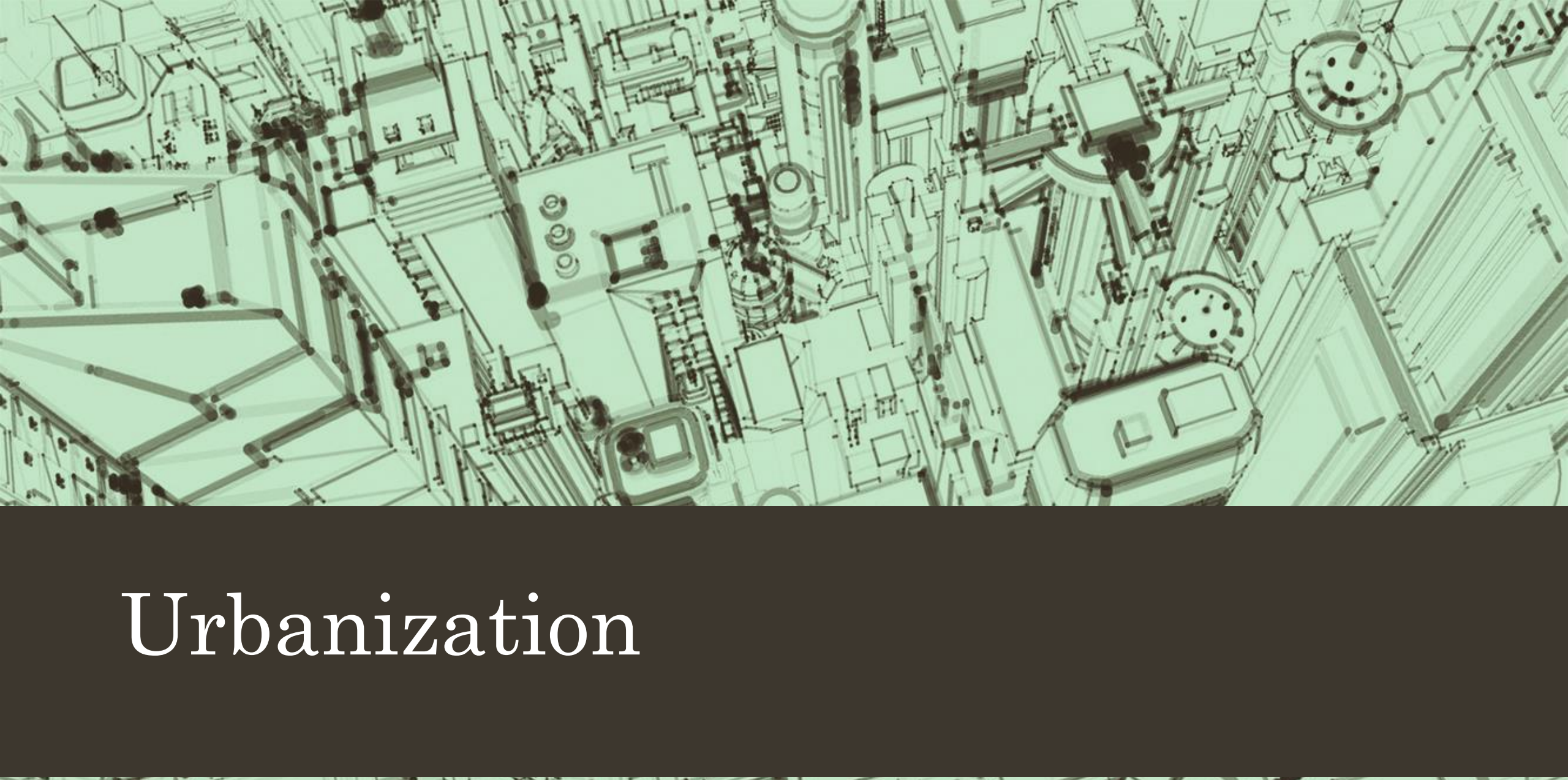


Urbanization

Outline

- Introduction
- Data
- Analysis
- Results
- Conclusions

Introduction

- Urbanization is the process in which a disproportionate percent of a country's population begins congregate in major metropolitan areas. The United Nations projects that 65% of the developing world, and 86% of the developed world the will be urbanized by 2050. Notably, between 2017 – 2030 roughly ~1.1 billion new city inhabitants will be absorbed by major cities.
- As a city develops, the gradual increase in local populations results in dramatic increase and changes in costs, often pricing the local working class and lower middle class out of the local marketplaces.

