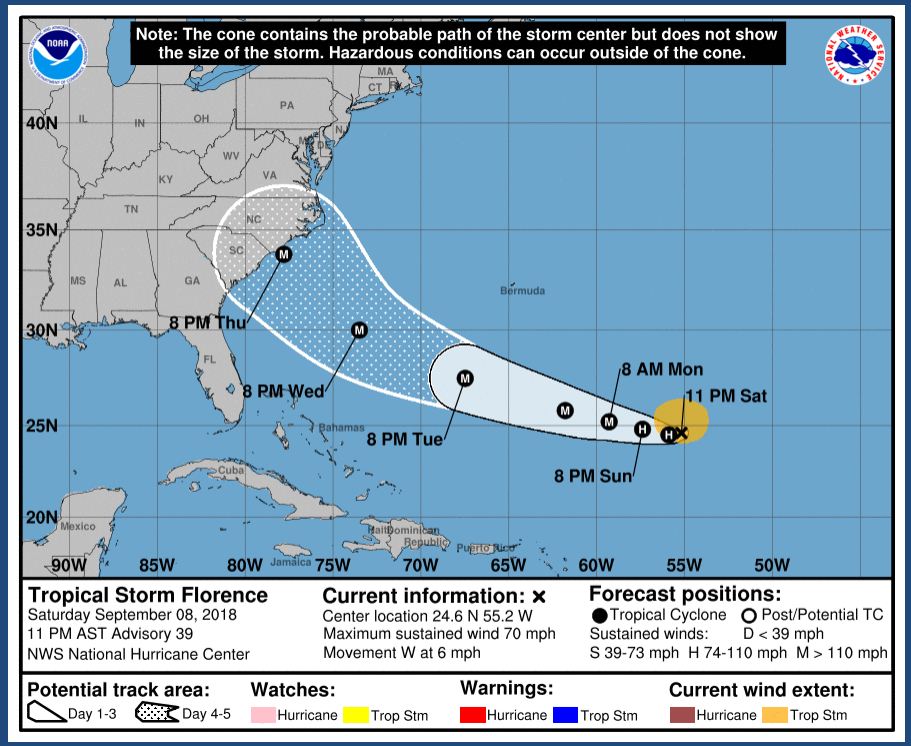
BEA Regional Advisory Committee
October 18, 2018

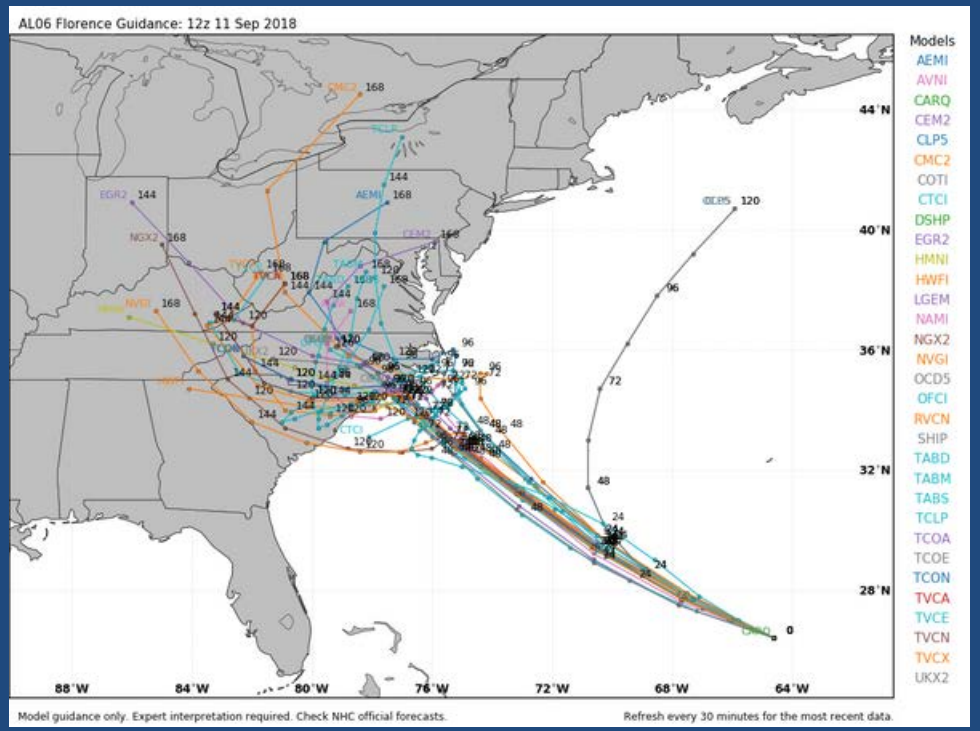
Russell S. Sobel, Ph.D.

