

Investigating the Feasibility of Forecasting Underemployment in Alabama

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Executive Summary

- This report presents the results of the first attempt at forecasting underemployment rates in the state of Alabama, its Workforce Investment advisory areas (WIAAs), and counties for 2013 through 2018 using past underemployment survey results. Combined time trend and autoregressive models are used.
- Estimating underemployment rates is crucial for determining the available labor pool in the state, WIAAs, and counties. Knowing the available labor pool facilitates economic development by demonstrating the availability of workers for both new and existing industry.
- The statewide underemployment rate is forecasted to slightly increase to 23.9 percent for 2013 from 23.8 percent in 2012, but maintain an overall downward trend through 2018. An expected rise in the number of employed workers in 2013 means that the number of underemployed workers will also go up if the 2013 underemployment rate forecast holds.
- At the regional level, the 2013 underemployment rate is projected to range from 21.8 percent for WIAA Region 3 to 26.6 percent for WIAA Region 6. Among counties, Macon is expected to have the highest rate of underemployment with 32.3 percent; Coffee will have the lowest rate at 15.7 percent. Thirty-two counties are projected to have underemployment rates above the state's 23.9 percent.
- Results from past surveys have shown that underemployed workers are part of an available labor pool that is willing to commute farther and longer for better jobs. The underemployed are more active in the labor market than other workers and are a resource for existing and new employers.
- It is determined that the results suffer from insufficient data used to generate the forecast estimates. Alabama must continue to conduct annual underemployment surveys for at least another five years before reliable forecasts of underemployment rates can be made, which will then reduce the frequency and also the cost of producing the annual workforce reports that are critical to economic development. Due to the insufficiency of the data used, the results presented in this report are imperfect and must be used solely for the purpose of validating the model used or for building a suitable model for estimating underemployment rates by comparing with actual survey results over the next few years. Any other use of the forecasts would be misleading and is strongly discouraged.

Investigating the Feasibility of Forecasting Underemployment Rates in Alabama

Overview

This report presents underemployment rate forecasts for the State of Alabama, its workforce investment advisory areas (WIAAs), and counties for 2013 through 2018. The purpose is to investigate whether survey results from the past few years contain sufficient data to enable estimation or forecasting of underemployment rates as these rates are crucial to economic development. They enable determination of available labor pools for the areas mentioned and help provide more comprehensive information about the available labor for both new and existing industry. However, underemployment surveys are expensive and so a principal reason for trying to estimate the rates is to produce the same comprehensive labor information at a lower cost.

For this report, underemployed persons are defined as workers who believe that their education and training, skills, or experience (i) are not fully utilized in their current jobs and (ii) qualify them for higher paying or more satisfying jobs for which they could leave their current positions. The forecasts were generated using results from past telephone surveys of both workers and nonworkers in the state. The surveys were designed specifically for estimating underemployment and associated demographic characteristics. Detailed results of the telephone surveys are presented in the *Underemployment in Alabama WIAAs* reports and *State of the Workforce Report I* through *State of the Workforce Report VII*.

It is important to note that lack of sufficient data for analysis in the state, regional, and county series impairs the reliability of the underemployment rate forecasts and the ability to experiment with different economic models that could potentially improve the quality of the forecasts. Just nine observations from seven surveys are used to forecast 2013 through 2018 underemployment rates, which are too few to obtain meaningful results. There is no official U.S. government statistics currently available on underemployed workers that can be used as an alternative or in combination with the current data to increase the degrees of freedom and the reliability of the results.

Another important point is that underemployment rate forecasts for the state and some of the workforce regions and counties may appear plausible due to lower variability in the state, workforce regions, and a few of the county series. For counties and regions with high underemployment variability, the results are evidently off the mark. This limitation can only be addressed through improving the number of observations to capture enough history in the series.

Rationale

Labor force data on counties or county groups are often limited to what is available from government sources. Existing data provide information on the employed and the unemployed. While valuable, such information may not be complete from the perspective of employers. New or expanding employers are interested in underemployment as well because incumbent workers are also potential employees. In fact, the kind of “quality” worker that many prospective employers want is generally or usually not unemployed.

Workers in occupations that underutilize their experience, training, and skills are underemployed. These workers might be receiving salaries below what they believe they can earn; they might also not be satisfied with their jobs. Underemployment occurs for various reasons including (i) productivity growth, (ii) spousal employment and income, and (iii) family constraints or personal preferences. Productivity growth creates underemployment as workers learn to do their jobs better and in shorter time. Spousal employment and income and extended family relationships or responsibilities may limit workers' ability to be in jobs that make full use of the value of their education, training, skills, and experience. Limited job opportunities and geographic immobility due to family constraints or personal preferences are other contributing factors. The various contributing factors combined with economic, social, and geographic characteristics make underemployment unique to areas.

Underemployment provides opportunities for selective job creation and economic growth. For example, a firm with needs for skills prevalent among the underemployed could locate in an area with underemployed workers, regardless of its unemployment rate. Low unemployment, suggesting limited labor availability, is not a hindrance to such a firm.

The underemployed present a significant pool of labor because they tend to respond to job opportunities that better match their skills, training, and experience. They also create opportunities for entry level workers as they leave lower-paying jobs and move into better-paying ones. Even if their previously held positions are lost or not filled (perhaps due to low unemployment), there is economic growth for the area in gaining higher-paying jobs.

Clearly, no labor profile is complete without an underemployment estimate. Other labor data can be combined with underemployment to construct a more comprehensive labor profile for each WIAA that will be valuable to community and regional leaders, educators, planners, policy makers, economic developers, and prospective employers.

The existing literature indicates that underemployment rates have been estimated for some states and communities.¹ For example, underemployment has been estimated for Kentucky, Nebraska, and certain areas in Alabama as part of workforce analysis studies (Bollinger et al. 2003; Bonnal et al. 2009; and Nebraska Underemployment Study 2002).² These approaches involve conducting extensive surveys in the target areas to measure underemployment. However, consistent data collection through surveys is an expensive venture that requires constant availability of research funds. To address this constraint an econometric model is needed to forecast or estimate the underemployment rates without carrying out a survey.

¹ An internet search using keywords such as *underemployment*, *workforce analysis*, *available labor*, and *labor supply* leads to numerous commissioned studies and reports on underemployment.

² Bollinger, C.R., P. Coomes, and M. Berger. 2003. *Measuring Underemployment at the County Level*. University of Kentucky Center for Poverty Research Discussion Paper Series #2003-08 (<http://www.ukcpr.org/Publications/DP2003-08.pdf>).

Bonnal, M., Lira, C., and Addy, S.N. 2009. *Underemployment and Local Employment Dynamics: New Evidence*. The Review of Regional Studies Vol. 39, No. 3, pp. 317-335

Nebraska Underemployment Study: A Comparative Analysis 1992-2000. 2002. Nebraska Workforce Development, Department of Labor, Labor Market Information Center (<http://www.NebraskaWorkforce.com>).

Methodology

The underemployment data used in this analysis were obtained from seven past underemployment surveys that were conducted in Alabama, the WIAAs, and all the counties in each WIAA from 2004 and 2012. The surveys were conducted by the Institute for Social Sciences Research of The University of Alabama as part of the State of the Workforce Reports for Alabama. In these surveys, employed workers were asked about underemployment including whether they were underemployed in their current primary job, and reasons for being underemployed among many other questions.

Two surveys were carried out over two-year spans and the results are allocated over the respective years accordingly. The 2005 survey began in Fall 2005 and ended in Spring 2006 with responses roughly split between the two calendar years so the underemployment rates for those two years are the same. A similar thing occurred with the 2007 survey as data collection continued through 2008 so the underemployment rate for these two years are also the same. This provided nine observations from seven surveys.

A combined deterministic time trend and autoregressive model was used to capture long-term behavior as well as short-term fluctuations. However, due to the short series, the autoregressive component had a limited effect for most of the series. The model could be expressed as follows:

$$x_{it} = \phi_{i0} + \phi_{i1}x_{it-1} + \dots + \phi_{ip}x_{it-p} + \delta_i t + \epsilon_{it}$$

where x_{it} are the state, regional, or county underemployment series, ϕ_i s are the autoregressive parameters, p is the autoregressive order, δ_i is the deterministic time trend, t is time, and ϵ_i s are the normally distributed errors with zero-mean and variance.

The SAS statistical software package was used and the results are presented in this report for all the counties, WIAAs, and the state. Underemployment rates are forecasted from 2013 through 2018. The historical underemployment rates from the surveys are presented together with the forecasted rates in Tables 1 and 2. Graphs showing the full forecast period are presented in Figure A1 and the Appendix. After validation, the results and the approach will enable estimation of future underemployment rates without having to conduct telephone surveys every year. However, utilization of the forecast results is subject to the following caveats.

Caveats

While the underemployment rate forecasts appear reliable at 95 percent confidence level for the state, most of the WIAAs, and some of the counties, the data series used to make the forecasts are severely limited. The nine observations in the data series are too few and critically reduce the degrees of freedom for the model. The low number of observations also limited the type of model used to forecast underemployment rates. Consequently, the validity of the estimates can be questioned and using them for policy analysis and advocacy could be misleading.

The majority of the county series are characterized by high degree of variability due to their small economies, greater workforce instability, and lower survey coverage compared to the regions. This makes underemployment less predictable in the counties and consequently the projections are expected to be less reliable.

Although the forecasts are an alternative to underemployment surveys, they have not been validated. The validation process will be conducted in 2014 using 2013 underemployment survey results and will continue through 2019 using future survey results. Hence, the underemployment rates forecasted should only be used for the purpose of validating the model or for building a more suitable model for estimating underemployment rates by comparing with actual survey results over the next few years. Any other use of the forecasts would be misleading and is strongly discouraged. For example, the forecasted rates should not be used for determining available labor pools or for policy discussions.

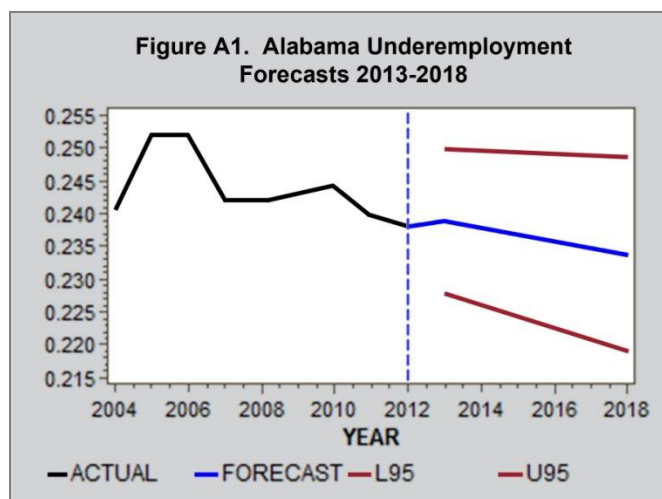
Statewide and WIAAs Underemployment Forecasts

Underemployment rates, both historical and forecasted for 2013 through 2018, are shown in Tables 1 and 2 and depicted in Figure A1 and Appendices I and II. Despite a declining trend, Alabama underemployment rates have been stable and range from 25.2 percent in 2005 and 2006 to 23.8 in 2012. The rate is expected to slightly rise to 23.9 percent in 2013. However, the statewide forecasts show that the downtrend will persist through 2018 taking the underemployment rate to 23.4 percent as shown in Table 1 and Figure A1. The slight increase in 2013 is likely to raise the number of underemployed workers as the number of employed workers is expected to go up. The short series to base the underemployment forecasts on made the time trend dominate in the model as is shown in the results tables and graphs, except for Covington and Pike counties. This affects the performance of the forecasting model as forecast errors are likely to be high. However, the forecasts are expected to be better for the state than for regions and counties due to less variability in the state data series.

