

Bankruptcy Detection Model

Presented by: Tony
Tedesco



CONTENTS

- ▶ Who am I?
- ▶ Bankruptcy and Covid
- ▶ Reasons for Bankruptcies
- ▶ Model and Analysis
- ▶ Conclusions and Recommendations





PART

01

**Who
Am I?**

Getting to know me

Background:

- Bachelors of Arts in Economics from Michigan State University
- Data Scientist with experience working with financial and business data
- Knowledge of American business industries and practices

Why Bankruptcies:

- Over 35,000 business bankruptcies in the U.S. per year
- 2020/2021 have been awkward years financially for many firms





PART

02

Bankruptcies and Covid

What was the impact?

Covid 19 had an impact on many businesses both large and small, both in and without the U.S.

Some of the hardest hit industries were:

- Travel
 - AeroMexico, Flybe, Hertz, Nok Air
- Restaurants
 - Friendly's, Sizzler, Ruby Tuesdays, California Pizza Kitchen, Chuck E. Cheese,
- Fitness
 - 24 Hour Fitness, Gold's Gym, GNC
- Clothing
 - JCPenney, Ann Taylor, J.Crew, Brooks Brothers, Lord & Taylor, True Religion, Men's Wearhouse
- Others
 - Cirque Du Soleil, Remington Arms, Intelsat, Whittington Petroleum





PART

03

Data

The Data

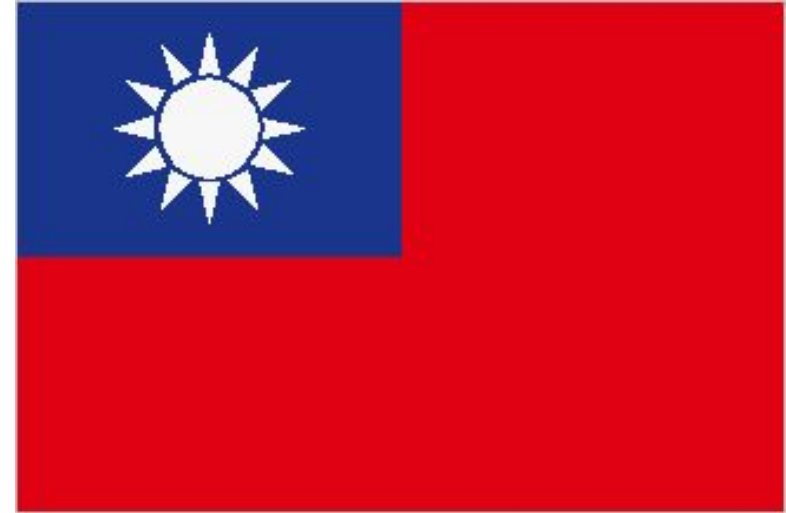
Two datasets from Kaggle.com:

First dataset:

- from Taiwan (1999-2009)
- looks at 6819 companies
- over 90 features mostly focused on attributes about the companies stock

Second data:

- from Poland (2000-2012)
- looks at over 42,000 companies
- 64 features mostly focused on the companies financial data



The Data Distribution

Despite being from two completely different countries, the ratio of bankruptcies to no bankruptcies was near identical

Taiwan:

- 96.77% non bankruptcies
- 3.23% bankruptcies

Poland:

- 97.83% non bankruptcies
- 2.17% bankruptcies



Problems with the Data

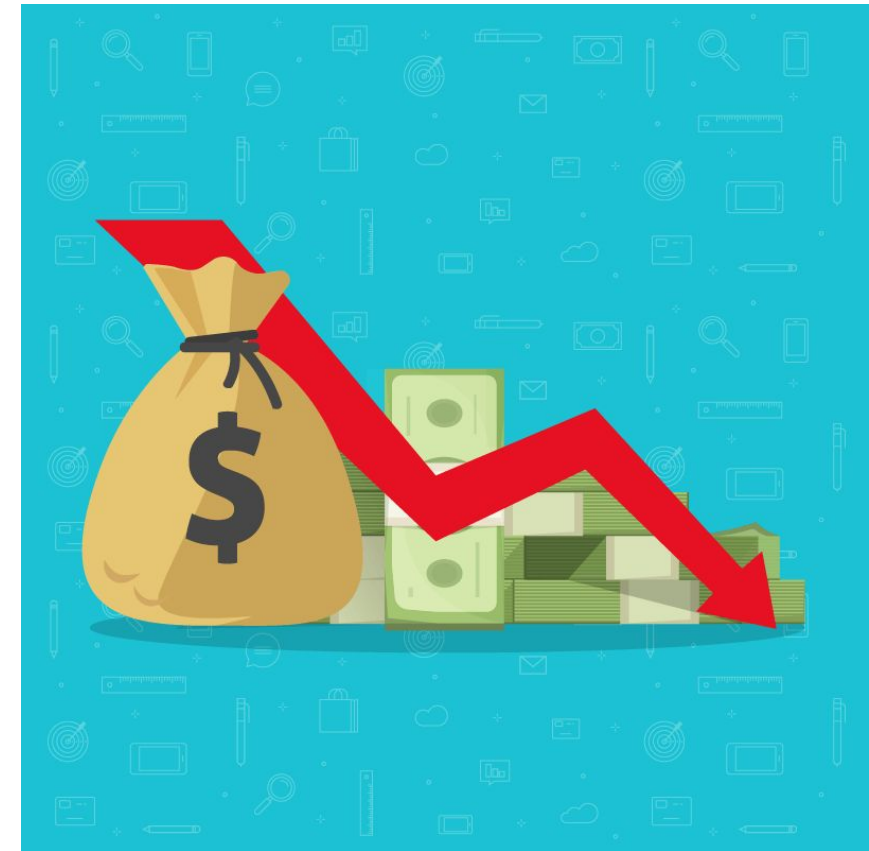
Despite the large number of features for both datasets, there was very little correlation between any of the features and bankruptcies

Studies suggest that the best predictors of bankruptcies are :

