The over-crowded American prison system

A forecast model for US prisoner population

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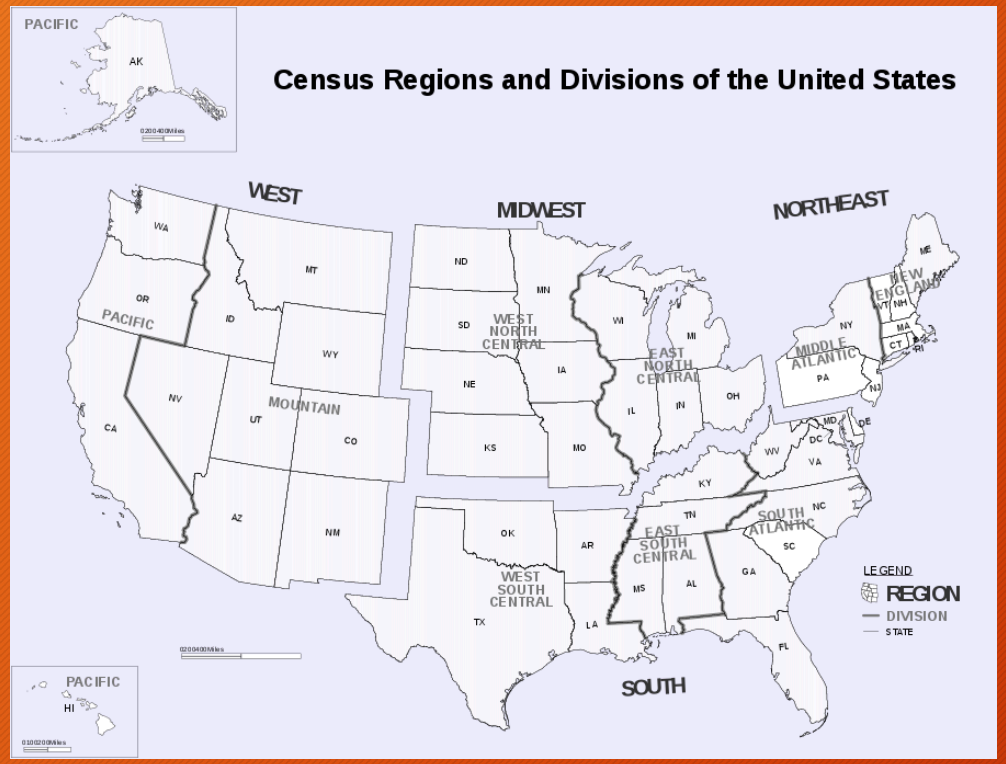
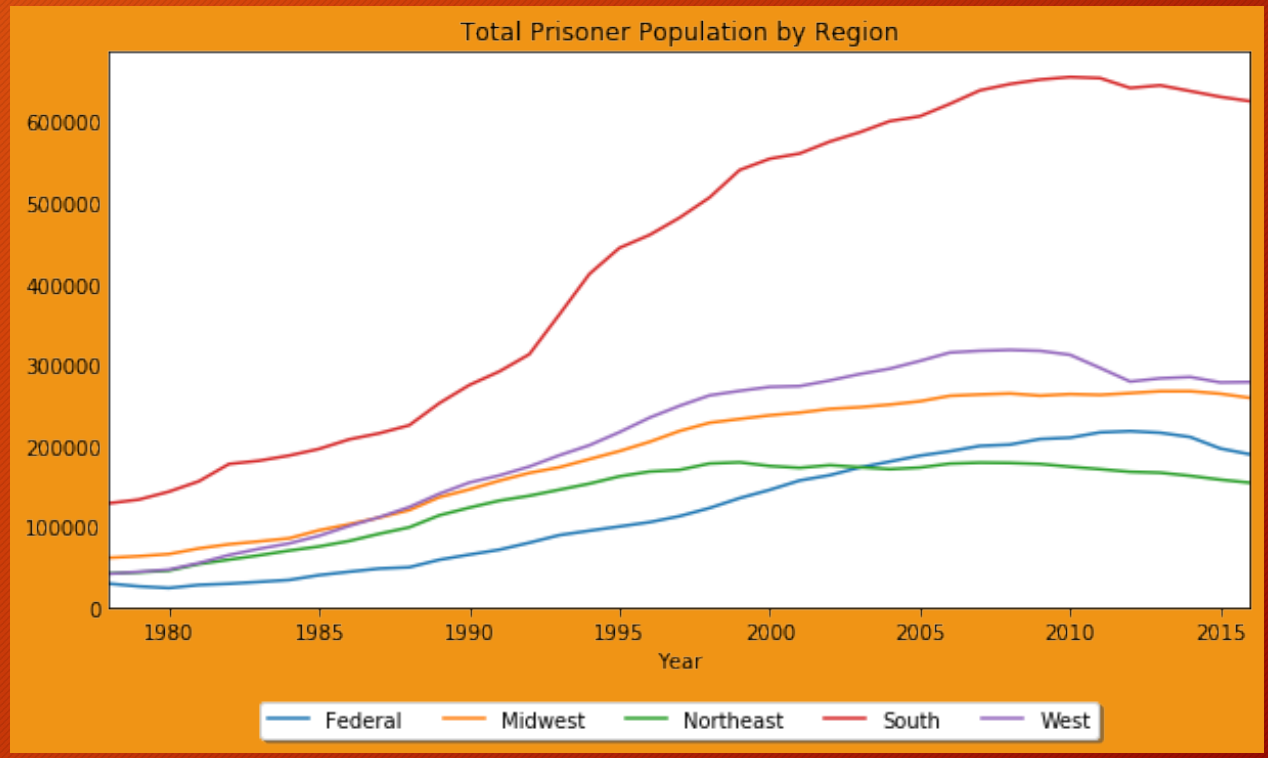
Crisis

- Over 1,500,000 inmates in the prison system and growing
- Begging in the 1980s, the Justice Departments have been contracting private corporations for prison operation
- A forecast model to predict future prisoner population

