Pac-12 Tuition Changes 2002-2018

Charles, Erin, Nick, and Phoebe

Motivation and Question Summary

It is clear to everyone the cost of college tuition has increased substantially in the last 40 years. Our objective is to analyzing trends in admissions, applications, and in/out of state tuition for PAC-12 Universities.

Research Questions:

- Is there a relationship between number of applications received per year and tuition cost over time?
- Is there a relationship between admissions and applications over time?

- Are there any differences between in state and out of state tuition cost change over time?

Research strategy and “why?”

Research strategy:

- Time series analysis, identify trends over time.

Why ask these questions?

- **Number of applications vs. tuition cost:**
  - We are researching this question because we believe the number of applications per school affects the tuition cost. We also want to analyze any differences between in state and out of state costs and gain insight into why.
- **Number of applications vs admissions:**
  - We are researching this question because we also believe the number of applications a school receives per year could affect their overall admissions rate.

Data for Questions

The search for data:

- College Scorecard API
  - What data is available? What can we isolate to further our exploration, and answer our question?
  - Tuition (in-state and out-of-state) by year
  - Admission Rates by year
- Applications and Admissions CSV; IPEDS Data Center
  - Number of applications received per year
  - Admissions data per year

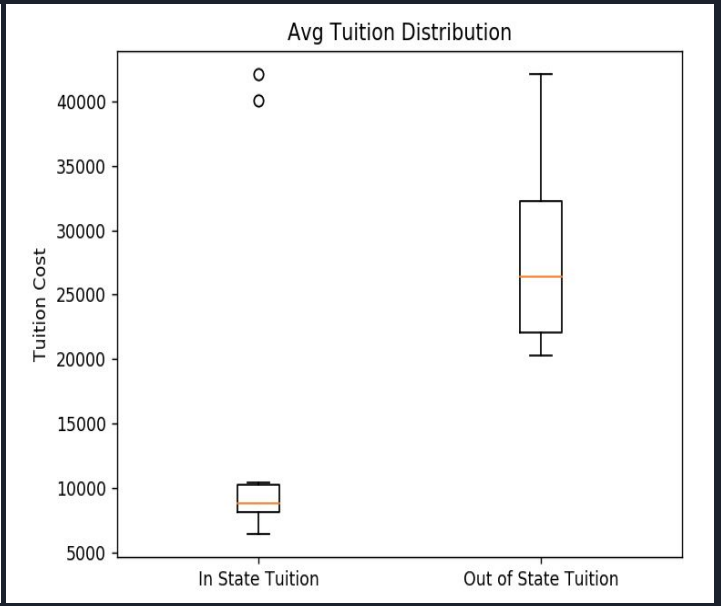
Data Acquisition and Cleanup

- Traversing through College Scorecard API
  - Wading through documentation, so much trial and error!
- Created Data Frames with interesting available statistics within the API
- Export Data Frames to csv, push to GitHub for everyone to check out
- Remove unwanted symbols, years with no data, etc.
  - Erin's % formula!
  - Nick's symbols removal!
- Narrowed down scope years due to data availability to 2002-2018
- Problems that arose:
  - Graphs including all schools were busy, too many lines
    - We decided to split graphs by state or region
  - Interesting data was available, but wanted to avoid expanding the scope beyond our question

Data Exploration

Box plot showing average tuition costs between in-state and out of state.

College_names	Average_Out_of_state_tuition	Average_In_state_tuition
University of Utah	$20,301	$6,431
Arizona State University-Tempe	$20,765	$7,748
Washington State University	$20,977	$9,349
Oregon State University	$22,382	$7,677
University of Arizona	$23,983	$8,224
University of Oregon	$25,649	$8,296
University of Washington-Seattle Campus	$27,176	$8,997
University of Colorado Boulder	$29,192	$8,546
University of California-Los Angeles	$32,217	$10,174
University of California-Berkeley	$32,524	$10,459
Stanford University	$40,077	$40,077
University of Southern California	$42,107	$42,107



Data Analysis

- Which relationships and trends seemed meaningful?
- % change versus raw data, when and why?
- Divvied up data for graphing
  - Nick-->Summary Stats
  - Charles-->Tuition vs Applications Data
  - Erin-->Admissions vs. Applications Data
  - Phoebe-->Tuition vs Applications Regressions
- Compared graphs, standardized xlims, ylims, coloring
- Discussed findings and implications

Analysis for Question One

Applications vs Tuition

1. We knew we needed to keep in mind that tuition increases for various reasons (government pressure, inflation, etc.) when doing our analysis.

2. Started by breaking up the colleges by states; focused mainly on the states of Washington, Oregon, California and Arizona.

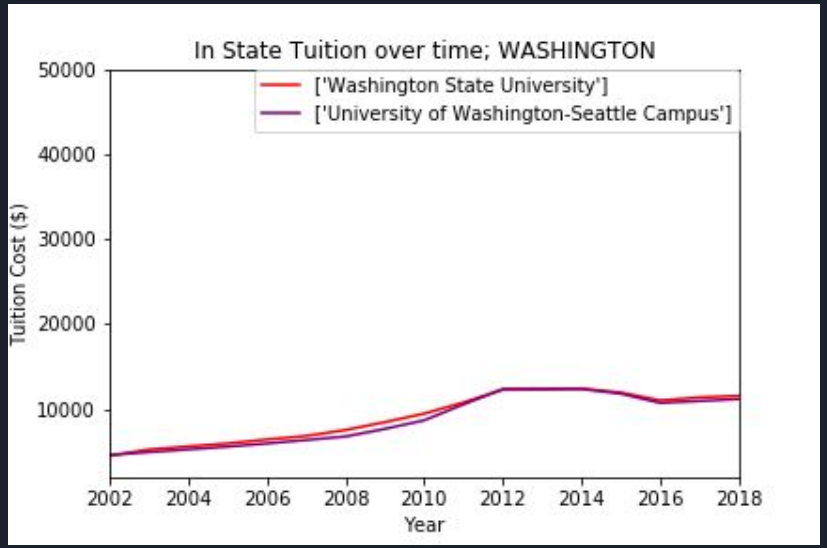
3. We began our analysis by comparing in state and out of state tuition differences and identified any trends or outliers.