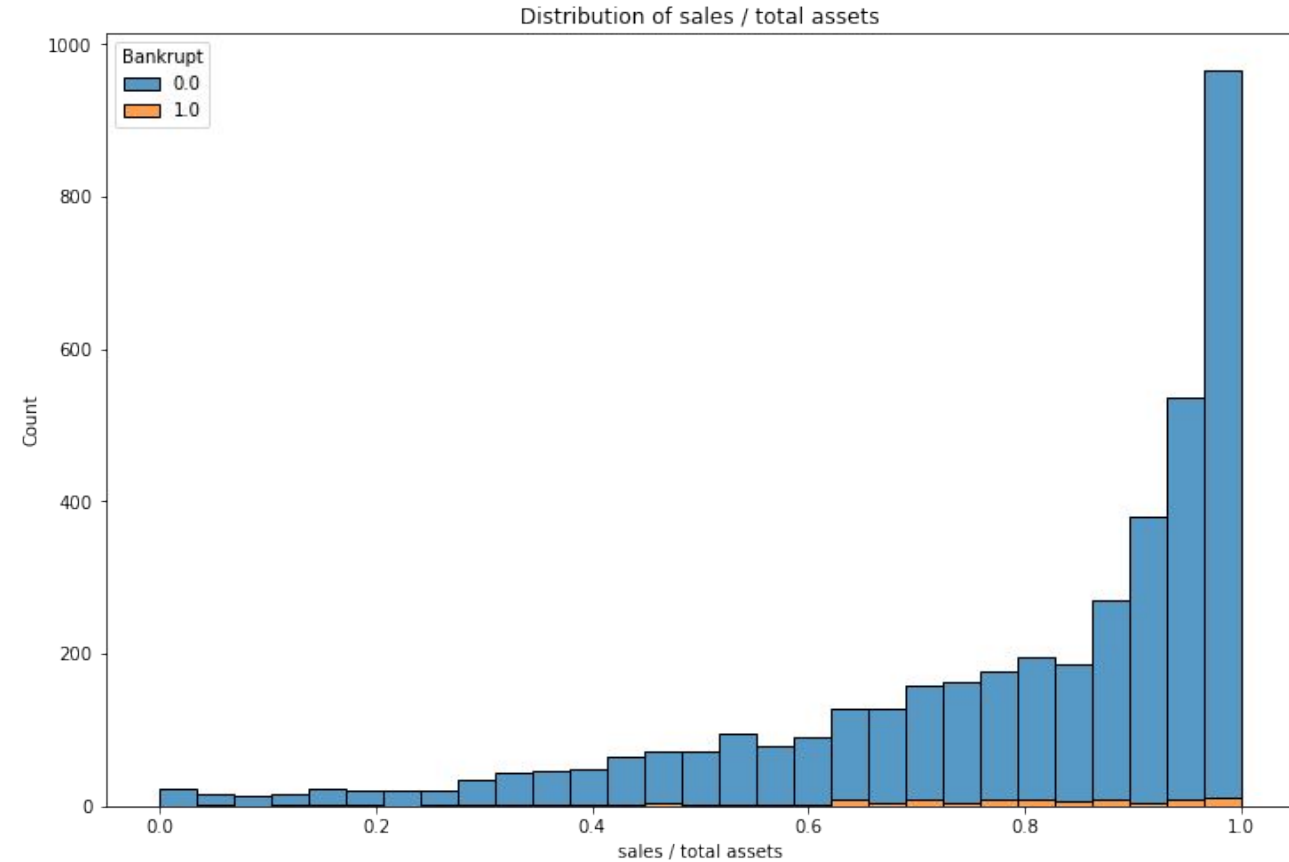
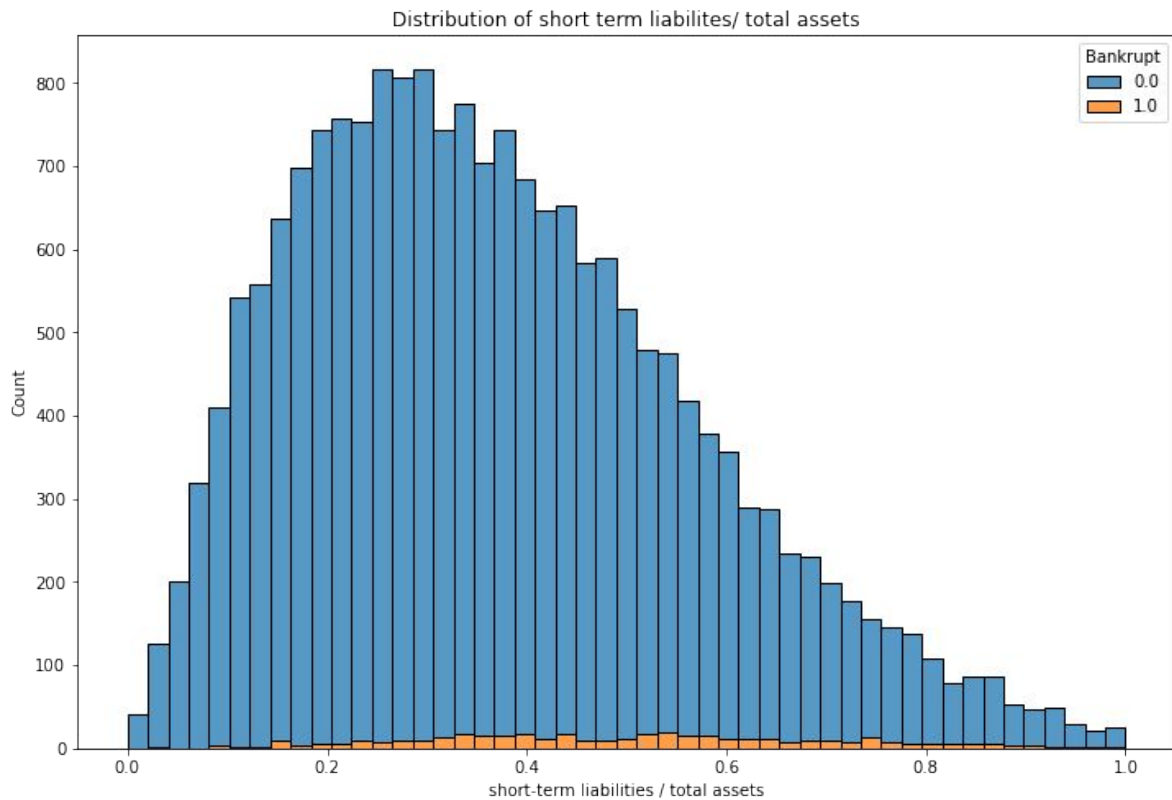
- The companies financials
- It's economic environment
- It's qualitative features

https://www.researchgate.net/publication/235643766_Bankruptcy_prediction_models_How_to_choose_the_most_relevant_variables

https://www.researchgate.net/publication/2340186_Choosing_the_Best_Set_of_Bankruptcy_Predictors