Growing prisoner population

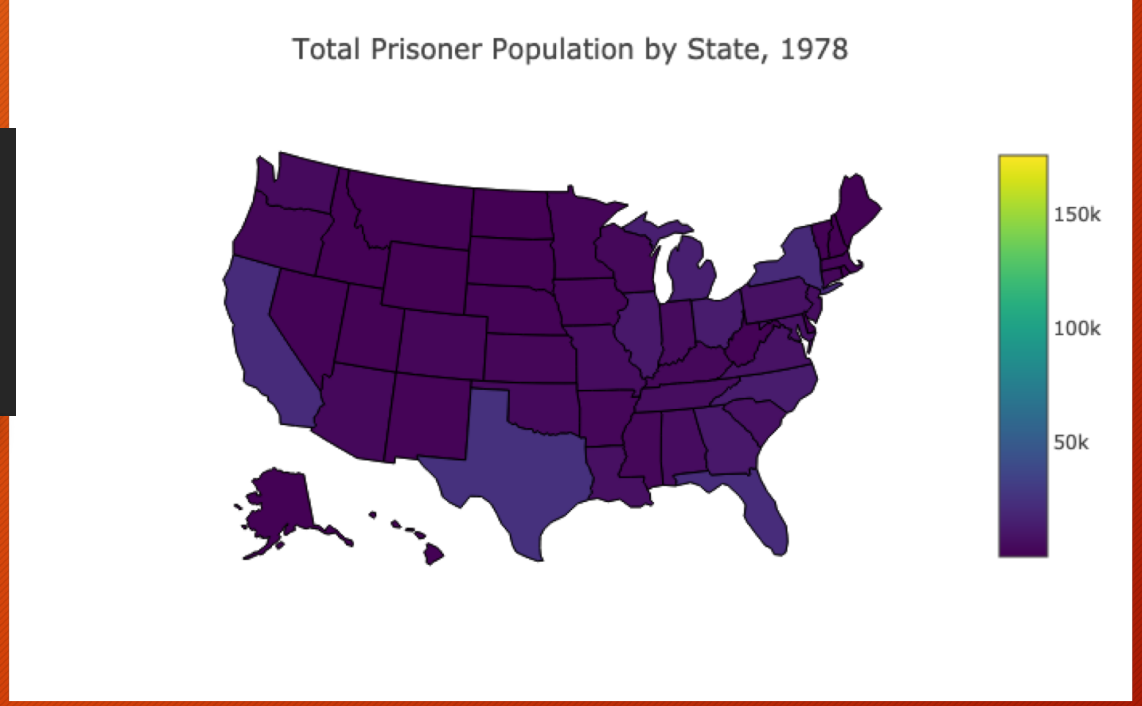


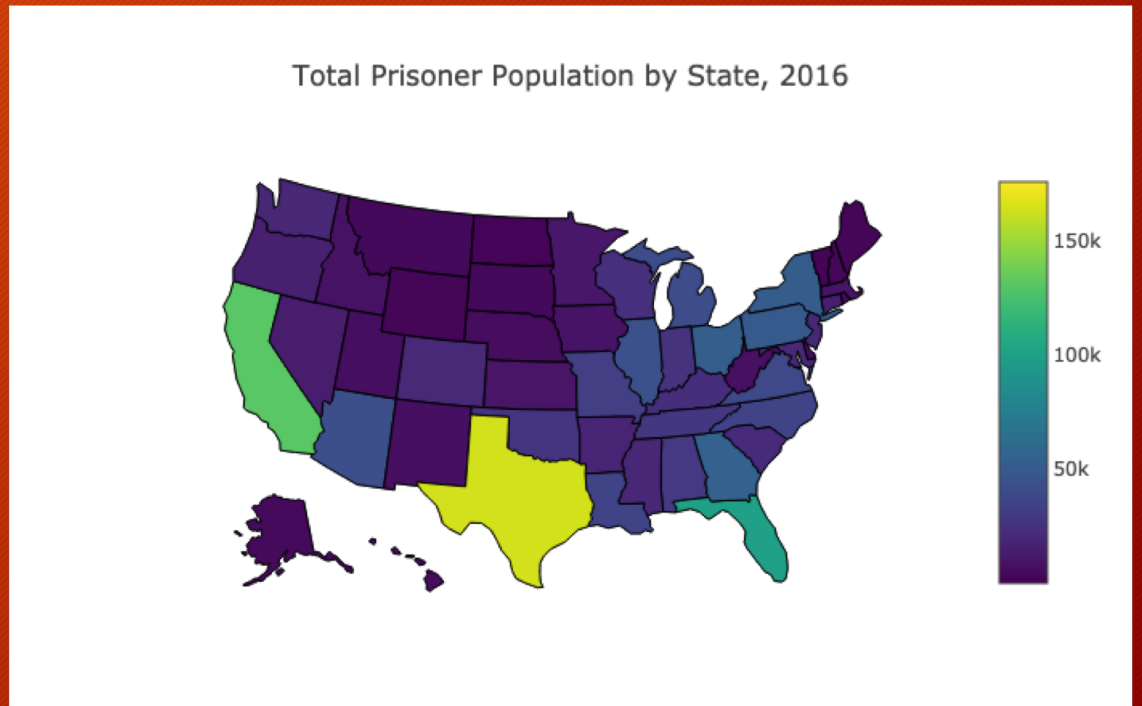


Growing prisoner population

Compared to 1978, the prisoner population in most jurisdictions.

- California
- Texas
- Florida.

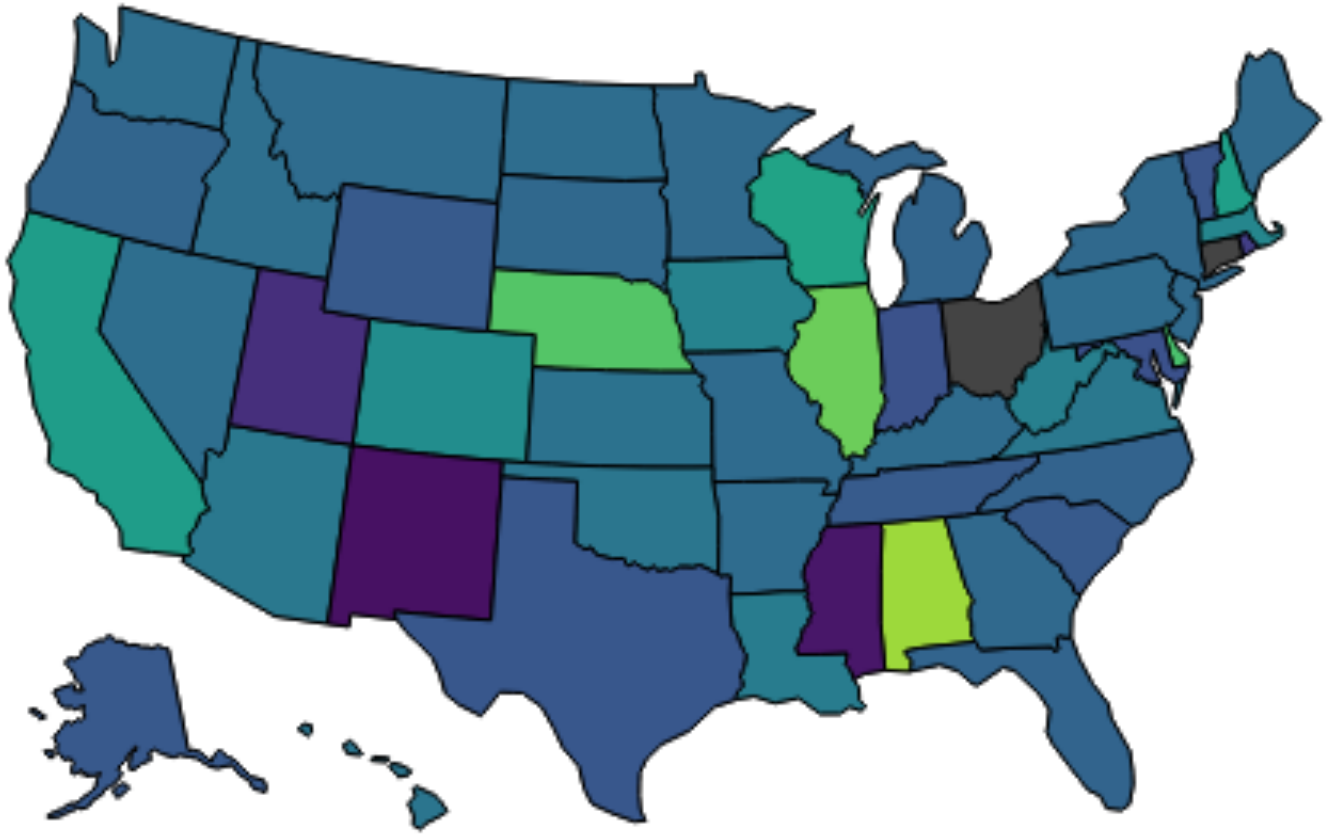




Over-saturated prison

For most states, prisons are operating over 100% of its capacity.

Prison Occupancy (High Estimation) by State, 2016



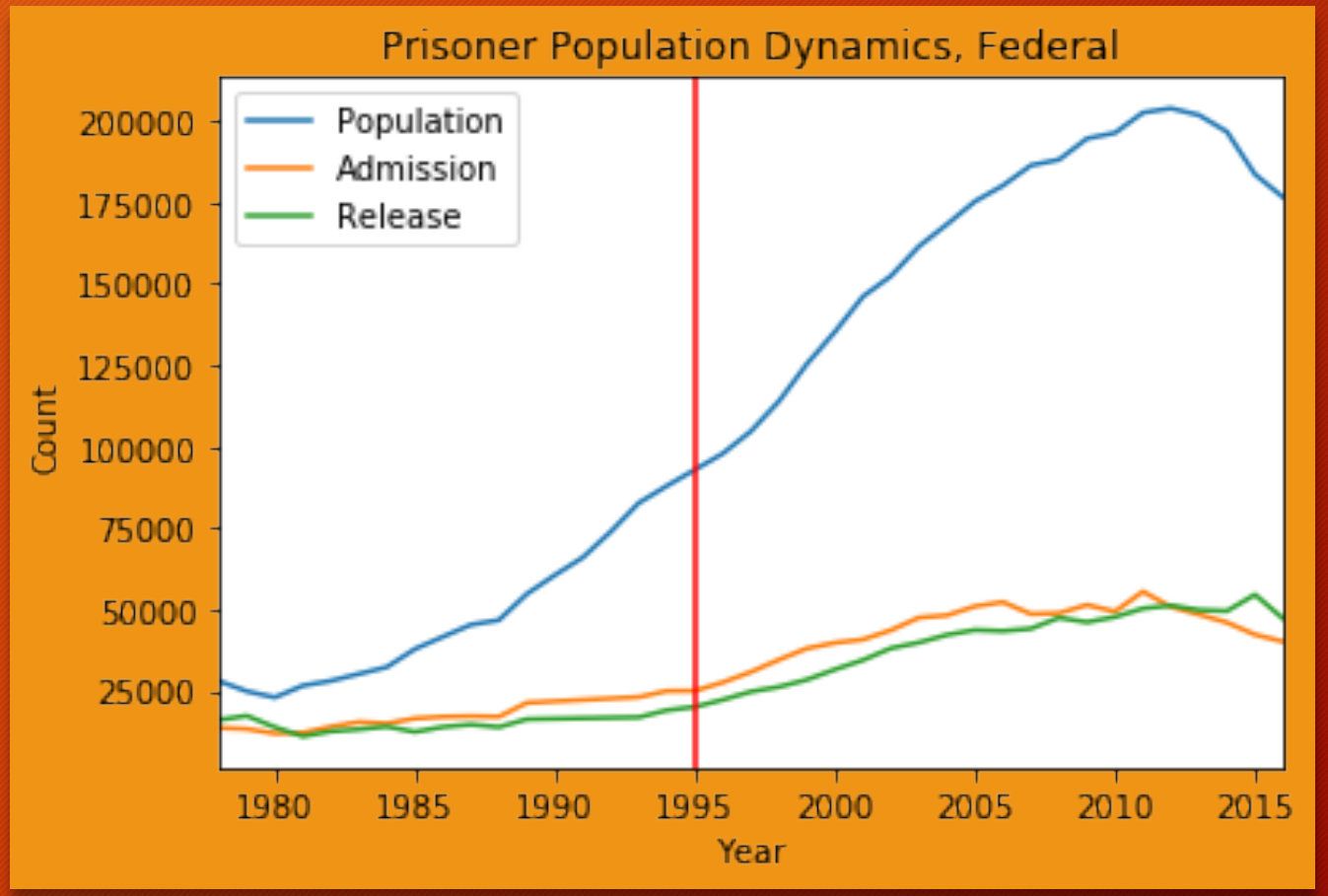
Problem – Can we make forecast?

