Forecasting Future Employment Based on Current Employment Statistics in different Sectors

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Agenda

- **The Application**

- **The Data**

- **The Analysis**

- **The Model**

- **Application Development**

- **The Conclusion**

The Data

- Monthly Population, Employment, & Labor market Statistics for year 1975 to year 2021

- Source : FRED Economic Data
https://fred.stlouisfed.org/categories/10

- Around 554 observations and 30 Variables

Features

- Average Weeks Unemployed

- Government social benefits to persons

- Personal Consumption Expenditures

- Personal Saving Rate

- Employment Level

- Employment in Leisure and Hospitality

- Employment in Retail Trade

- Employment in Mining and Logging

- Employment in Education and Health Services

- Employment in Manufacturing and so on....

Insights from data analysis

Yearly change in unemployment and unemployment benefit
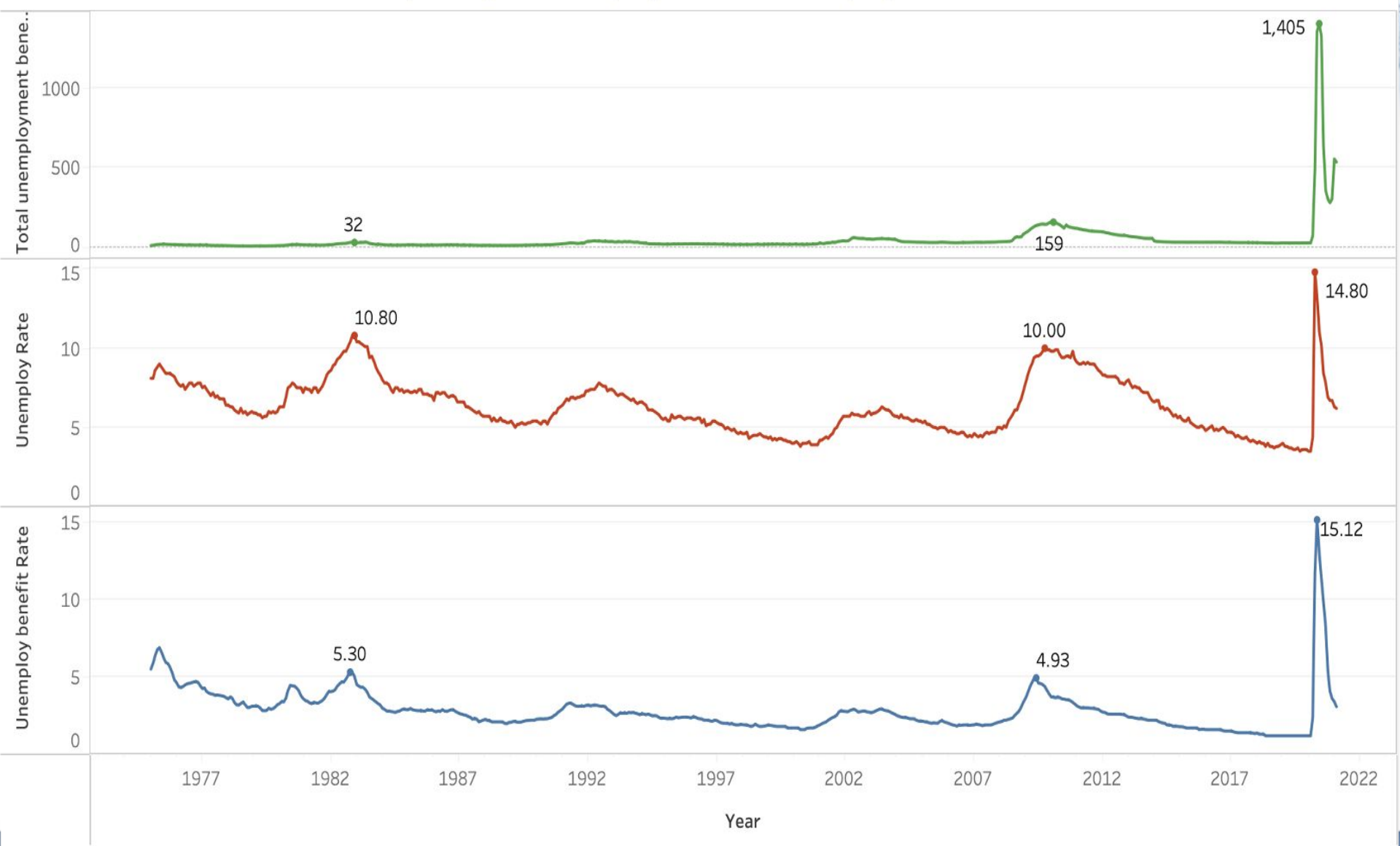
The trends of Gov Unemp Insur, Unemploy Rate, Insured Unemploy Rate for 45 years. In year 2009 and year 1983 unemployment rate was around 10% and govt unimployment benefit rate was around 5% which is $32 billion. While in year 2020 unemployment rate was around 14% and govt unimployment benefit rate was around 15% which is $1.4 trillion.
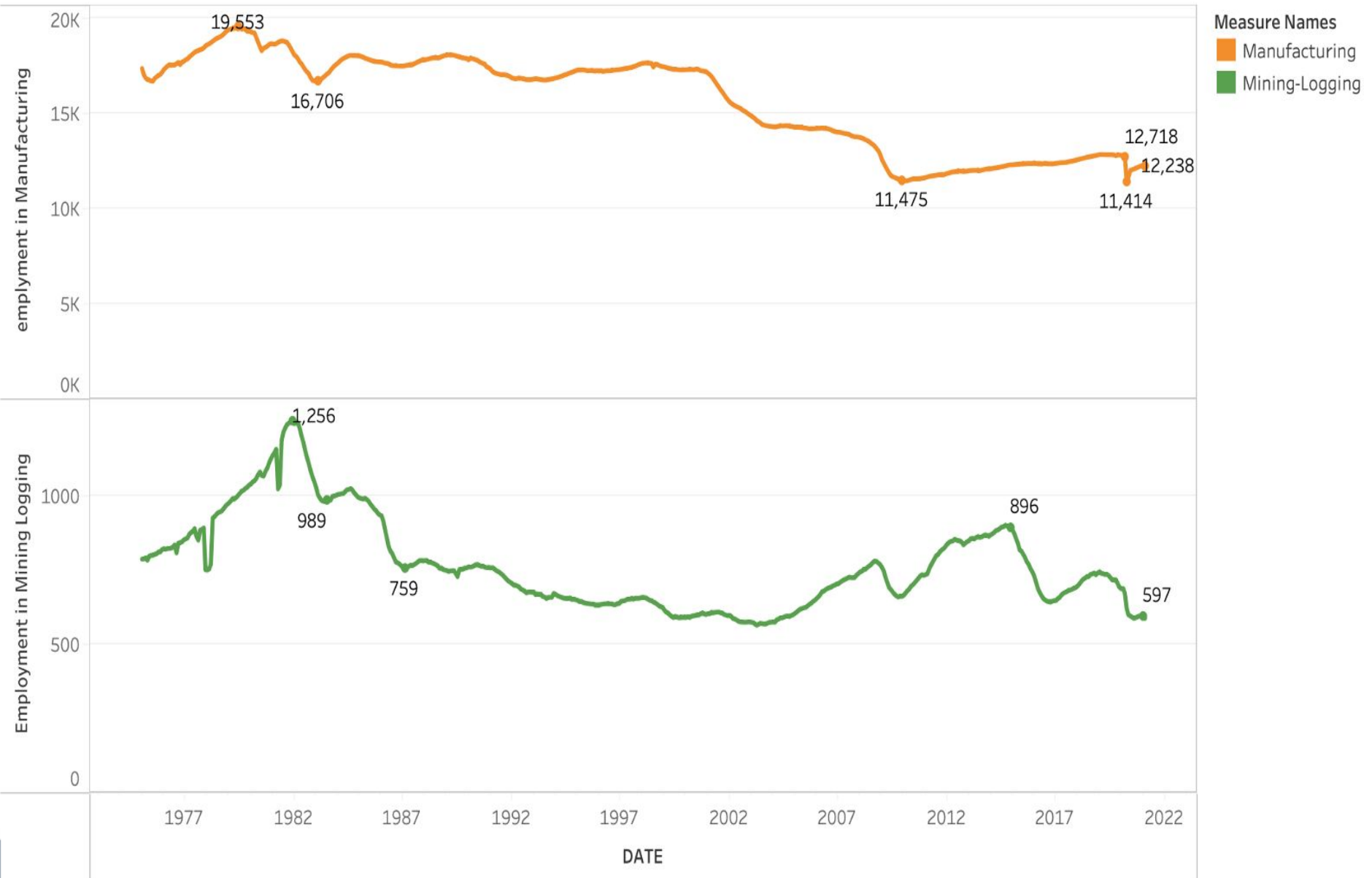
Insights from data analysis

