

# American Express - Default Prediction

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## 1. Abstract

Whether out at a restaurant or buying tickets to a concert, modern life counts on the convenience of a credit card to make daily purchases. It saves us from carrying large amounts of cash and also can advance a full purchase that can be paid over time. How do card issuers know we'll pay back what we charge? That's a complex problem with many existing solutions—and even more potential improvements, to be explored in this competition.

Credit default prediction is central to managing risk in a consumer lending business. Credit default prediction allows lenders to optimize lending decisions, which leads to a better customer experience and sound business economics. Current models exist to help manage risk. But it's possible to create better models that can outperform those currently in use.

American Express is a globally integrated payments company. The largest payment card issuer in the world, they provide customers with access to products, insights, and experiences that enrich lives and build business success.

In this competition, you'll apply your machine learning skills to predict credit default. Specifically, you will leverage an industrial scale data set to build a machine learning model that challenges the current model in production. Training, validation, and testing datasets include time-series behavioral data and anonymized customer profile information. You're free to explore any technique to create the most powerful model, from creating features to using the data in a more organic way within a model.

If successful, you'll help create a better customer experience for cardholders by making it easier to be approved for a credit card. Top solutions could challenge the credit default prediction model used by the world's largest payment card issuer—earning you cash prizes, the opportunity to interview with American Express, and potentially a rewarding new career.

## 2. Data

目的は月々の顧客プロファイルに基づいて、将来のクレジットカードの支払い滞納を予測すること。ターゲットの二値は最新の明細から 18 カ月のパフォーマンスウィンドウを観察することによって計算され、そして

し顧客が最新の明細から 120 日以内に支払いをしなかった場合、デフォルトイベントとみなす。  
データセットは明細日付で各顧客ごとに集約されたプロファイル特徴を含む。特徴は匿名化標準化されそして、次の一般的なカテゴリーに落とし込まれる。

- `D_*` =Delinquency variables 延滞変数
- `S_*` =Spend variables 支出変数
- `P_*` =Payment variables 支払変数
- `B_*` =Balance variables バランス変数
- `R_*` =Risk variables リスク変数

次の特徴はカテゴリーに分類される。

```
['B_30', 'B_38', 'D_114', 'D_116', 'D_117', 'D_120', 'D_126', 'D_63', 'D_64', 'D_66', 'D_68']
```

あなたの仕事はそれぞれの `customer_ID` について将来のデフォルトを `target=1` で予測すること。

- `train_data.csv` (16.39GB)顧客ごとの明細データを持つ学習データ
- `train_labels.csv` (30.75MB) `customer_ID` ごとの `target` ラベル
- `test_data.csv` (33.82GB)テストデータ; `customer_ID` ごとの `target` を予測する
- `sample_submission.csv` (61.95MB)正しい形式の提出サンプル

## 3. feather 形式に変換

What is feather?

Feather: A Fast On-Disk Format for Data Frames for R and Python, powered by Apache Arrow

CSV データが重すぎて、このまま `read_csv` するとメモリが飛ぶ。そこで軽量な feather 形式に変換する。ついでに、データ型も換えておく。

```

# standard lib
from pathlib import Path
import gc
# third party
from tqdm import tqdm
import pandas as pd
import numpy as np

def create_feather(input_path: Path, save_path: Path):
    ...
    csvからfeather形式に変換する
    ...

    df = pd.DataFrame()
    with pd.read_csv(input_path, chunksize=10000) as reader:
        for chunk in tqdm(reader):
            for column in chunk.columns:
                data_type = chunk[column].dtype
                if data_type == np.float64:
                    chunk[column] = chunk[column].astype(np.float16)
                elif data_type == np.int64:
                    chunk[column] = chunk[column].astype(np.int8)
            df = pd.concat([df, chunk])

        gc.collect()

    df.to_feather(save_path)

if __name__ == "__main__":
    path_list = [
        Path(r>Data\amex-default-prediction\train_data.csv"),
        Path(r>Data\amex-default-prediction\test_data.csv")
    ]
    feather_path = Path(r>Data\feather_data")
    for path in path_list:
        create_feather(path, (feather_path / path.name).with_suffix(".ftr"))