THE CITADEL
BAKER SCHOOL OF BUSINESS

Assessing Prior Accuracy:

1. The science of forecasting improves by subjecting past predictions to the test of their after-the-fact accuracy.
2. Using the average of multiple independent forecasts does the best (I do this individually & we do as a group)





7-day advance forecast!

Using a type of AVERAGING is best

Russell S. Sobel, Ph.D.

Assessing Prior Accuracy:

In 2015 the BEA began providing us with the data to begin assessing our own forecasts (and averaging methods) so we may improve.

South Carolina Board of Economic Advisors
Survey Results of Regional Advisory Committee
Summary of Economic Forecast Assumptions

Most Recent	Current 1/ Forecast Rates FY2016-17	Regional Advisory Committee Forecast Rates Forecast for FY2016-17					Simple Average	Olympic Scoring	MEMO BEA
		Brown	Hefner	Kaglic	Sobel	von Nessen			
4.2%	4.90%	4.50%	4.30%	4.32%	4.04%	4.00%	4.23%	4.22%	4.75%

I begin with a fourth year assessment of this prior to turning to my forecasts.

Which Averaging Methodology?

- We have 5 variables to forecast and have had 5 forecasters in the past
- “Simple” average is the normal average (mean) using the data from all forecasters for each variable
- “Olympic” averaging (scoring) drops both the highest and lowest forecasts for each variable, and then averages the remaining scores

Which Averaging Methodology?

Question 1: Olympic vs. Simple Average Methodology for Combining Forecasts

My Prior Conclusions: Olympic came closer in three of the five in both 2015 and 2016, tied in 2017

= Closest to Actual

FY2017-18	Simple Average	Olympic Scoring	Actual	Winner
Personal Income	4.05%	4.08%	4.00%	Simple
Employment	1.87%	1.82%	1.50%	Olympic
Inflation	1.95%	1.90%	2.30%	Simple
Sales Tax	3.43%	3.45%	4.80%	Olympic
Inc. Tax	3.70%	3.90%	7.10%	Olympic

October 2018 Update: Olympic best in three of five

Implication: Olympic still slightly better including all years

Individual Accuracy vs. Averages

Question 2: How Are We Doing Individually & Wisdom of Crowds Logic

My Prior Conclusions: "(1) I tended to underestimate employment, (2) no one person dominates forecasts, showing value of multiple forecasters; (3) the Olympic averages have done better than any one person.

Variable	*Closest Forecast (Oct. 2015)*	*Closest Forecast (Oct. 2016)*	*Closest Forecast (Oct. 2017)*	*Closest Forecast (Oct. 2018)*
Personal Income	Sobel	von Nessen	Sobel/von Nessen (tie)	Hefner
Employment	Witte (Hefner)	Hefner	Kaglic	Kaglic
Inflation	Witte (Hefner)	Kaglic	Hefner / Sobel (tie)	Sobel
Sales Tax	Sobel	Brown	Sobel	Kaglic
Income Tax	Sobel	Hefner	Hefner	Hefner