Yearly Employment in Retail, and Leisure-Hospitality
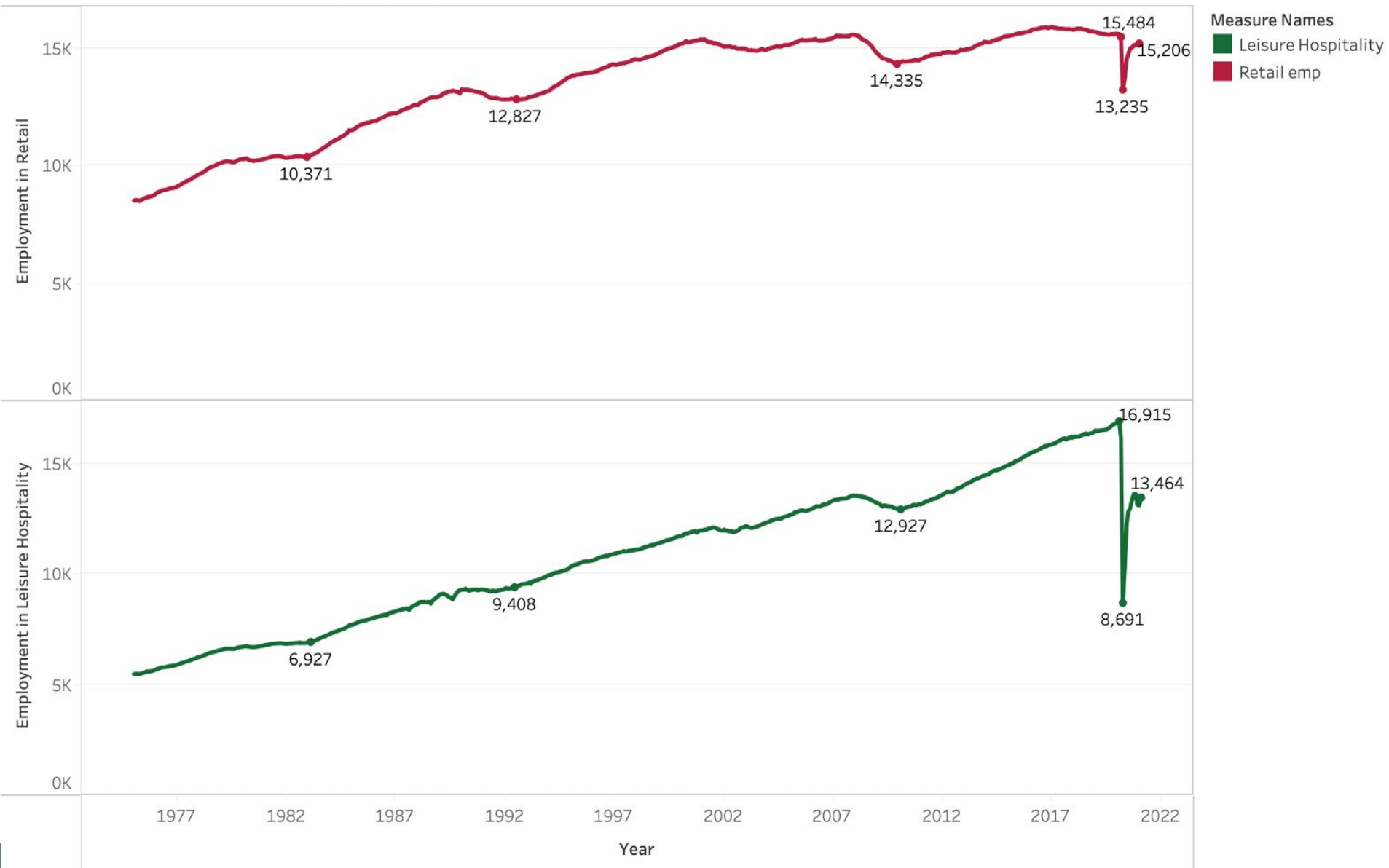
The trends of employment in retail, and liesure-hospitality. Retail has had a fairly decent recovery following March 2020 while leisure and hospitality, which saw around a 50% drop in employment levels, is still struggling to return to a familiar trend in employment levels at a time before March of 2020.