```

2 時間ぐらいかかった。

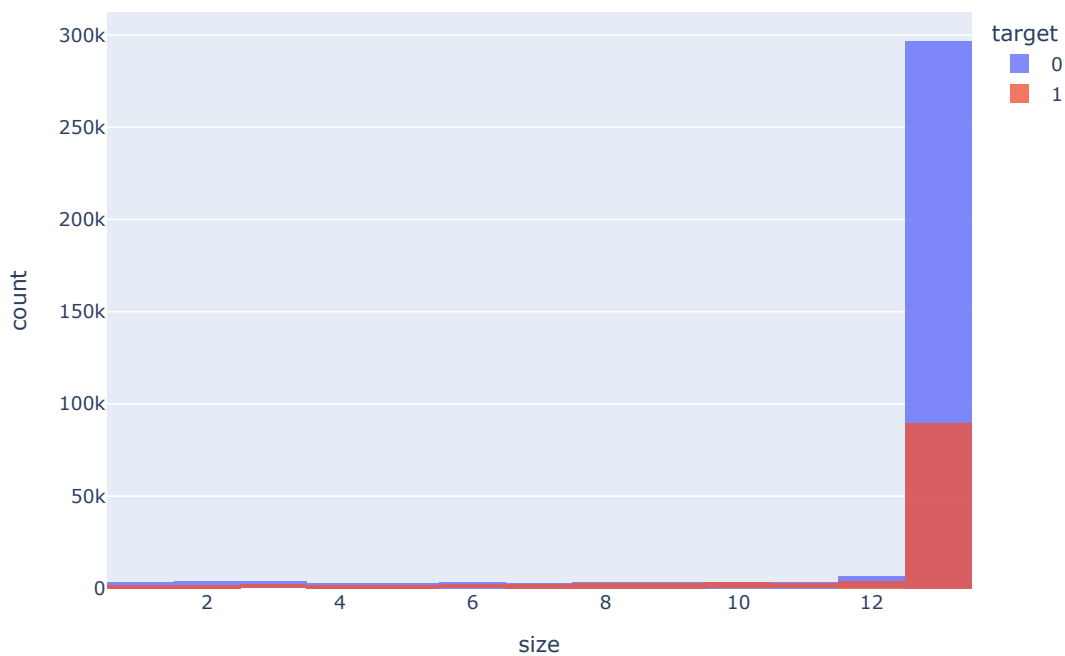
- train\_data.csv (16.39GB) -> ftr:**1.67GB**
- test\_data.csv (33.82GB) -> ftr:**3.44GB**

pandas で to\_feather するには以下のライブラリが必要

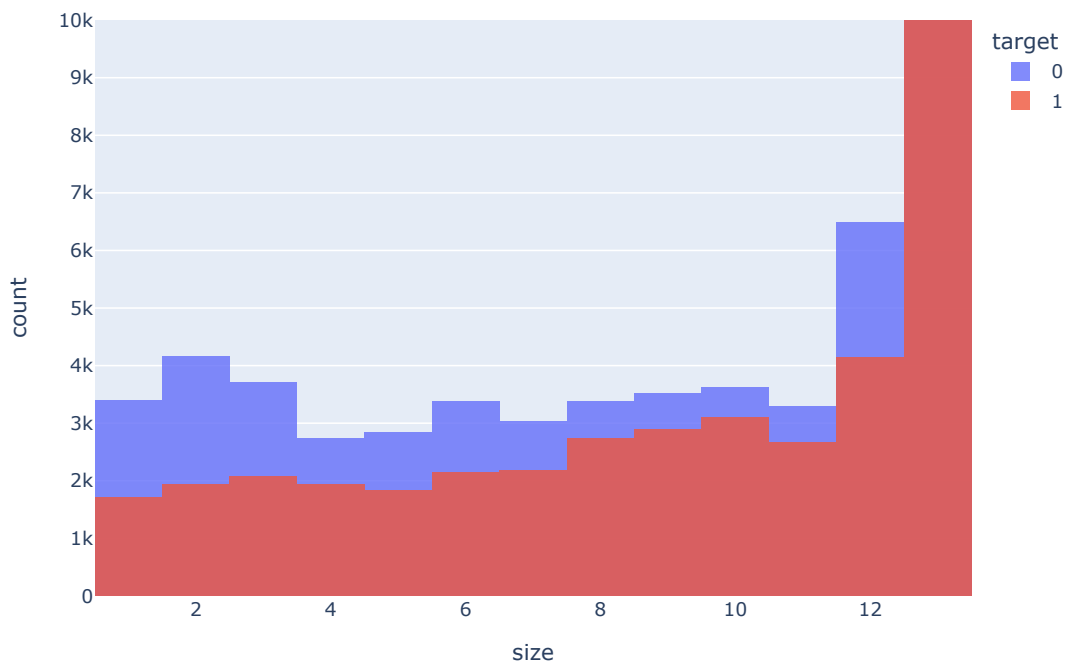
Package	Version
-----	-----
pandas	1.4.2
pyarrow	8.0.0