= Closest to Actual

FY2017-18	Brown	Hefner	Kaglic	Sobel	von Nessen	Actual
Personal Income	4.7%	4.0%	3.8%	4.5%	3.3%	4.0%
Employment	2.3%	1.8%	1.6%	1.8%	1.9%	1.5%
Inflation	1.9%	2.0%	1.8%	2.3%	1.8%	2.3%
Sales Tax	3.7%	3.0%	3.8%	3.2%	N/A	4.8%
Inc. Tax	3.9%	4.0%	N/A	3.2%	N/A	7.1%

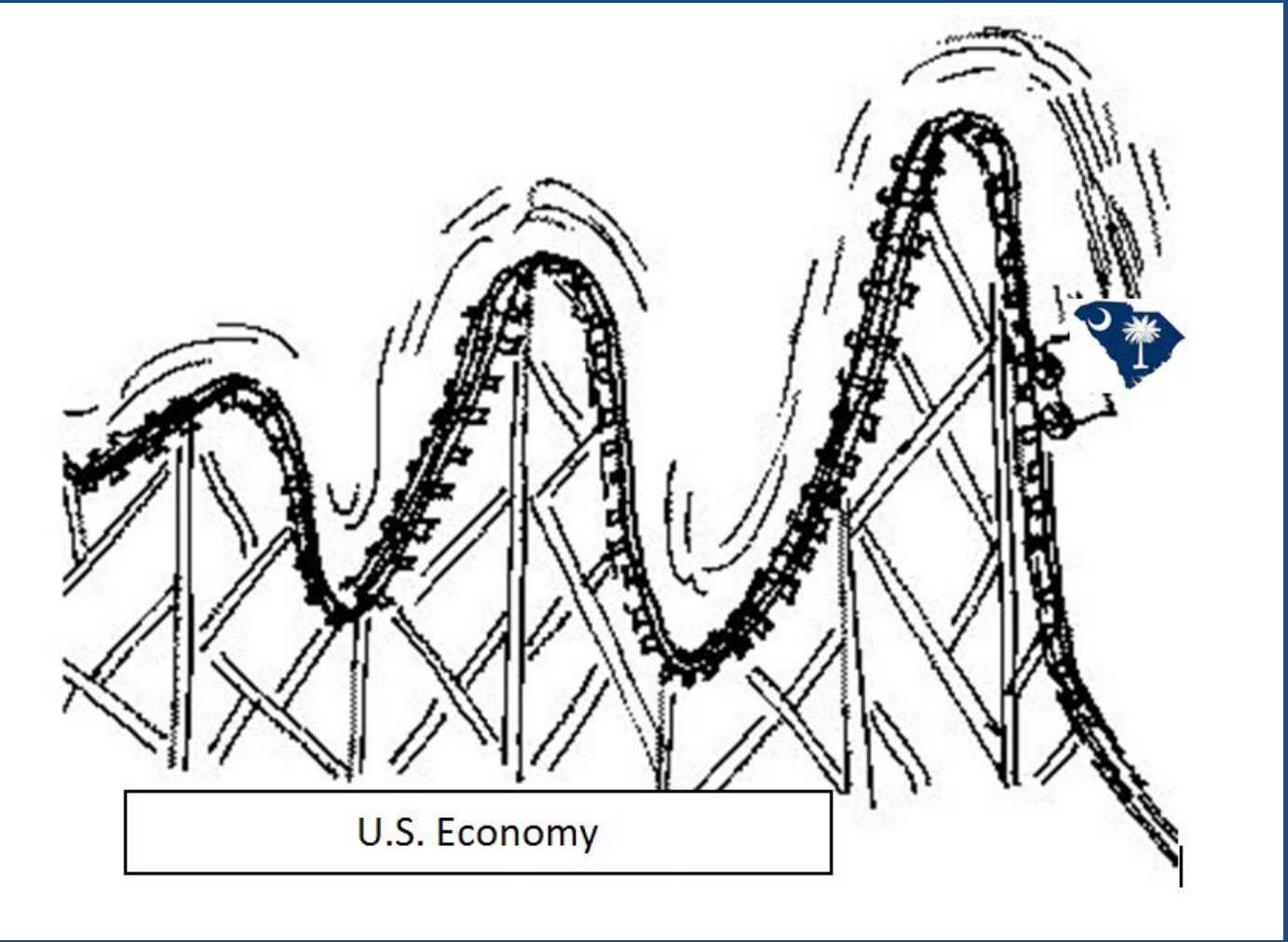
W-L-T vs Olympic	
Brown	1-2-2
Hefner	4-1-0
Kaglic	2-2-0
Sobel	2-3-0
von Nessen	0-3-0