Table 1. Alabama WIAAs Underemployment Rate Forecasts, 2013-2018 (Percent)

Area	Actual										Forecasts					
	2004	2005	2006	2007	2008	2009	2010	2011	2012		2013	2014	2015	2016	2017	2018
WIAA Region 1	19.4	22.3	22.3	20.1	20.1	20.5	22.1	21.6	22.8		22.2	22.4	22.6	22.8	22.9	23.1
WIAA Region 2	21.7	24.1	24.1	24.6	24.6	22.9	22.5	25.5	23.2		24.1	24.2	24.3	24.4	24.5	24.6
WIAA Region 3	26.2	26.4	26.4	23.0	23.0	23.9	22.9	21.8	24.0		21.8	21.4	20.9	20.4	19.9	19.5
WIAA Region 4	25.2	18.5	18.5	20.3	20.3	24.3	25.2	25.7	24.0		25.3	25.8	26.4	27.0	27.5	28.1
WIAA Region 5	23.6	24.8	24.8	27.9	27.9	25.6	24.2	22.6	23.9		24.3	24.1	24.0	23.8	23.7	23.5
WIAA Region 6	28.5	25.1	25.1	27.7	27.7	24.6	28.8	26.5	26.2		26.6	26.6	26.6	26.6	26.6	26.6
WIAA Region 7	26.8	25.6	25.6	22.4	22.4	27.5	23.7	23.2	25.5		23.8	23.6	23.4	23.3	23.1	22.9
WIAA Region 8	26.6	25.6	25.6	30.2	30.2	28.3	25.4	23.3	25.8		25.7	25.5	25.3	25.1	24.9	24.7
WIAA Region 9	22.8	24.9	24.9	25.1	25.1	23.8	24.7	26.6	22.6		24.7	24.7	24.8	24.8	24.8	24.9
WIAA Region 10	22.2	27.0	27.0	22.8	22.8	21.9	26.6	23.6	22.0		22.9	22.7	22.5	22.3	22.1	21.8
Jefferson County	22.5	28.6	28.6	19.8	19.8	25.2	26.1	28.3	25.8		26.0	26.2	26.4	26.6	26.9	27.1
Mobile County	24.6	29.3	29.3	29.7	29.7	27.3	23.9	29.9	23.9		26.3	26.1	25.9	25.6	25.4	25.2
Alabama	24.0	25.2	25.2	24.2	24.2	24.3	24.4	24.0	23.8		23.9	23.8	23.7	23.6	23.5	23.4

Note: A few WIAA definitions in terms of county groupings changed over the 2004-2012 period. There are too few data observations to allow for reliable and consistent estimates. The forecasts are likely to be better for the state but poor at the county levels because there is less variation in the state and regional data series.



At the regional level, underemployment is projected to range from 21.8 percent for WIAA Region 3 to 26.6 percent for WIAA Region 6 in 2013. Five workforce regions—WIAA Regions 2, 4, 5, 6 and 9—are expected to have higher underemployment rates than the state. Jefferson and Mobile counties are also expected to have higher underemployment rates than Alabama. By 2018 four regions—WIAA Regions 2, 4, 8, and 9—will have higher underemployment than Alabama. Among the counties, Macon is expected to have the highest rate of underemployment in 2013 with 32.3 percent and Coffee will have the lowest rate at 15.7 percent (Table 2). Thirty-two counties are projected to have underemployment rates above Alabama’s 23.9 percent. This is comparable to 33 counties in 2012 that had higher underemployment than the state. However, larger forecasting errors are visible in the county estimates and graphs. For instance, some counties like Lauderdale, Randolph, Talladega, and Macon have negative lower bounds at 95 percent confidence level.

Workforce Region 1 comprises of six counties—Colbert, Franklin, Lauderdale, Lawrence, Marion, and Winston. Regional underemployment is expected to slightly decline to 22.2 percent in 2013 from the 22.8 percent observed in 2012 while maintaining an overall upward trend through 2018. Within the region, county underemployment rates will range from 16.7 percent in Colbert County to 28.3 percent in Franklin in 2013. Only Franklin County is expected to have a higher underemployment rate than the state. Graphs for the six-year forecasts (2013-2018) for the region and the counties are presented in Appendices I and II. As in the state underemployment forecasts, the data series are too short for quality forecast estimates. For instance, the Franklin County rate forecasts (Appendix II) indicate that underemployment will rise to almost 40 percent in 2018. This shows the inability of the model to forecast correctly given the few data observations.

Region 2 comprises of Cullman, DeKalb, Jackson, Limestone, Madison, Marshall, and Morgan counties. Regional underemployment is expected to rise to 24.1 percent in 2013 from 23.2 percent in 2012. DeKalb, Limestone, and Morgan counties are expected to have higher underemployment rates than the region and the state. Marshall County will have the lowest underemployment rate at 18.1 percent and DeKalb will have the highest with 25.7 percent. The regional projections picture through 2018 indicates a somewhat stable underemployment rate rising to 24.6 percent. In 2018 only DeKalb and Morgan counties will have higher rates than the region.

Table 2. County Underemployment Rate Forecasts, 2013-2018

County	Actual									Forecasts					
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Autauga	23.3	32.3	32.3	26.7	26.7	21.1	18.8	24.6	20.3	19.5	18.3	17.2	16.1	15.0	13.8
Baldwin	14.7	23.5	23.5	16.7	16.7	21.3	29.1	30.3	18.0	25.6	26.5	27.3	28.1	28.9	29.7
Barbour	23.5	25.8	25.8	23.8	23.8	26.8	27.3	34.6	21.4	27.9	28.3	28.6	29.0	29.4	29.8
Bibb	23.5	32.5	32.5	23.0	23.0	22.0	25.5	22.6	19.2	19.7	18.7	17.7	16.6	15.6	14.6
Blount	20.3	20.6	20.6	20.3	20.3	22.2	21.8	13.6	16.4	16.9	16.3	15.8	15.3	14.7	14.2
Bullock	25.9	27.3	27.3	36.1	36.1	29.4	26.7	15.7	26.9	24.7	24.1	23.4	22.8	22.1	21.5
Butler	32.8	17.0	17.0	25.6	25.6	20.0	20.0	23.1	33.3	25.6	25.9	26.2	26.6	26.9	27.3
Calhoun	27.4	20.3	20.3	27.9	27.9	31.3	27.3	19.7	23.9	25.2	25.3	25.3	25.3	25.3	25.4
Chambers	28.7	24.1	24.1	36.1	36.1	23.2	29.3	23.7	25.0	26.3	26.0	25.7	25.4	25.1	24.8
Cherokee	15.5	27.1	27.1	23.0	23.0	28.1	25.9	21.8	28.1	27.5	28.1	28.7	29.3	29.9	30.6
Chilton	24.7	15.0	15.0	22.0	22.0	19.6	17.0	27.3	16.1	20.2	20.2	20.3	20.4	20.4	20.5
Choctaw	25.0	27.3	27.3	29.8	29.8	21.6	21.2	30.0	25.5	25.5	25.3	25.2	25.0	24.8	24.6
Clarke	22.2	30.5	30.5	25.0	25.0	16.4	27.3	14.6	17.5	16.4	15.1	13.7	12.3	11.0	9.6
Clay	24.6	19.0	19.0	23.1	23.1	16.0	31.4	20.4	27.5	25.4	26.0	26.5	27.1	27.6	28.2
Cleburne	21.7	27.1	27.1	29.8	29.8	19.3	18.5	31.3	14.8	20.8	20.1	19.4	18.7	18.0	17.2
Coffee	18.2	38.6	38.6	15.3	15.3	25.5	15.5	24.1	16.1	15.7	14.2	12.8	11.3	9.8	8.4
Colbert	12.9	26.9	26.9	25.8	25.8	27.6	17.9	13.0	14.0	16.7	15.8	14.9	14.1	13.2	12.3
Conecuh	31.7	21.2	21.2	30.9	30.9	19.6	34.0	13.0	22.6	21.1	20.3	19.5	18.7	18.0	17.2
Coosa	28.8	25.5	25.5	31.0	31.0	25.9	17.0	18.0	23.6	19.7	18.6	17.5	16.5	15.4	14.3
Covington	20.3	28.6	28.6	14.1	14.1	29.8	36.8	25.5	17.0	23.8	30.6	25.6	20.7	24.8	28.8
Crenshaw	26.1	29.8	29.8	25.8	25.8	21.2	14.3	24.0	20.4	17.8	16.5	15.3	14.0	12.7	11.5
Cullman	27.1	19.1	19.1	21.8	21.8	12.1	28.8	29.2	20.6	23.4	23.6	23.8	24.1	24.3	24.5
Dale	23.4	20.7	20.7	20.0	20.0	19.6	32.1	21.1	25.8	25.3	25.9	26.5	27.0	27.6	28.1
Dallas	30.8	25.9	25.9	21.3	21.3	25.0	26.2	28.6	29.8	26.8	26.9	27.1	27.2	27.4	27.5
DeKalb	18.0	26.7	26.7	23.6	23.6	17.9	27.6	25.0	25.9	25.7	26.1	26.5	26.9	27.2	27.6
Elmore	24.7	18.6	18.6	16.1	16.1	24.1	18.6	15.5	22.8	18.7	18.6	18.5	18.3	18.2	18.0
Escambia	22.6	22.8	22.8	16.1	16.1	29.8	27.6	19.6	23.2	23.7	23.9	24.2	24.5	24.7	25.0
Etowah	28.9	21.4	21.4	34.2	34.2	27.7	29.3	22.7	31.5	29.9	30.3	30.7	31.1	31.5	31.9
Fayette	6.3	23.3	23.3	24.1	24.1	25.9	26.9	22.6	16.4	25.4	26.2	27.0	27.8	28.6	29.4
Franklin	19.1	14.3	14.3	16.1	16.1	18.2	21.8	21.8	35.1	28.3	30.0	31.7	33.5	35.2	36.9
Geneva	19.4	29.1	29.1	30.8	30.8	25.0	24.0	14.0	17.3	18.6	17.4	16.3	15.1	13.9	12.8
Greene	29.1	31.5	31.5	28.8	28.8	20.7	29.6	19.2	27.5	22.8	21.9	21.0	20.0	19.1	18.2
Hale	30.0	19.6	19.6	16.4	16.4	19.6	16.0	19.2	23.1	17.3	16.7	16.2	15.6	15.1	14.5
Henry	28.1	24.6	24.6	35.0	35.0	13.7	30.0	21.8	23.6	23.2	22.6	22.0	21.4	20.8	20.2
Houston	19.2	28.6	28.6	15.3	15.3	21.5	29.9	20.8	26.9	24.2	24.5	24.8	25.0	25.3	25.6
Jackson	17.5	29.8	29.8	25.4	25.4	23.2	19.0	19.6	21.7	20.4	19.7	19.1	18.5	17.8	17.2
Jefferson	22.5	28.6	28.6	19.8	19.8	25.2	26.1	28.3	25.8	26.0	26.2	26.4	26.6	26.9	27.1
Lamar	37.7	26.8	26.8	17.9	17.9	25.9	24.0	30.2	28.0	24.0	23.5	23.1	22.6	22.2	21.8
Lauderdale	19.0	23.2	23.2	20.7	20.7	17.9	17.9	14.7	25.8	19.4	19.2	19.0	18.8	18.6	18.4
Lawrence	26.6	24.1	24.1	24.6	24.6	19.6	17.9	24.1	20.7	19.5	18.8	18.1	17.5	16.8	16.1
Lee	21.6	23.8	23.8	27.8	27.8	29.0	22.6	20.9	22.6	23.9	23.8	23.7	23.6	23.5	23.4

Note: There are too few data observations to allow for reliable and consistent estimates. The forecasts are likely to be better for the state but poor at the county levels because there is less white noise in the state and regional data series.