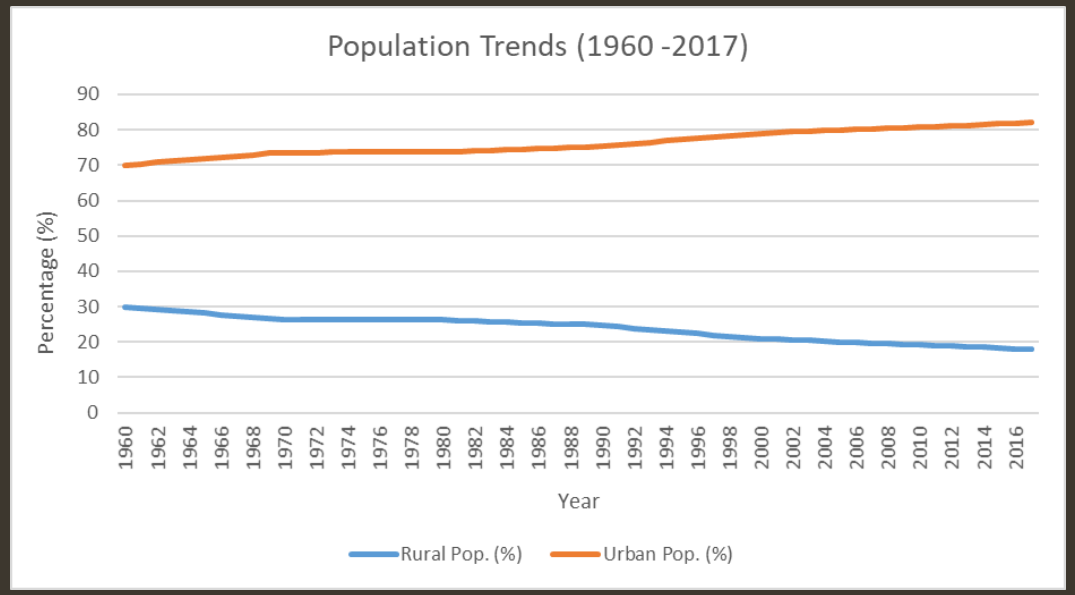
Data

- Overview of Urbanization Trends
  - Basic Plotting
- Job Growth vs Urban Growth
  - Job migration?
- Wage Growth vs Inflation
  - Median Income (Historical Growth) compared to the yearly inflation rate.
- Property values / Rental rates
  - Effects on “average joe”, with a mortgage example.