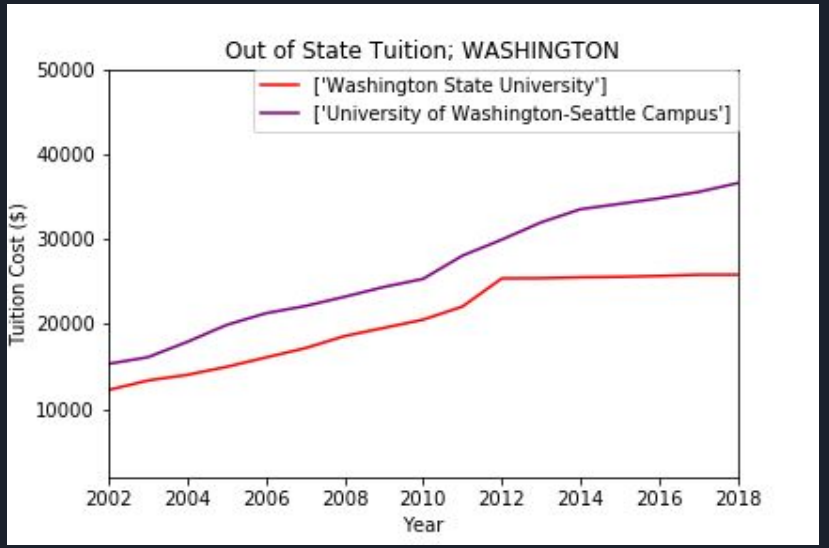
4. We then compared that analysis with the changes in number of applications for each school and identified any relationships.

First

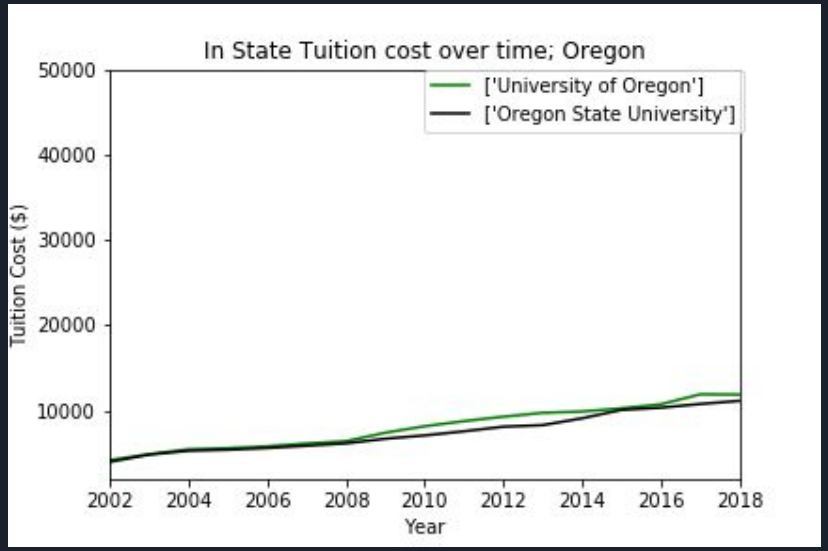
Show relationship between in state and out of state tuition costs.

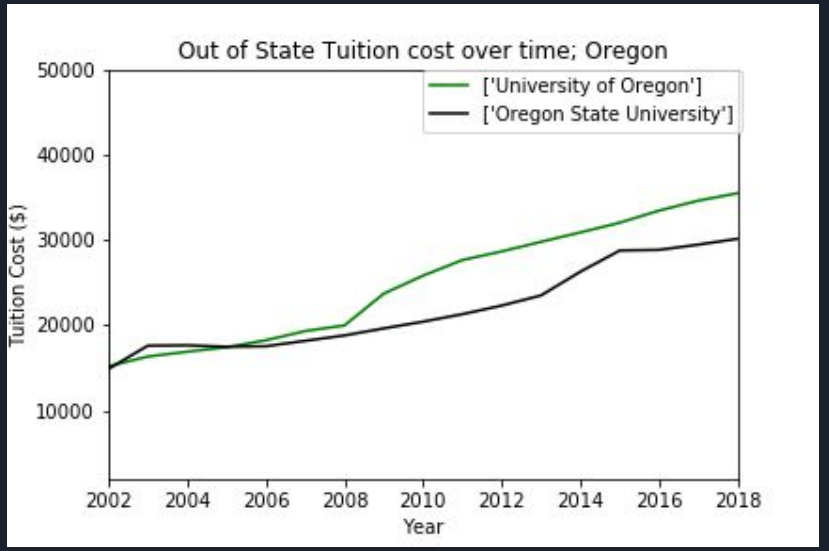
Washington
In State vs Out of State Tuition