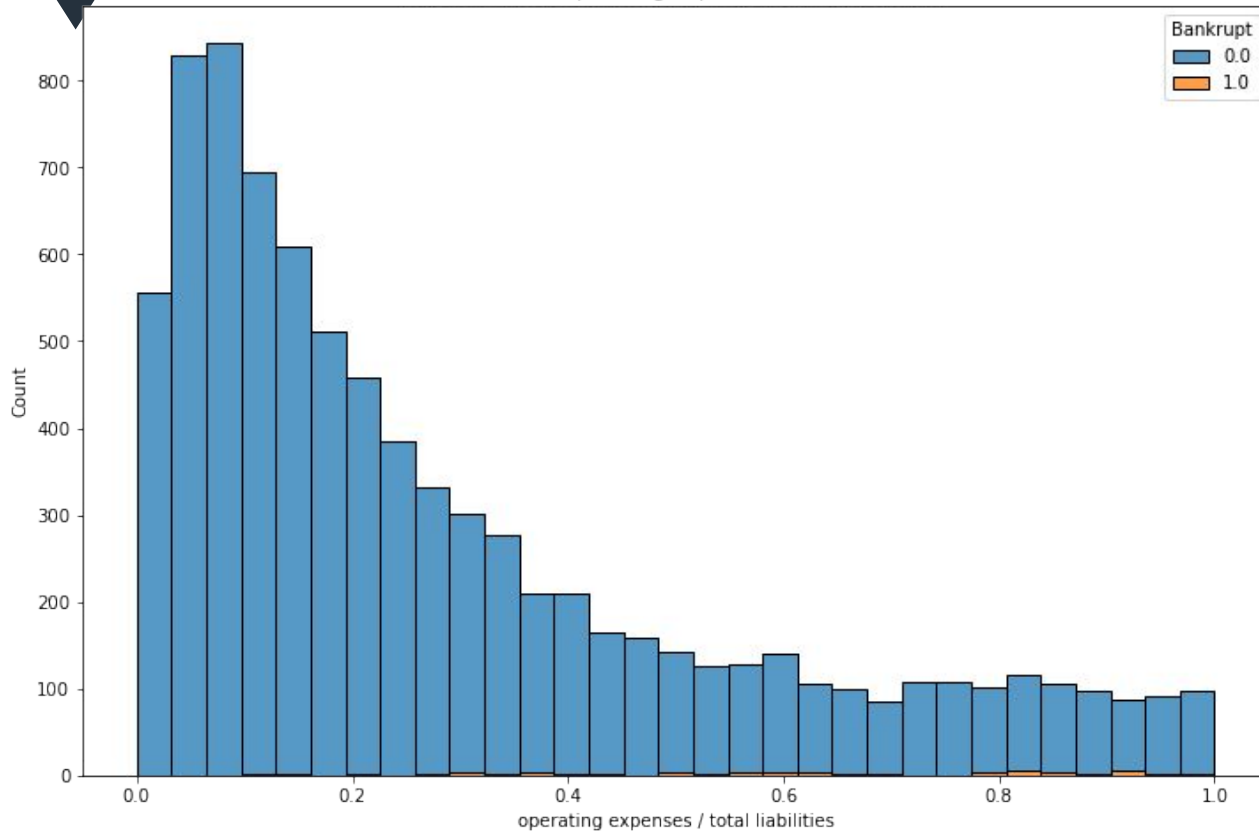


Polish Data Distribution

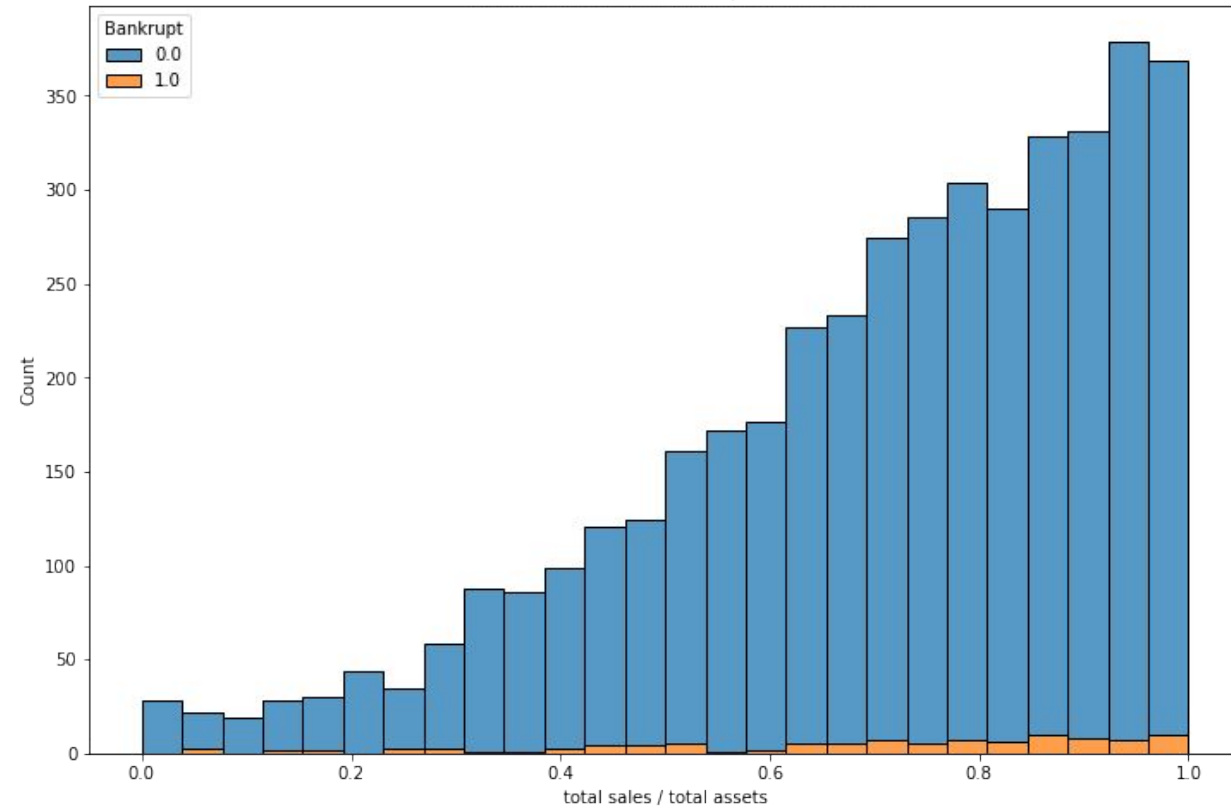


Polish Data Distribution