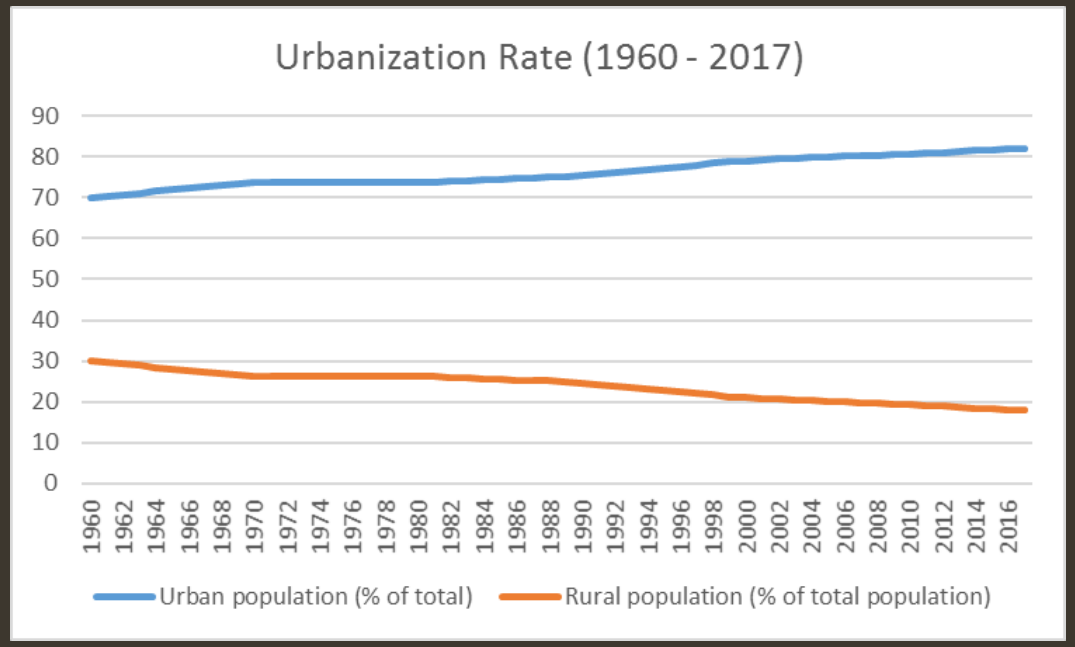
- Inflation & Wage growth:
  - 1. Independent samples t-test which compares mean for two groups or……
  - 2. Paired sample t-test which compares means from the same group at different times
  - PROC CORR in regards to Wage growth rate, Inflation rates, and residential price growth.

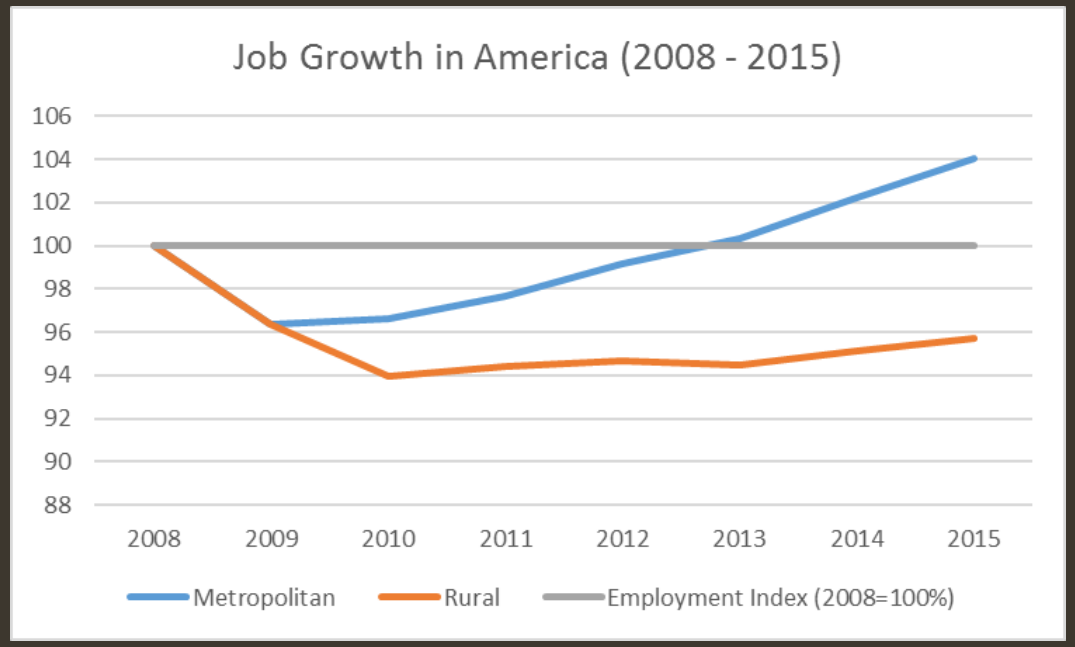
Aggregate Urbanization Trend

- Overall the rural population has dropped by ~40% since 1960, and the urban population has increased ~17%, as a percentage of population.