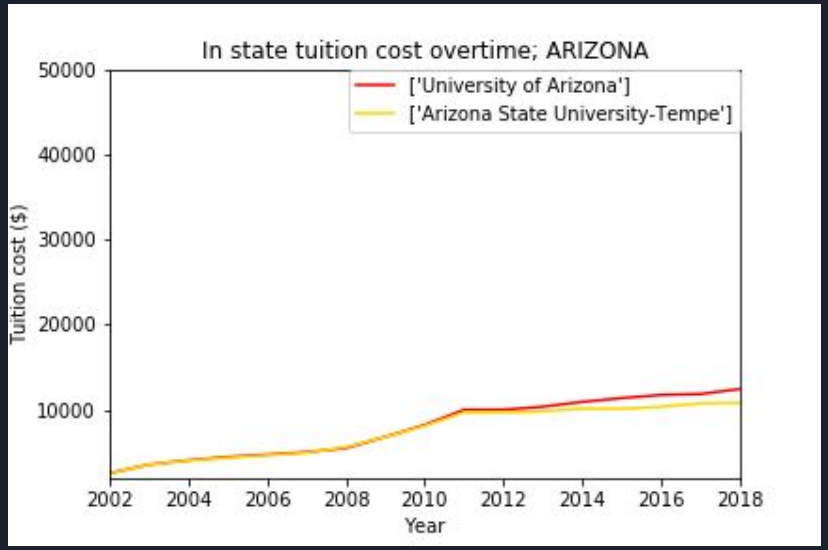


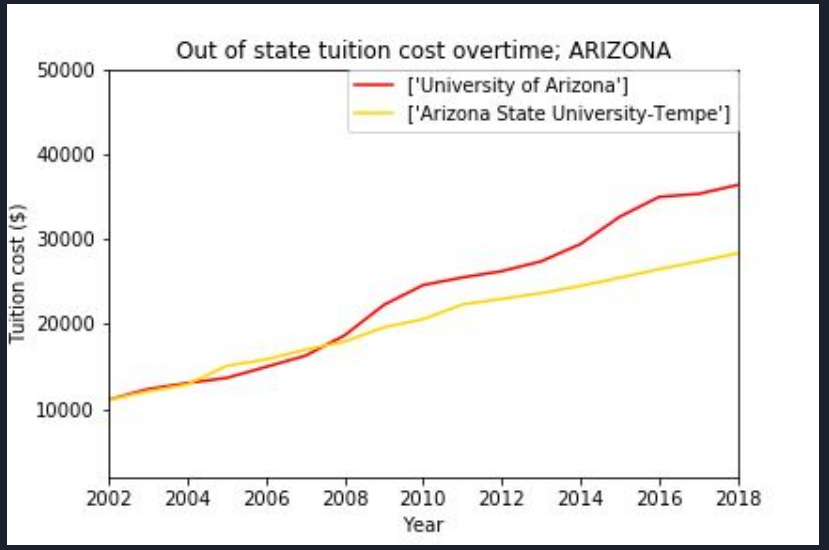
Oregon
In State vs Out of State Tuition



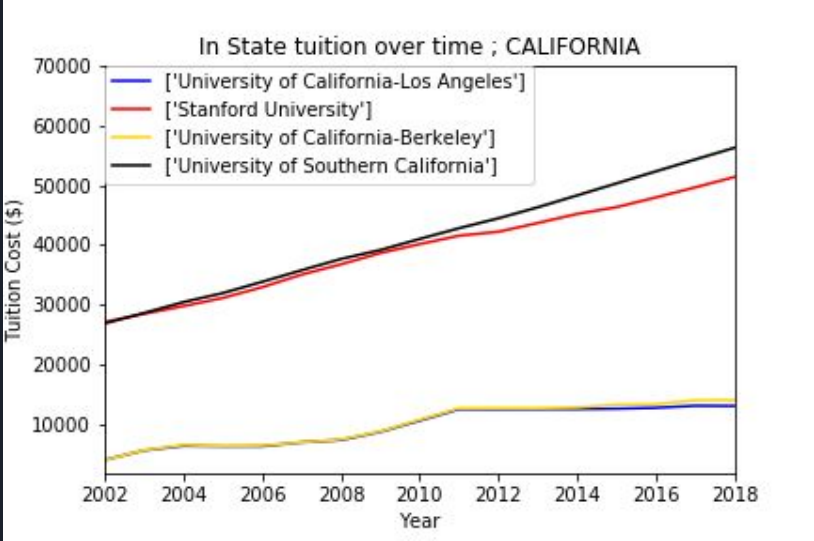


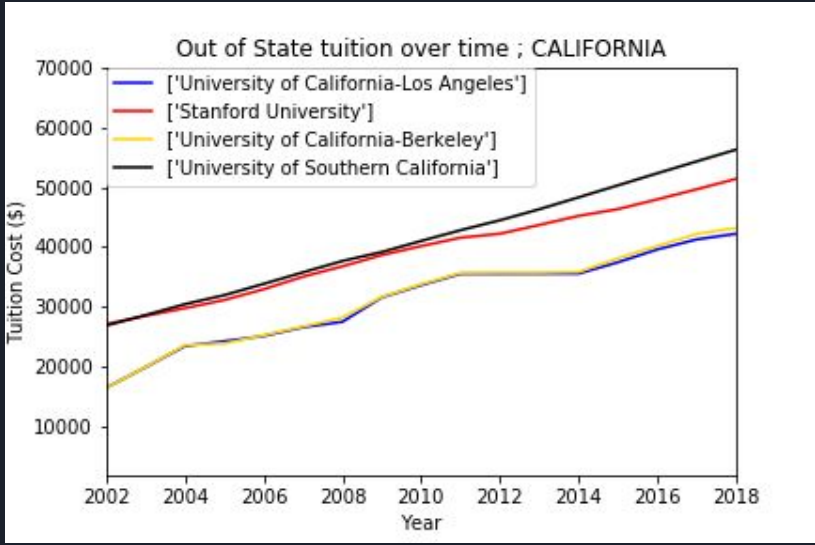
Arizona
In State vs Out of State Tuition





