

CAPITAL PUNISHMENT IN THE U.S.

Examining Trends

OBJECTIVE

- What factors may systematically influence the *time* an offender can expect to spend on death row?

DATASET

- 794 executions from 2000 thru 2014.
- Scraped from Clark County (Indiana) Prosecuting Attorney's [website](#).
- Raw data: state; sentence date; victim(s) race/sex/age; ...
- Paired down to:
 - 759 samples,
 - 39 features*

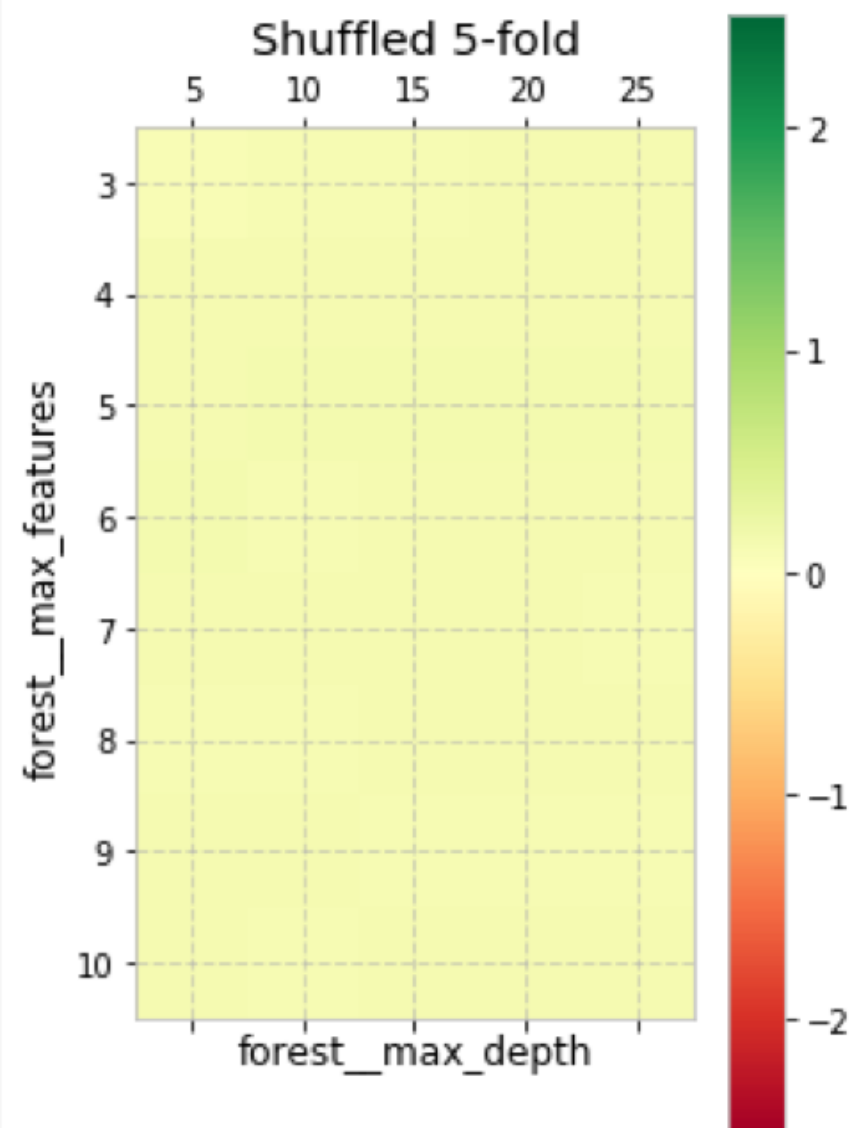
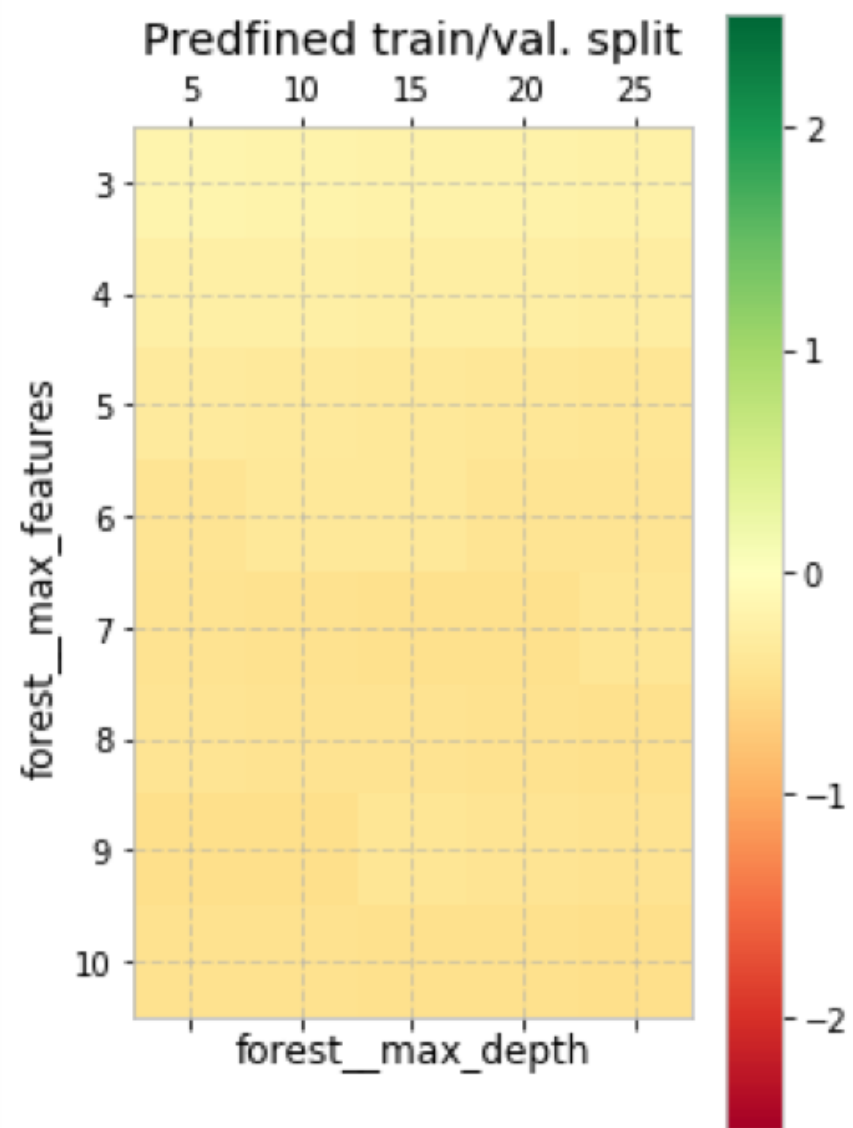
*Also ran recursive feature eliminations down to $n=4$, but results were not materially different with additional feature selection.

