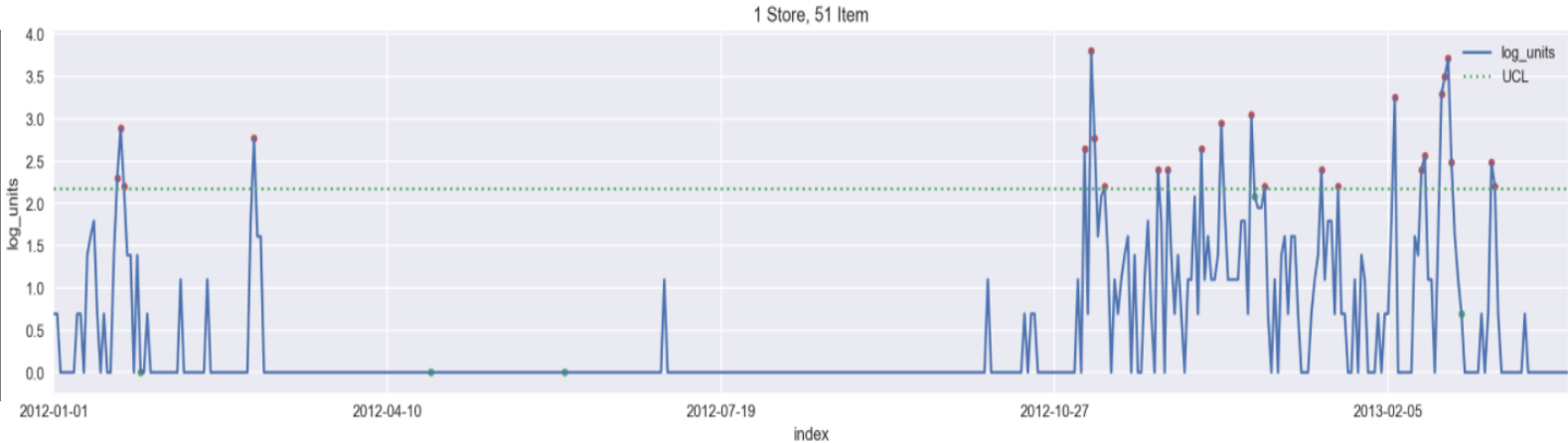
- 외부데이터 사용 금지
- Train data set에서 2013-04-01 이전 데이터를 Training data로 정의한다
- You do not need to forecast weather in addition to sales (it's as though you have a perfect weather forecast at your disposal)

Assumptions

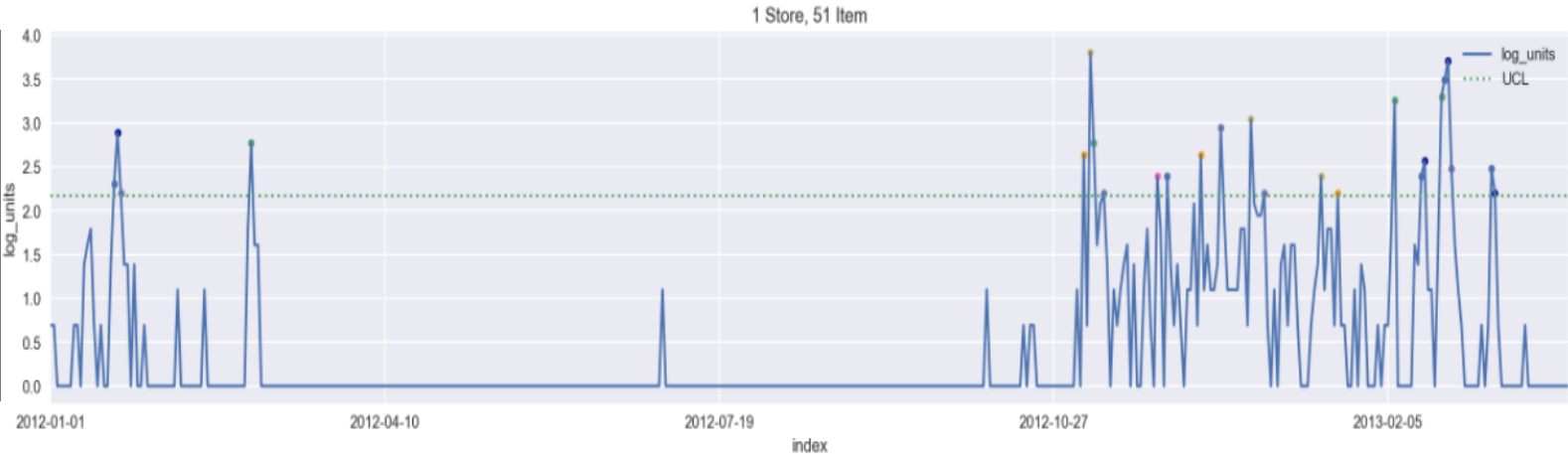
- Weather event는 문제에서 정의한 Preciptotal > 1 inch, Snowfall > 2inch 를 따른다
- Target value “units”는 독립변수(들)의 선형조합이다