## 4. データの概観

### 4.1. 明細数の確認



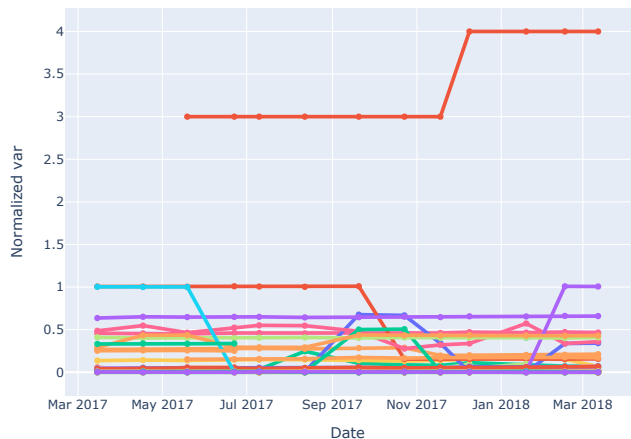
顧客単位の明細データ数



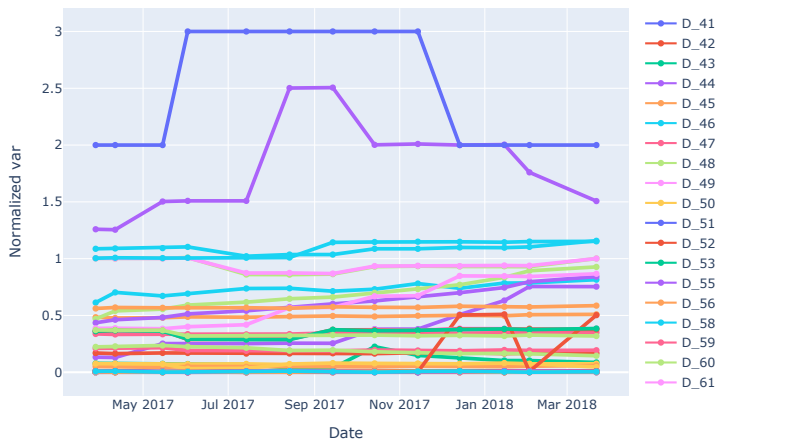
拡大

### 4.2. カテゴリ別に target を比較

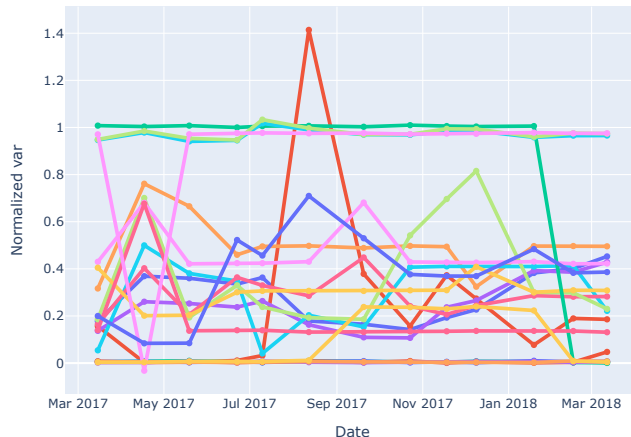
Delinquency target=0, line=84



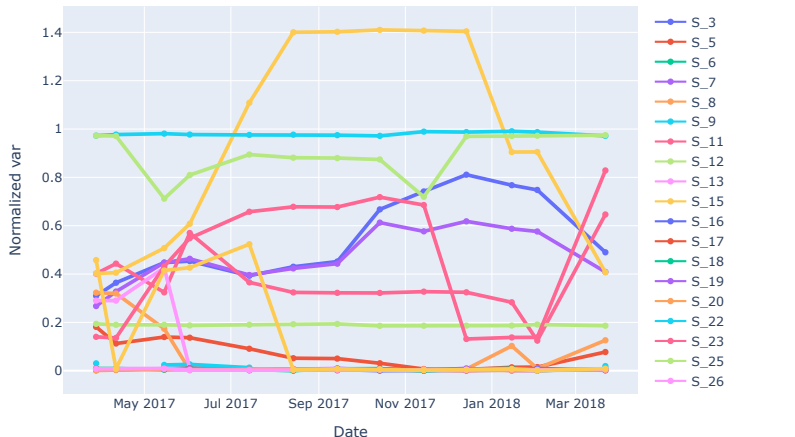