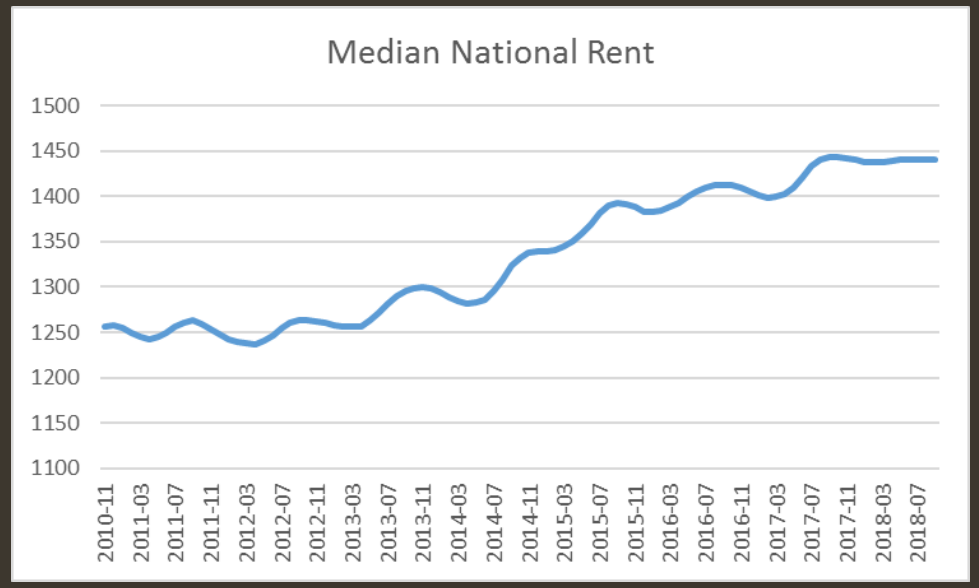
Urbanization vs Job Growth

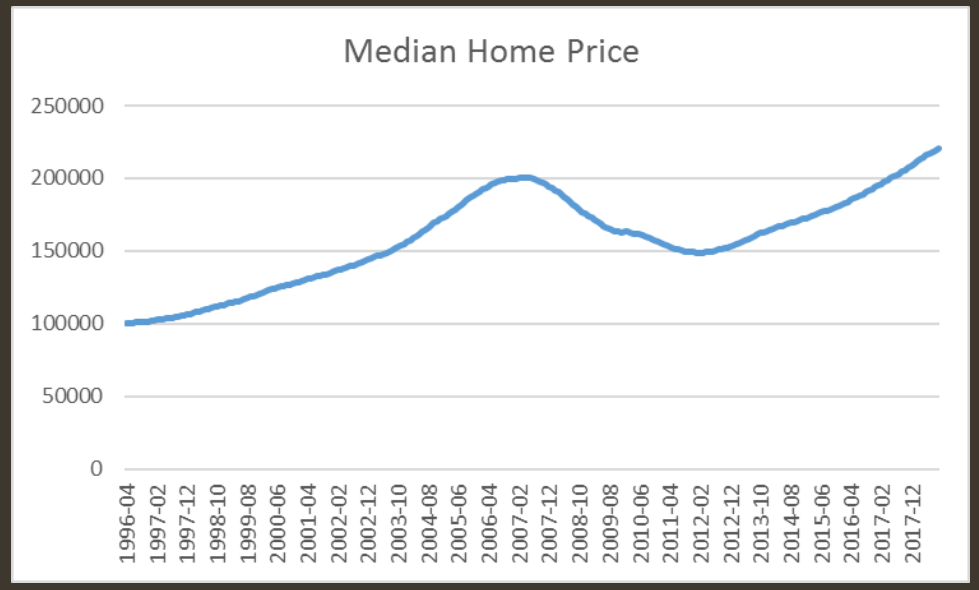




Median Home Price vs Rent

- Only four times since 1963 has the Median Home Price Growth been negative: 1970,1991, 2008, and 2009.
- Average Annual Growth rate:
  - Since 1963 - 5.6%
  - Since 1980 - 4.5%
  - Since 1995 - 4.2%
  - Since 2008 - 3.9%
- Median Rental Price has risen 14.6% since 2010.