- Project prisoner population
- Project prison occupancy
- Where to build prisons
- When to build prisons

Forecast model

Data

- Annual population $p[t]$
- Annual admission $a[t]$
- Annual release $r[t]$
- Annual average sentencing $y[t]$



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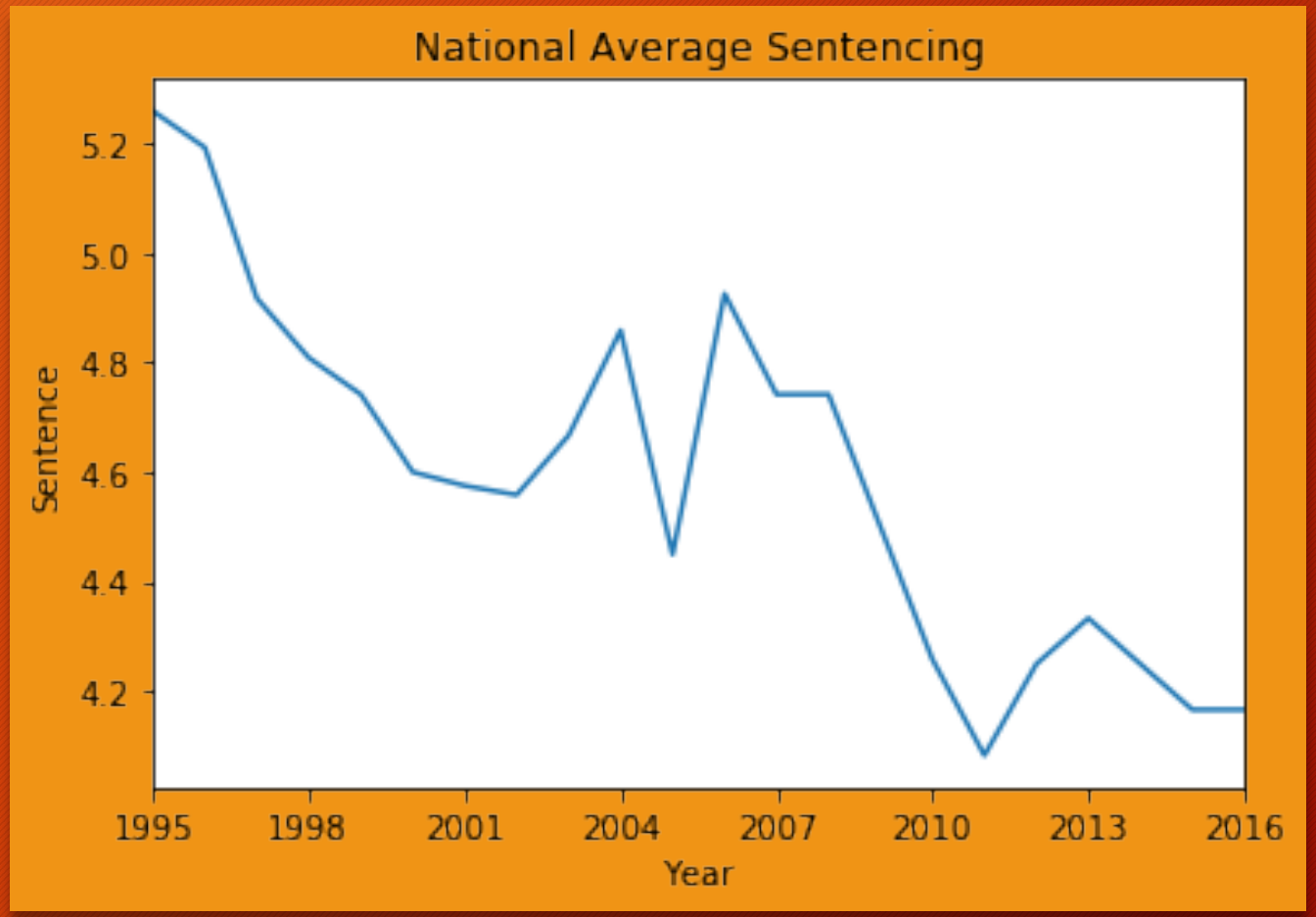
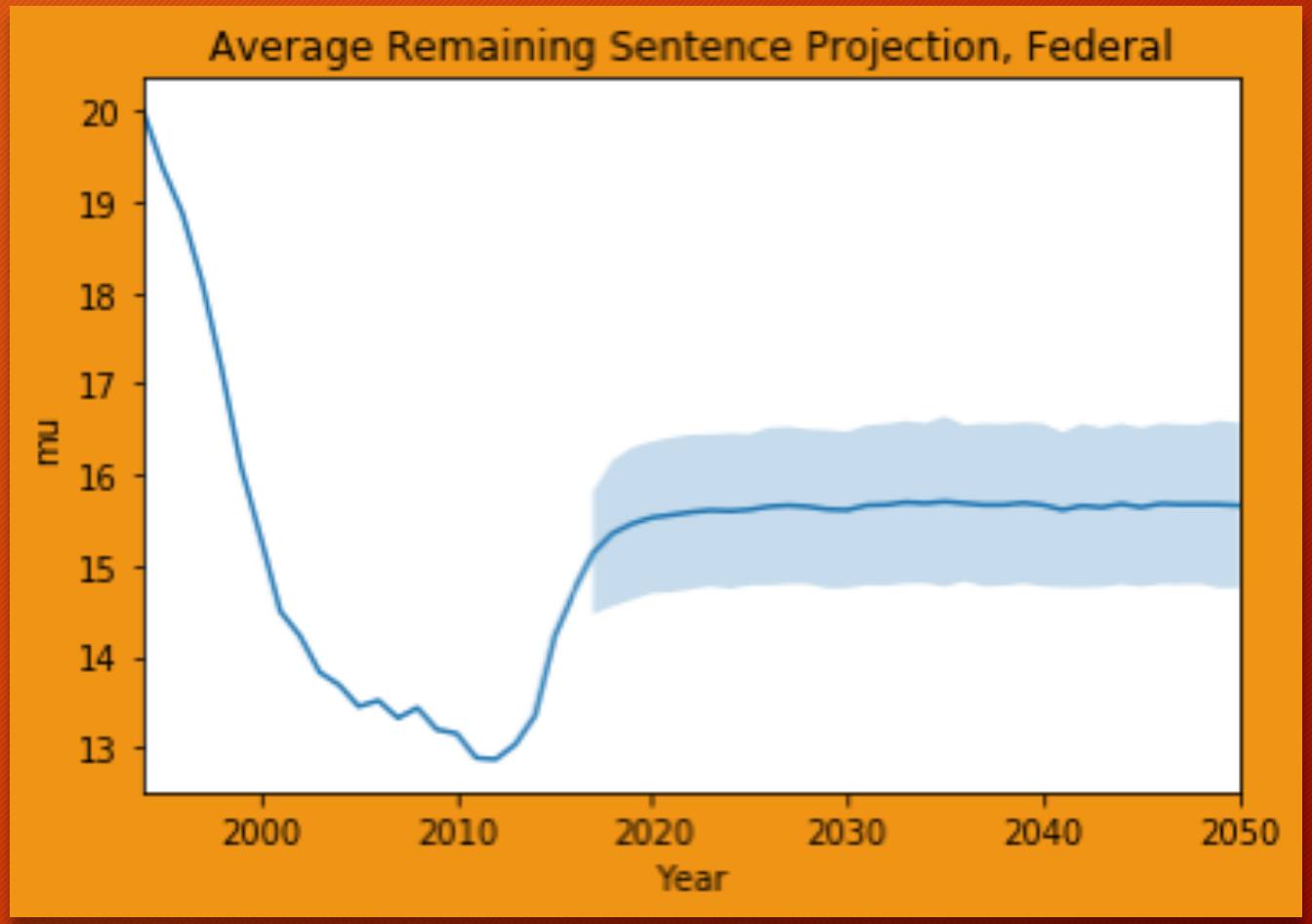


Forecast model

Model

- $[t] - p[t-1] = a[t] - r[t] + \epsilon p[t-1], \epsilon \sim N(0, \delta^2)$
- $p[t]\mu[t] = p[t-1](\mu[t-1] - 1) + 0.5r[t] + a[t]y[t] - 0.5a[t]$
- $r[t] = F(1; \mu[t-1], \sigma^2)p[t-1]$