Insights from data analysis

Yearly employment change in Mining-Logging and Manufacturing

The trends of Manufacturing and Mining-Logging for 45 years. In year 1983 trend had steep fall around 16% from their employment trend started falling more.

Insights from data analysis

Yearly employment in Education-health, Construction, Gov, and Business

Measure Names
- Construction
- Education-Health Services
- Government
- Professional-Business Services
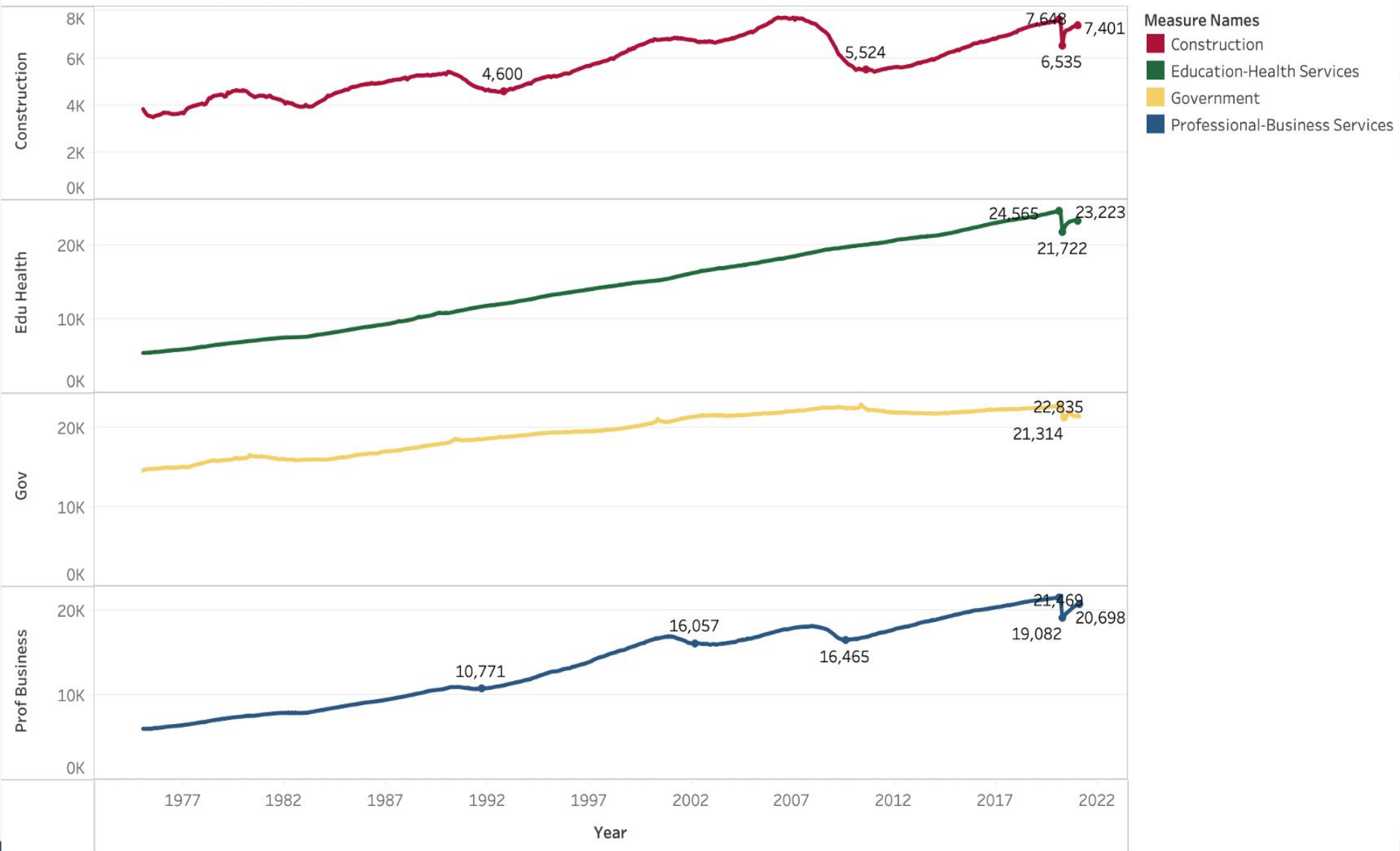
The trends of employment in education-health, construction, gov, and business. Except construction all sectors have stable trend. Construction has small falls but within a year treds are going up.

The Model

Vector AutoRegression (VAR)

A time series model that takes in multiple predictors over time (including the target value(s)) and can forcast a multivariate output.

The Model

Endogenous vs. Exogenous

Features to be Forecasted

Exogenous Features

22 variables like:

- Average Weeks Unemployed

- Government social benefits to persons

- Personal Consumption Expenditures

- Personal Saving Rate

- Employment Level

and so on…..

Endogenous Features

8 variables like:

- Employment in Leisure and Hospitality

- Employment in Retail Trade

- Employment in Mining and Logging

- Employment in Education and Health Services

- Employment in Manufacturing

and so on….

The Model

- Augmented Dickey-Fuller Test

- Stationary Data vs. Non-Stationary Data

- Making data stationary by takes away the trend by calculating the discrete difference along a given axis (similar to scaling data)

Forecasting Predictions

Date	Retail	Mining-Loggin	leisure_hospitality
2021-03-31	15110.583400	563.751478	12659.193580
2021-04-30	12945.314919	497.895555	5352.786919
2021-05-31	13355.866834	484.315183	6772.750027
2021-06-30	14232.338373	497.119732	8831.385584
2021-07-31	14466.566166	505.184920	9460.702175
2021-08-31	14770.130427	499.879896	9687.916025
2021-09-30	14827.697227	506.029489	10065.136772
2021-10-31	14940.453734	520.900829	10368.398142
2021-11-30	14959.834849	511.877418	10392.854939
2021-12-31	15014.290097	514.831929	9908.211546
2022-01-31	15065.899957	520.027279	9856.885240
2022-02-28	15125.393351	520.306492	10226.457131