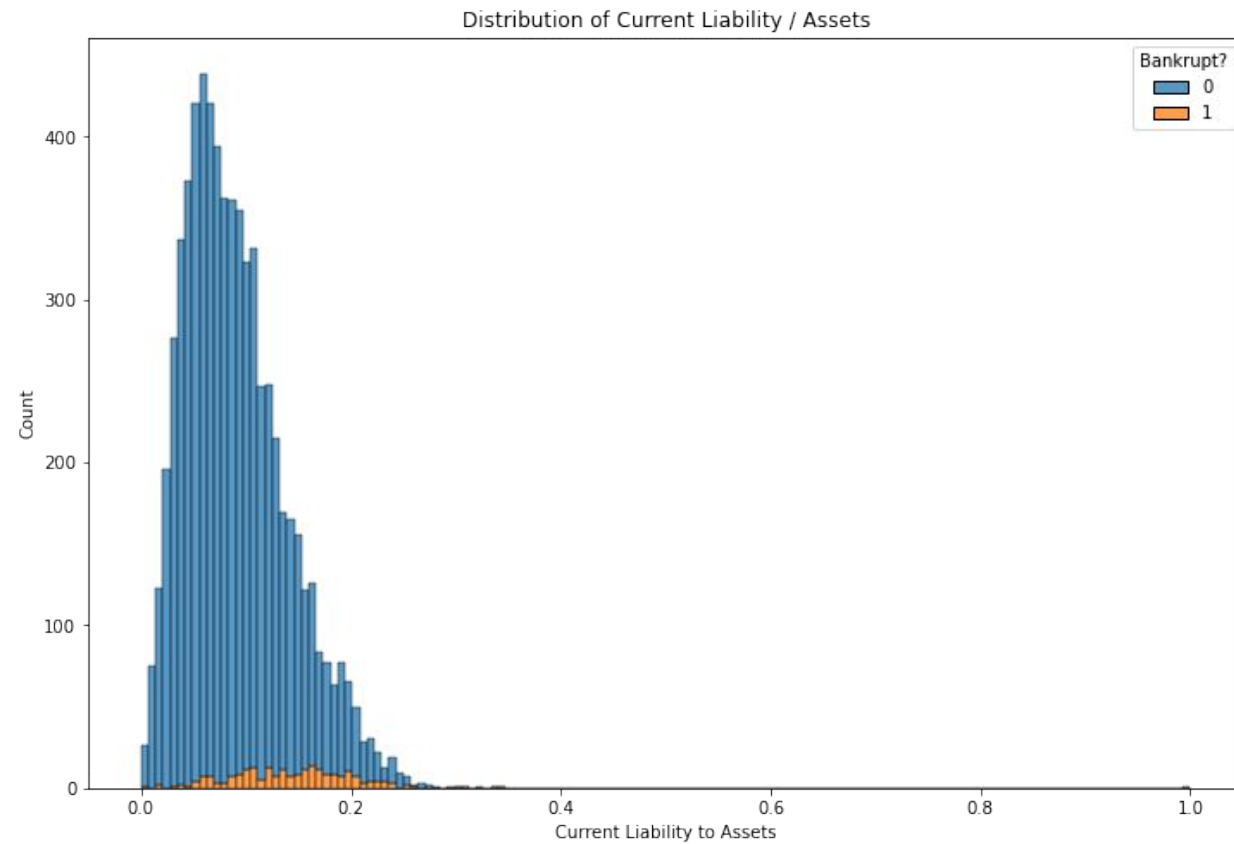
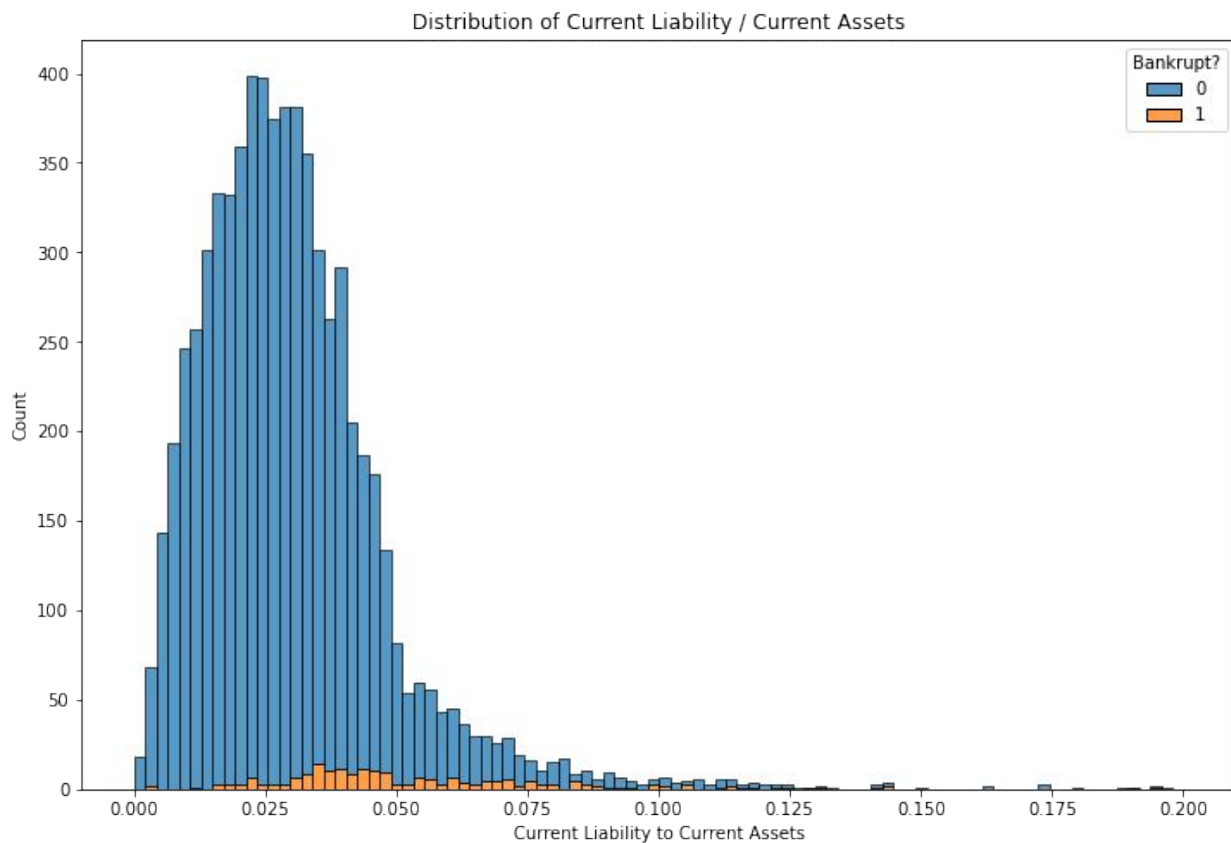
Distribution of operating expenses / total liabilities