Initial $\mu[t]$=20, resolved $\mu[t]$ ->



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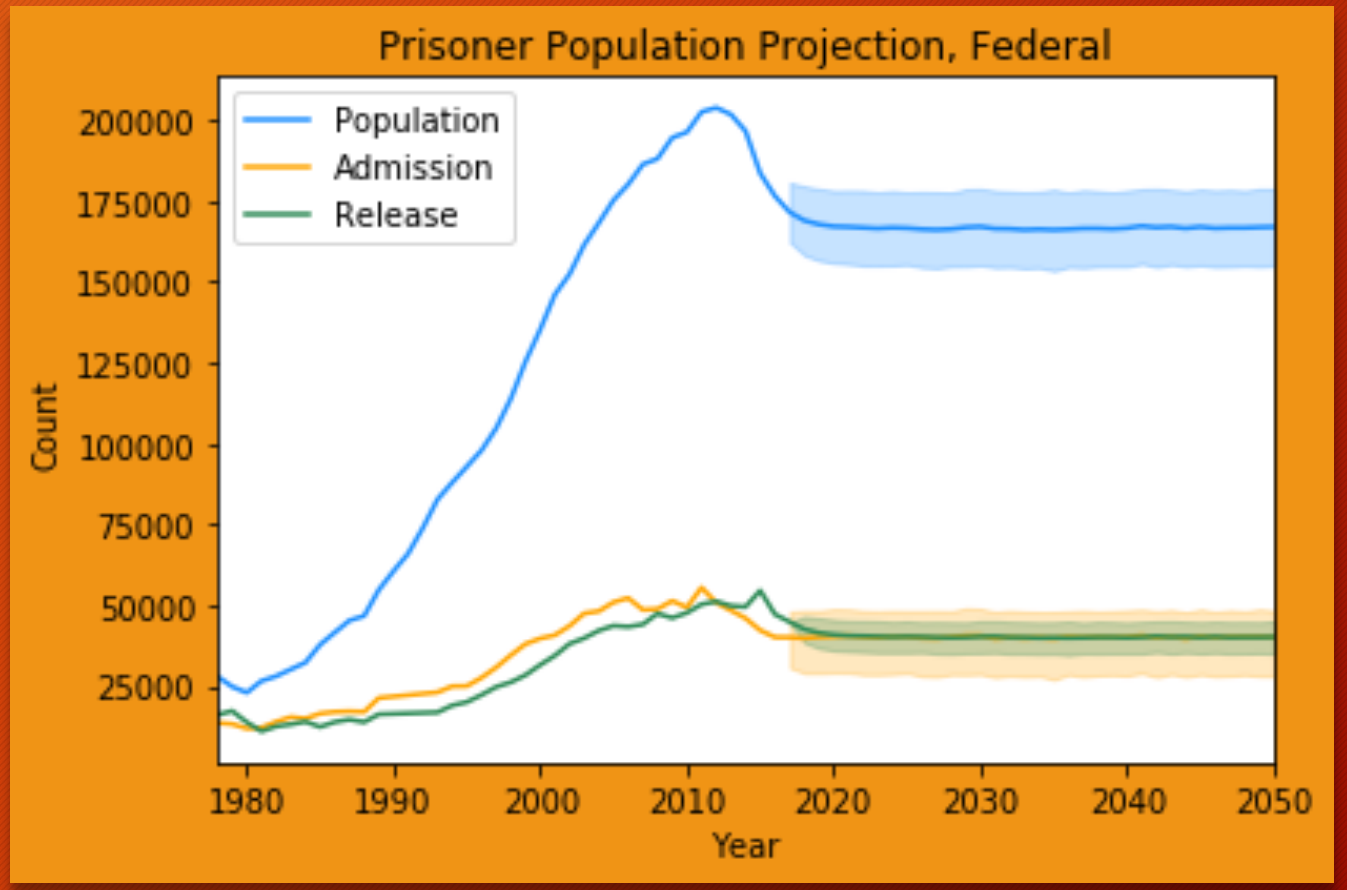
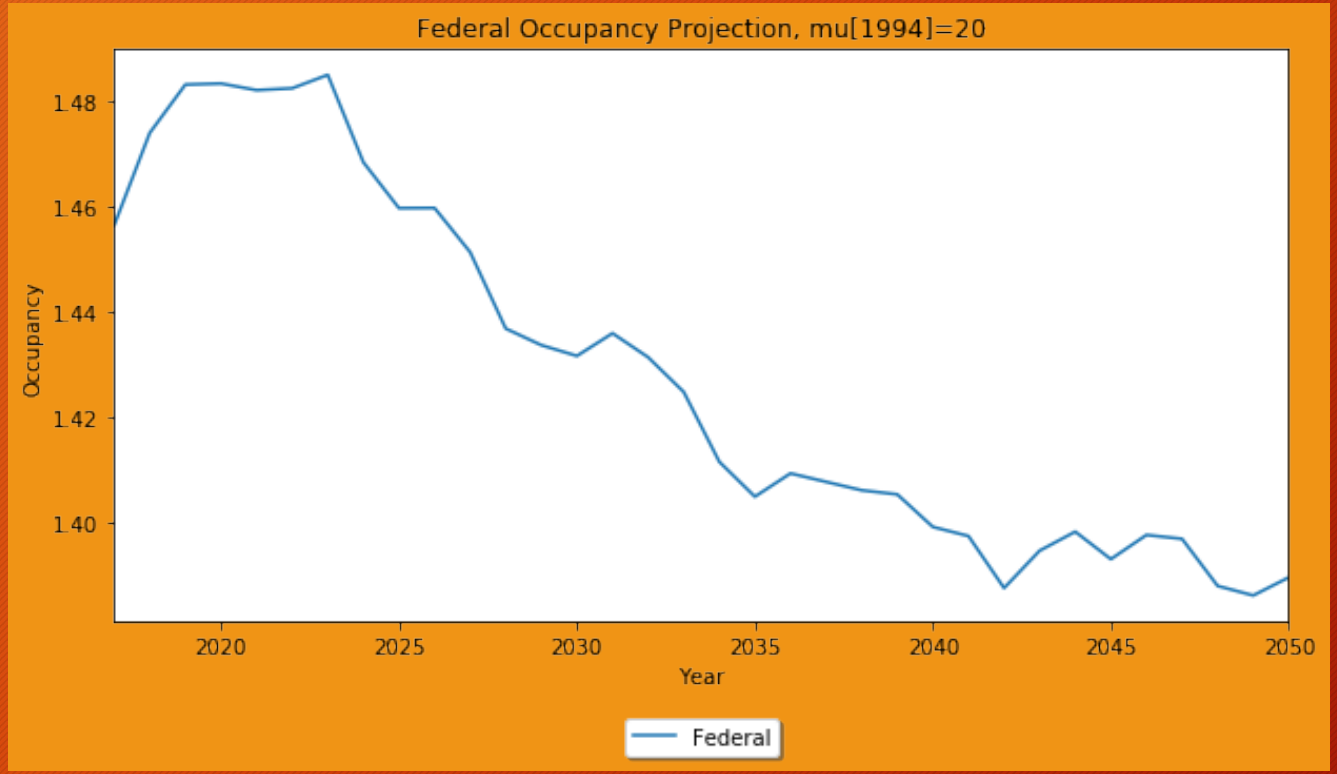
Resolved $p[t]$, $a[t]$, $r[t]$ ->



Capacity projection



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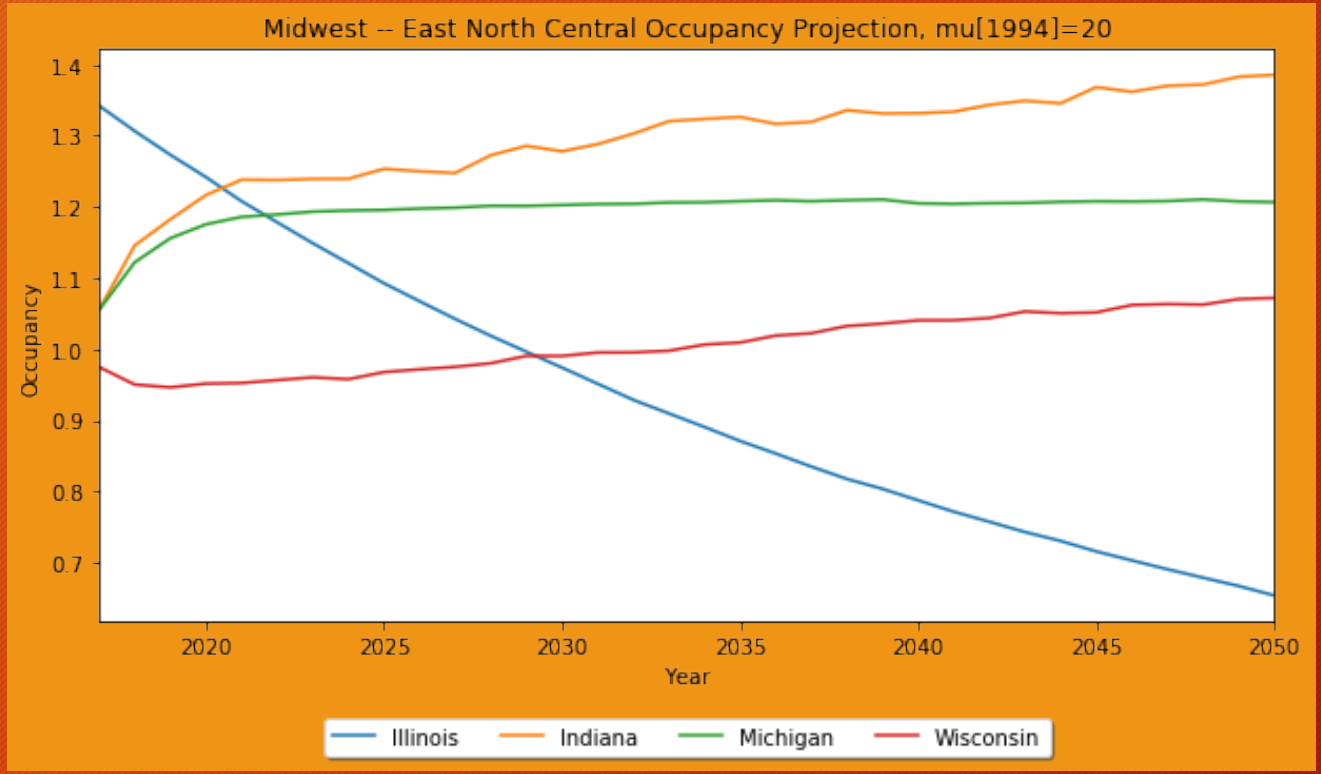