California
In State vs Out of State Tuition





Analysis for Question One

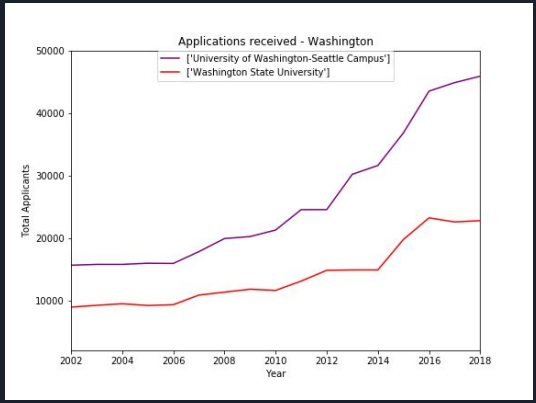
In State vs Out of State Tuition Costs:

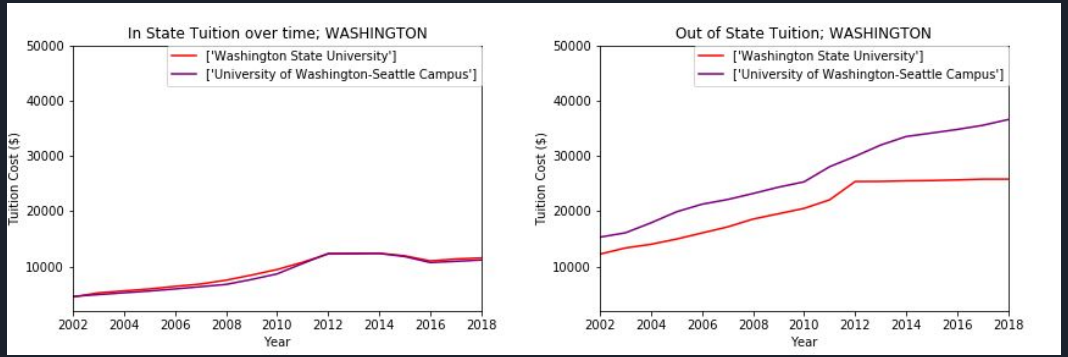
- From the first part of our analysis of question one, we were able to identify:
  - Both in state and out of state tuitions increase over time.
  - Out of state tuition was increasing at a larger rate than in state (most cases).
  - Stanford and USC appear to be outliers given their high tuition costs for in and out of state.

Second

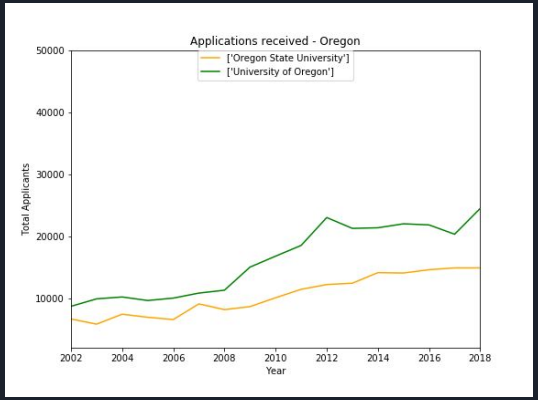
Show relationship between number of applicants and tuition costs.