PREDICTIVE MODELING PROCESS

- Preprocessing: univariate feature selection with f-regression.
- Cross-validation: (1) predefined split, (2) shuffled 5-fold.
 - Training/validation data: first 500 records (time series-sorted).
- Grid search optimization over 1-2 parameters per model.
- Remove linear trend from response variable.

PREDICTIVE MODELING RESULTS

Model	Grid Search parameters	Validation R ²	Test R ²	Note
Linear regression	<ul style="list-style-type: none"> • none 	0.24	-1.01	
K-nearest neighbors regression	<ul style="list-style-type: none"> • Number of neighbors 	0.05	-0.95	
Ridge regression (L2)	<ul style="list-style-type: none"> • Alpha (<i>a.k.a. lambda</i>) 	0.14	-1.01	
Lasso regression (L1)	<ul style="list-style-type: none"> • Alpha 	0.14	-1.01	
Elastic net (L1 + L2)	<ul style="list-style-type: none"> • Alpha (<i>a.k.a. lambda</i>) • L1 ratio (<i>a.k.a. alpha</i>) 	0.16	-0.77	
Decision tree regression	<ul style="list-style-type: none"> • Max depth • Max features 	0.03	-0.91	
Random forest regression	<ul style="list-style-type: none"> • Max depth • Max features 	0.14	-0.67	1500 trees