Table 2. County Underemployment Rate Forecasts, 2013-2018 (continued)

County	Actual*									Forecasts					
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Limestone	27.3	24.1	24.1	24.1	24.1	17.9	18.2	21.7	34.5	24.3	24.4	24.4	24.5	24.5	24.6
Lowndes	23.2	22.6	22.6	15.4	15.4	30.2	24.1	22.6	25.5	24.6	25.1	25.5	26.0	26.4	26.9
Macon	32.8	26.4	26.4	34.6	34.6	38.0	24.1	29.1	34.6	32.3	32.6	32.8	33.1	33.3	33.5
Madison	27.1	29.5	29.5	26.3	26.3	24.8	22.3	25.5	24.2	22.9	22.2	21.6	20.9	20.3	19.6
Marengo	22.6	19.0	19.0	28.8	28.8	28.8	27.1	25.9	26.8	29.7	30.6	31.4	32.3	33.2	34.1
Marion	28.1	20.3	20.3	24.2	24.2	21.8	24.6	20.0	27.1	23.5	23.5	23.6	23.6	23.6	23.6
Marshall	18.7	23.6	23.6	21.7	21.7	23.0	20.3	19.6	15.0	18.1	17.6	17.1	16.5	16.0	15.5
Mobile	24.6	29.3	29.3	29.7	29.7	27.3	23.9	29.9	23.9	26.3	26.1	25.9	25.6	25.4	25.2
Monroe	20.0	24.5	24.5	20.8	20.8	17.7	22.6	32.1	25.5	26.3	26.9	27.6	28.2	28.8	29.4
Montgomery	28.4	30.4	30.4	22.0	22.0	31.5	28.6	24.5	26.8	25.6	25.3	25.0	24.7	24.4	24.1
Morgan	23.8	20.3	20.3	23.5	23.5	30.7	26.7	24.1	19.3	24.7	24.9	25.1	25.3	25.6	25.8
Perry	26.4	35.2	35.2	32.2	32.2	15.4	30.0	16.0	24.1	19.6	18.0	16.4	14.9	13.3	11.7
Pickens	23.7	19.2	19.2	26.9	26.9	20.0	20.8	25.0	21.1	22.8	22.8	22.9	22.9	23.0	23.0
Pike	25.4	20.3	20.3	30.9	30.9	12.7	17.0	27.3	29.2	22.5	21.4	26.7	27.9	24.3	23.7
Randolph	22.9	35.2	35.2	26.5	26.5	32.2	29.6	22.0	19.2	22.7	21.7	20.7	19.7	18.7	17.8
Russell	31.3	15.8	15.8	30.2	30.2	22.5	25.4	27.9	23.7	26.2	26.5	26.8	27.1	27.4	27.7
St. Clair	20.0	19.8	19.8	22.1	22.1	19.6	28.1	22.0	19.1	22.8	23.1	23.4	23.7	23.9	24.2
Shelby	31.3	15.8	15.8	24.7	24.7	35.5	28.4	29.0	25.9	30.2	31.1	32.0	32.9	33.8	34.7
Sumter	30.9	20.4	20.4	31.6	31.6	30.0	28.0	37.3	22.2	30.5	31.0	31.5	32.0	32.5	32.9
Talladega	15.9	32.8	32.8	22.4	22.4	25.0	16.1	26.7	19.3	20.7	20.1	19.5	19.0	18.4	17.8
Tallapoosa	26.3	17.2	17.2	20.0	20.0	22.4	20.7	18.9	24.6	21.4	21.6	21.7	21.8	22.0	22.1
Tuscaloosa	28.2	28.2	28.2	23.5	23.5	30.3	21.3	16.5	31.3	23.1	22.6	22.1	21.6	21.1	20.6
Walker	25.8	23.2	23.2	17.2	17.2	16.4	25.5	24.6	35.1	26.9	27.6	28.4	29.1	29.9	30.6
Washington	30.5	27.3	27.3	24.1	24.1	23.1	13.3	30.8	22.6	20.6	19.8	19.0	18.1	17.3	16.5
Wilcox	34.5	23.2	23.2	24.5	24.5	23.5	33.3	24.5	28.0	26.4	26.3	26.3	26.2	26.2	26.1
Winston	18.5	26.9	26.9	12.0	12.0	19.6	27.5	24.0	12.0	17.8	17.3	16.9	16.5	16.0	15.6
Alabama	24.0	25.2	25.2	24.2	24.2	24.3	24.4	24.0	23.8	23.9	23.8	23.7	23.6	23.5	23.4

Note: There are too few data observations to allow for reliable and consistent estimates. The forecasts are likely to be better for the state but poor at the county levels because there is less white noise in the state and regional data series.

WIAA Region 3 comprises of Bibb, Fayette, Hale, Greene, Lamar, Pickens, and Tuscaloosa counties. The region is expected to have a lower underemployment rate in 2013 (21.8 percent) than observed in 2012 (24.0 Percent), the lowest in the state. Estimates for WIAA Region 3 show a sharp decline of underemployment from about 26 percent in 2006 to about 19 percent in 2018 (Table 1 and Appendix I). This underscores the extent of the errors in the forecast estimates; the county forecasts also portray the presence of large forecasting errors. The lower bound 95 percent confidence interval line approaches zero by 2018 in Bibb, Greene, and Hale counties. Of the seven counties, two—Fayette and Lamar—are expected to have higher underemployment rates than Alabama in 2013. Underemployment rate forecasts are highest in Fayette County and lowest in Hale.

Region 4 has historically had higher regional underemployment rates than Alabama. The region consists of Blount, Chilton, Jefferson, St. Clair, Shelby, and Walker counties. Regional underemployment is expected to rise to 25.3 percent in 2013 from 24.0 percent in 2012. By 2018, the region will have a rate of 28.1 percent, the highest in the state. Shelby County at 30.2 percent will have the highest underemployment rate in the region in 2013 while Blount with 16.9 percent will have the lowest. The wide 95 percent confidence interval for the region and the counties (Appendices I and II) indicate large forecasting errors which will be determined during the results validation process. The lower bound 95 percent confidence interval for Blount and Chilton counties drop to below 5 percent in 2018 highlighting the large margins of error in the forecasts.

WIAA Region 5 comprises of nine counties—Calhoun, Cherokee, Clay, Cleburne, Coosa, Etowah, Randolph, Talladega, and Tallapoosa. The region's underemployment rate is projected to be 24.3 percent in 2013 up from 23.9 percent in 2012. By 2018 the rate will gradually drop to 23.5 percent. At 29.9 percent, Etowah County will have the highest underemployment rate while Coosa at 19.7 percent will have the lowest in 2013. Calhoun, Cherokee, Clay, and Etowah counties will have higher underemployment rates than Alabama and the region. The poor performance of the forecasting model can be clearly seen in the county graphs. Randolph and Talladega county graphs show negative 95 percent confidence interval lower bounds, which is impossible.

Workforce Region 6 comprises of Dallas, Marengo, Perry, Sumter, and Wilcox counties. In 2013 Region 6 is expected to have an underemployment rate of 26.6 percent and the highest regional underemployment in Alabama, which is consistent with past rates. Of the five counties, only Perry County will have a lower rate than the state. Sumter County has the highest underemployment in the region. Based on the forecast graphs, Dallas County rates appear underestimated. Regional underemployment rates are expected to remain high and stable through 2018.

Region 7 consists of six counties—Autauga, Butler, Crenshaw, Elmore, Lowndes, and Montgomery. Regional underemployment is expected to fall to 23.8 percent in 2013 from 25.8 percent in 2012. Among the counties, underemployment is expected to range from 17.8 percent in Crenshaw County to 25.6 percent in Butler and Montgomery counties. Butler, Lowndes, and Montgomery counties will have higher underemployment rates than Alabama. By 2018 the region's underemployment will have declined to 22.9 percent.

In Region 8, underemployment is expected to inch down to 25.7 percent in 2013 from 25.8 percent in 2012. This workforce region comprises of Bullock, Chambers, Lee, Macon, and Russell counties. Within the region, underemployment will range from 23.9 percent in Lee County to 32.3 percent in

Macon. All the counties in the region have higher underemployment rate forecasts than Alabama and Macon has the highest rate in the state. The county and region graphs in the Appendix show significant forecasting errors as the 95 percent confidence intervals are extremely large for the region and its counties. For counties such as Bullock and Chambers, the lower bound confidence intervals are almost zero. The region's underemployment rate forecast is somewhat stable through 2018 and expected to gradually decline to 24.7 percent.

Workforce Region 9 has eight counties—Baldwin, Choctaw, Clarke, Conecuh, Escambia, Mobile, Monroe, and Washington. Regional underemployment is expected to jump from 22.6 percent in 2012 to 24.7 percent in 2013. Among the counties, Clarke is expected to have the lowest rate while Monroe and Mobile will have the highest at 26.3 percent. Clarke, Conecuh, Escambia, and Washington counties have lower underemployment rates than the state. By 2018 the regional underemployment rate is expected to be 24.9 percent. The forecast graphs show large confidence intervals with the lower bounds turning negative in 2018 for Clarke, Conecuh, and Washington counties. This suggests the presence of large forecasting errors resulting from the small number of observations and highlights the need for more data to effectively estimate and forecast the rates with a higher degree of certainty.

Workforce Region 10 comprises of Barbour, Coffee, Covington, Dale, Geneva, Henry, Houston, and Pike counties. Underemployment is projected to rise in 2013 to 22.9 percent in the region but remain below the state average. County underemployment will range from 15.7 in Coffee to 27.9 percent in Barbour in 2013. Only two counties—Barbour and Houston—will have higher underemployment than Alabama. Regional underemployment is expected to decline to 21.8 percent in 2018. Despite the short data series short-term effects were well captured in Covington and Pike counties which can be clearly seen in the forecast graphs. However, as for several other counties, the lower 95 percent confidence interval bounds were negative.

Although Jefferson and Mobile counties are included in WIAA Regions 4 and 9, respectively, they have large and unique economies and are consequently reported with the WIAA regions. In 2013, underemployment is projected to go up in both counties to 26.0 percent in Jefferson County and 26.3 percent in Mobile. The rate will increase to 27.1 percent in 2018 for Jefferson County but is expected to drop to 25.2 percent for Mobile. As in the other workforce regions and many counties, these forecast estimates are not perfect and are subject to measurement and specification errors.