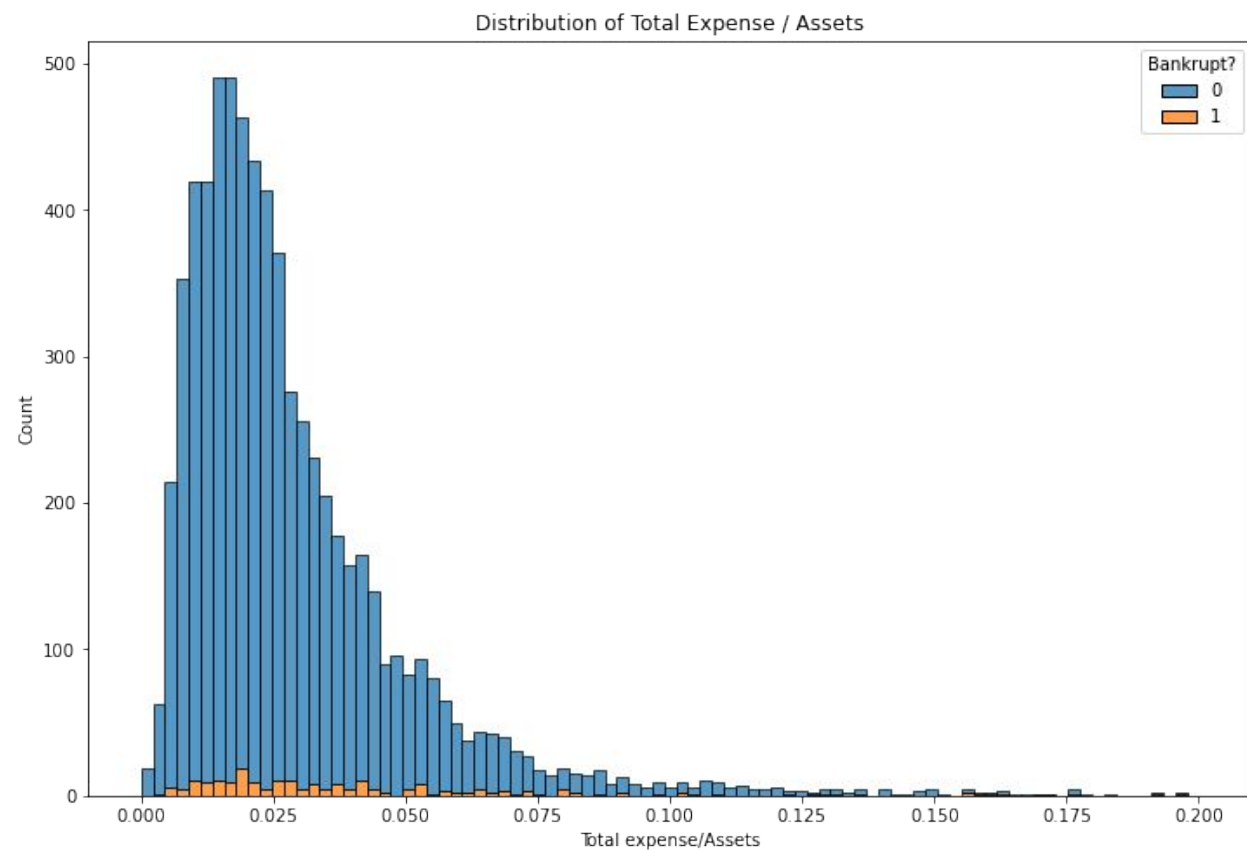
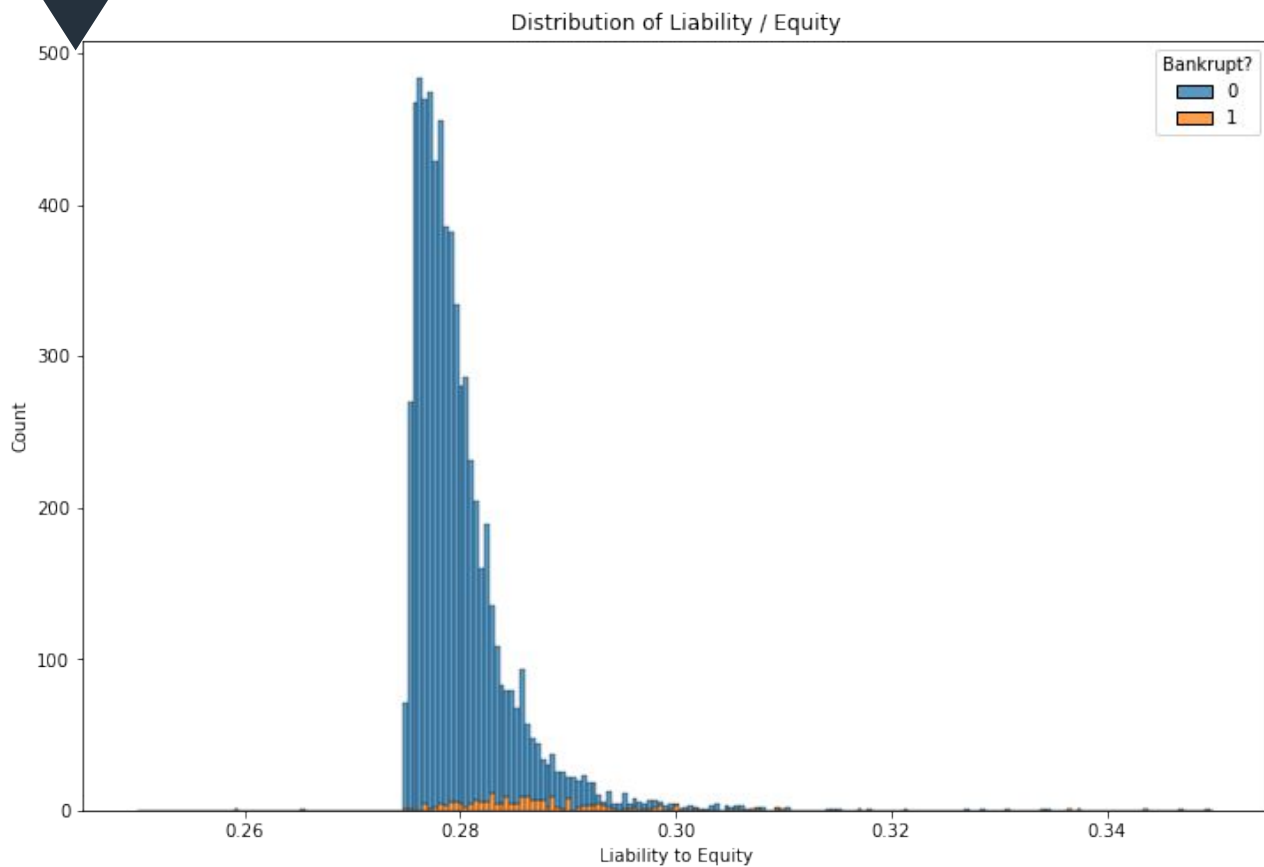
Distribution of total sales / total assets