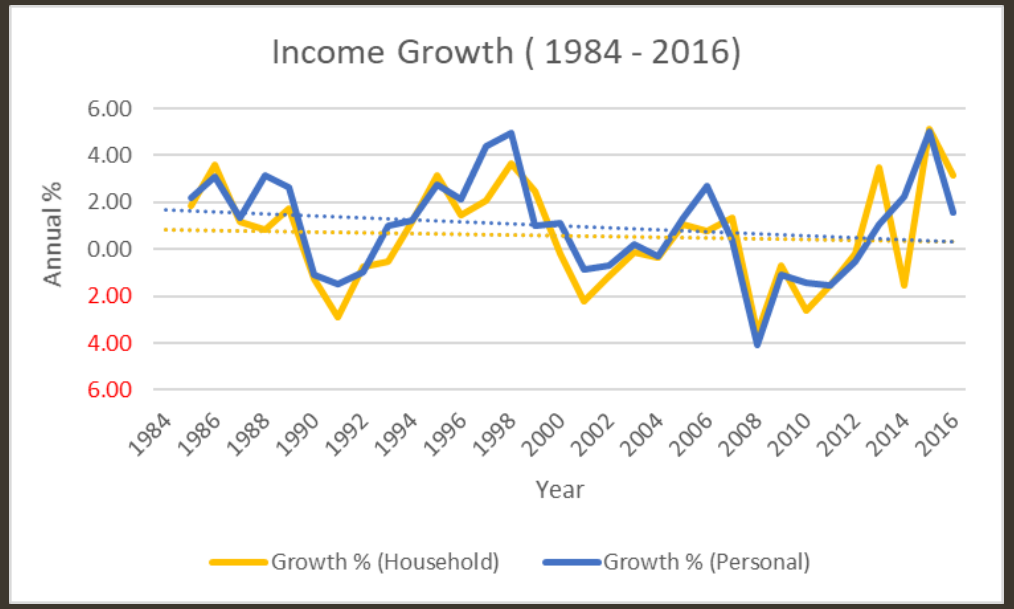


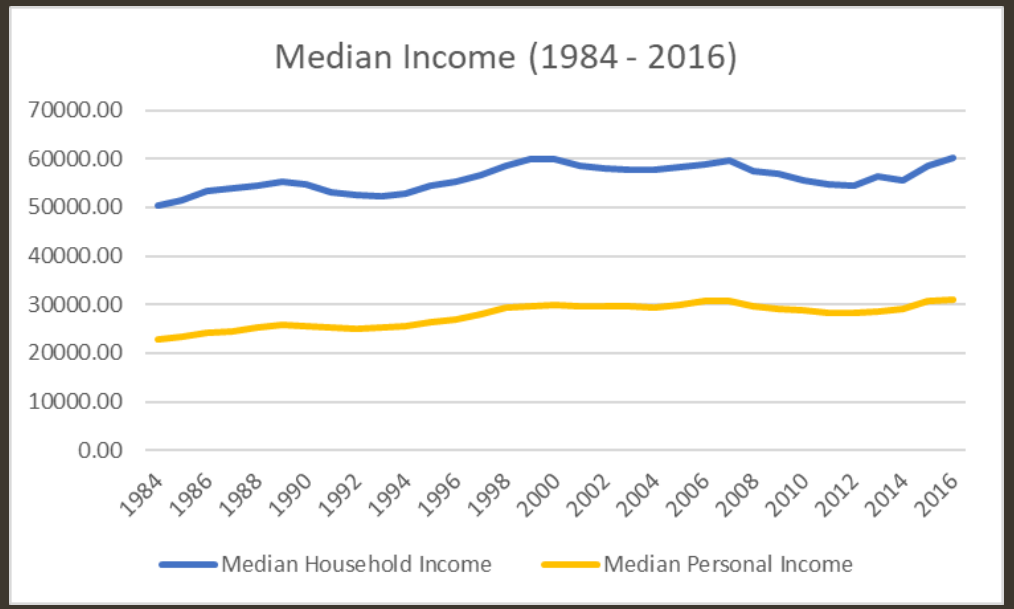


Median Income

- Since 1985, Median Household Income has grown at a 0.56%. Furthermore, Median Personal Income rose 0.98% on average.
  - Pre Recession average growth (Household) - 0.73%
  - Post Recession average growth (Household) - 0.18%
  - Pre Recession average growth (Personal) – 1.31%
  - Post Recession average growth (Personal) - 0.13%
- Negative Income Growth:

range	agg_growth	cpi_growth	home_growth	household_growth	personal_growth
1990 - 1993	0.02539441	0.03205742	0.026979613	-0.013772149	-0.006415382
2000 - 2004	0.02287707	0.02548736	0.034010869	-0.008049631	-0.001170181
2008 - 2012	0.01536173	0.0159905	0.0193844	-0.017187853	-0.017449294





Median Income (cont.)

- Household:

range	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
post		9	0.00184	0.0302	0.0101	-0.0356	0.0515
pre		23	0.00732	0.0175	0.00365	-0.0292	0.0368
Diff (1-2)	Pooled		-0.00548	0.0216	0.00851		
Diff (1-2)	Satterthwaite		-0.00548		0.0107		

- Personal:

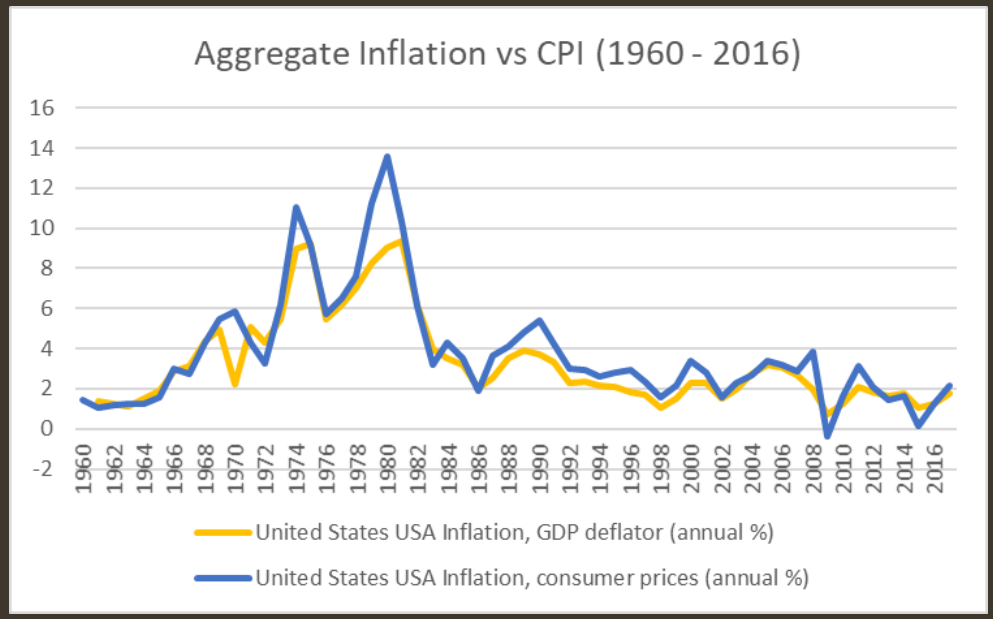
range	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
post		9	0.00131	0.0266	0.00886	-0.0410	0.0504
pre		23	0.0131	0.0177	0.00370	-0.0146	0.0496
Diff (1-2)	Pooled		-0.0118	0.0205	0.00805		
Diff (1-2)	Satterthwaite		-0.0118		0.00960		

```
proc ttest data=household;
class range;
var growth;
title 't-test of median household income growth: pre and post recession';
run;

proc ttest data=personal;
class range;
var growth;
title 't-test of median personal income growth: pre and post recession';
run;
```

Inflation

- Aggregate Inflation has averaged 3.32% from 1960 – 2017, and the CPI has averaged 3.76%.
- This means that prices have doubled roughly every ~20-25 years. Median Home Price has outpaced Inflation over the last 20-25 years.
- If median income growth would have matched the inflation rate since 1990, the Median Household income would be 84,629 and the Median Personal Income would be 42,355.