2. EDA (Exploratory data analysis)

Unit vs .Date
(Mean + 2 * Sigma Highlighted)

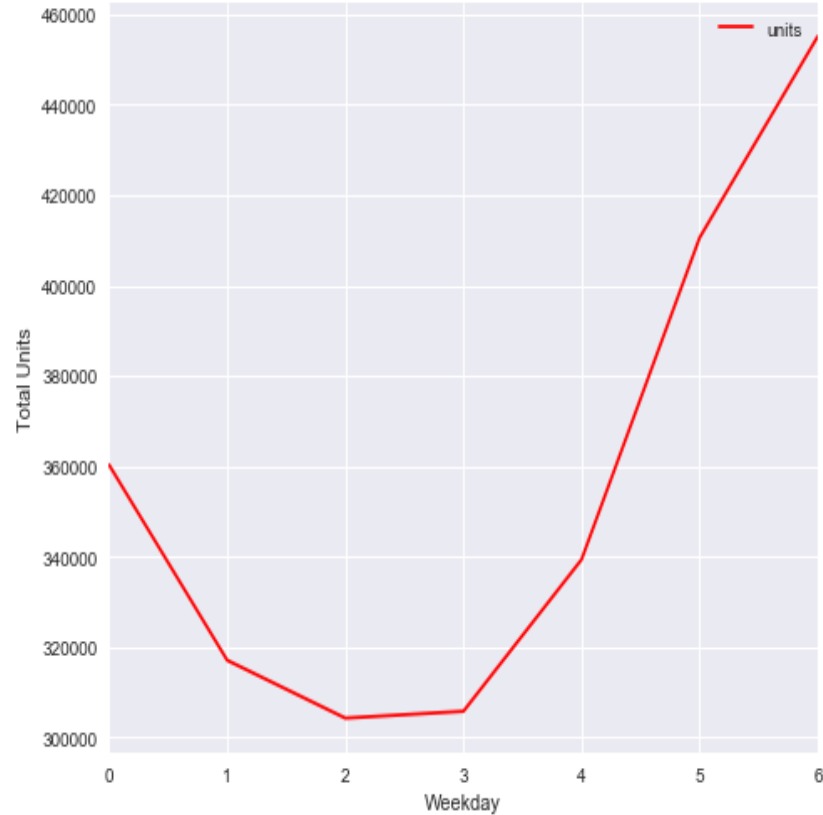


Unit vs. Date
(Weekday Highlighted)