Taiwanese Data Distribution

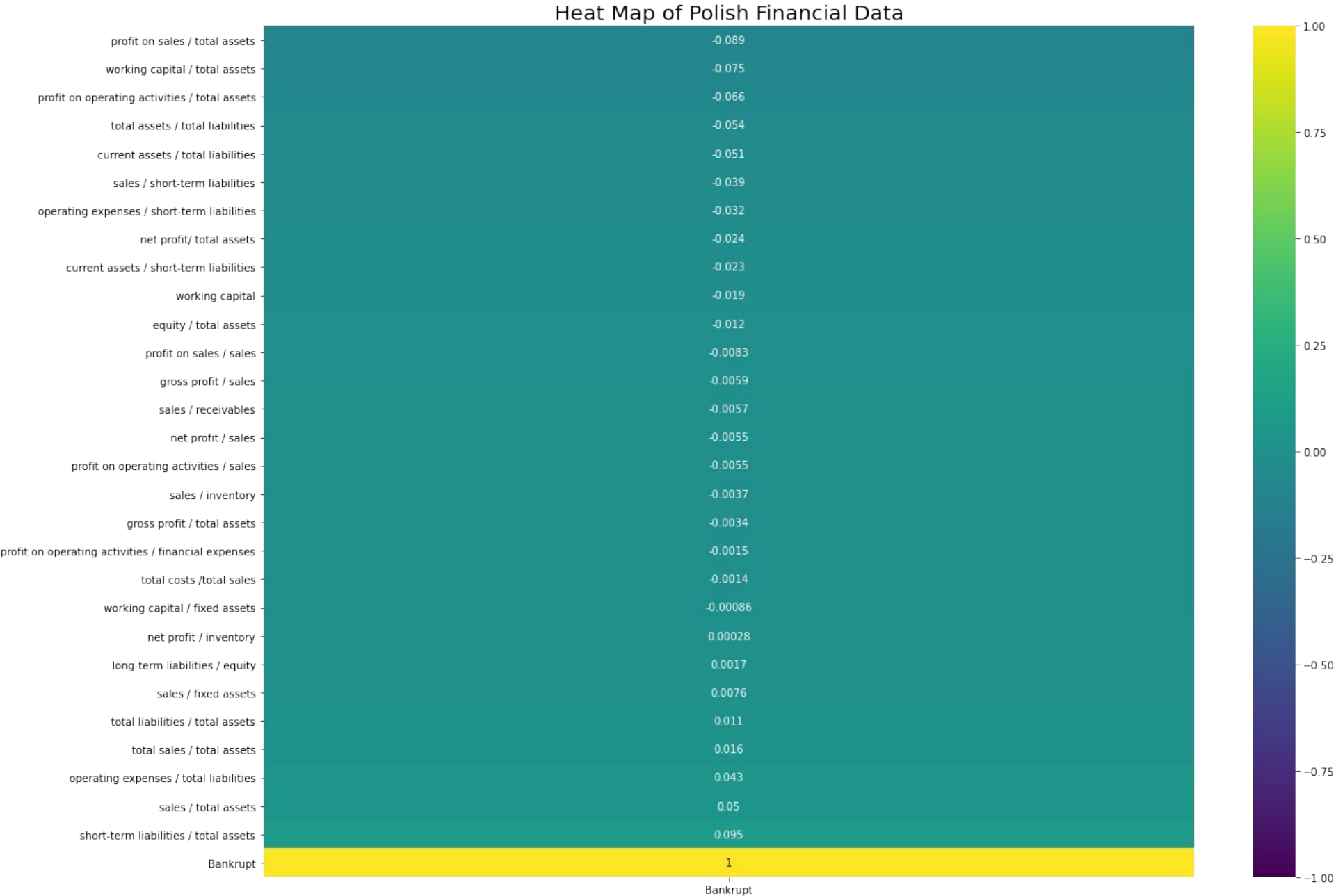


Taiwanese Data Distribution

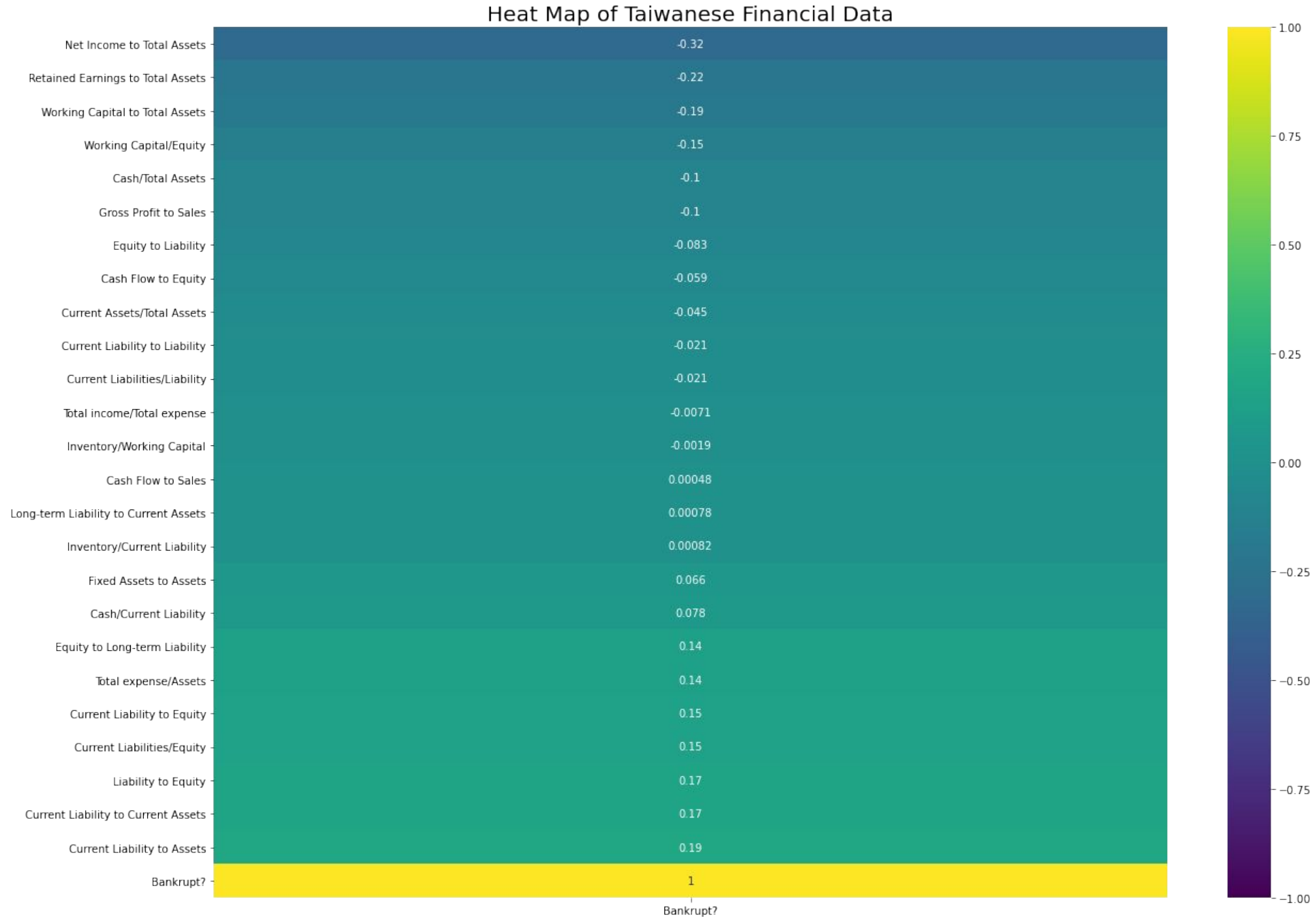




Polish Data Correlation Heat Map



Taiwanese Data Correlation Heat Map





PART

04

The Model

The Modeling Process

The Goal:

1. Using Several Machine Learning Techniques (such as Logistic Regression, Random Forest, Gradient Boosting, Extra Trees and Neural Networks), create a model to outperform our very high baselines
2. Create a model that produces the lowest number of false negative classifications (optimizing for sensitivity)



The Best Model

The best performing model was the Gradient Boosting Classifier:

Poland:

- Accuracy: 99.91%
- Sensitivity: 99.9%

Taiwan:

- Accuracy: 97.57%
- Sensitivity: 99.45%

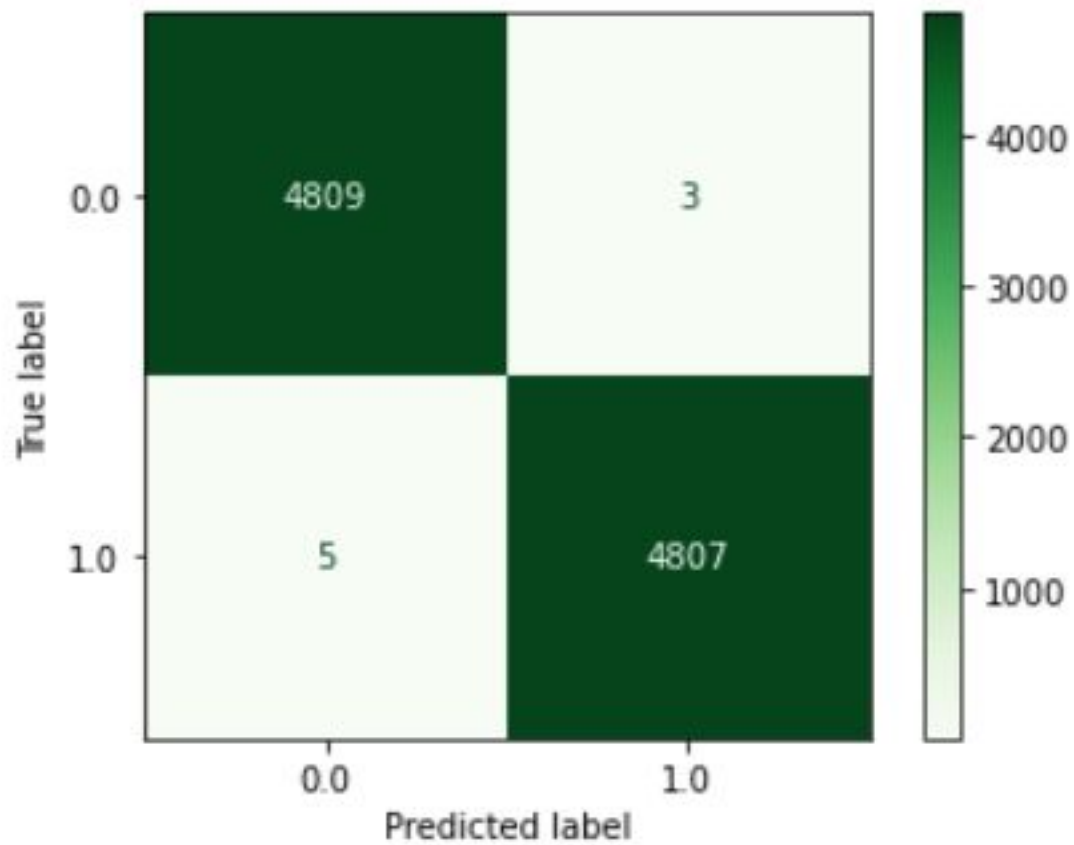
Baseline:

- $P = 97.83\%$
- $T = 96.77\%$

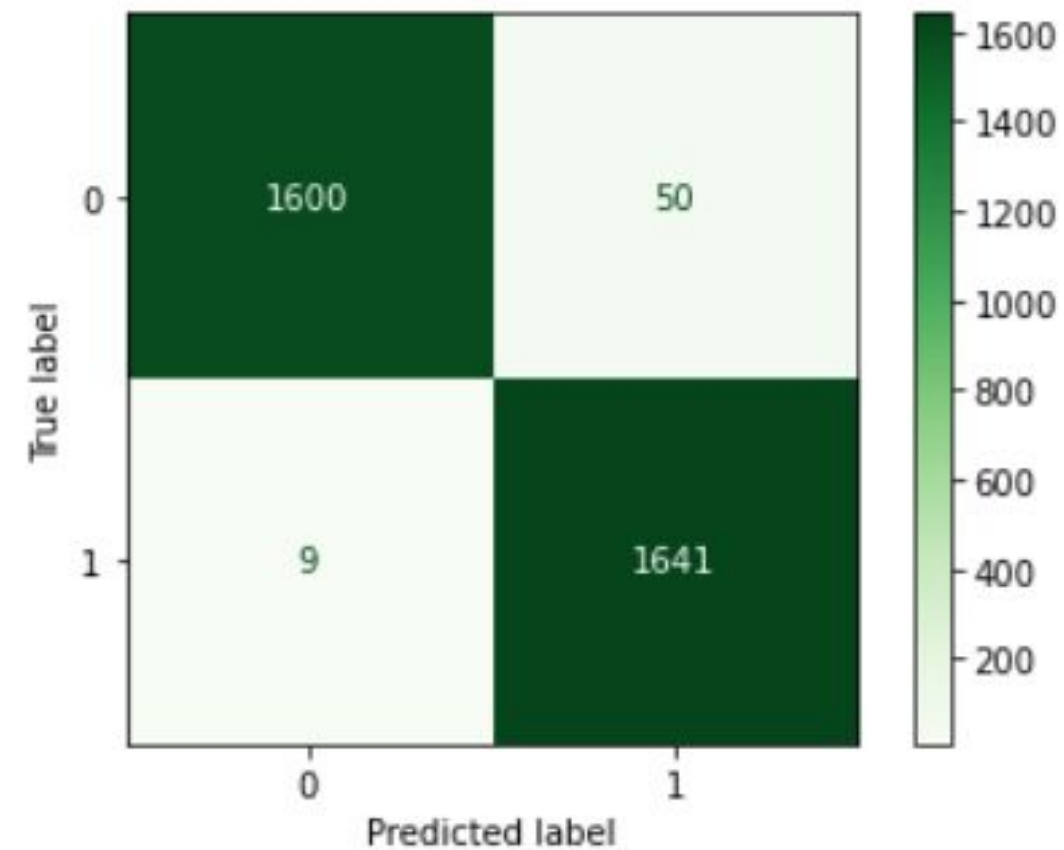


The Model Visualized

Poland Confusion Matrix



Taiwan Confusion Matrix





PART

05

Conclusion

What We Learned

Using the model, we can accurately predict bankruptcies, while also reducing the risk of providing potential dangerous information

A Lot of what can affect the possibility of a company going bankrupt is dependent on harder to quantify metrics and events outside of a company's control



The Next Steps



What to do if your company is in financial trouble:

- Pay minimum amount to creditors
- Cut spending
- Find minimum cost level
- Re-negotiate what you can
- Create short term cash flow
- Establish a business plan
- Utilize tax loopholes/ reforms
- Employe a financial advisor

[How to Avoid a Business Bankruptcy \(chron.com\)](#)

[Tips on How to Avoid Bankruptcy | Build a Strong Business | Scott Chernich: Foster Swift](#)



THANK YOU

Powered by **GoogleSlides.org**