October 2018 Update: My employment forecast would have been more accurate without my correction factor (would have been 1.4%), but my adjustment was closer to the group, so sticking with it one more year. Olympic average is still generally better than any one of us overall (except Hefner this year).

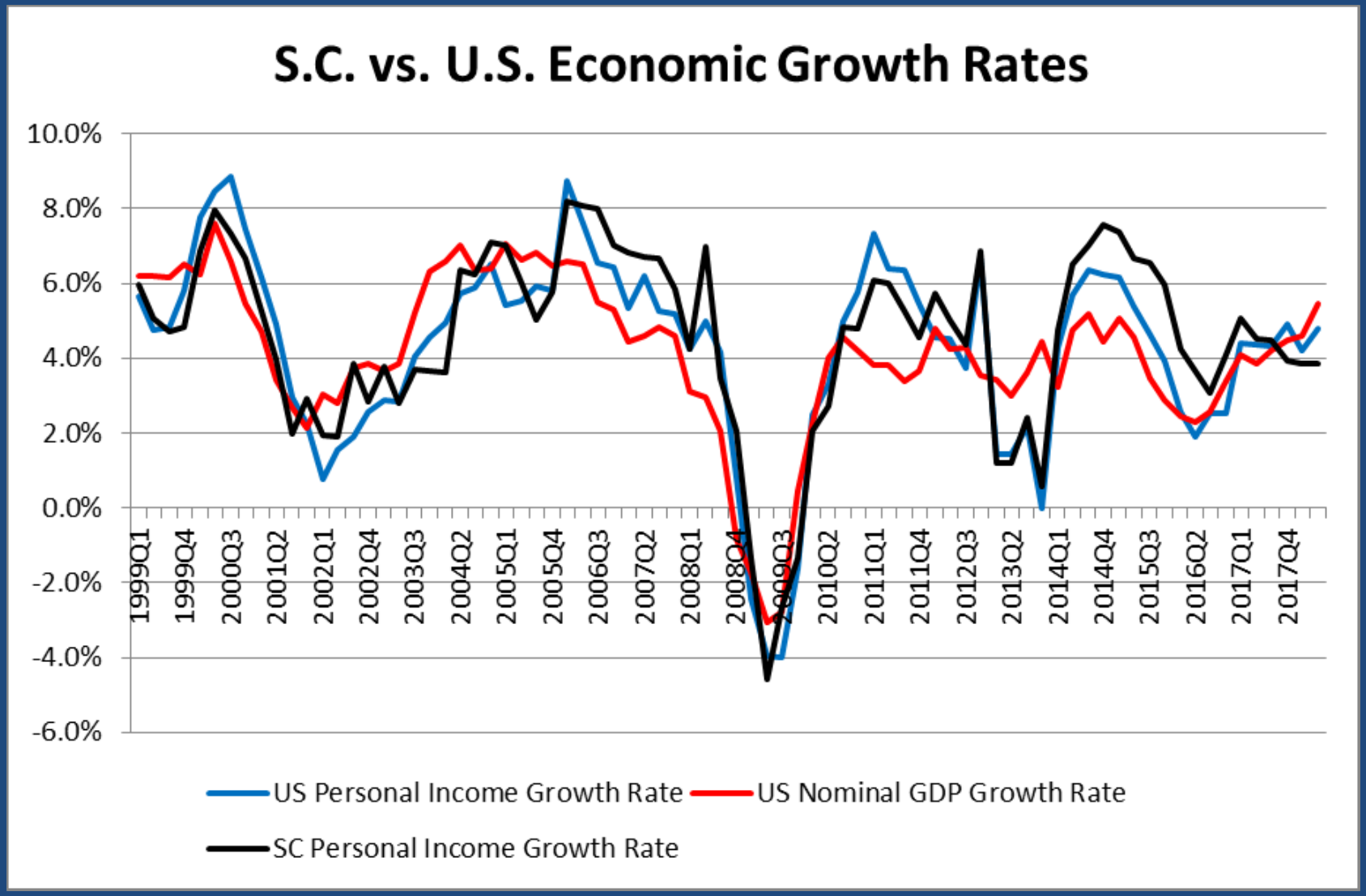
- On to my forecasts for this year and the methodology……