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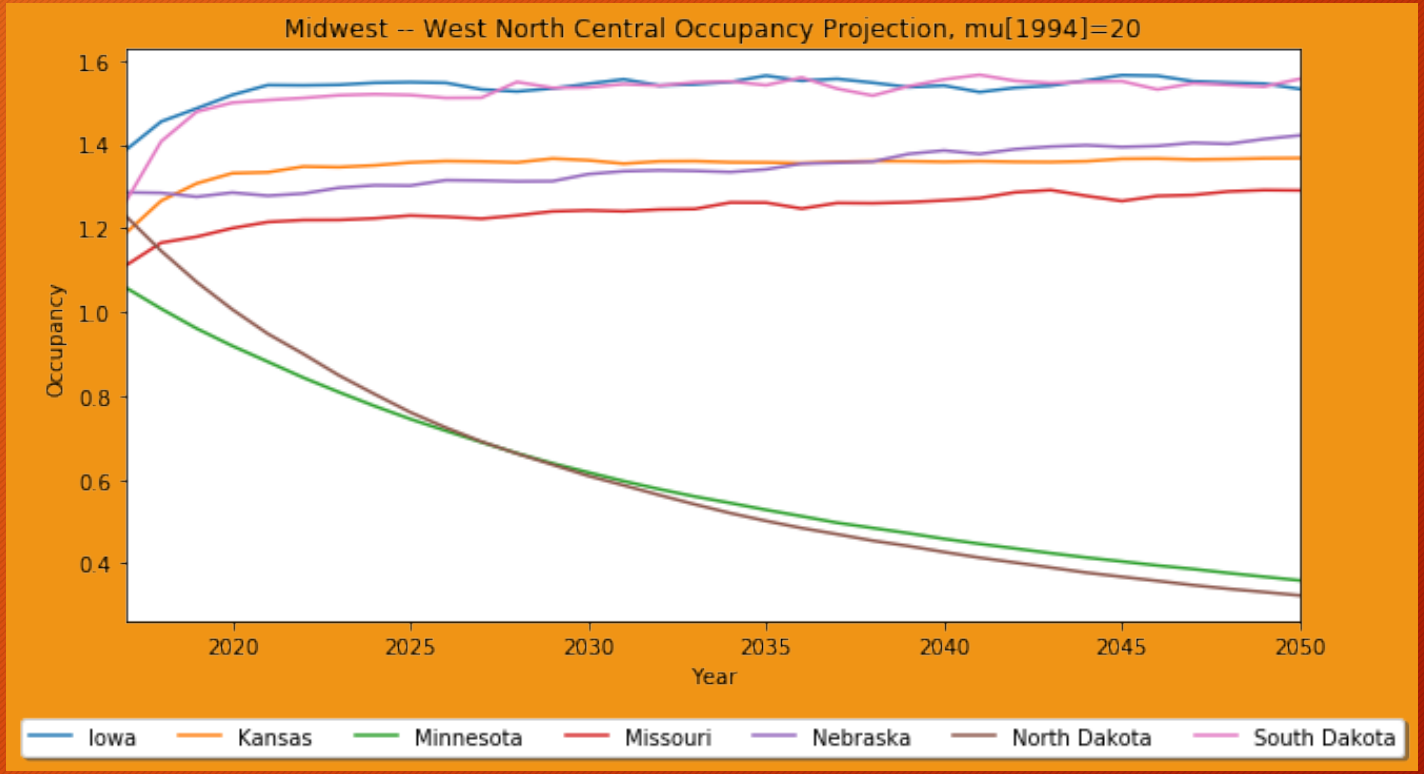

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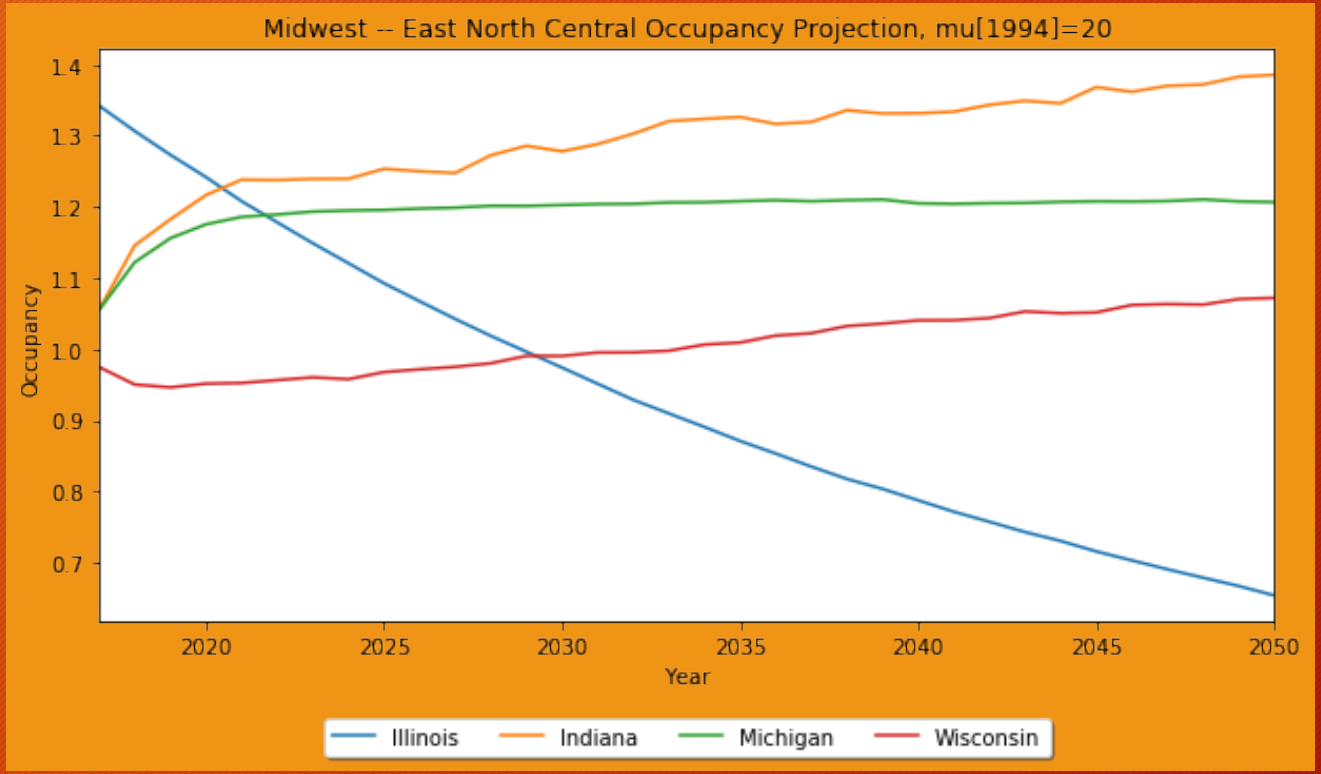