The Data made Stationary

Differenced data over time

Differenced data Percentage

The Data made Stationary

Differenced data Percentage

The Predictions

Targets with Prediction
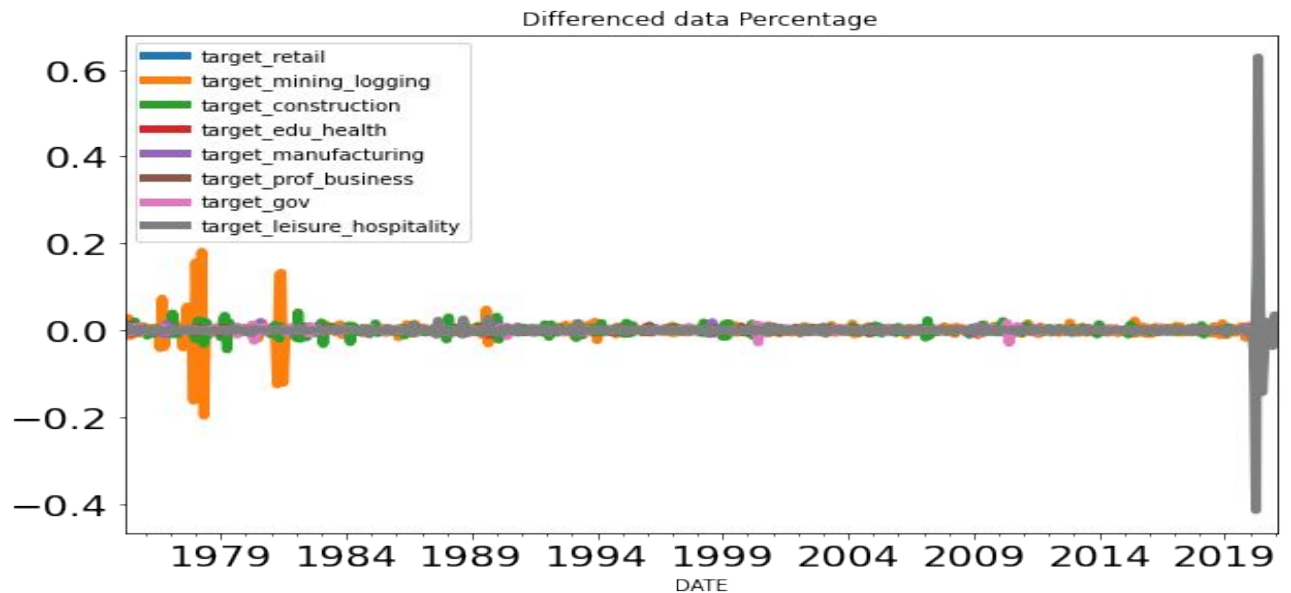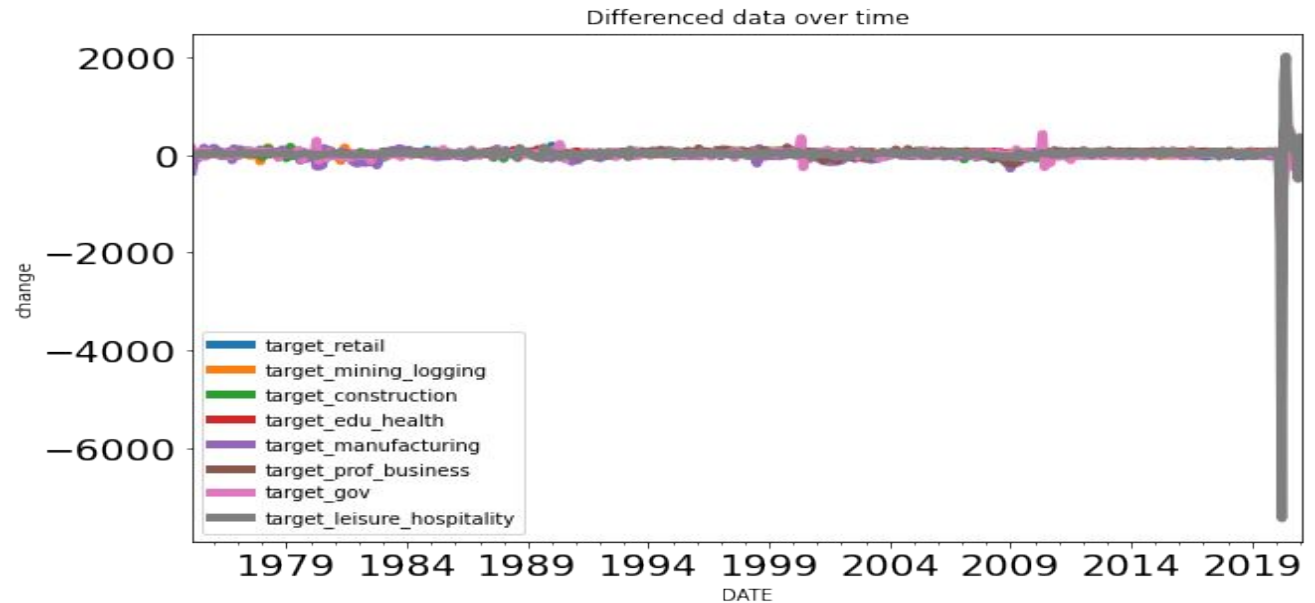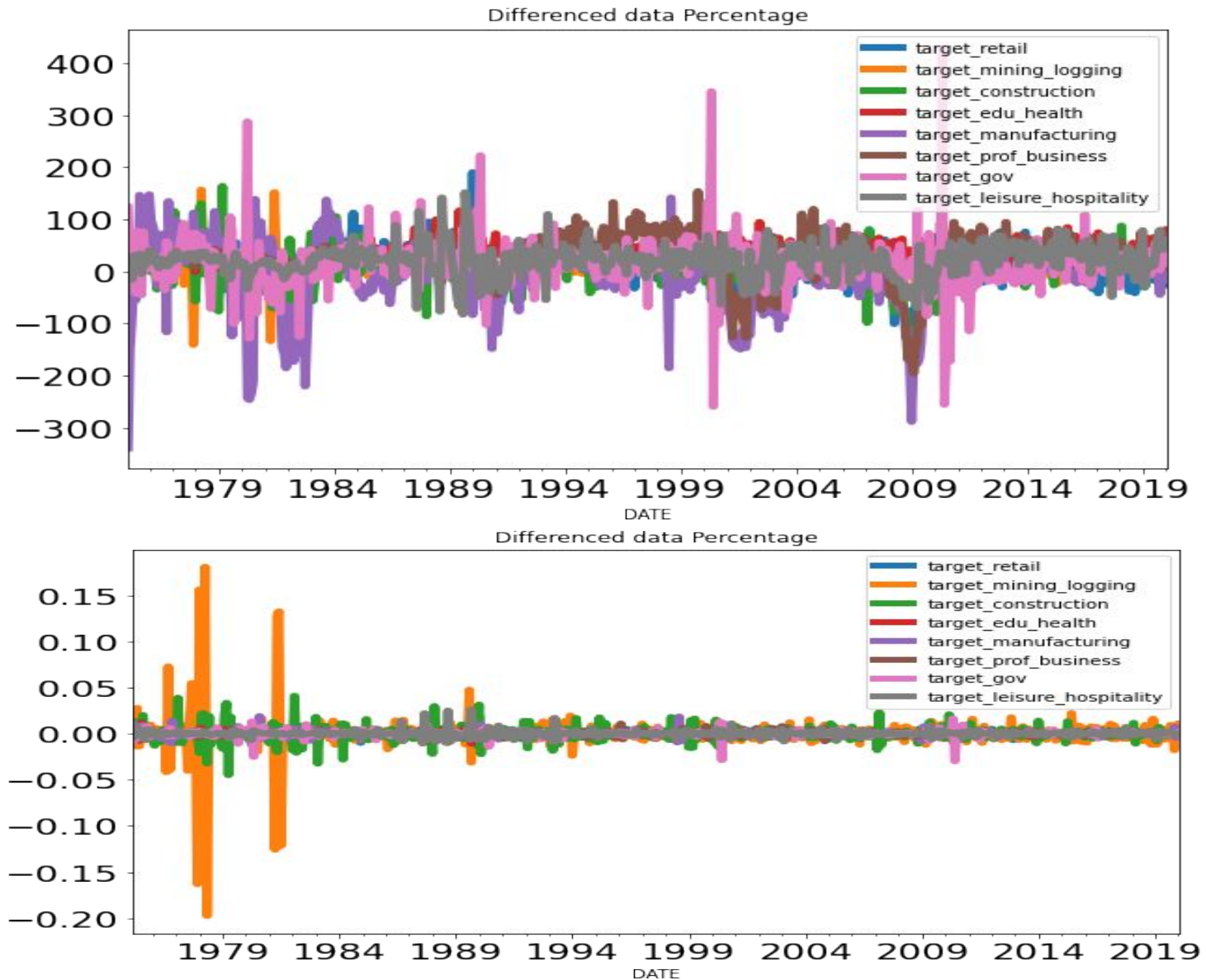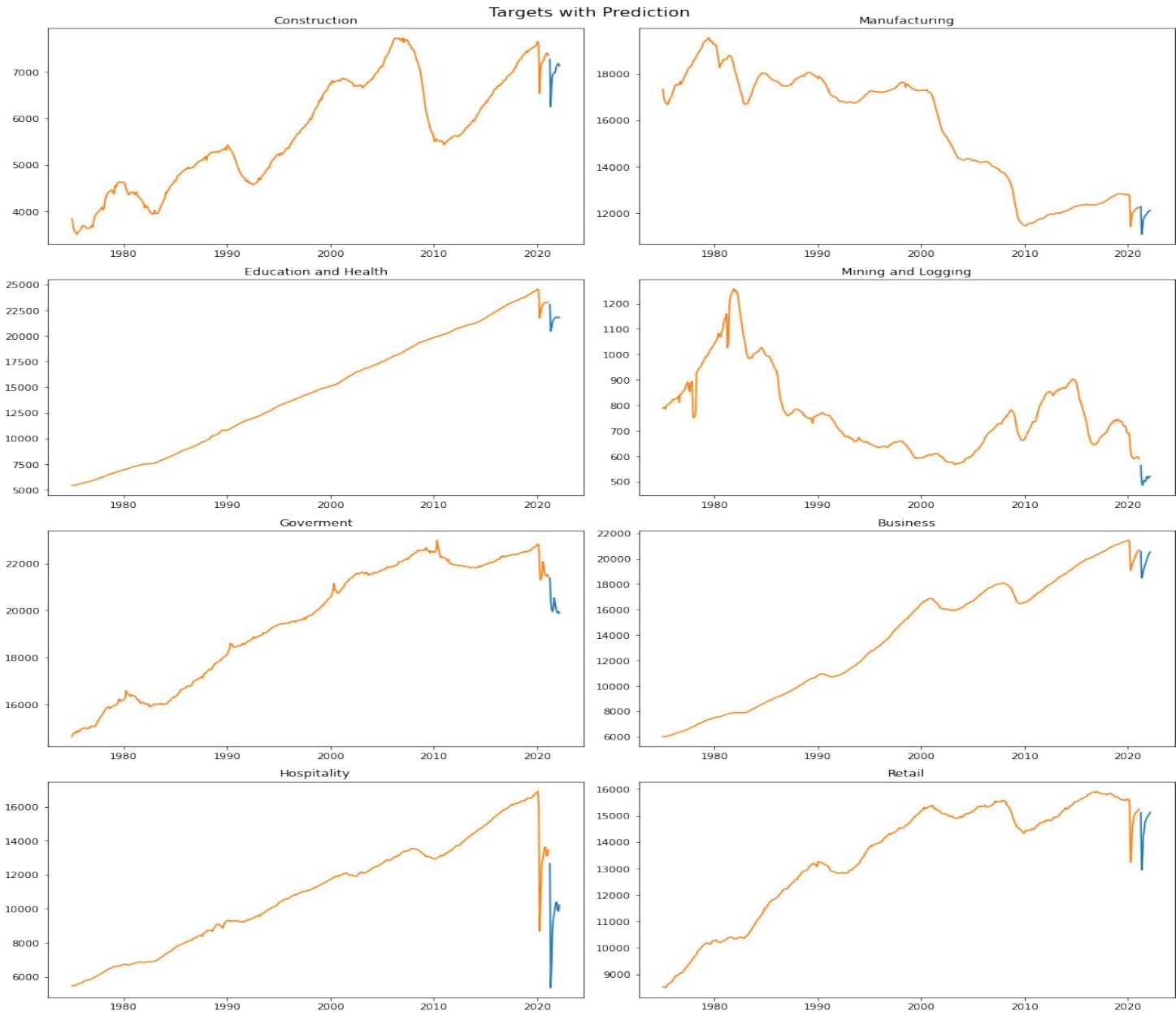
The Predictions(% Change)