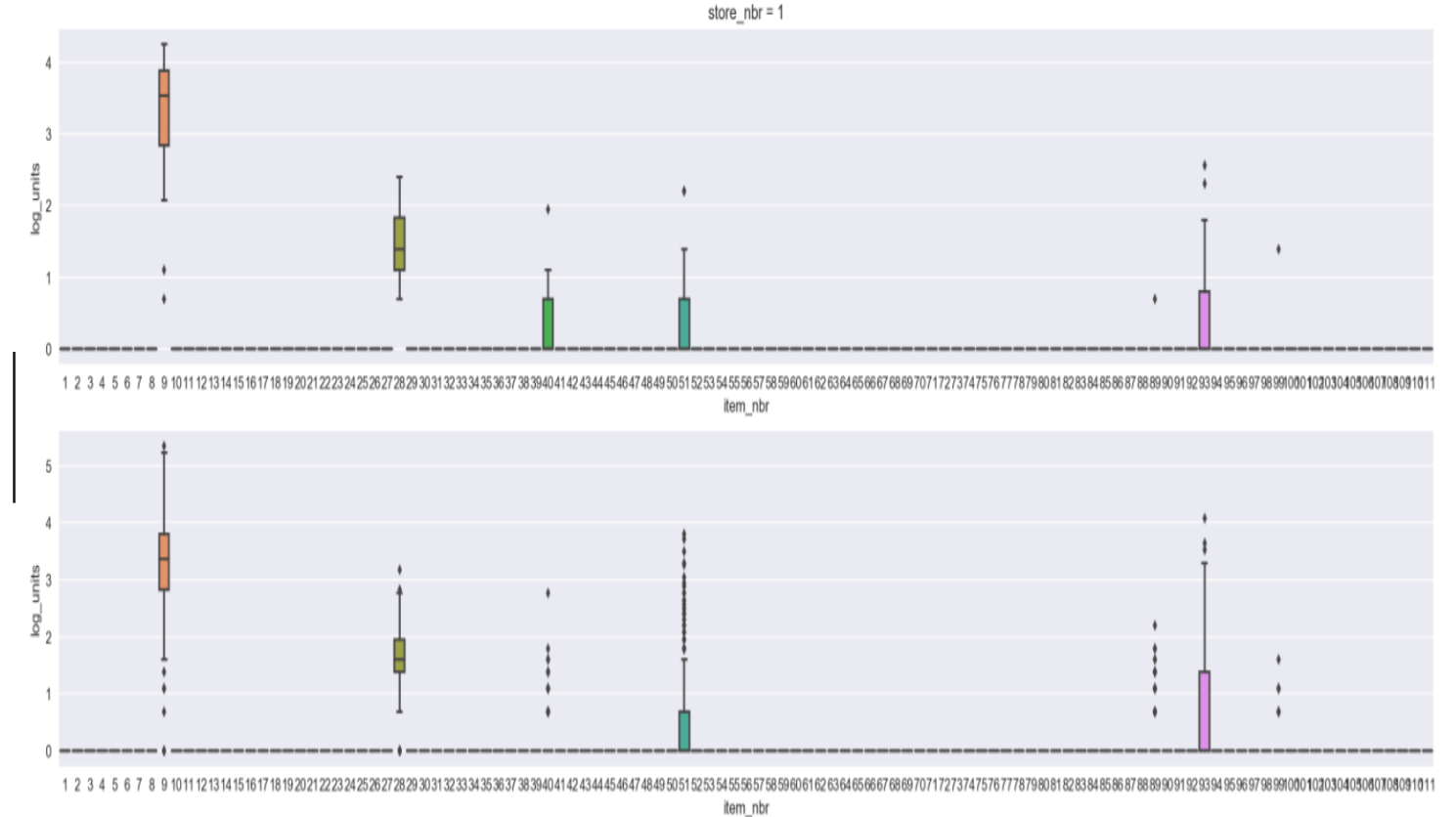


Monday: 3
Tuesday: 1
Wednesday: 3
Thursday: 4
Friday: 5
Saturday: 4
Sunday: 5

2. EDA (Exploratory data analysis)



[1] 요일 별 유닛 총 판매량