- Worth explicitly noting that our job is to forecast NOMINAL income and revenue (not "inflation adjusted" REAL values as in many other forecasts)

S.C. Economy is Closely Tied to the U.S. National Economy:



S.C. Personal Income vs U.S. Economy:



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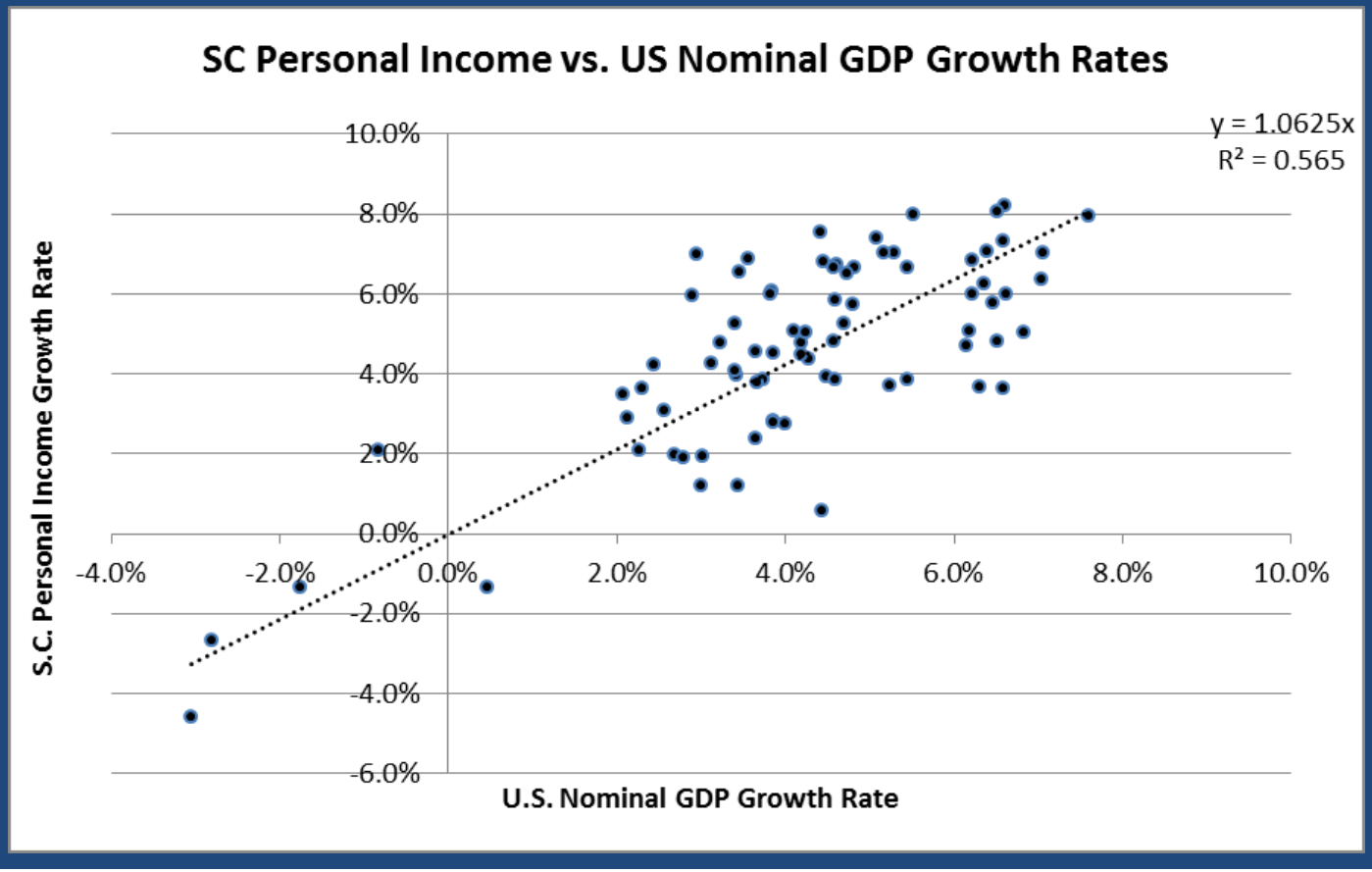