Targets with Prediction (Percent Change)

The Predictions (Without Covid Data)

Targets with Prediction (No Covid)
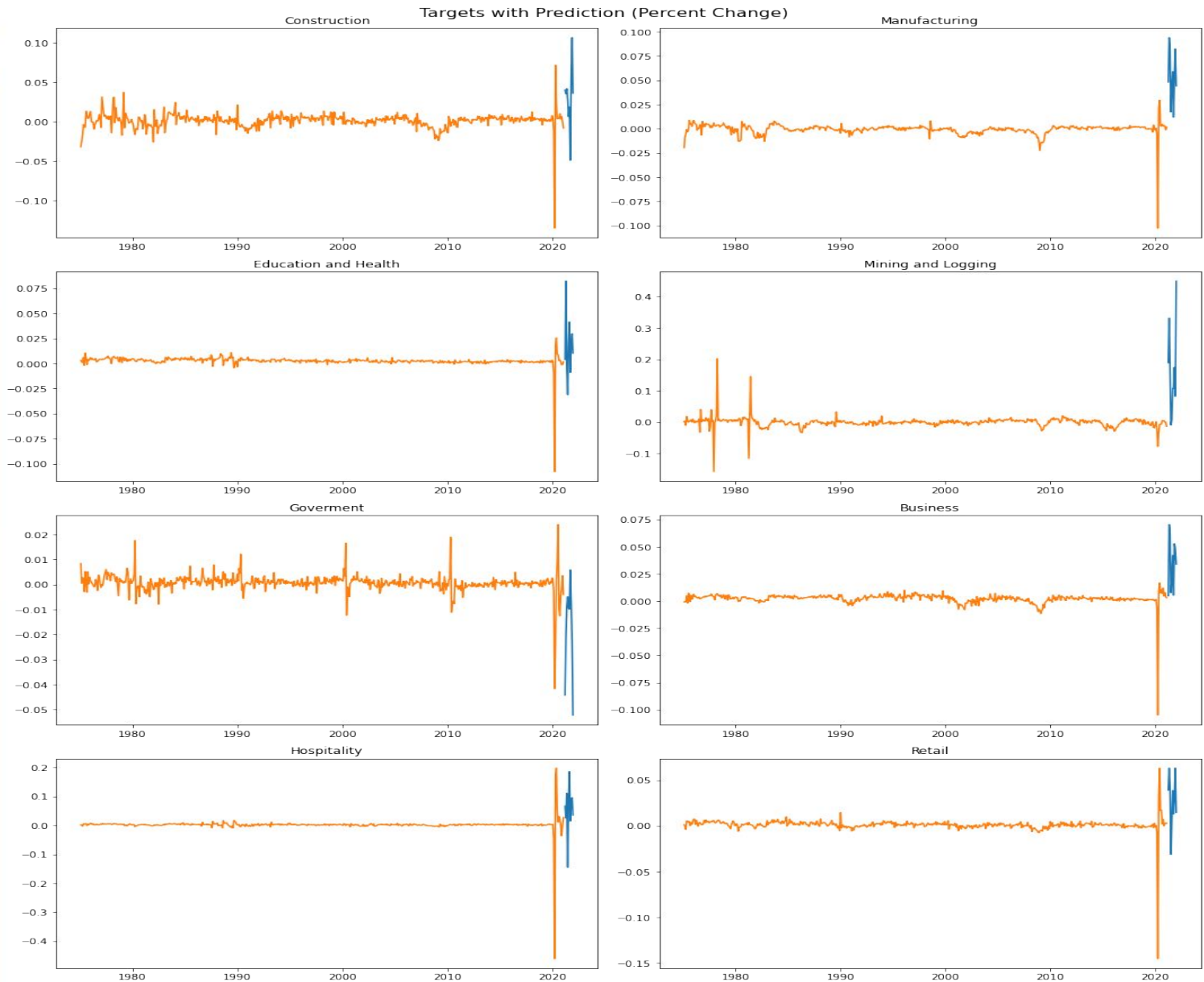
The Predictions (Without Covid Data, % Change)