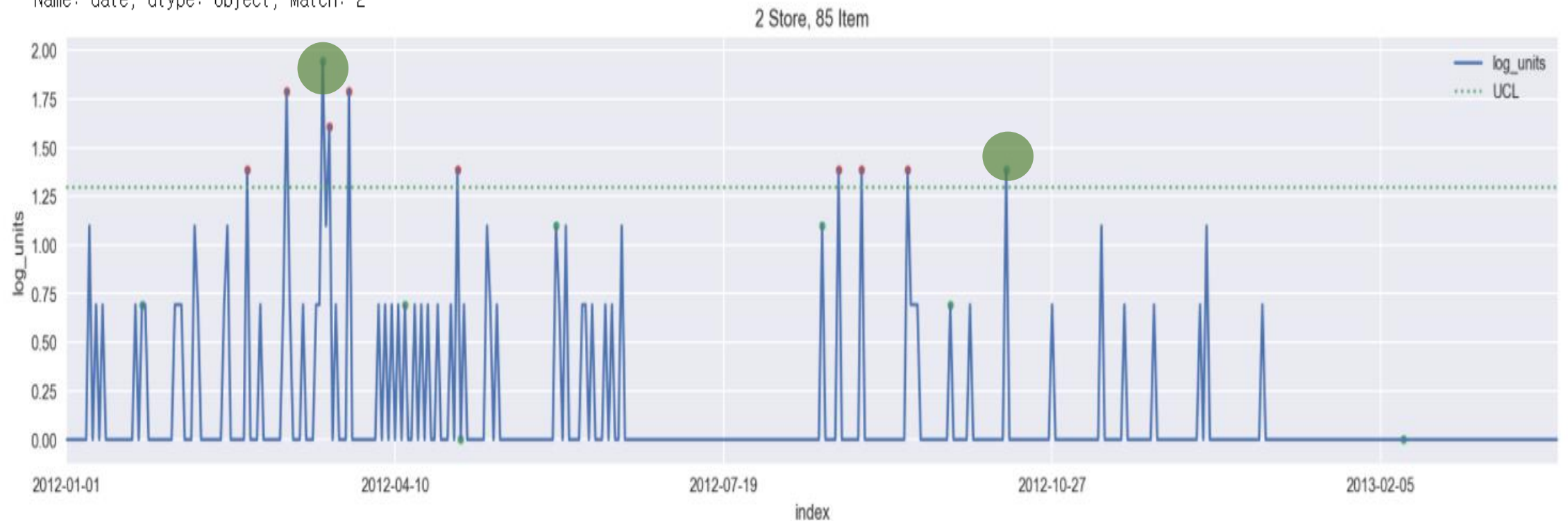


[2] Store_nbr 1의 아이템별 공휴일/비공휴일 판매량

2. EDA (Exploratory data analysis)

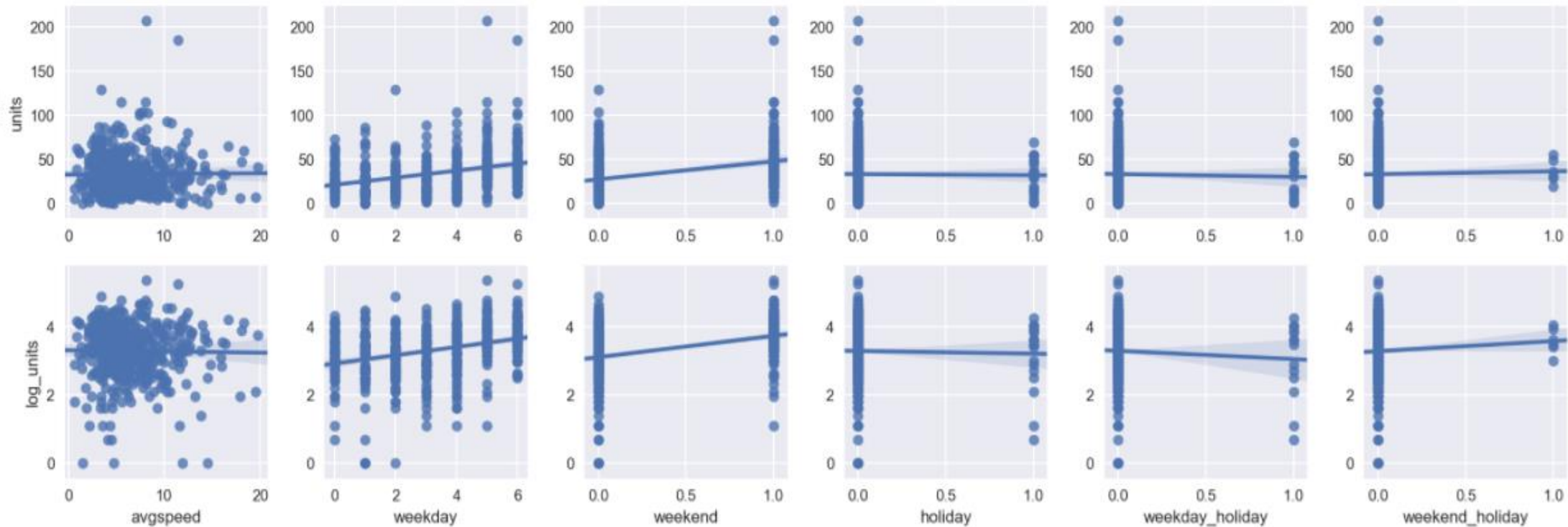
Unit vs Date (Weather Event Highlighted)