Delinquency target=1, line=86



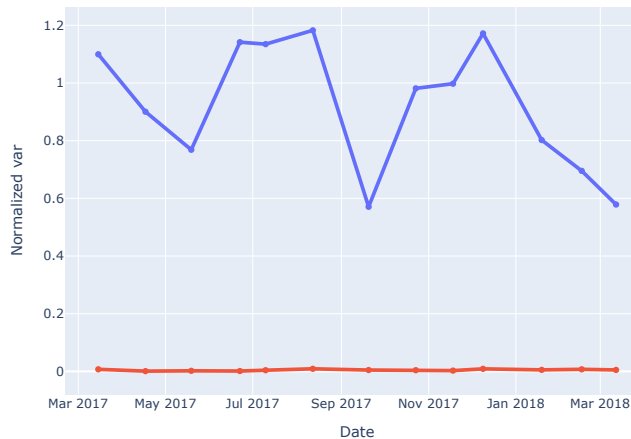
Spend target=0, line=21



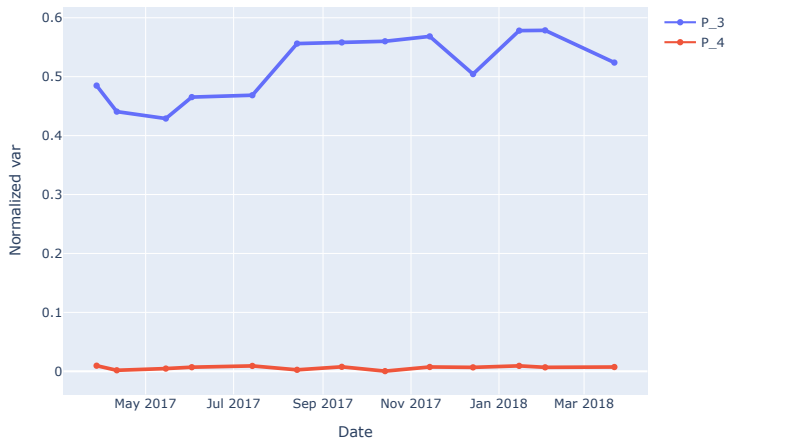
Spend target=1, line=20



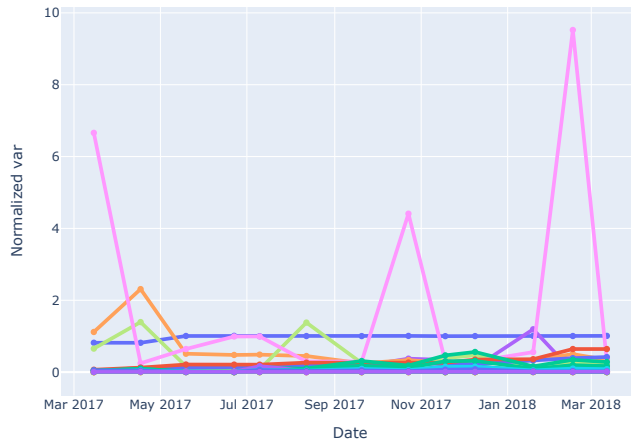
Payment target=0, line=2