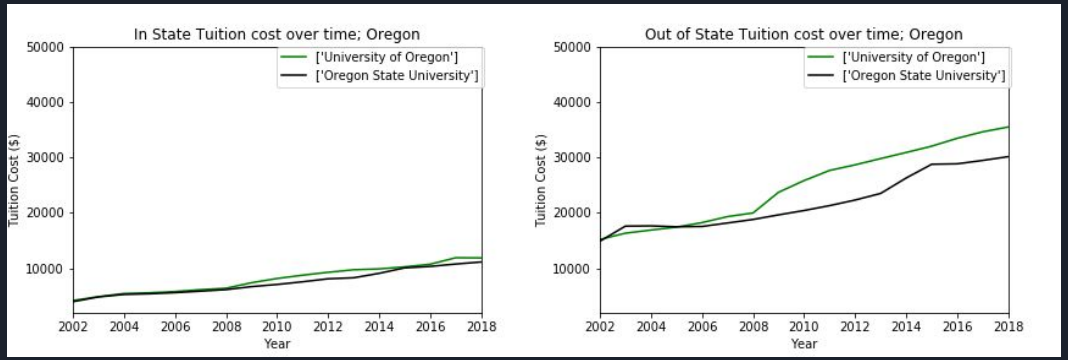
Washington
Applicants vs Tuition Costs



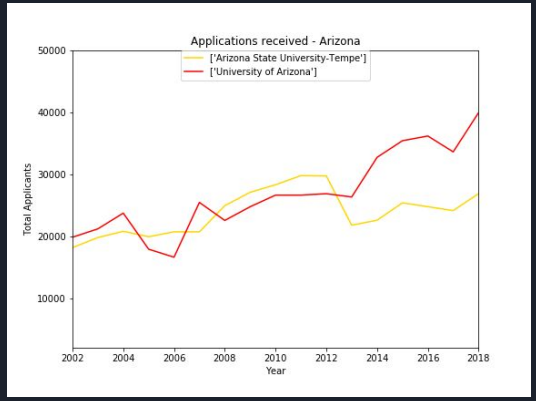


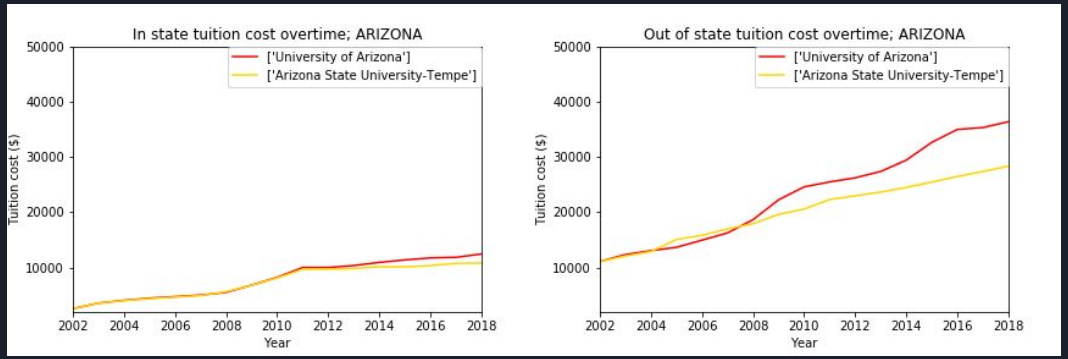
Oregon
Applicants vs Tuition Costs



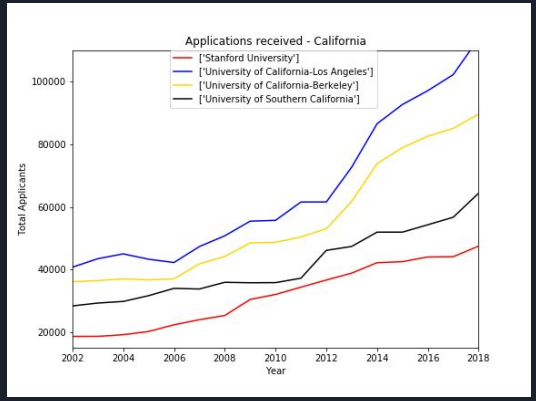


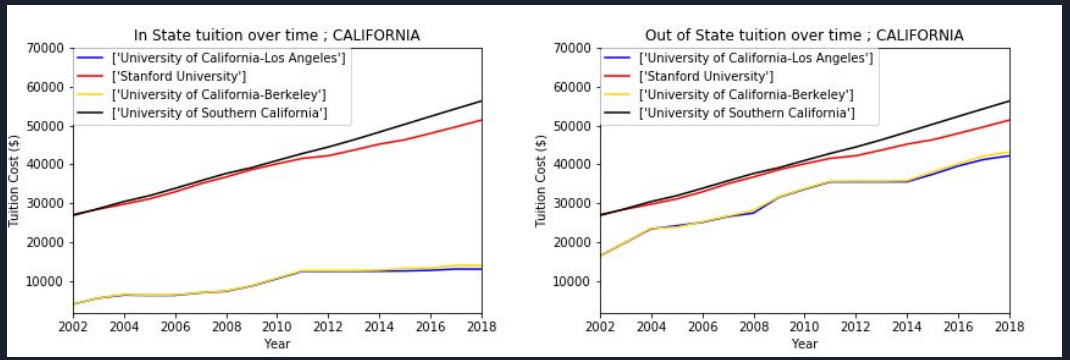
Arizona
Applicants vs Tuition Costs





California
Applicants vs Tuition Costs





Analysis for Question One

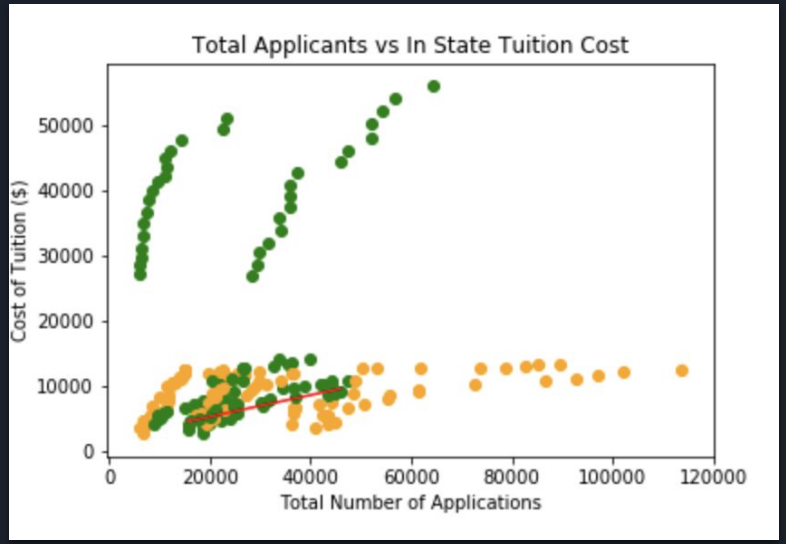
Applications vs Tuition

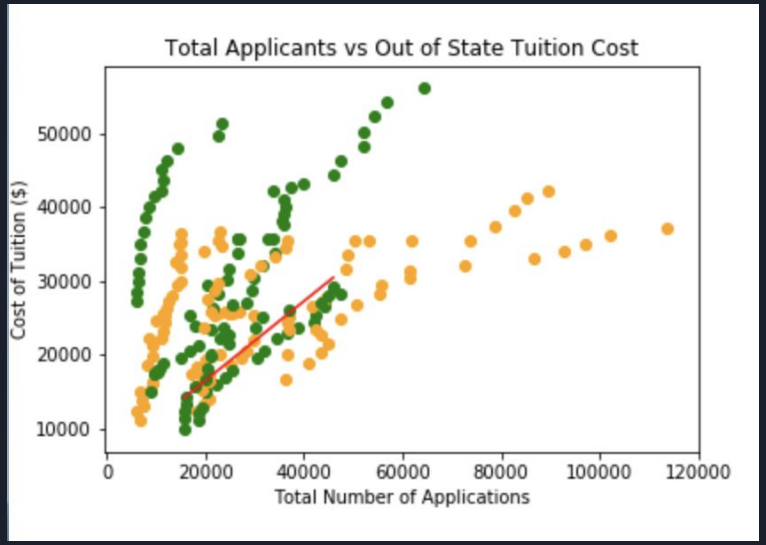
- From the second part of our analysis of question one, we were able to identify:
  - An Increases in number of applications is related to increases tuition costs.
  - In and out of state tuition affected differently by changes in applicants.
  - Out of state has a stronger relationship with changes in applicants.
  - Some California schools have a different tuition dynamic.
    - Stanford and USC
      - Same in and out of state tuition cost.