Warning! : 85221 2012-03-19
177573 2012-10-13
Name: date, dtype: object, Match: 2



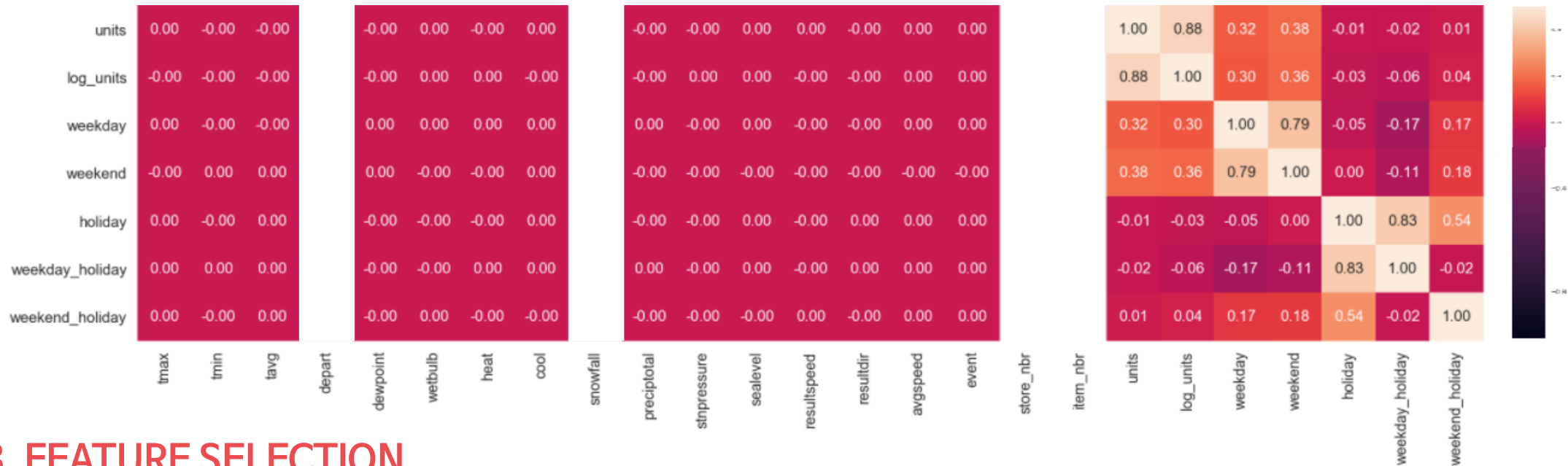
2. EDA (Exploratory data analysis)