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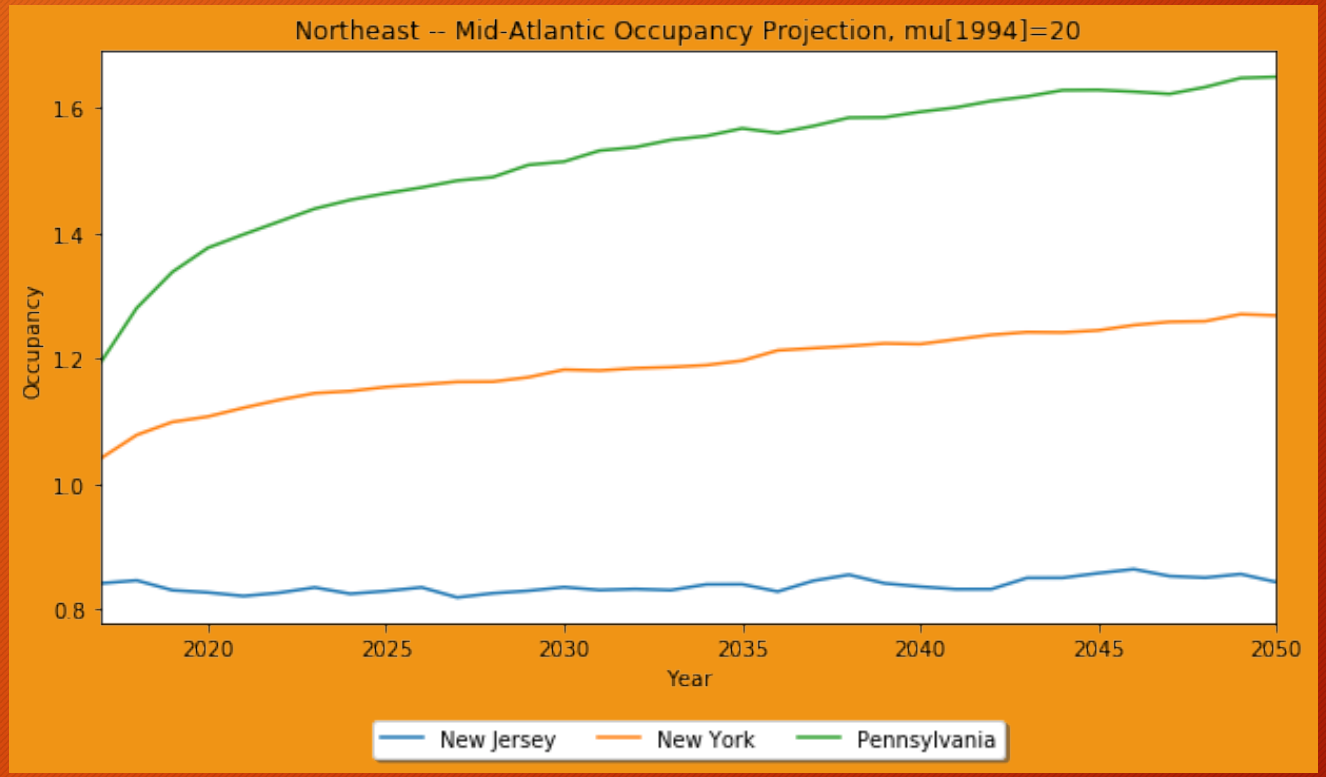

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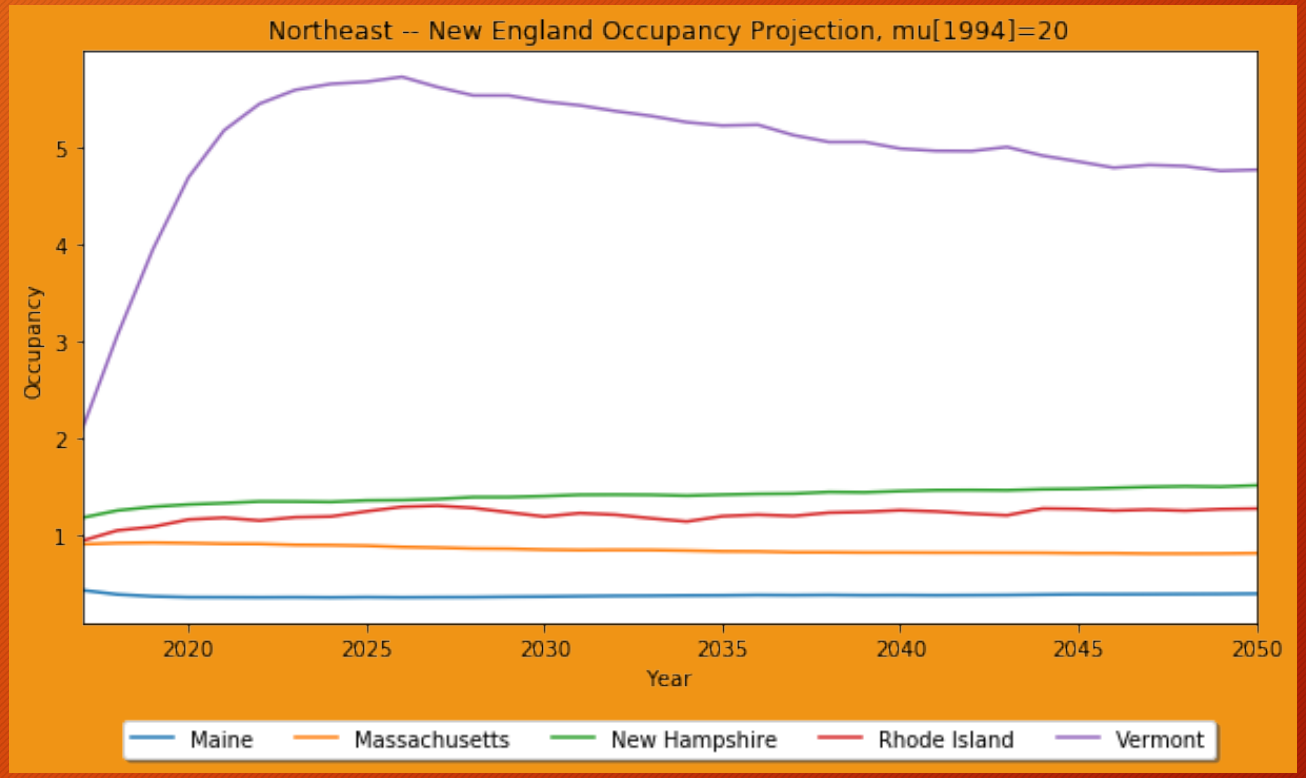

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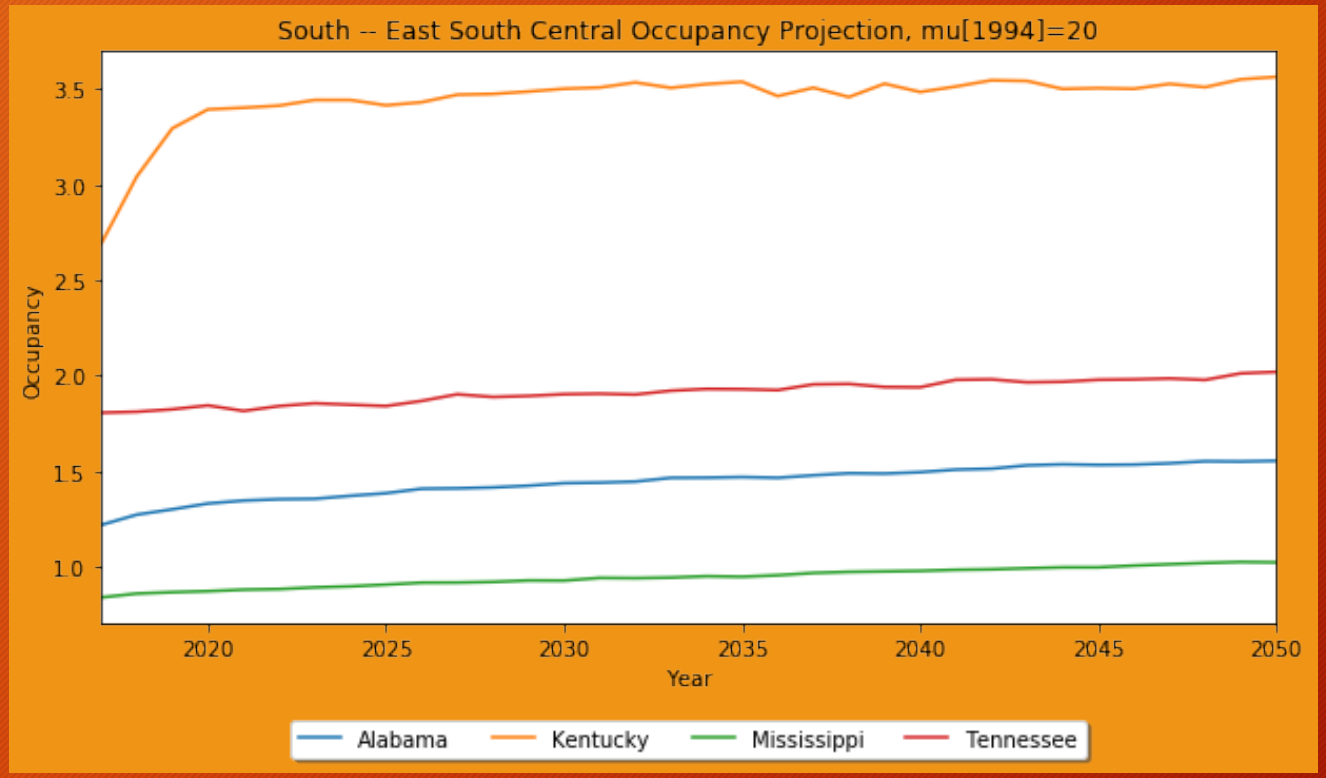