Third

Run regression on number of applicants and tuition costs.

Applications VS Tuition Costs





Conclusion for Question One

Applications vs Tuition

- Over time, tuition has increased for both in and out of state students, while increasing at a greater rate for out of state.
  - This difference could be due to school's national popularity, government funding, or high numbers of out of state applicants.

- When analyzing data on number of applicants and tuition costs and found a relationship between the two.
  - Points in time where in and out of state costs differ the most is when the total number of applicants increasing.
  - This leads us to believe there could be a correlation between in and out of state tuition cost and application numbers.
  - Given our regression analysis, we identified a positive correlation between both in and out of state tuition costs with number of applicants.

Limitations Question One

Applications vs Tuitions costs:

- We were able to run a regression to identify correlation between out of state tuition vs overall application numbers.

- If we had access to data on in and out of state application numbers, we could run a better regression.
  - Given our data, we are limited to only testing correlation between total applicants and in and out of state tuitions.

- Leave out USC and Stanford next time

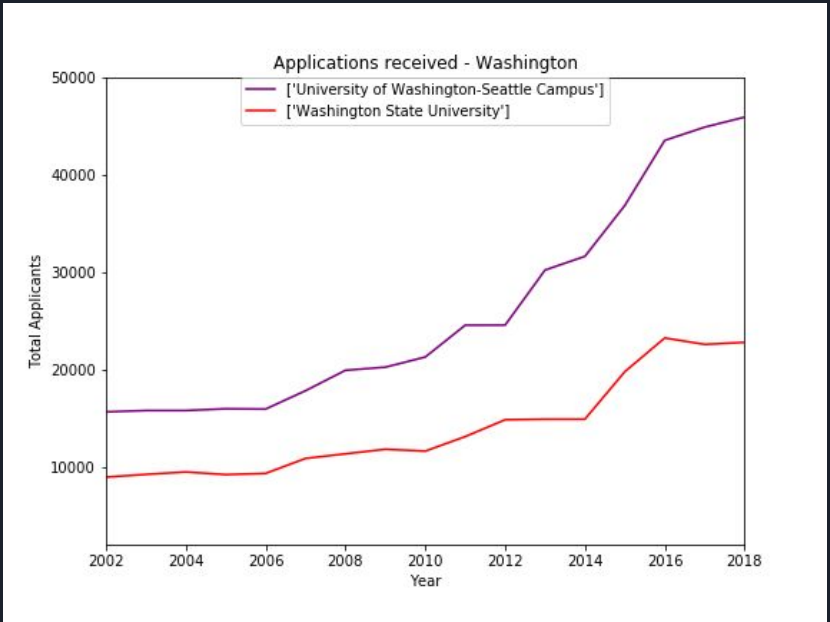
Analysis for Question two

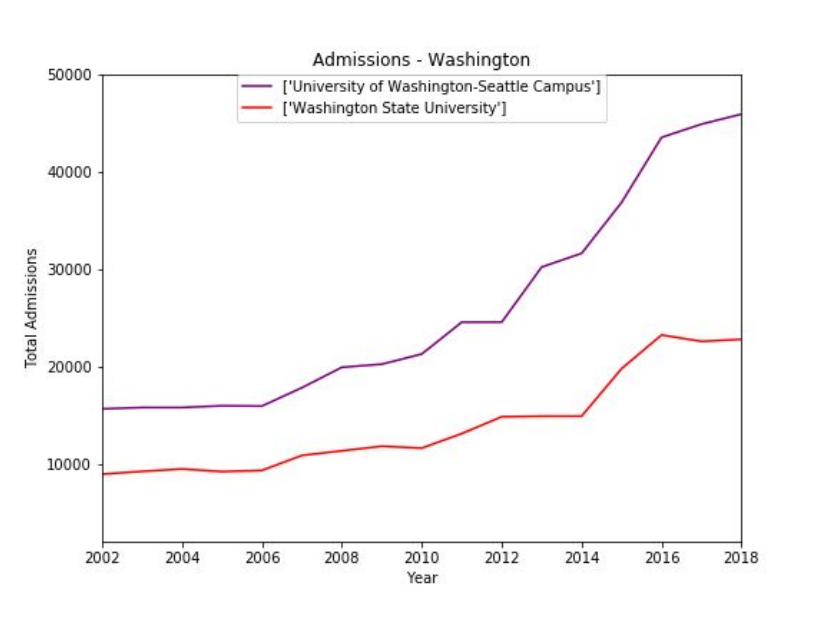
Is there a relationship between admissions and applications over time?

1. We knew that there were limits to admissions regardless of number of applications received but wanted to see if we could find trends.