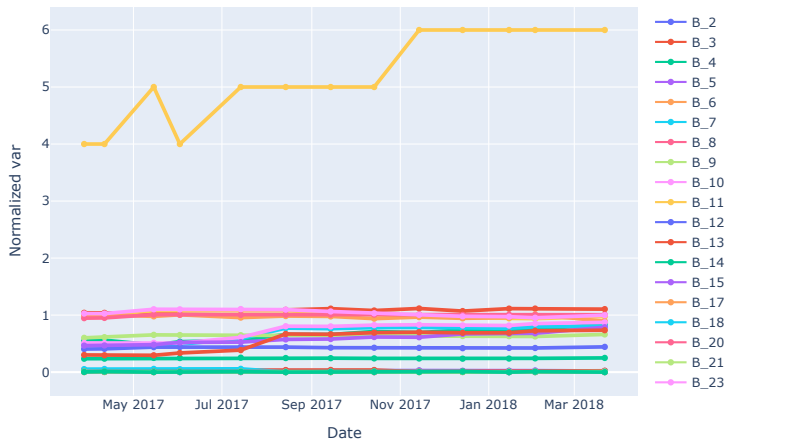
Payment target=1, line=2



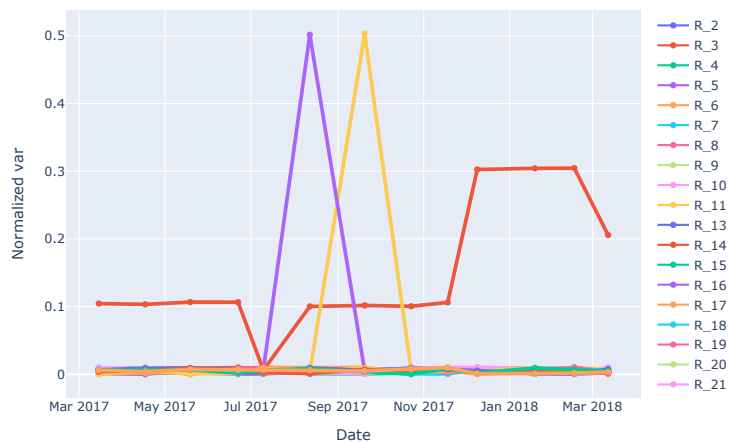
Balance target=0, line=35



Balance target=1, line=34

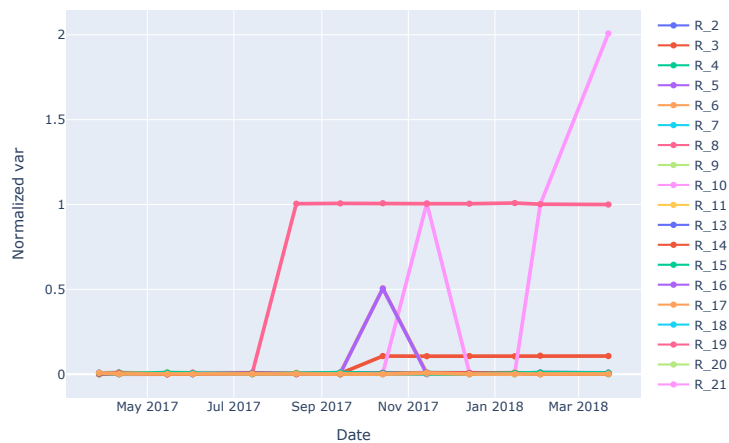


Risk target=0, line=25



破産しない

Risk target=1, line=25



破産する