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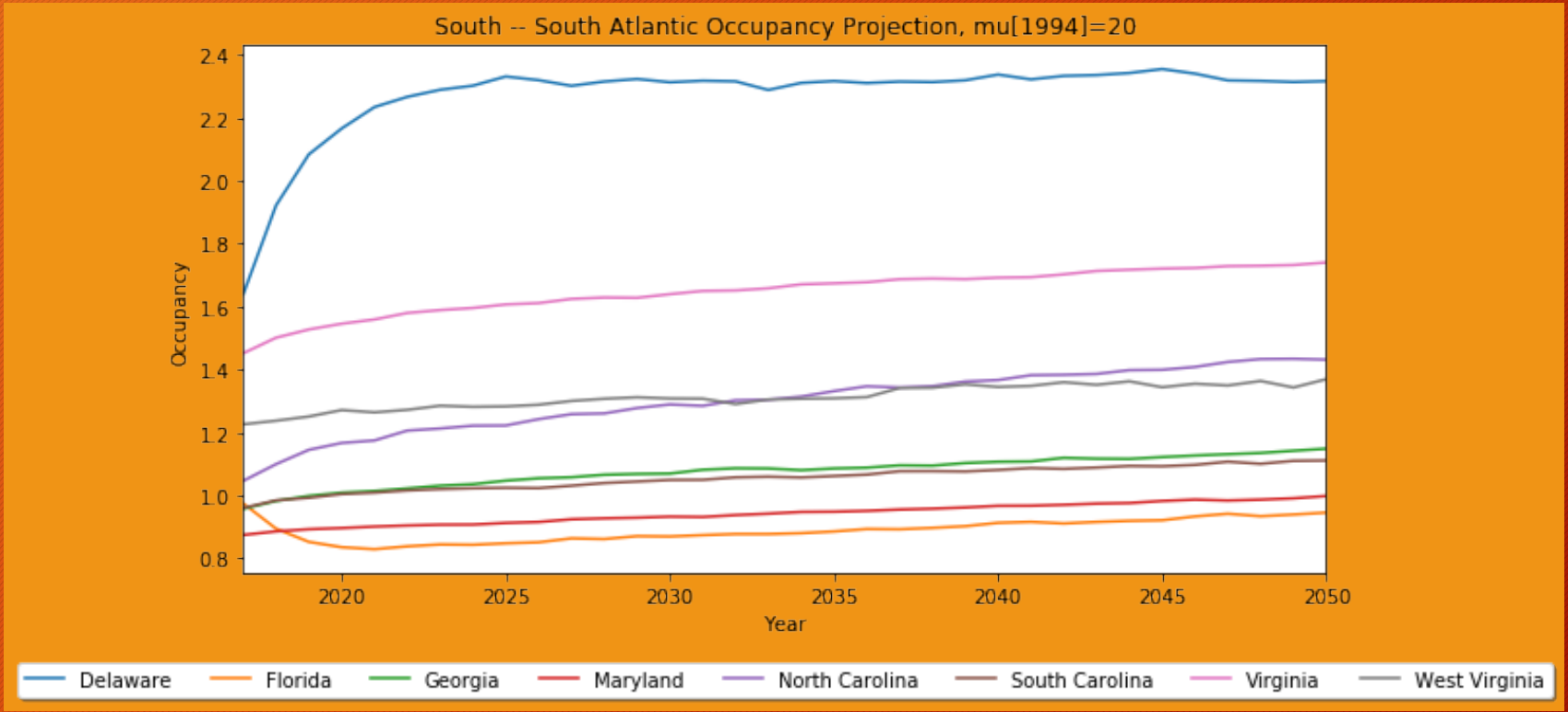

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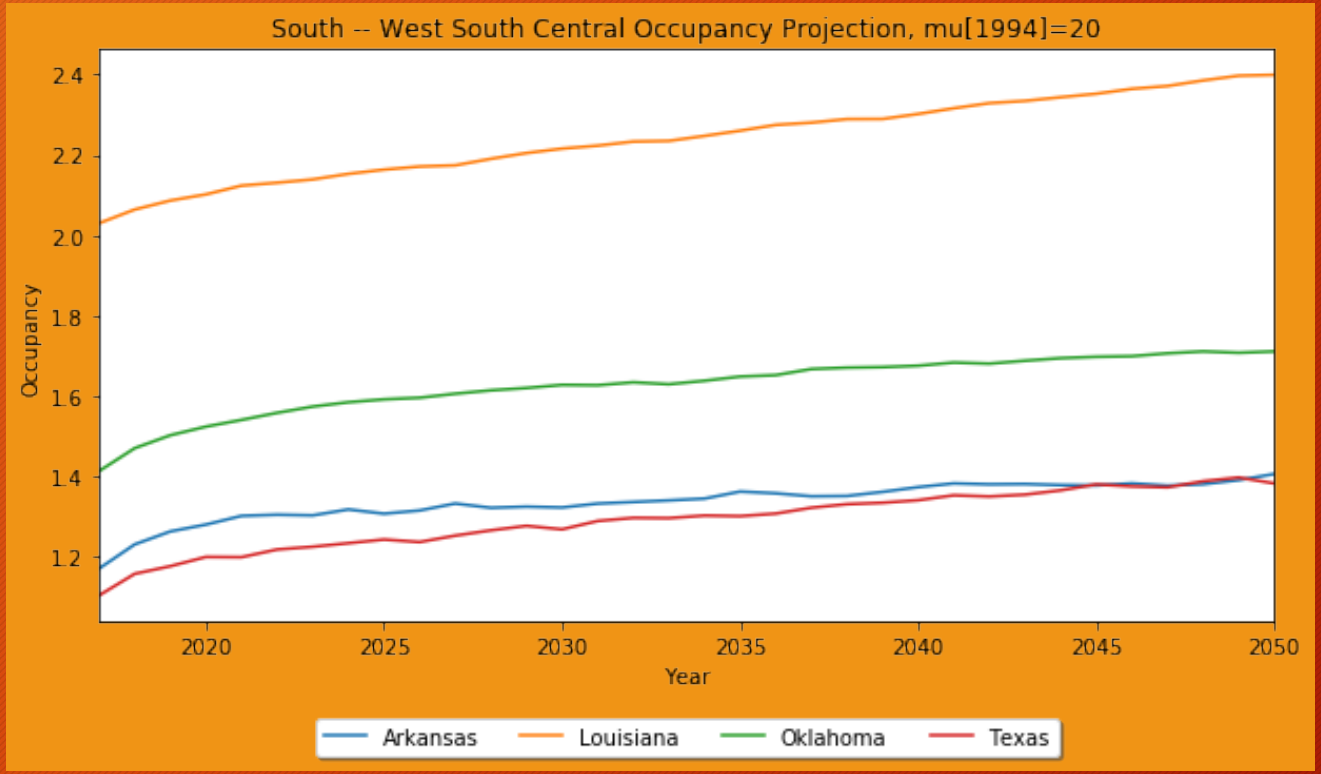

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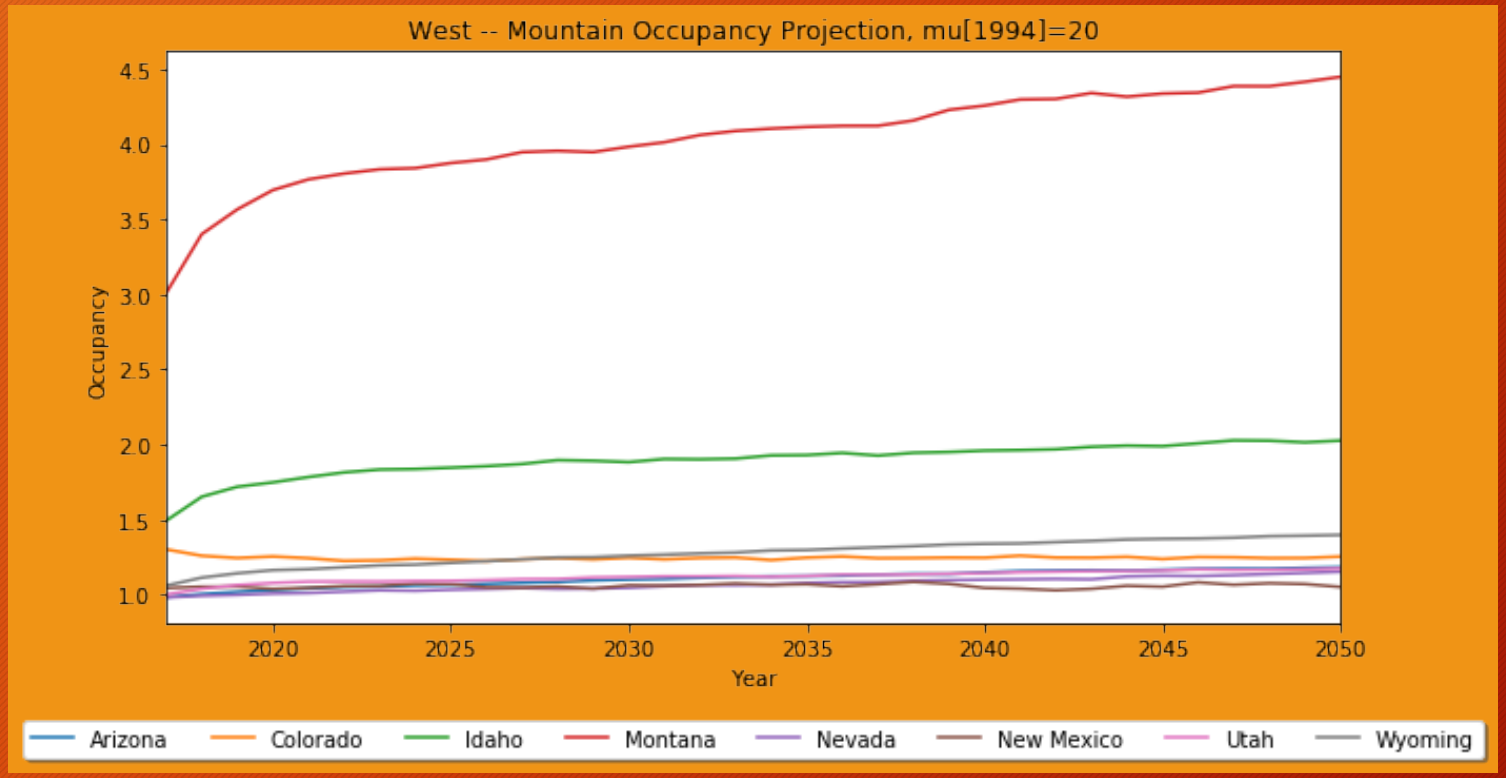