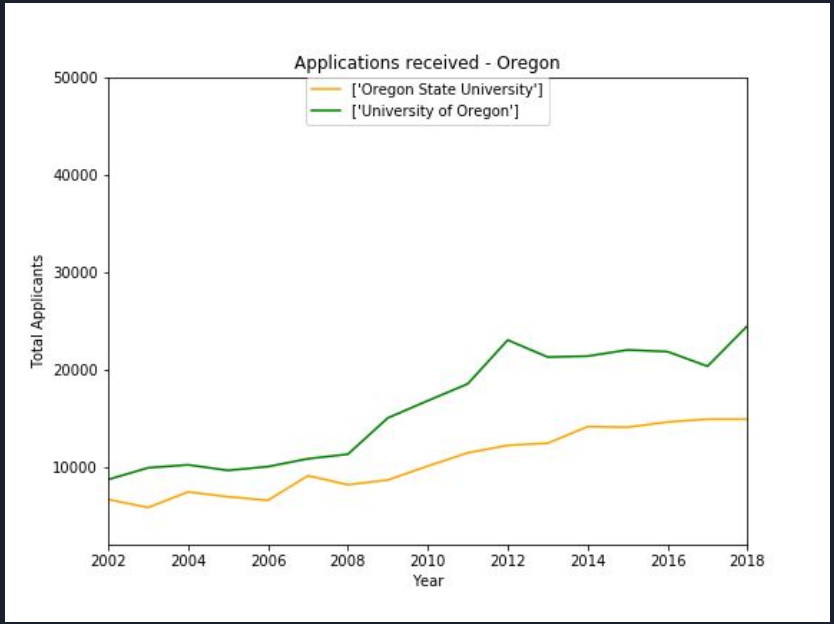
2. We used line graphs to identify if there is a correlation between applications and admissions.