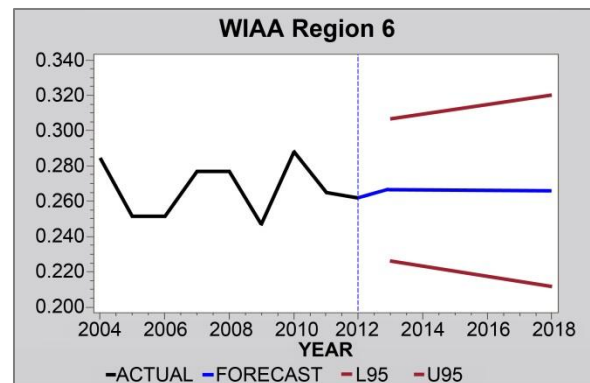
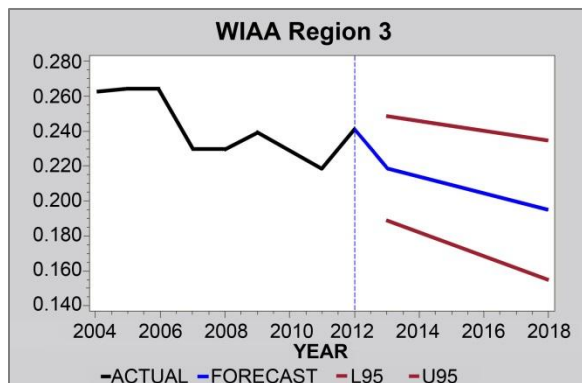
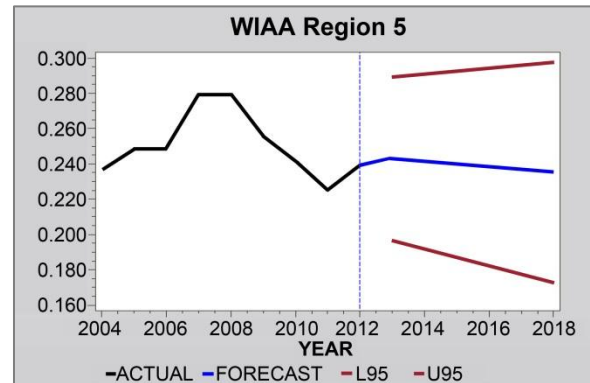
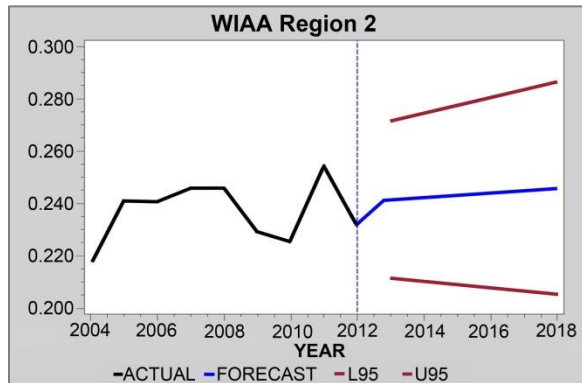
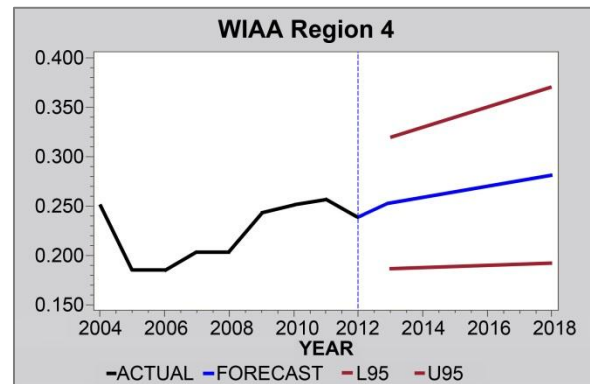
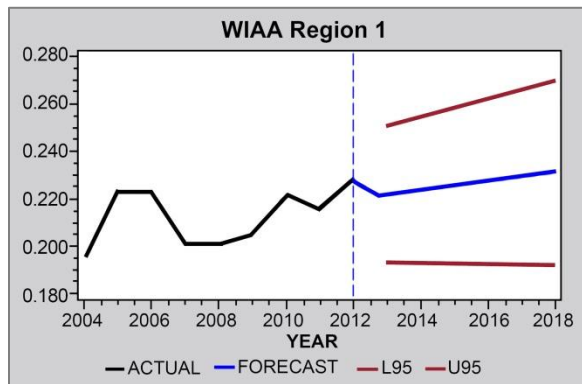
Conclusions

This report presents the first attempt at forecasting underemployment rates in Alabama, its workforce development regions, and all 67 counties from 2013 through 2018. In 2013, underemployment is expected to remain steady in the state but significantly rise in Regions 2, 4, 5, and 6. Among the workforce development regions, underemployment is expected to be highest in Region 6 and lowest in Region 3. Regions 4, 5, 6, and 9 are expected to have higher underemployment rates than Alabama's 23.9 percent. At the county level, 32 counties will have higher rates than the state. Macon County is expected to have the highest underemployment rate in 2013 at 32.3 percent while Coffee gets the lowest at 15.7 percent. By 2018 underemployment will be lowest in Region 3 with a decline to 19.5 percent and highest in Region 4 with a rise to 28.1 percent.

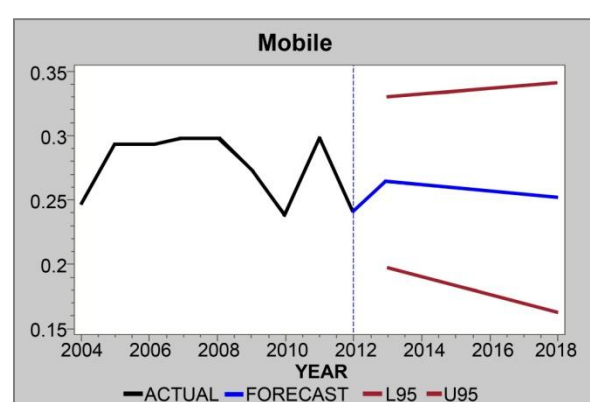
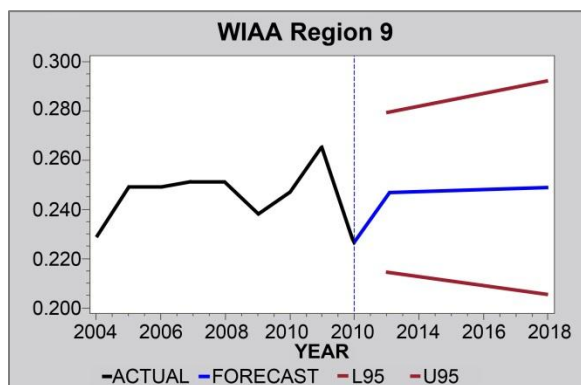
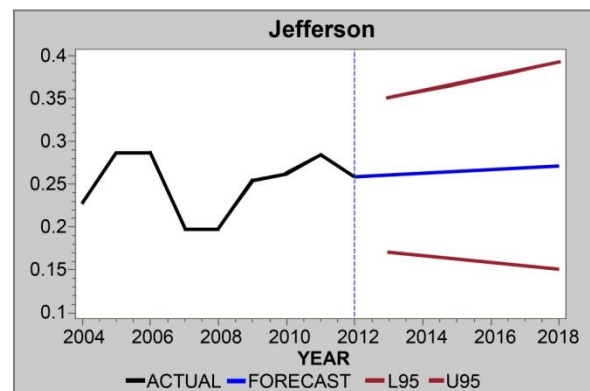
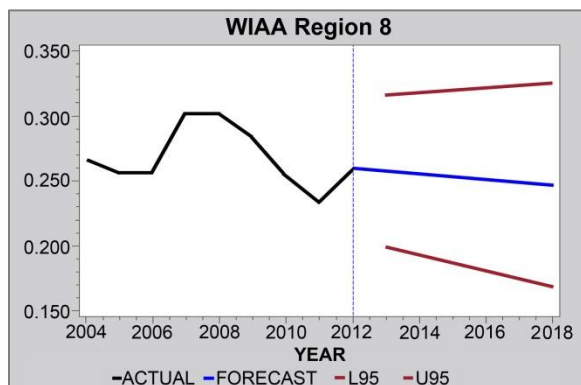
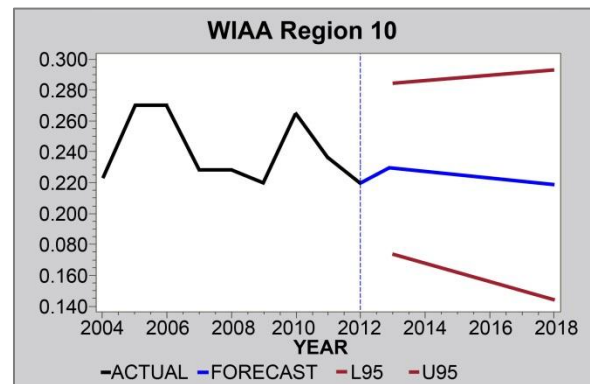
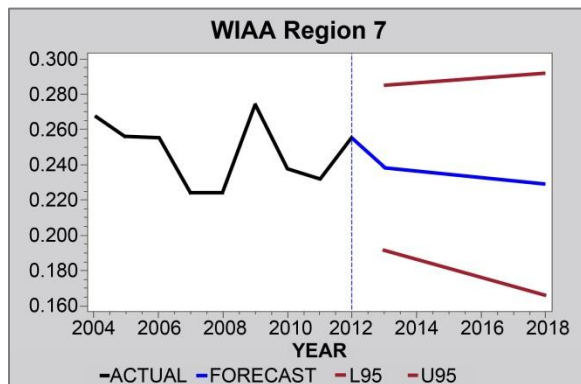
Although the underemployment rate forecasts look reliable at the state and to some extent the regional level, deriving the estimates using very short data series results in very large forecast errors and confidence intervals. This is clearly visible when looking at the extended forecast period in the graphs in Appendices I and II. The size of the errors will be determined during validation as 2013 and future underemployment surveys are completed. In addition, the forecast estimation is highly dependent on time trend forecasting which is subject to poor performance when used to forecast for relatively long periods into the future.

Clearly, it is extremely important to improve the number of observations in the data series in order to improve the performance of the model and the reliability of the underemployment rate estimates by significantly reducing forecast errors. Doing so will help achieve the aim of reducing the cost of producing the annual workforce reports. When a well specified and validated model is available, underemployment rate estimates can be made in such a way as to reduce the need for frequent costly surveys.

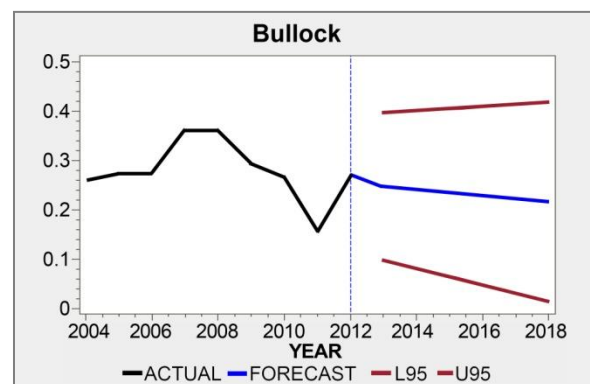
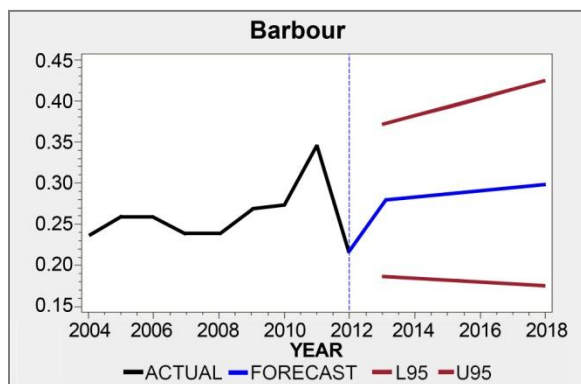
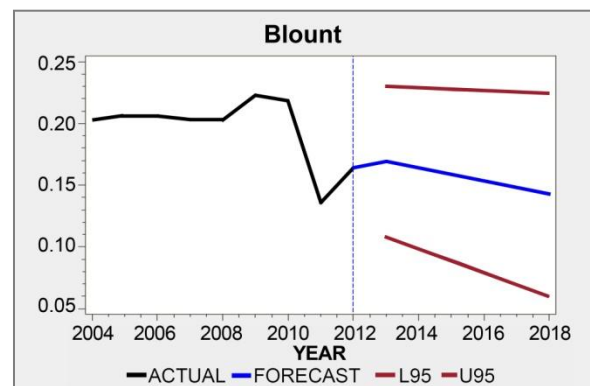
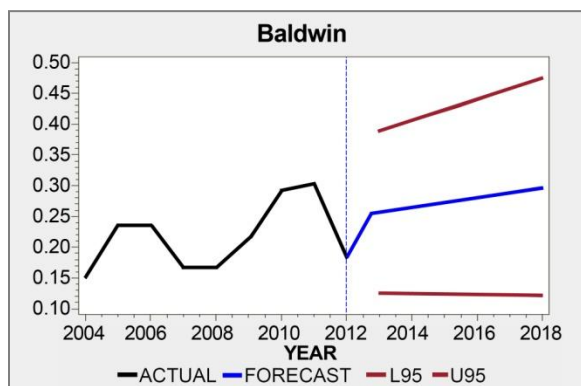
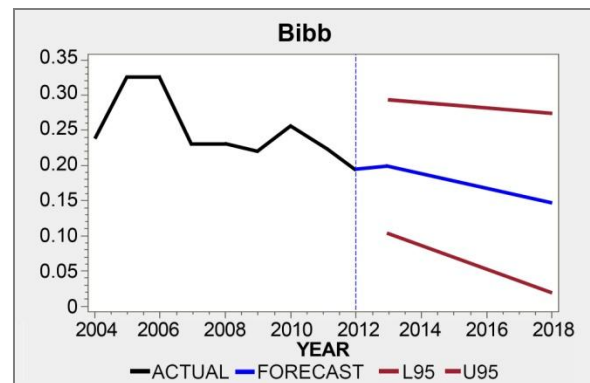
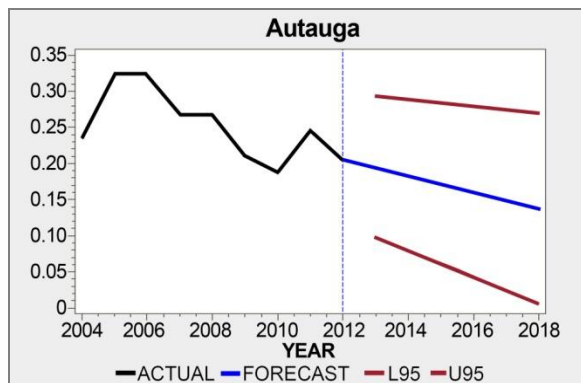
Appendix I: WIAA Underemployment Rate Forecasts, 2013-2018