Inflation (cont.)

- Aggregate Inflation:

range	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
post		9	0.0152	0.00489	0.00163	0.00757	0.0209
pre		61	0.0343	0.0233	0.00298	-0.00147	0.0946
Diff (1-2)	Pooled		-0.0191	0.0220	0.00784		
Diff (1-2)	Satterthwaite		-0.0191		0.00340		

CPI:

range	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
post		9	0.0146	0.0104	0.00348	-0.00320	0.0314
pre		61	0.0382	0.0291	0.00373	-0.00981	0.1350
Diff (1-2)	Pooled		-0.0236	0.0276	0.00984		
Diff (1-2)	Satterthwaite		-0.0236		0.00510		

```
proc ttest data=inflation;
class range;
var agg_growth;
title 't-test of aggregate inflation: pre and post recession';
run;

proc ttest data=cpi;
class range;
var cpi_growth;
title 't-test of consumer price index: pre and post recession';
run;

proc ttest;
paired agg_growth*cpi_growth;
title 't-test (paired) of aggregate inflation vs cpi from 1947-2007';
run;
```

Paired:

N	Mean	Std Dev	Std Err	Minimum	Maximum
70	0.00340	0.00958	0.00115	-0.0194	0.0446

DF	t Value	Pr > |t|
69	2.97	0.0041

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.00340	0.00111	0.00568	0.00958	0.00821	0.0115

Pearson Correlation (1984-2017)

6 Variables:	h_growth	p_growth	home_growth	rent_growth	inflation_growth	cpi_growth

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
h_growth	32	0.00578	0.02143	0.00803	-0.03564	0.05148
p_growth	32	0.00978	0.02084	0.01088	-0.04104	0.05035
home_growth	32	0.04366	0.04437	0.03977	-0.06287	0.13773
rent_growth	32	0.03297	0.01105	0.03189	0.00231	0.06125
inflation_growth	32	0.02197	0.00810	0.02095	0.00757	0.03927
cpi_growth	32	0.02657	0.01219	0.02811	-0.00320	0.05419

```
proc corr data=all
        pearson spearman kendall hoeffding
        plots = matrix(histogram);
        var h_growth p_growth home_growth rent_growth
inflation_growth cpi_growth;
        title 'Proc Corr of all growth rates';
run;
```

Pearson Correlation Coefficients, N = 32
Prob > |r| under H0: Rho=0

	h_growth	p_growth	home_growth	rent_growth	inflation_growth	cpi_growth
h_growth	1.00000	0.82412 <.0001	0.35979 0.0431	0.26553 0.1419	-0.19342 0.2888	-0.32545 0.0691
p_growth	0.82412 <.0001	1.00000	0.39815 0.0240	0.24508 0.1764	-0.04169 0.8208	-0.20129 0.2693
home_growth	0.35979 0.0431	0.39815 0.0240	1.00000	0.17817 0.3293	0.17745 0.3312	0.04295 0.8155
rent_growth	0.26553 0.1419	0.24508 0.1764	0.17817 0.3293	1.00000	0.38353 0.0302	0.27241 0.1315
inflation_growth	-0.19342 0.2888	-0.04169 0.8208	0.17745 0.3312	0.38353 0.0302	1.00000	0.88453 <.0001
cpi_growth	-0.32545 0.0691	-0.20129 0.2693	0.04295 0.8155	0.27241 0.1315	0.88453 <.0001	1.00000

What does this mean for you?

- Currently the median monthly income is as follows:
  - Household: $5025 monthly
  - Personal: $2591 monthly
- As of 2018 the median national rate is $1440, and the median home value is $315,600.
- Average 30 year mortgage rate is currently 5.04%, and the 15 year rate is 4.38%.
  - 30 year monthly payment: $1,702
  - 15 year monthly payment: $2,395