PRELIMINARY CONCLUSIONS

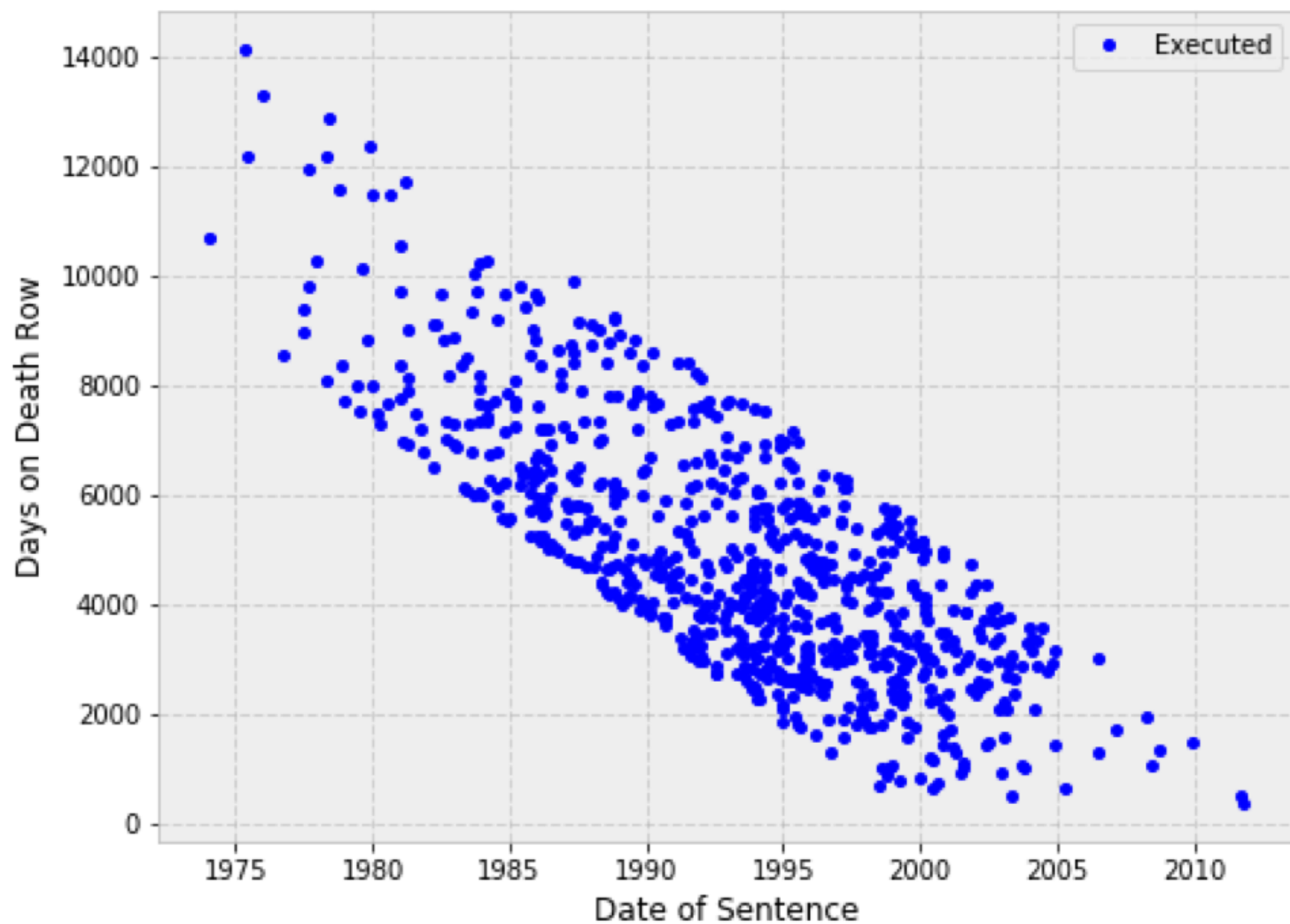
Ceteris paribus, factors such as:

- victim demographic traits,
- police officer involvement in murder, or
- age of murderer at time of sentencing

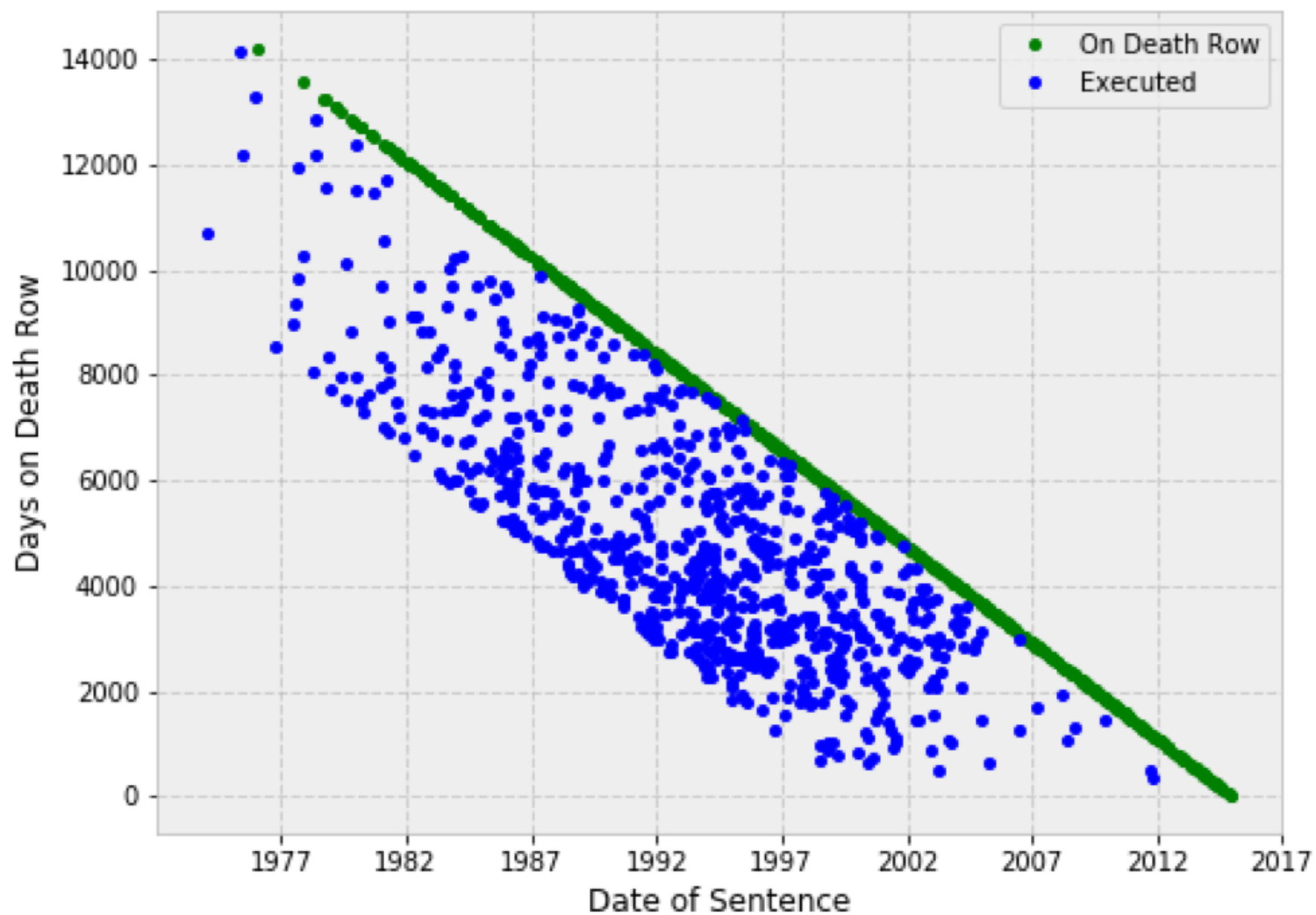
...do **not** appear to systematically influence time spent awaiting execution.