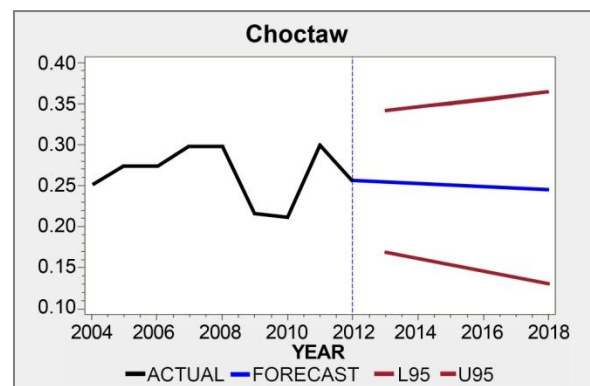
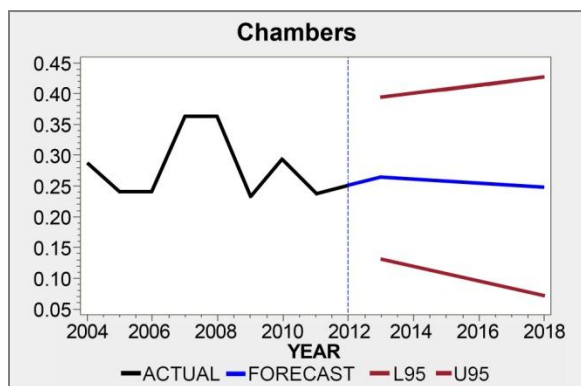
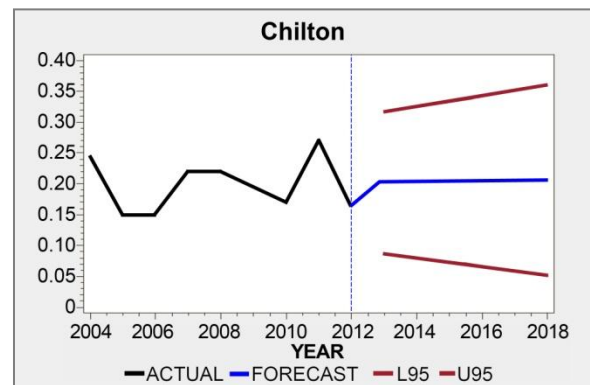
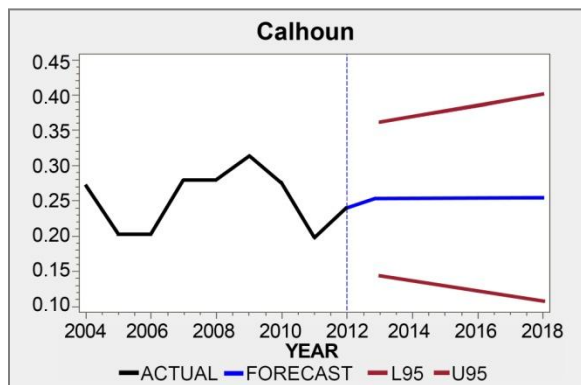
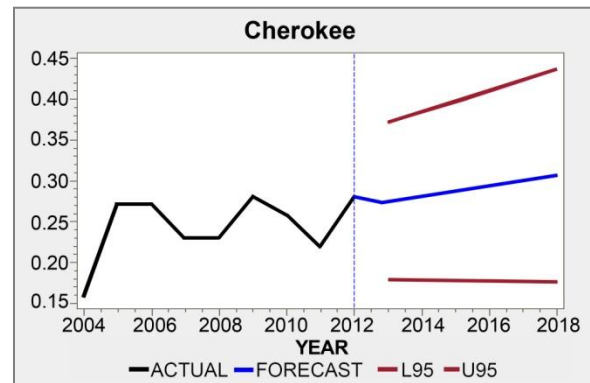
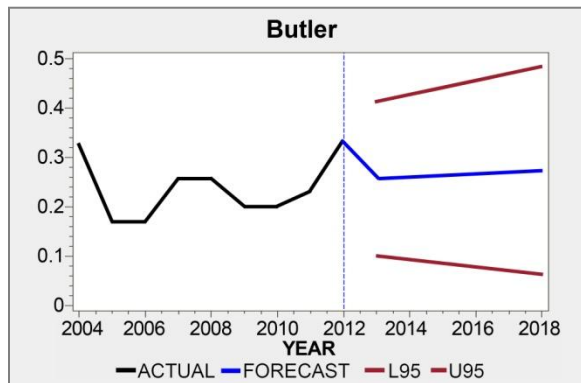
Appendix I: WIAA Underemployment Rate Forecasts, 2013-2018 (continued)



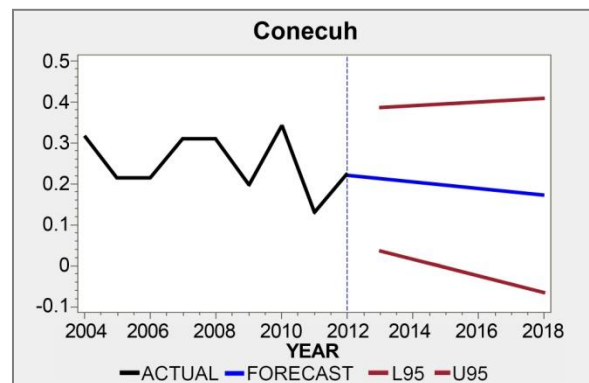
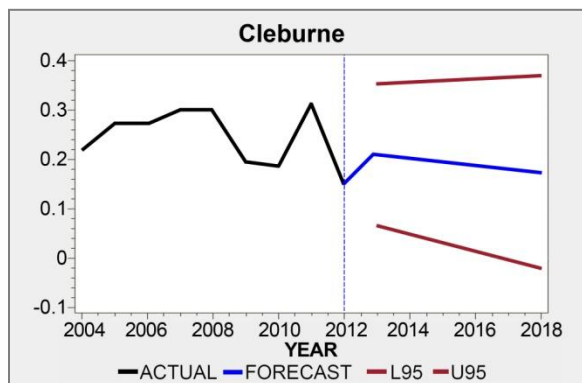
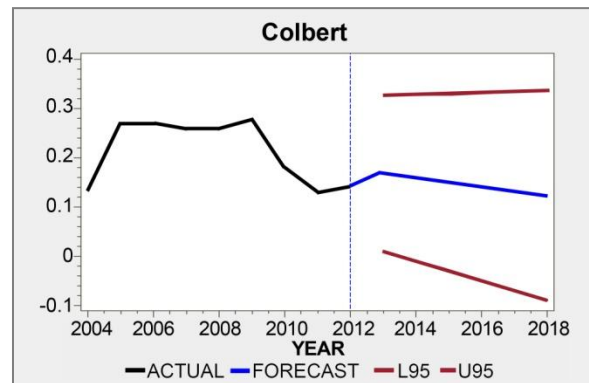
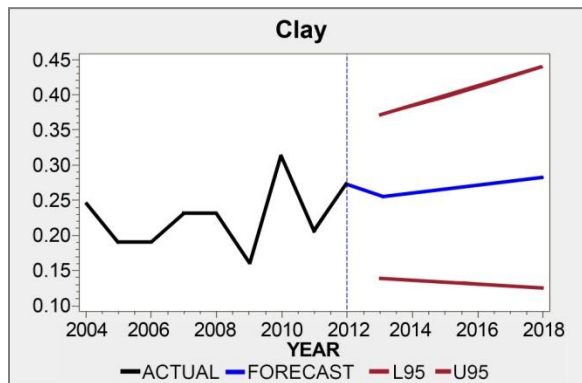
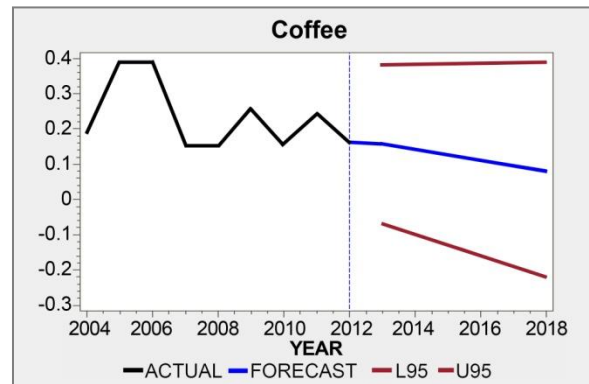
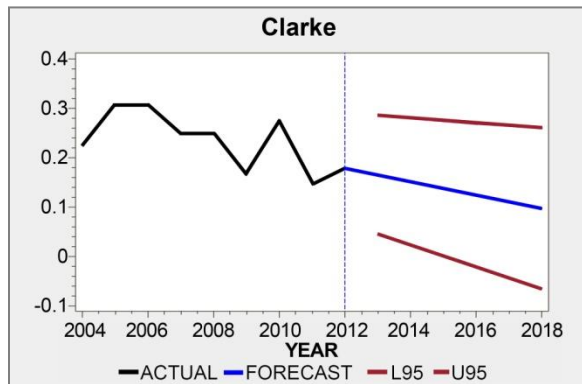
Appendix II: County Underemployment Rate Forecasts, 2013-2018