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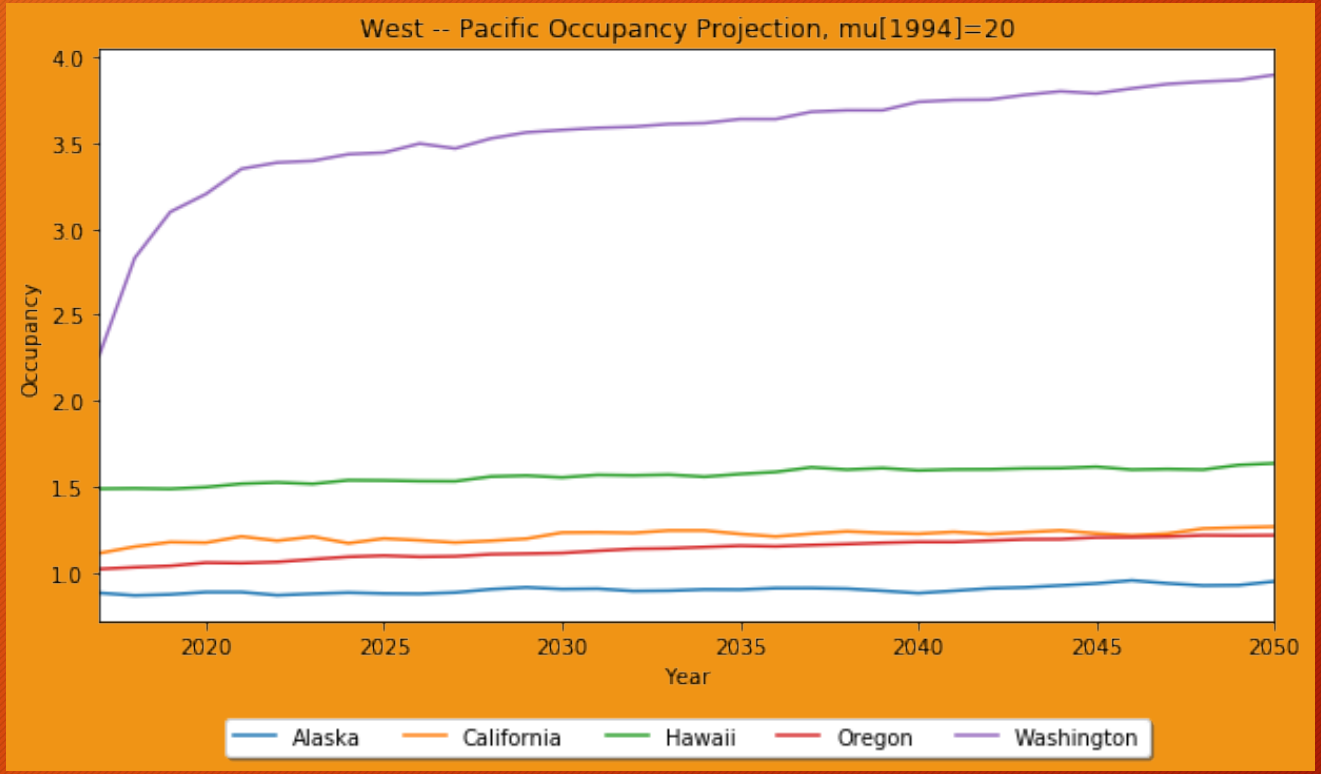


States, occupancy > 1.5

State	Year	State	Year
Kentucky	Now	Delaware	Now
Louisiana	Now	Idaho	Now
Montana	Now	Iowa	2020
Tennessee	Now	South Dakota	2023
Vermont	Now	Virginia	2038
Washington	Now	Oklahoma	2039

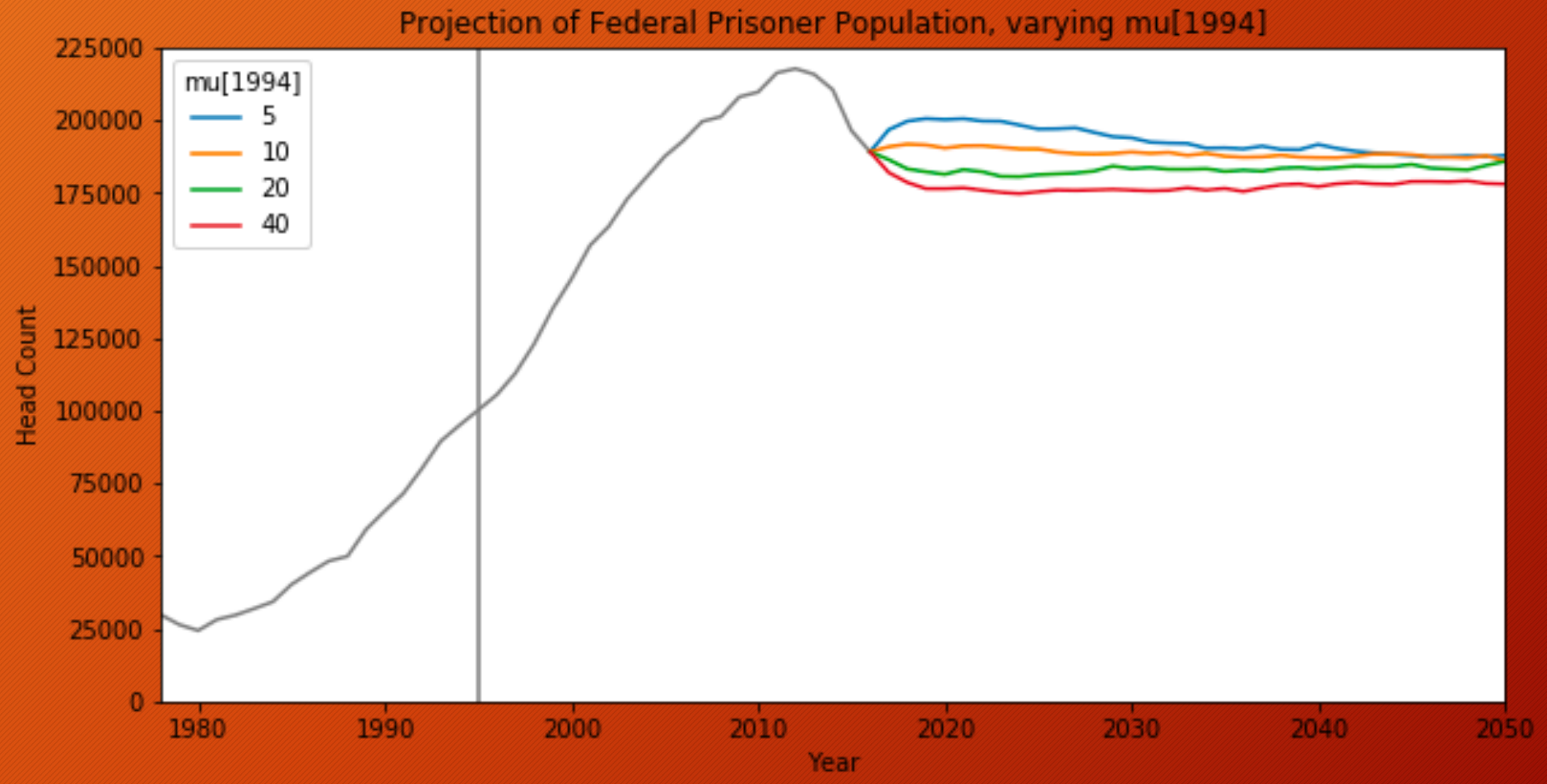
States, occupancy < 1.0

State	Year	State	Year
Alaska	Now	Maine	Now
South Carolina	Now	Indiana	Now
Rhode Island	Now	Georgia	Now
Oregon	Now	Florida	Now
New Jersey	Now	Arizona	Now
Nevada	Now	Massachusetts	Now
Mississippi	Now	Minnesota	2019
Utah	Now	North Dakota	2021
Wisconsin	Now	Illinois	2032
Maryland	Now		

Conclusion

- Build new prisons in Kentucky, Louisiana, Montana, Tennessee, Vermont, Washington, Delaware, Idaho, Iowa and South Dakota
- Prepare for future projects in Virginia and Oklahoma
- Expect business contraction in Alaska, South Carolina, Rhode Island, Oregon, New Jersey, Nevada, Mississippi, Utah, Maryland, Maine, Indiana, Georgia, Florida, Arizona, Massachusetts and Minnesota
- Expect shrinking market in North Dakota and Illinois

Impact of different $\mu[1994]$



Future work

- Collect data $y[t]$ for each jurisdiction
- Survey evidence that back a reasonable guess of $\mu[1994]$