HOWEVER...

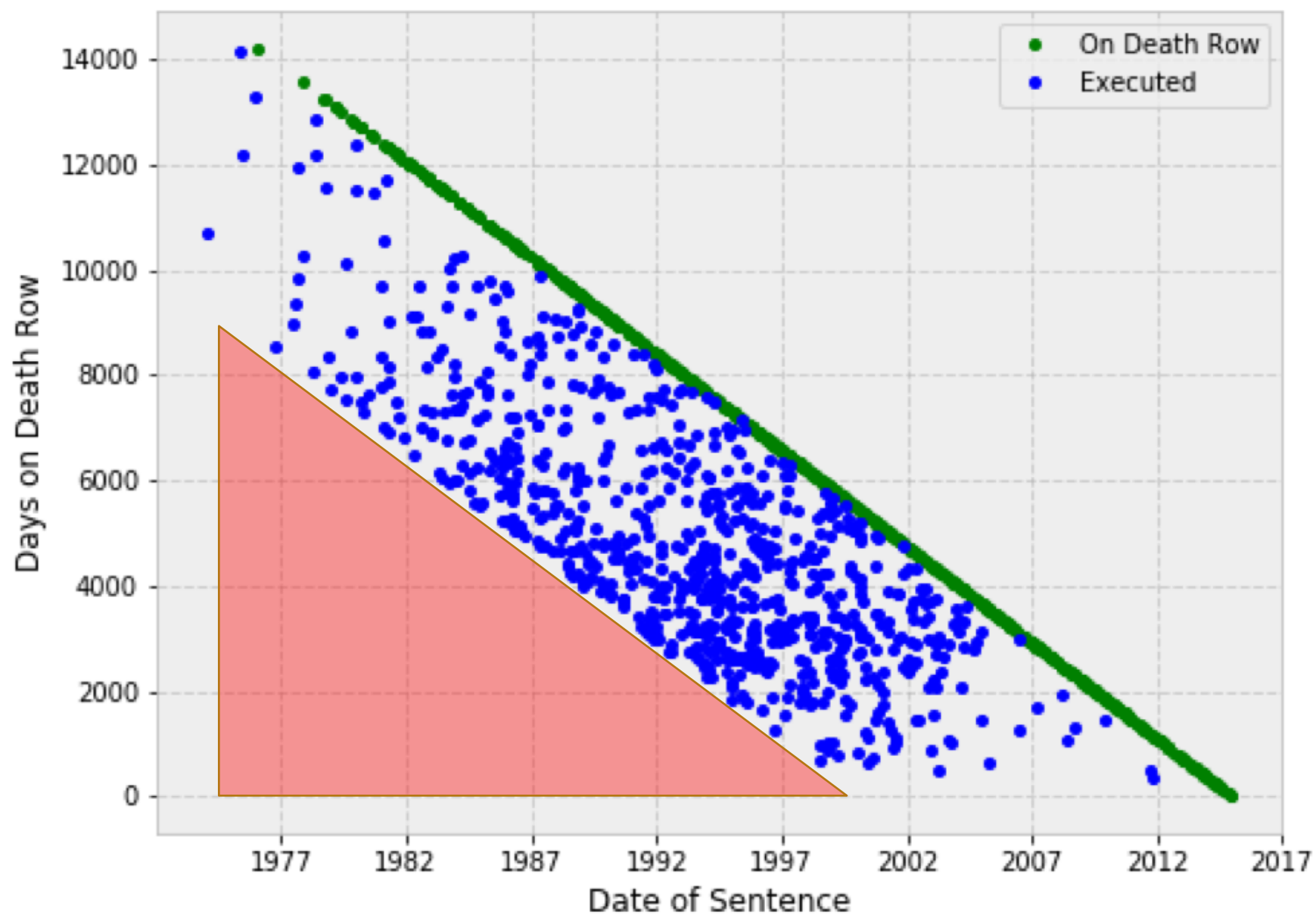
Time on Death Row as a Function of Sentence Date