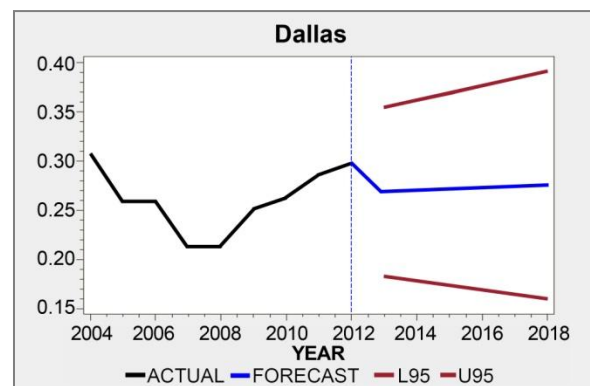
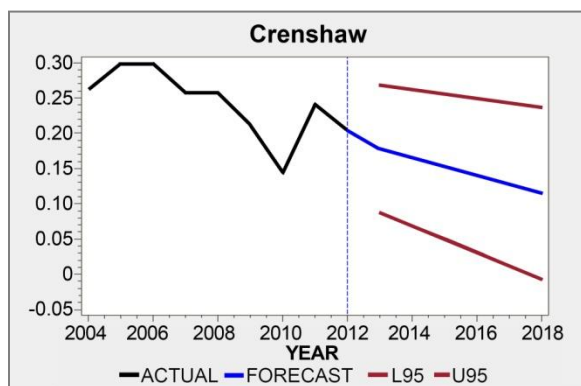
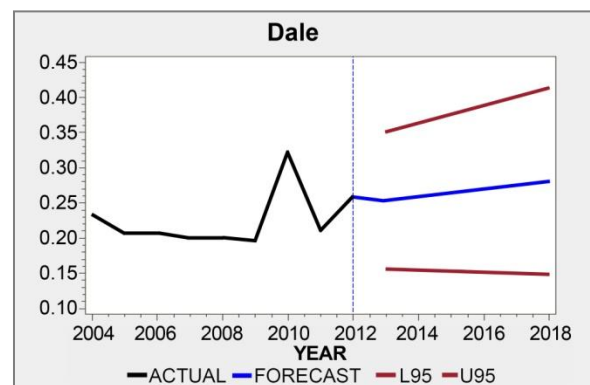
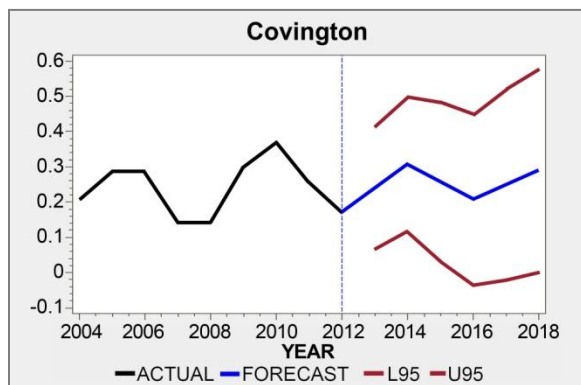
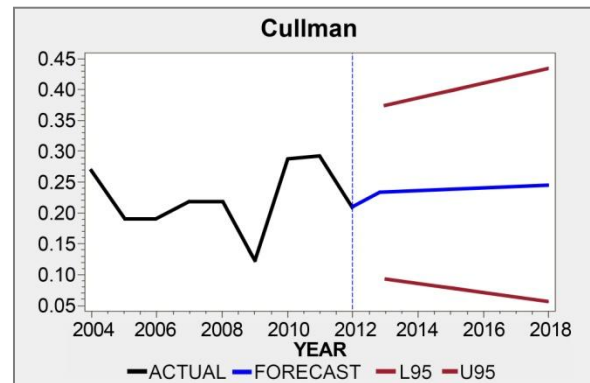
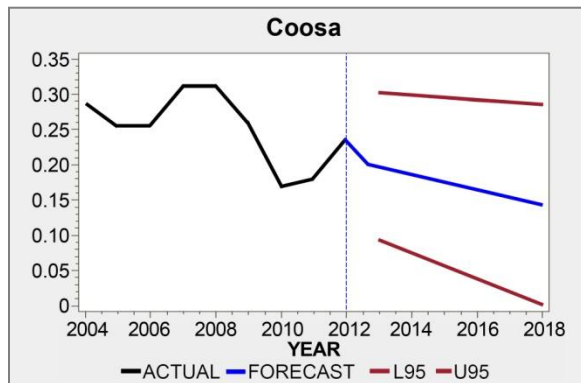
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



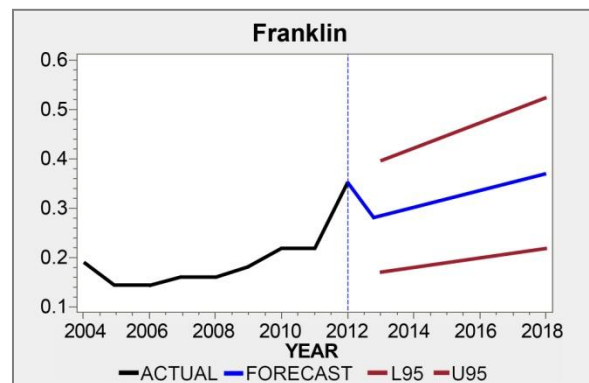
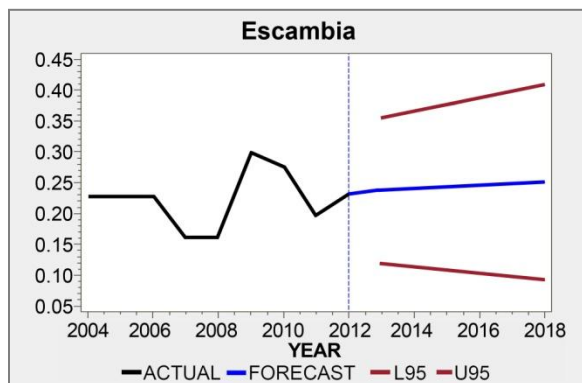
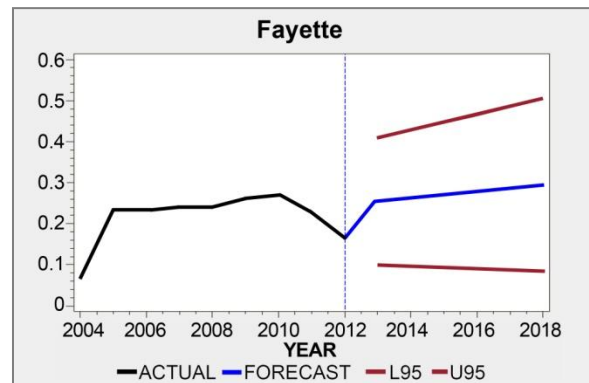
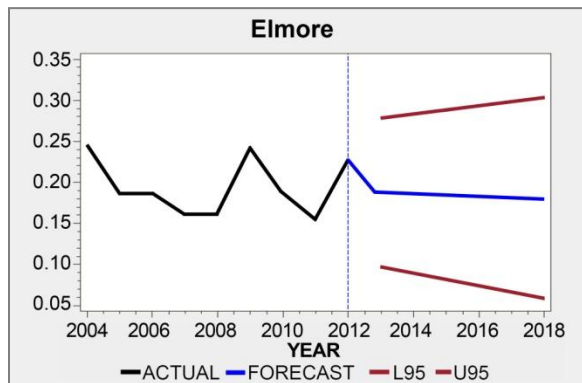
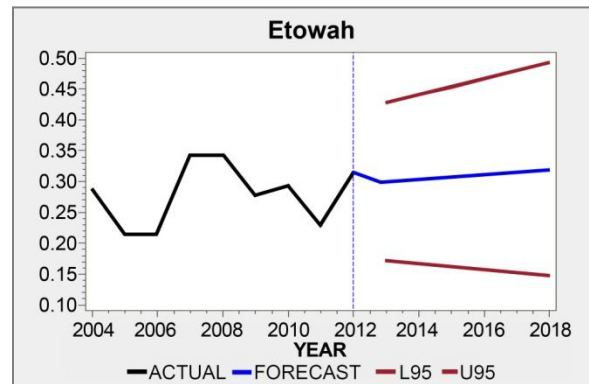
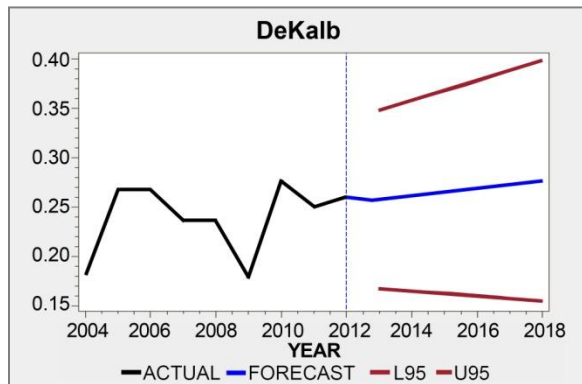
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



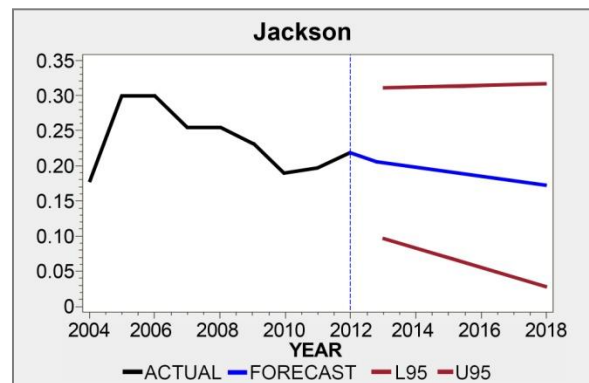
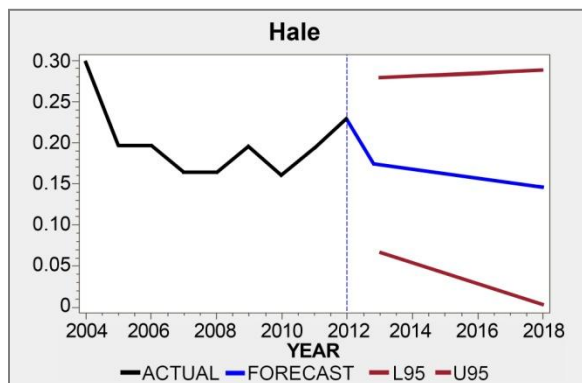
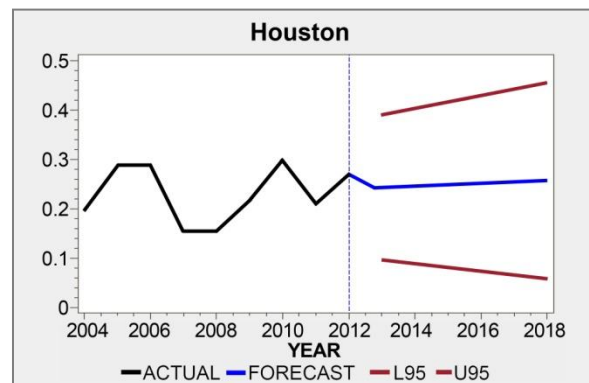
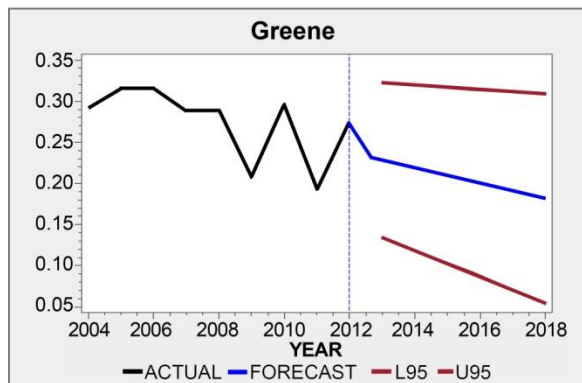
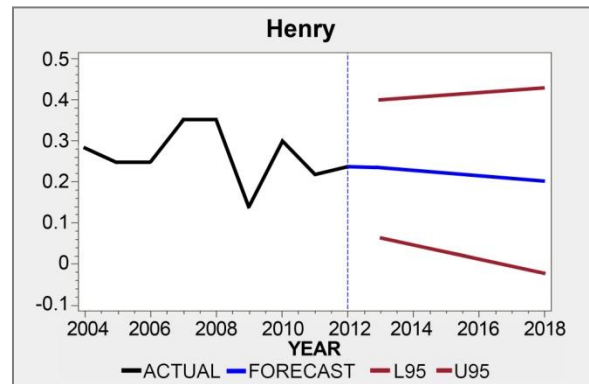
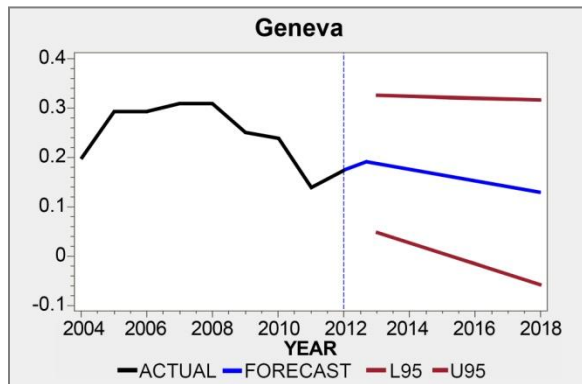
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