1번 스토어 9번 아이템 Pair Plot



2. EDA (Exploratory data analysis)

1번 스토어 9번 아이템 Correlation Plot



3. FEATURE SELECTION

- 각 Store_nbr, Item_nbr별로 나누어 Modeling해야 한다.
- Weather와 log_units(또는 units)는 큰 상관관계가 없어 보인다.
- Weekday와 Holiday가 log_units(또는 units)와 약간의 상관관계가 있어 보인다. (Item_nbr에 따라 다름)

4. OLS MODELING (Trial & Error)

Trial Test

| Your most recent submission | | | | |
|--|-------------------|-----------|----------------|---------|
| Name | Submitted | Wait time | Execution time | Score |
| sub_test.csv | a few seconds ago | 3 seconds | 6 seconds | 1.78595 |
| Complete | | | | |
| Jump to your position on the leaderboard ▾ | | | | |

| Your most recent submission | | | | |
|--|-------------------|-----------|----------------|---------|
| Name | Submitted | Wait time | Execution time | Score |
| sub_test3.csv | a few seconds ago | 2 seconds | 5 seconds | 0.44340 |
| Complete | | | | |
| Jump to your position on the leaderboard ▾ | | | | |

| Your most recent submission | | | | |
|--|-------------------|-----------|----------------|---------|
| Name | Submitted | Wait time | Execution time | Score |
| sub_test2.csv | a few seconds ago | 1 seconds | 5 seconds | 0.44604 |
| Complete | | | | |
| Jump to your position on the leaderboard ▾ | | | | |

Trial 1. 2등 (뒤에서)

$\log_units \sim C(\text{store_nbr}) + C(\text{item_nbr}) + C(\text{weekday}) + C(\text{holiday}) + C(\text{event}) + 0$

Trial 2. 485명중 350등





$C(\text{store_nbr}):C(\text{item_nbr}) + C(\text{weekday}) + C(\text{holiday}) + C(\text{event}) + 0$

Trial 2-1

$C(\text{store_nbr}):C(\text{item_nbr}) + C(\text{weekday}) + C(\text{holiday}) + \text{snowfall} + \text{preciptotal} + 0$

4. OLS MODELING (Trial & Error)

Trial Test

| Your most recent submission | | | | | | |
|--|-------------------|-----------|---|---------|----|----|
| Name | Submitted | Wait time | Execution time | Score | | |
| sub_test4.csv | a few seconds ago | 3 seconds | 5 seconds | 0.15898 | | |
| Complete | | | | | | |
| Jump to your position on the leaderboard ▼ | | | | | | |
| 272 | ▼14 | 63614 |  | 0.15659 | 20 | 3y |
| 273 | ▲3 | 81010 |  | 0.15800 | 69 | 3y |
| 274 | ▼2 | mnrl |  | 0.15944 | 2 | 3y |
| 275 | ▲3 | sna |  | 0.15984 | 8 | 3y |

Trial 3.

$$\log_units \sim C(station_nbr):C(store_nbr):C(item_nbr) + C(weekday) + C(holiday) + C(event) + 0$$


Memory Error 발생
Station_nbr별로 나눠서 OLS실행

Trial4.

$$\log_units \sim C(store_nbr):C(item_nbr) + C(weekday) + C(holiday) + C(event) + 0$$