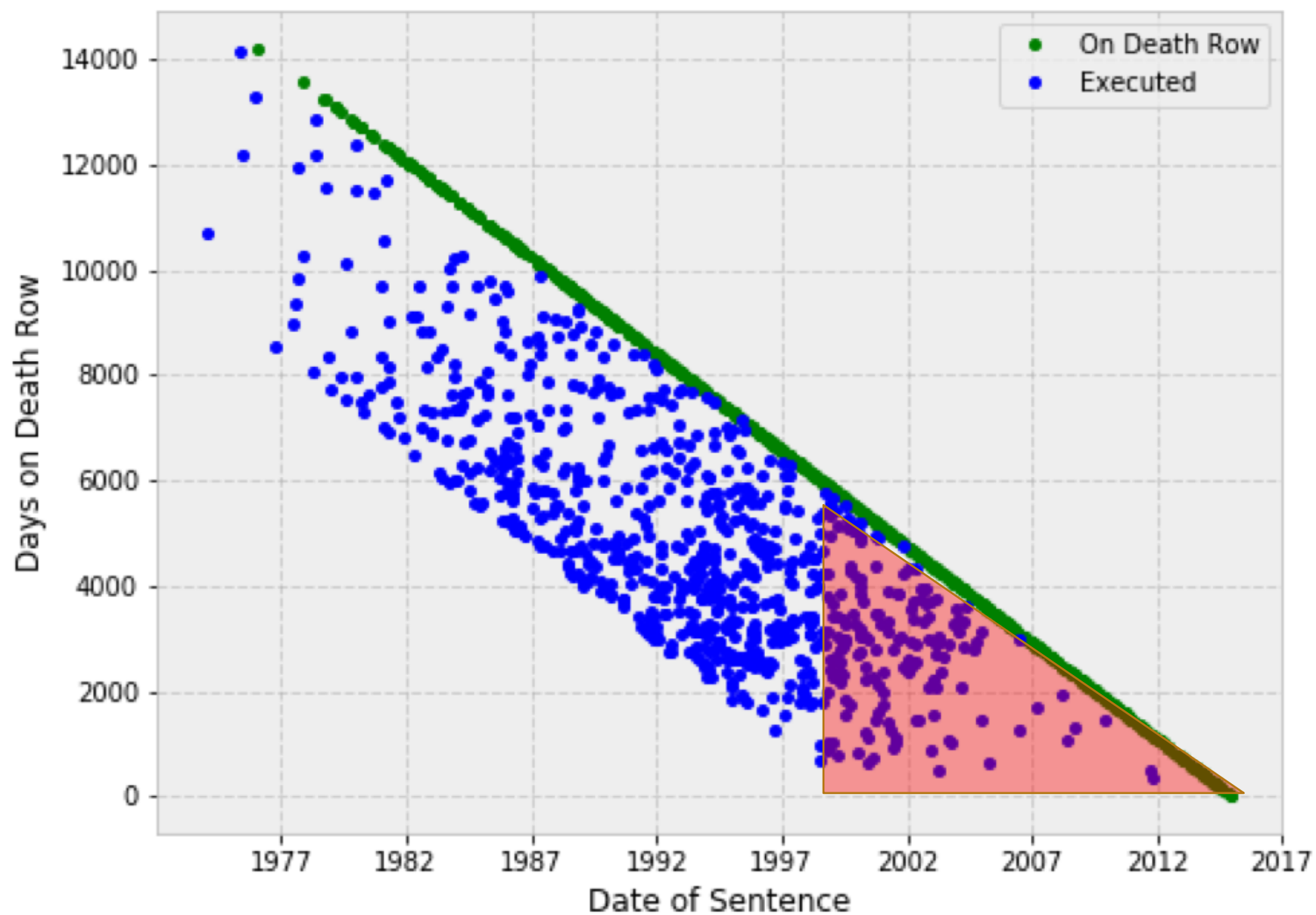
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REMAINING QUESTIONS

- Influence of *Furman v. Georgia* (1972) and *Gregg v. Georgia* (1976)?
- “No one is quite sure why Arturo Aranda is still alive. Arturo has served 11,630 days since he was received by the Texas Department of Justice.”