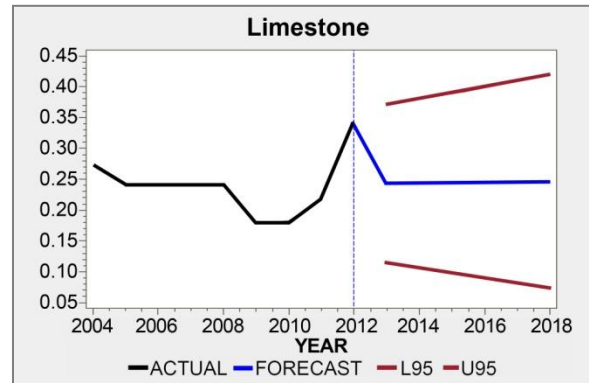
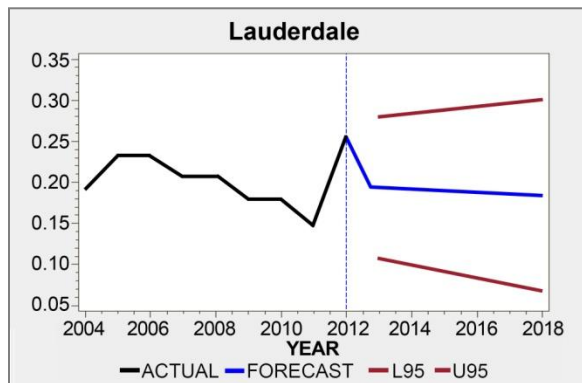
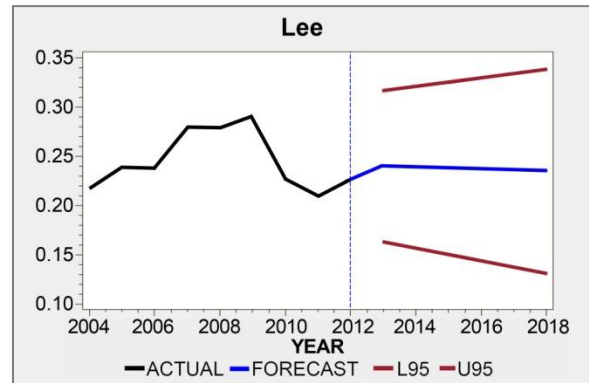
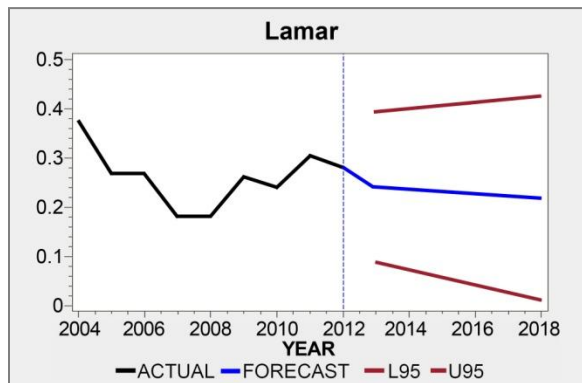
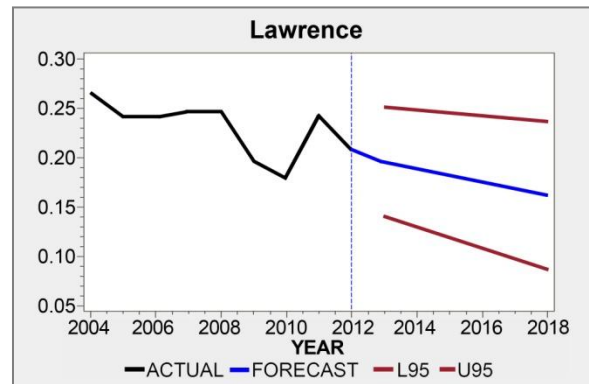
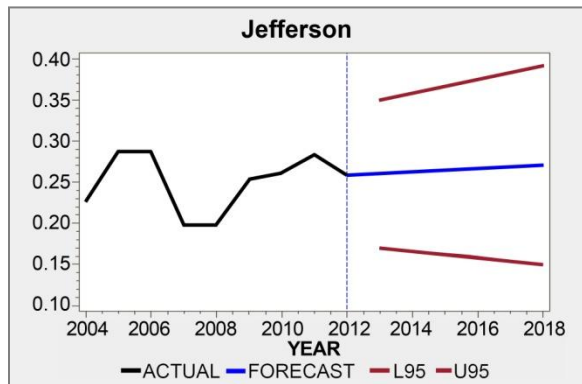
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



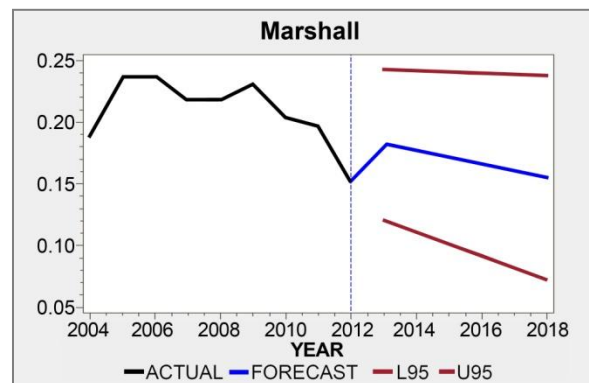
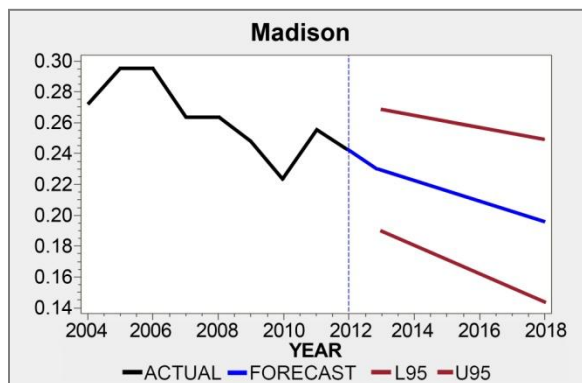
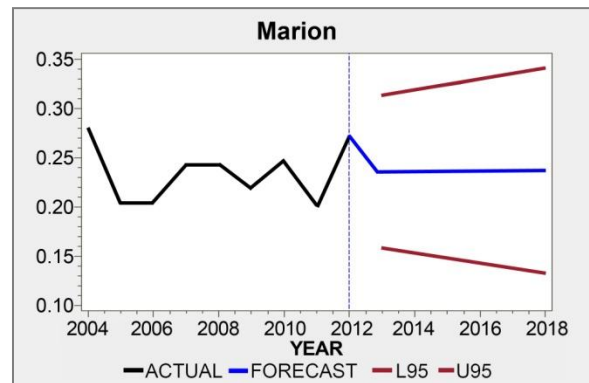
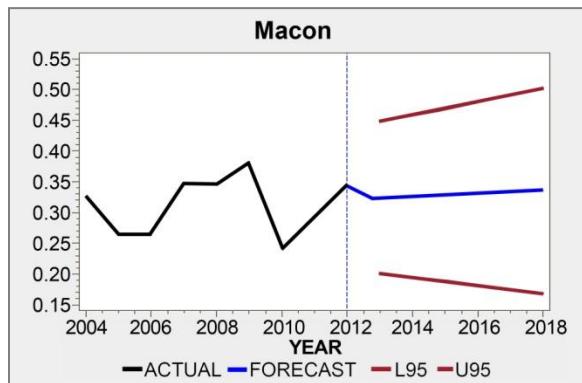
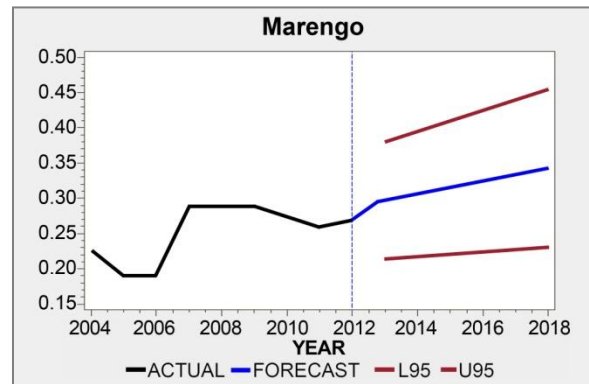
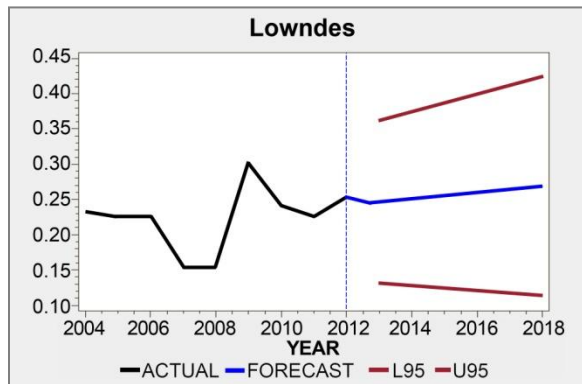
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