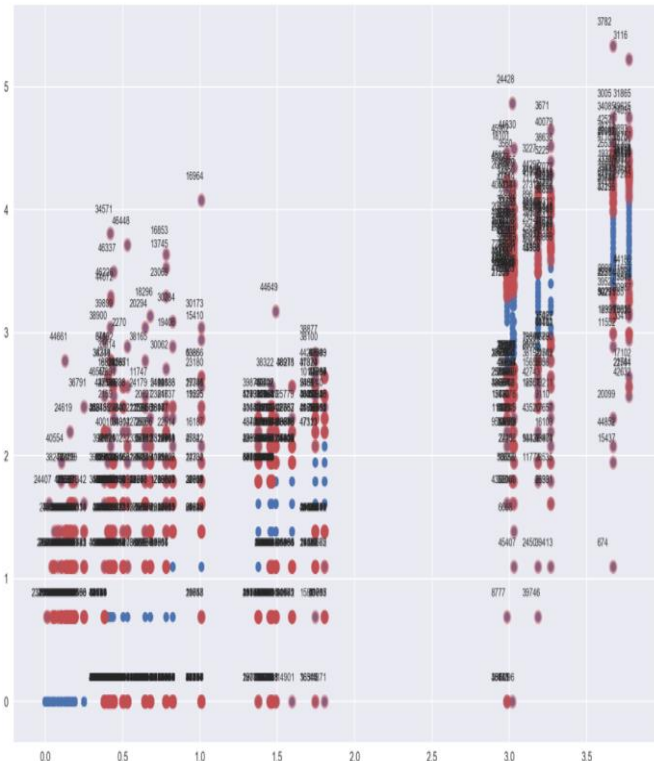
Trial5.

$$\log_units \sim C(store_nbr):C(item_nbr) + C(weekday) + C(holiday) + snowfall + preciptotal + 0$$


Store_nbr별로 나눠서 OLS Event 제외
결과 좋지 않음

4. OLS MODELING (Final)

Final Model Result



Walmart Recruiting II: Sales in Stormy Weather

Predict how sales of weather-sensitive products are affected by snow and rain

485 teams · 3 years ago

OverviewDataDiscussionLeaderboardRulesTeam

My SubmissionsLate Submission

Your most recent submission

| Name | Submitted | Wait time | Execution time | Score |
|--|-----------|-----------|----------------|---------|
| sub_finally.csv | just now | 2 seconds | 4 seconds | 0.15794 |
| Complete | | | | |
| Jump to your position on the leaderboard | | | | |

Walmart Recruiting II: Sales in Stormy Weather

Predict how sales of weather-sensitive products are affected by snow and rain





485 teams · 3 years ago

OverviewDataDiscussionLeaderboardRulesTeam

My SubmissionsLate Submission

Your most recent submission

| Name | Submitted | Wait time | Execution time | Score |
|--|--------------|-----------|----------------|---------|
| sub_test1.csv | 18 hours ago | 3 seconds | 5 seconds | 0.15825 |
| Complete | | | | |
| Jump to your position on the leaderboard | | | | |

| | | | | | |
|-----|-----|-------|---|---------|----|
| 272 | ▼14 | 63614 |  | 0.15659 | 20 |
| 273 | ▲3 | 81010 |  | 0.15800 | 69 |
| 274 | ▼2 | mnrl |  | 0.15944 | 2 |
| 275 | ▲3 | sna |  | 0.15984 | 8 |

Trial 3.
log_units ~
C(item_nbr):C(weekday):C(item_nbr)
+ C(holiday) + 0

최종:


log_units ~ C(item_nbr):C(weekday)
+ 0

5. CONCLUSION



- 각 요일, Item_nbr별 Units의 평균치를 구하는 모델
- 잔차가 Non-normal함
 - 요인)
 - 1) Units에 영향을 주는 알 수 없는 Feature들이(Disturbance)충분히 많지 않아 정규분포로 수렴하지 못함
 - 2) 잔차끼리 독립이 아님(선형 회귀 모형이 아닌 시계열 모형을 사용해야하는 결론)

6. 시계열 모형 (MOVING AVERAGE)



Walmart Recruiting II: Sales in Stormy Weather

Predict how sales of weather-sensitive products are affected by snow and rain
485 teams · 3 years ago