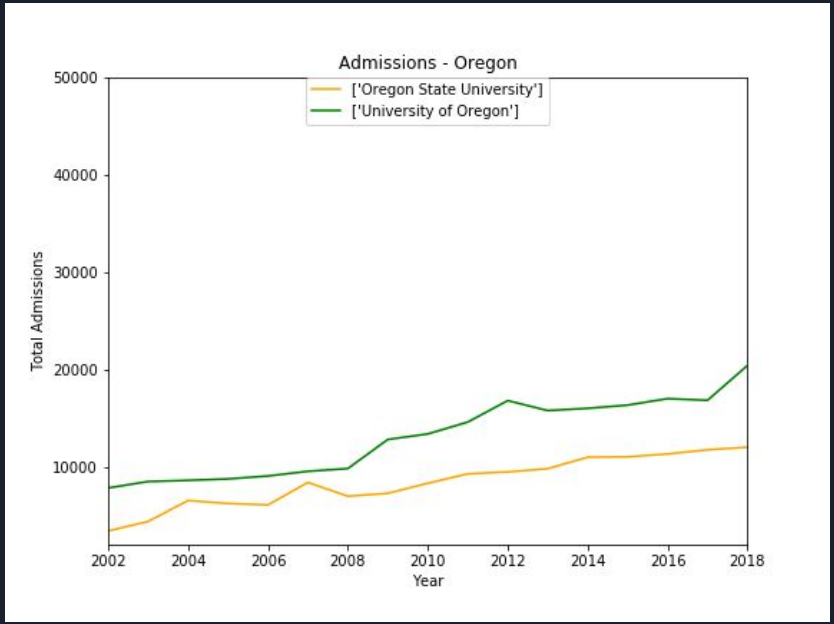
Washington
Applications vs. Admission



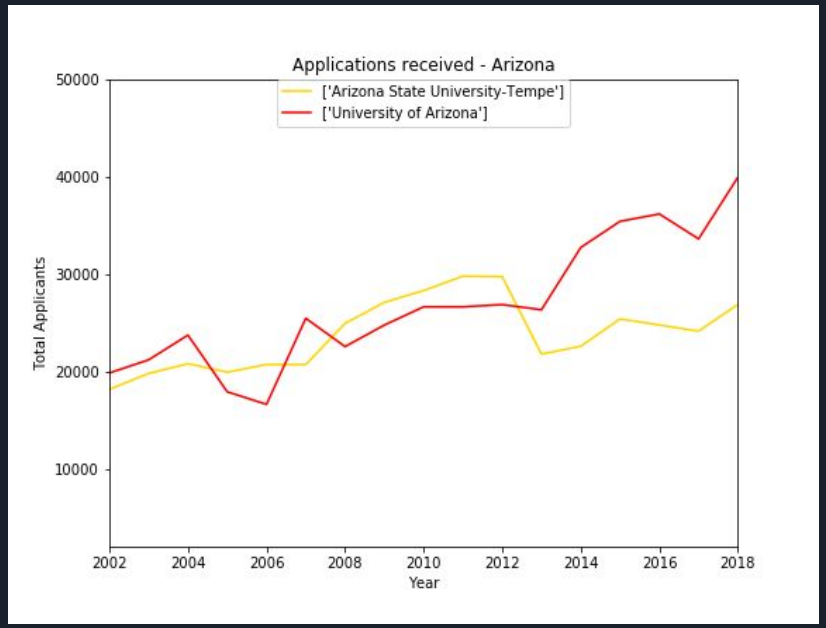


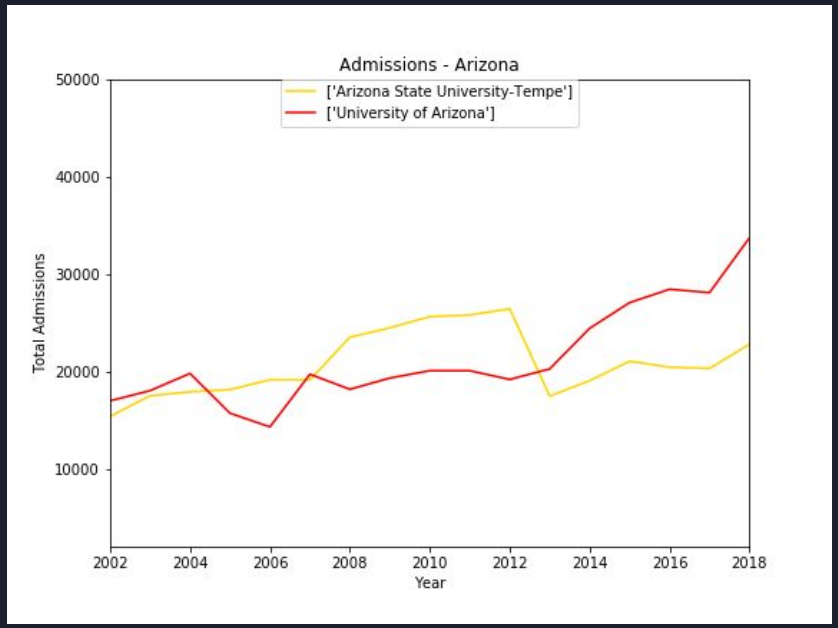
Oregon
Applications vs. Admission



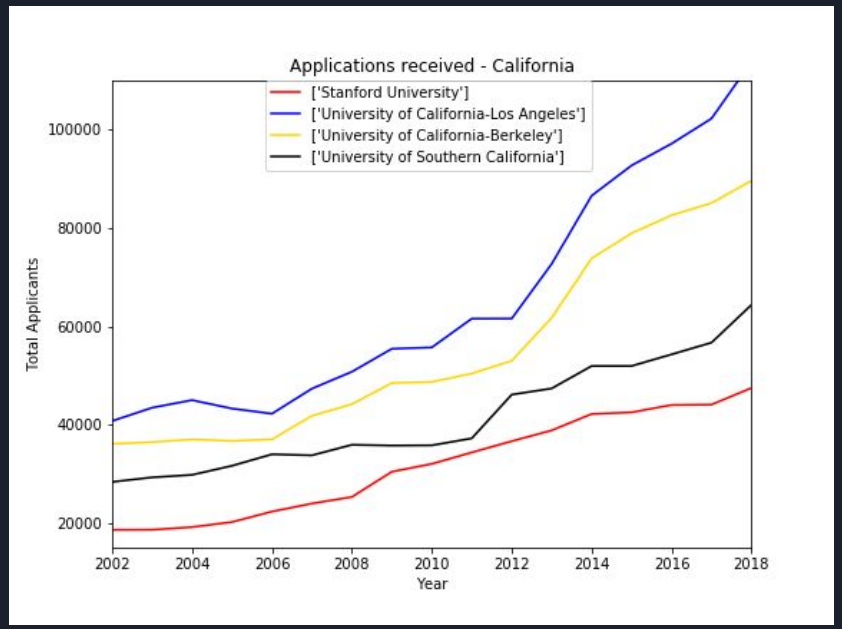


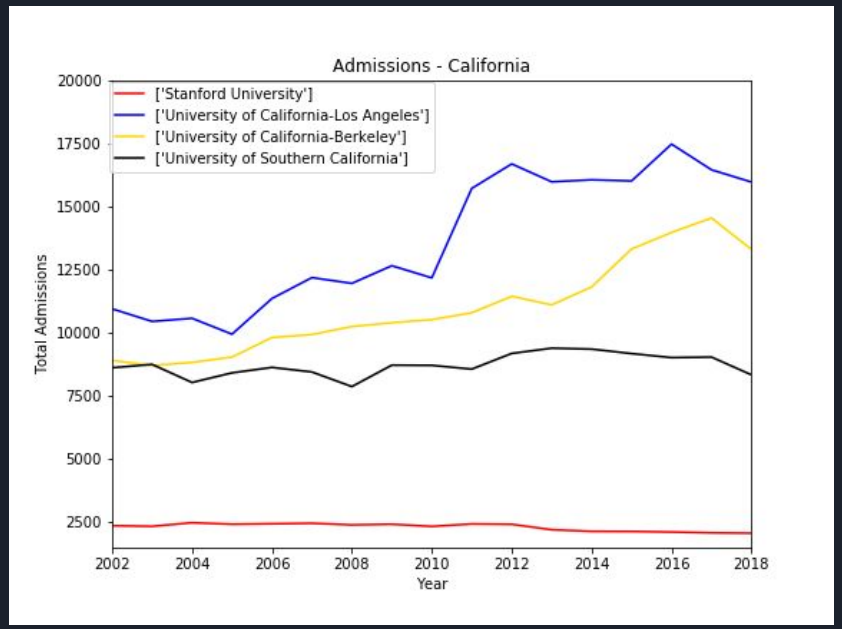
Arizona
Applications vs. Admission





California
Applications vs. Admission





Conclusion for Question Two

- There is a correlation between the number of applications received and admissions.
- CALIFORNIA
  - Overtime there was an increase in the number of applications received across all 4 schools
  - Around 2012 the increase appears to grow - many more applications received each year.
  - Stanford is the outlier for admissions - this line remains relatively flat.

Post Mortem

- Difficulties that arose
  - Combining Jupyter Notebook code and maintaining working code
    - Reset and run kernels, wordy code, take breaks
  - California Schools!!
    - USC and Stanford in-state tuition = out-of-state tuition
    - More expensive in general
- Additional application data
- Additional questions/further research:
  - What factors in society/economy/etc. could be affecting the changes in amount of applicants to certain schools? Ex: ASU circa 2012?
  - How have the demographics of applicants and admitted students changed over time?
  - Do sports records and out of state applicant numbers correlate?

Data Sources:

- College Scorecard:
  - https://collegescorecard.ed.gov/data/documentation/
- IPEDS Data Center
  - https://nces.ed.gov/ipeds/use-the-data