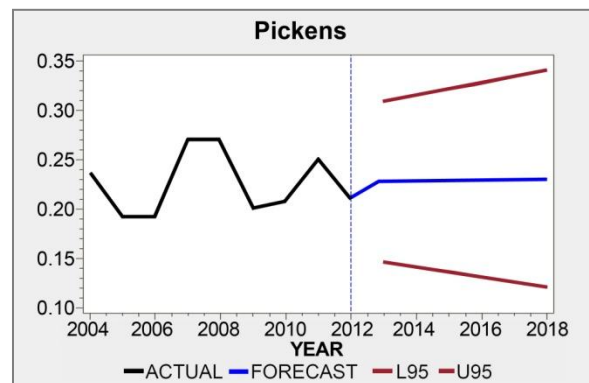
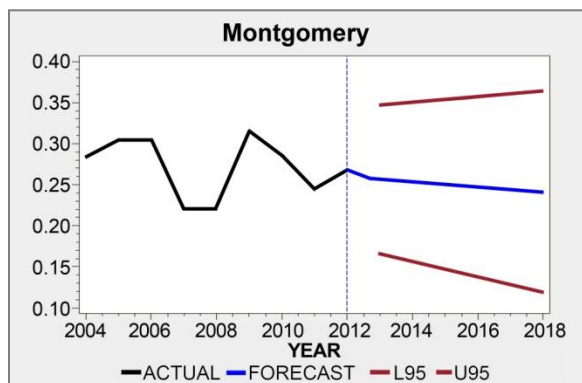
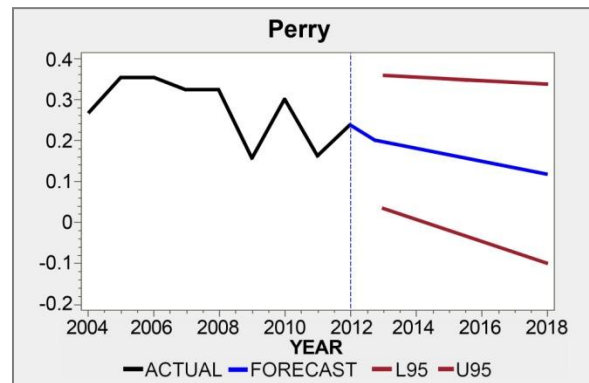
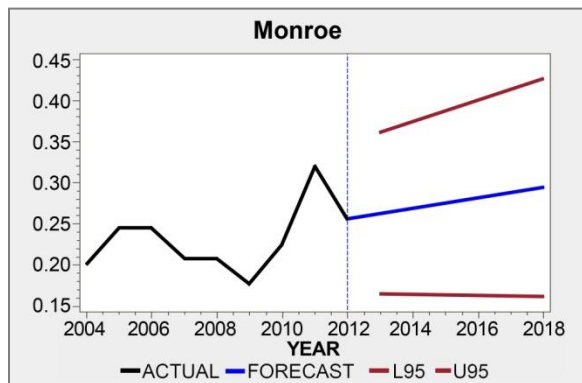
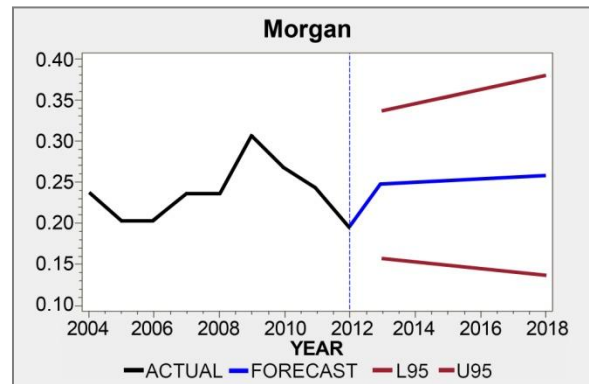
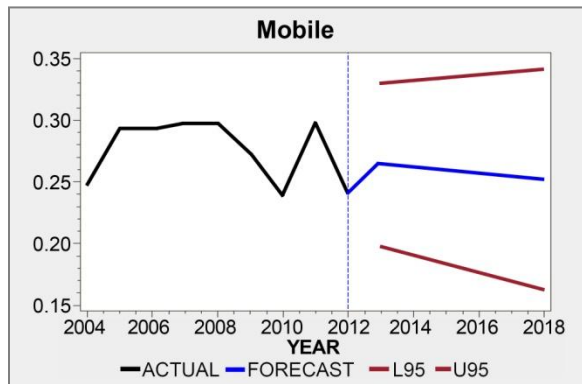
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



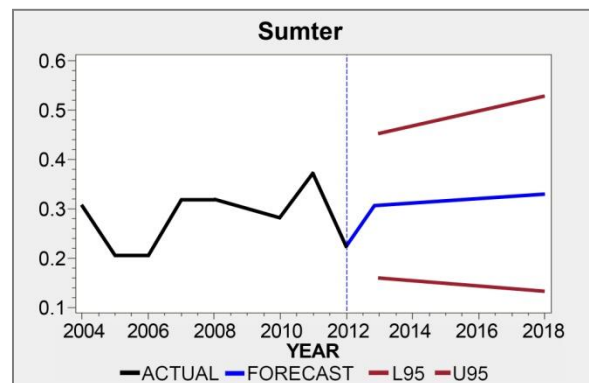
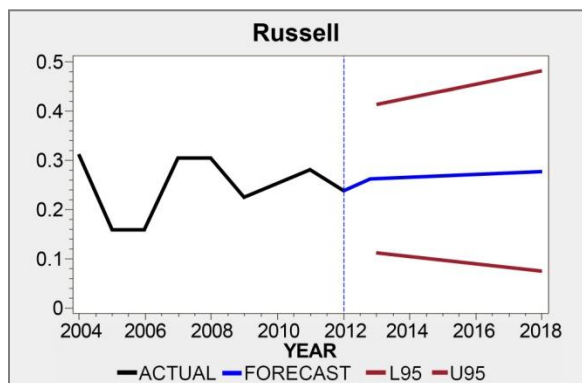
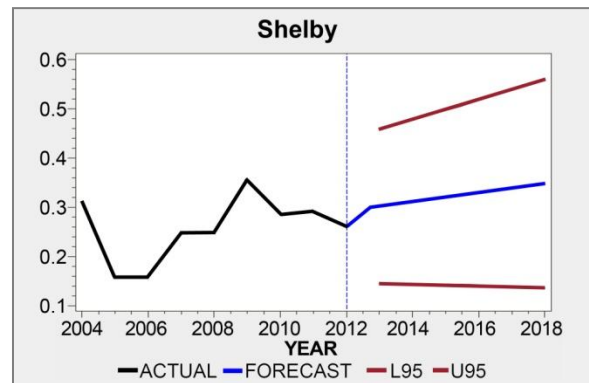
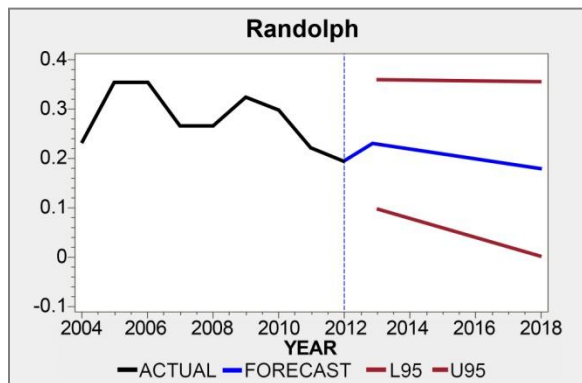
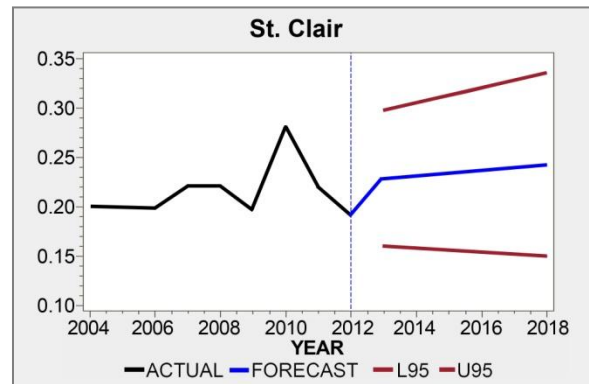
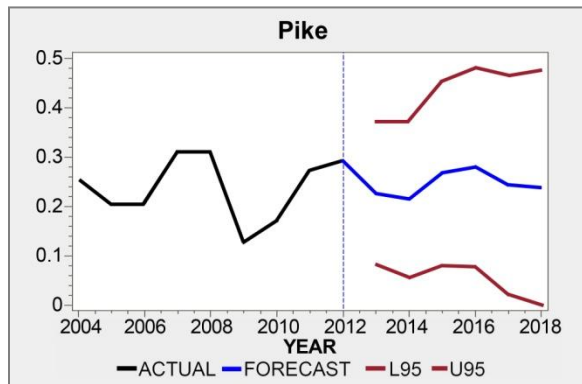
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



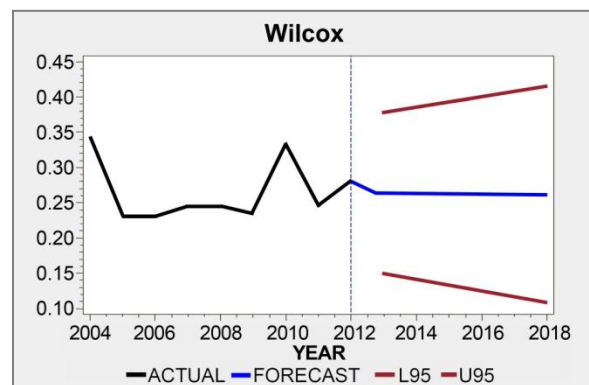
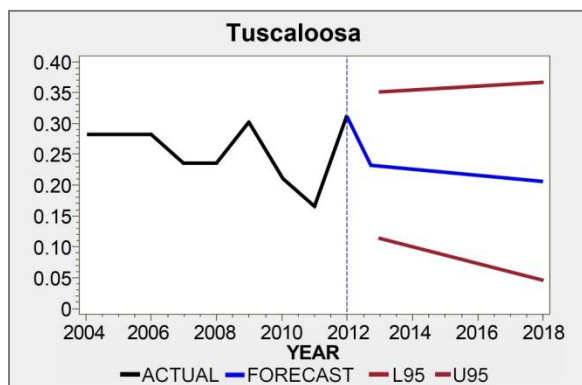
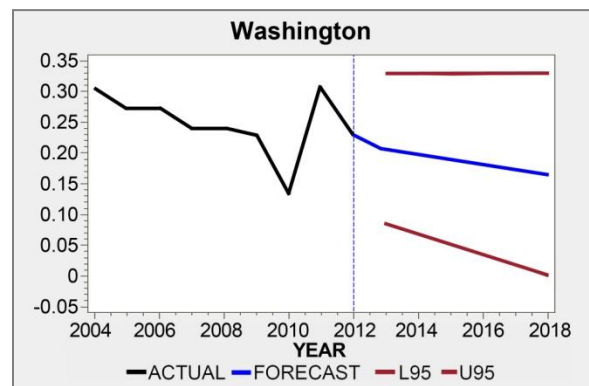
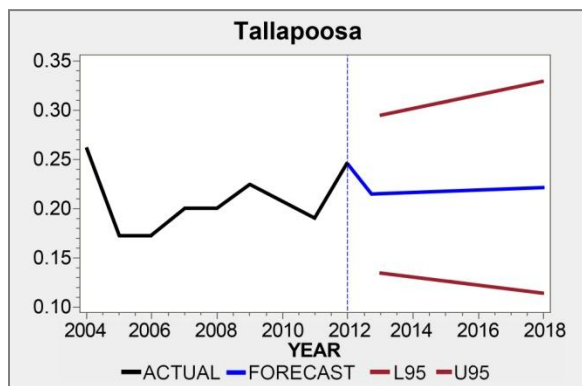
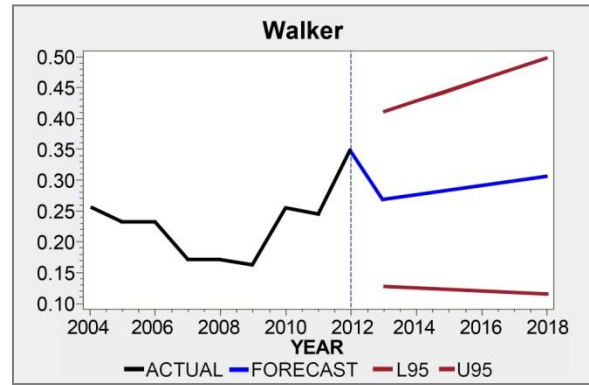
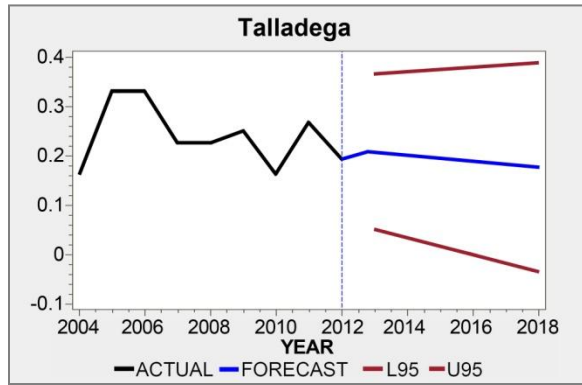
Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)



Appendix II: County Underemployment Rate Forecasts, 2013-2018 (continued)