Targets with Prediction (Percent Change No Covid)
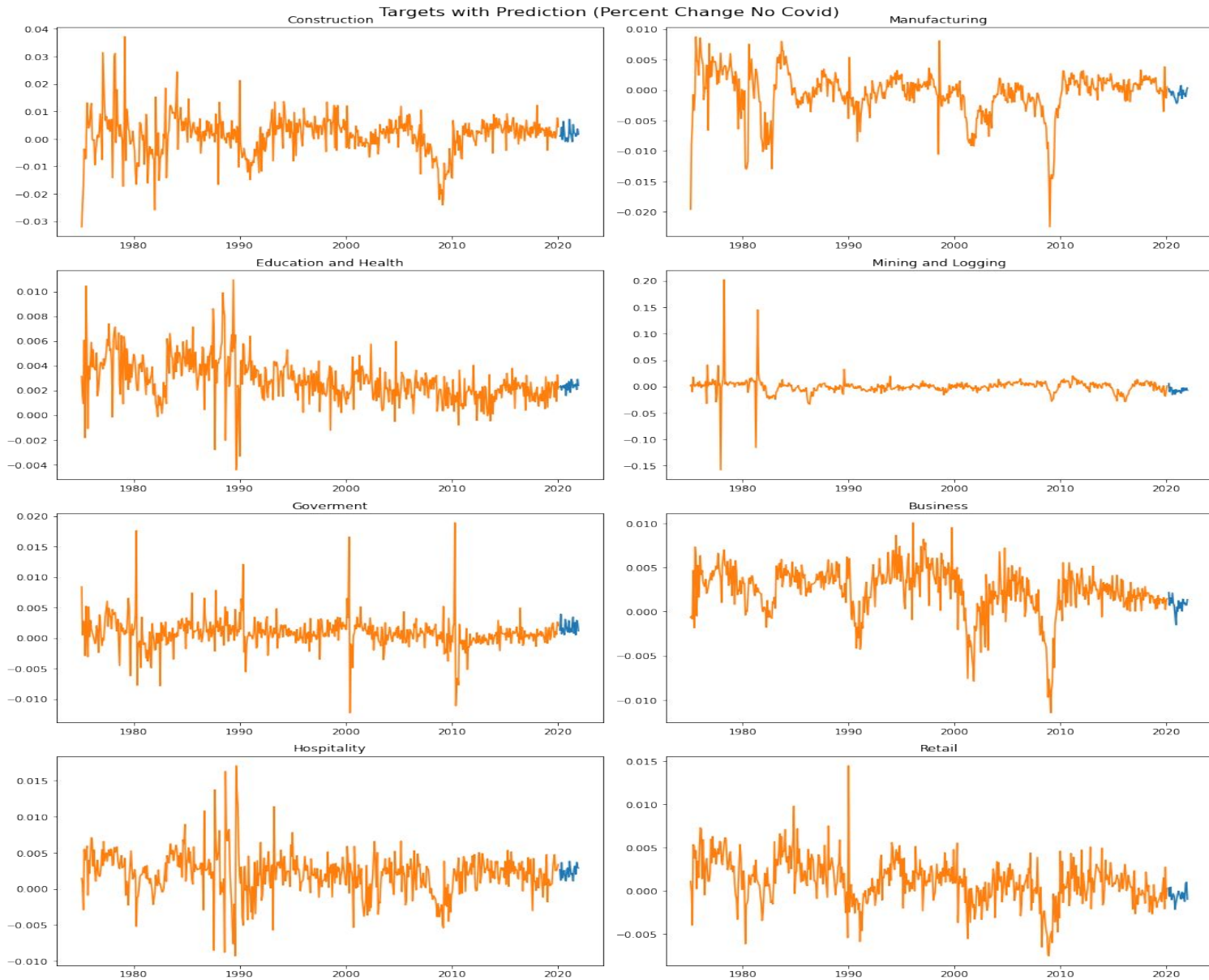
Developing Application
Flask

- Flask is a web framework written in python.

- We used flask to create our web app

Developing Application

Heroku

Heroku is a platform as a service (PaaS) that enables developers to build, run, and operate applications entirely in the cloud." - quote from heroku.com"

Limitations

- Unpredictability cause by Covid-19

- Truncated data for Covid-19

- Model is still a good indicator of the future

Conclusions and Recommendations

- **Model predicts growth in: Business, Retail, Construction, Leisure & Hospitality, Education & Health Services and Government**
- **Model predicts decline in: Mining & Logging and Manufacturing**
- **We recommend:**
  - **Specify a particular timeframe in the future**
  - **Use Web App to determine employment rates for desired length of time and stay up to date on Covid19 recovery**
  - **Seek employment in: retail, construction, hospitality, education or government**

THANK YOU

Are There any questions, or comments?