Overview
Data
Discussion
Leaderboard
Rules
Team
My Submissions
Late Submission

Your most recent submission

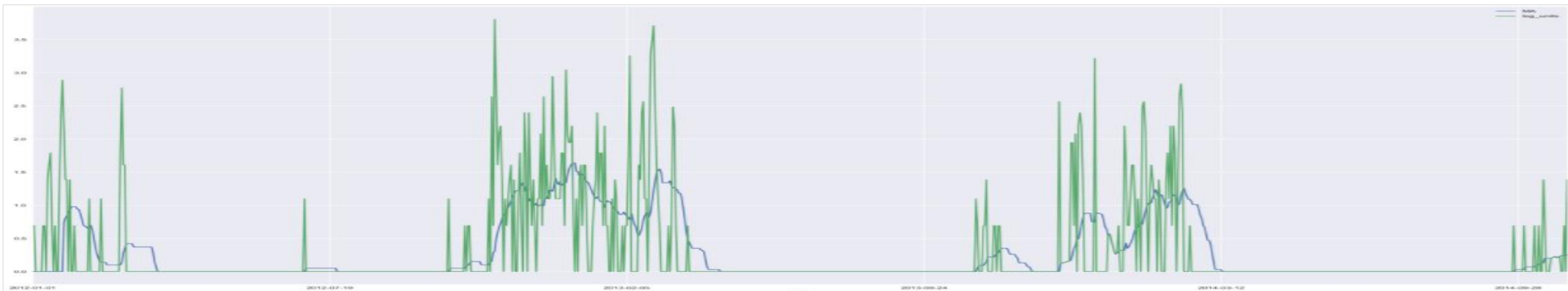
| Name | Submitted | Wait time | Execution time | Score |
|--------|-------------------|-----------|----------------|---------|
| ma.csv | a few seconds ago | 5 seconds | 4 seconds | 0.10568 |

Complete

[Jump to your position on the leaderboard](#)

| | | | | | | |
|-----|-----|--------------------|---|---------|----|----|
| 96 | ▲6 | 35957 |  | 0.10521 | 26 | 3y |
| 97 | ▲13 | anaef |  | 0.10530 | 7 | 3y |
| 98 | ▲4 | Victor Mayrink |  | 0.10553 | 37 | 3y |
| 99 | ▲1 | TheAnalyticProphet |  | 0.10570 | 23 | 3y |
| 100 | ▲3 | 99247 |  | 0.10586 | 11 | 3y |

- 1번 Store의 51번 Item의 MA를 이용한 Fit 그래프.



7. SUMMERY

- 종속변수 Units는 독립변수 Store_nbr, Item_nbr, Weekday, Holiday, Event의 선형조합으로 결정되는 기대 값과 고정된 분산을 가지는 정규분포를 따른다 라고 가정하였다.
- 각 스토어의 아이템별 Units vs. Date 플롯은 판매량이 Random함을 알 수 있었다.
- 그 Random함이 Weekday, Holiday, Event에 영향을 받은 것인지 알아보기 위해 다수의 OLS를 시행하였다.
- Holiday와 Event의 영향력이 없다고 판단하고, Item_nbr와 Weekday의 Interaction을 모수로 사용하는 OLS를 최종 모델로 채택하였다.
- 최종 모델에서 잔차의 분포가 정규분포를 따르지 않음을 확인하였다.
- 각 스토어의 아이템별 잔차가 정규분포를 따르지 않음을 확인하였고 그 이유는 잔차 간의 독립이 성립되지 않기 때문이라고 생각한다.
- 잔차 간 독립이 성립하지 않음은 종속변수 간의 관계가 있음을 나타내고 따라서 시계열 모형 (이동평균선)을 이용하여 \hat{y} 값을 재 추정해 보았다.
- 회귀모형보다 좋은 결과값을 확인하였다.

Thank You