The elasticity of S.C. Personal Income with Respect to U.S. Nominal GDP over the long term is not significantly different from 1.0 using quarterly data (converted to annual changes vs. 4 quarters ago), from 1992 Q1 to present. I therefore assume that:

S.C. Personal Income Growth Rate ≈ U.S. Nominal GDP Growth Rate

Summary of Major Economic Forecasts:

I rely on three independent major national forecasts as the basis for my state-level forecasts:

1. IMF World Economic Outlook (July 2018 Update and April 2018 original)
2. Federal Reserve Bank of Philadelphia's Livingston Survey (June 2018)
3. Survey of Professional Forecasters (Third Quarter 2018 released August 2018)

I will skip quickly through the detail slides, but have them in case there are questions (in handout).

Summary of Major Economic Forecasts:

1. IMF World Economic Outlook (July 2018 Update and April 2018 original)[1]

	World Output Growth	*U.S. Inflation*	*U.S. Nominal GDP*
2018:	3.9%	2.4%	5.3%
2019:	3.9%	2.3%	5.0%
Long Term (through 2023):		1.7%	3.1%

Averaging these two gives 2.35% for **FY2018-19**

Long term for **FY2019-20** average of these two is 2.0%

Averaging these two gives 5.15% for **FY2018-19**, and averaging lower two gives 4.05% for **FY2019-2020**.

Summary of Major Economic Forecasts:

2. Federal Reserve Bank of Philadelphia's Livingston Survey (June 2018)[2]

U.S. Nominal GDP Growth Rate

2018Q2 to 2018Q4:	5.2%
2018Q4 to 2019Q2:	5.0%
Annual 2017 to 2018:	4.9%
Annual 2018 to 2019:	5.1%
Long Term (Next 10 Years):	4.5%

2018Q3 to 2019Q2 is **FY2018-2019**, the avg. of these two is 5.1%

FY2019-2020, avg. 4.8%

CPI Inflation Rate

June 2018 to Dec 2018: 2.2%
Dec 2018 to June 2019: 2.2%

June 2018 to June 2019 is roughly **FY2018-2019**, the average of these two is 2.2%

Annual 2017 to 2018: 2.6%
Annual 2018 to 2019: 2.3%
Long Term (Next 10 Years): 2.3%

Looking out into **FY2019-2020**, inflation average 2.3%

Summary of Major Economic Forecasts:

3. Survey of Professional Forecasters (Third Quarter 2018 released August 10, 2018)[3]

	Nominal GDP%	*Employment Growth%*
2018:Q3	5.1%	1.6%
2018:Q4	5.3%	1.4%
2019:Q1	5.1%	1.3%
2019:Q2	4.6%	1.3%
2019:Q3	4.7%	1.2%

2018Q3 to 2019Q2 is **FY2018-2019**, the average of these four is 5.025%, **FY2019-20** begins 4.7% for 2019Q3

2018Q3 to 2019Q2 is **FY2018-2019**, the average of these four is 1.4%, **FY2019-20** begins 1.2% for US. [My new adjustment is: SC=1.3*US] or 1.82% and 1.56%

Probability of Negative Real GDP Growth by Quarter:

2018:Q3	6.6%
2018:Q4	10.5%
2019:Q1	13.2%
2019:Q2	16.4%
2019:Q3	19.6%

The chance of a negative quarter of GDP growth during FY2018-19 (2018Q3 to 2019Q2) averages 11.675%, and the probability grows as we move toward first quarter of FY2019-20 – **SIMILAR TO A YEAR AGO**

Continued…..

Summary of Major Economic Forecasts:

3. Survey of Professional Forecasters (Third Quarter 2018 released August 10, 2018)[3]

U.S. Inflation Rate (CPI):

Quarterly Data

2018:Q3	2.3%
2018:Q4	2.3%
2019:Q1	2.4%
2019:Q2	2.1%
2019:Q3	2.3%

2018Q3 to 2019Q2 is **FY2018-2019**, the average of these four is 2.275%

Q4/Q4 Annual Averages

2018	2.4%
2019	2.3%
2020	2.3%

2019Q3 into 2020 is **FY2019-2020**, the average of these two is 2.3%

Summary of Forecast Data:

Economic Estimates:

	FY 2018-2019			FY 2019-2020		
	SC Personal Income Growth (=US Nominal GDP Growth)	CPI Inflation Rate	SC Employment Growth	SC Personal Income Growth (=US Nominal GDP Growth)	CPI Inflation Rate	SC Employment Growth
International Monetary Fund	5.15%	2.35%		4.05%	2.0%	
Livingston Survey	5.1%	2.2%		4.8%	2.3%	
Survey of Professional Forecasters	5.025%	2.275%	1.82%	4.7%	2.3%	1.56%
Average	5.09%	2.28%	1.82%	4.52%	2.20%	1.56%
Median	5.10%	2.28%	1.82%	4.70%	2.30%	1.56%

****I use the Medians as the basis for my overall forecast****

Revenue Estimates:

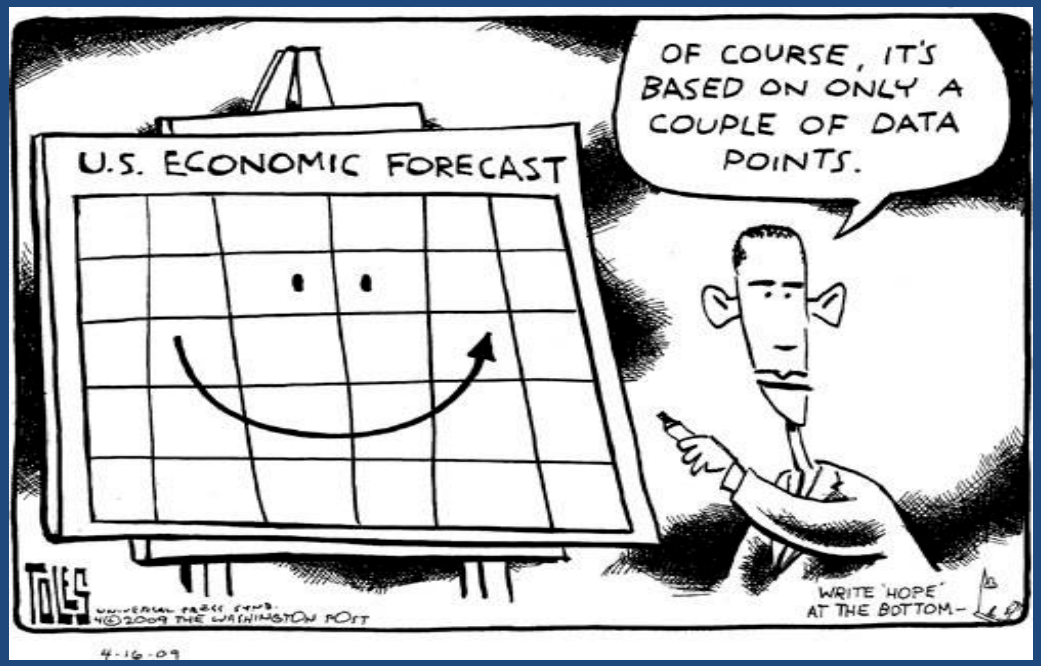
	FY2018-2019	FY2019-2020
Sales Tax Revenue[4]	3.8%	4.4%
Individual Income Tax Revenue[5]	3.4%	3.7%
Using estimated elasticities per Sobel & Holcombe (1996) method.		

Forecast Table:

What is your forecast growth rate for the following variables:

Variable	Actual FY2017-18	Most Recent 2/	Current 1/ Forecast Rates FY2018-19	Forecast FY2018-19	Forecast FY2019-20
S.C. Personal Income	4.00%	3.89%	4.25%	5.1%	4.7%
S.C. Employment	1.5%	1.8%	1.8%	1.82%	1.56%
Inflation Rate (CPI-U)	2.3%	2.7%	2.0%	2.28%	2.30%
Sales Tax (Y-T-D)	4.8%	4.4%	3.5%	3.8%	4.4%
Individual Income Tax (Y-T-D)	7.1%	8.0%	2.8%	3.4%	3.7%

Caveats & Notes:



1. The above forecasts do not include the impact of September 2018 Hurricane Florence, which may result in a short run negative (or unclear?) impact on income growth.
2. The impact of the increase in U.S. tariffs and the counter response has the potential to significantly lower overall U.S. (and S.C.) growth ….
3. Second year of a new adjustment factor for my employment forecasts which have been systematically low…. So we can discount my employment estimates if we want until the new method is proven more accurate.
4. Ask that the BEA continue to provide us with the numbers necessary to continue to assess the accuracy of our methodologies.

Forecasts vs. Actual – Year 4 of the Analysis

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[1] See https://www.imf.org/en/Publications/WEO/Issues/2018/07/02/world-economic-outlook-update-july-2018 and https://www.imf.org/en/Publications/WEO/Issues/2018/03/20/world-economic-outlook-april-2018. Inflation rates are averages of forecasted GDP deflator and CPI inflation rates; nominal GDP is sum of real GDP and inflation.

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[4] STR = -0.0059 + 0.8566*PI (employing decimal equivalents of percentages).

[5] IITR = -0.0451 + 1.7523*PI (employing decimal equivalents of percentages).

South Carolina Board of Economic Advisors
Regional Advisory Committee
Economic Forecast Assumptions

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Individual Income Tax (Y-T-D)	7.1%	8.0%	2.8%	3.4%	3.7%

Notes: 1/ Current forecast rates as of April 10, 2018 (the last official BEA forecast estimate).
2/ Growth rate as of the most recent time period, e.g. month, quarter.

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Washington, D.C.
U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C.
S.C. Board of Economic Advisors, Columbia, S.C.

BEA/RWM/010/01/18

Issues to Consider:

What are the significant/specific factors/sectors affecting personal income?
What are the significant/specific factors/sectors affecting employment?
What are the key risks you see over the next 20 months?
Are there any other key points that should be considered?