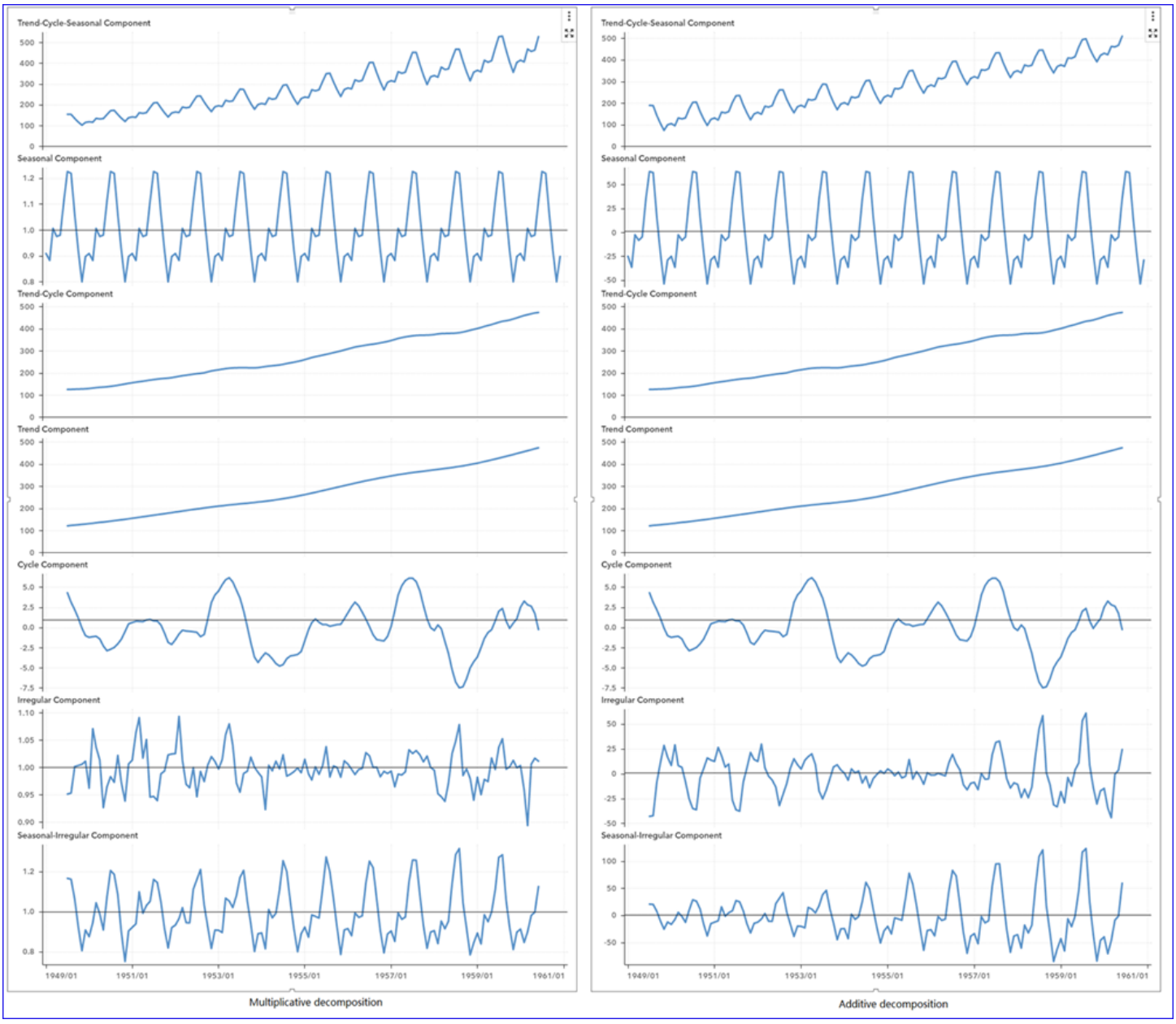
Revealing Change

Cairo presents three strategies:

1. Decomposing a time series:
    a. a concise summary of the data manipulation involved **(Connor)**: Decomposing a time series is a useful tactic to properly view time series data. Within time series data there are three features that may have to be accounted for; trends, seasonality and noise. To get a better image of what the data is telling us the author starts by fixing the plot scale, this helps us see any potential trends or seasonality. He then proceeds to calculate percentages for the data and not just look at raw totals, as those change over time and don't show the whole picture. He then uses the average value for a variable of interest to calculate differences from the mean and give yet another metric to look at. Finally, the author mentions throughout that having multiple plots to compare and investigate goes a long way towards finding the truth in the data.
    b. the types of patterns or comparisons the manipulation makes easier for a viewer **(Connor/Miles):** This type of manipulation helps solve some common drawbacks of time series data. Primarily, this strategy allows us to distinguish trends or seasonality that are present in the data. We can also sometimes find the noise in the data, though to a lesser degree. This strategy also helps us compare common time scales and see how percentages or differences compare to a raw total during a specific time frame.
    c. an example of a graphic from outside of the book that illustrates the strategy **(Miles)**:
        i. The following plot (source) shows how a time series can be decomposed in two different ways (classical-additive vs classical-multiplicative) into components capturing
            1. the overall trend
            2. the seasonal effect on the trend
            3. the random-noise effect on the trend
            4. the de-trended series (the seasonal-irregular component)
        ii. Notice how the multiplicative decomposition is much more effective at describing our data (judging by the seasonal-irregular component) because of the *assumptions* made about the original series



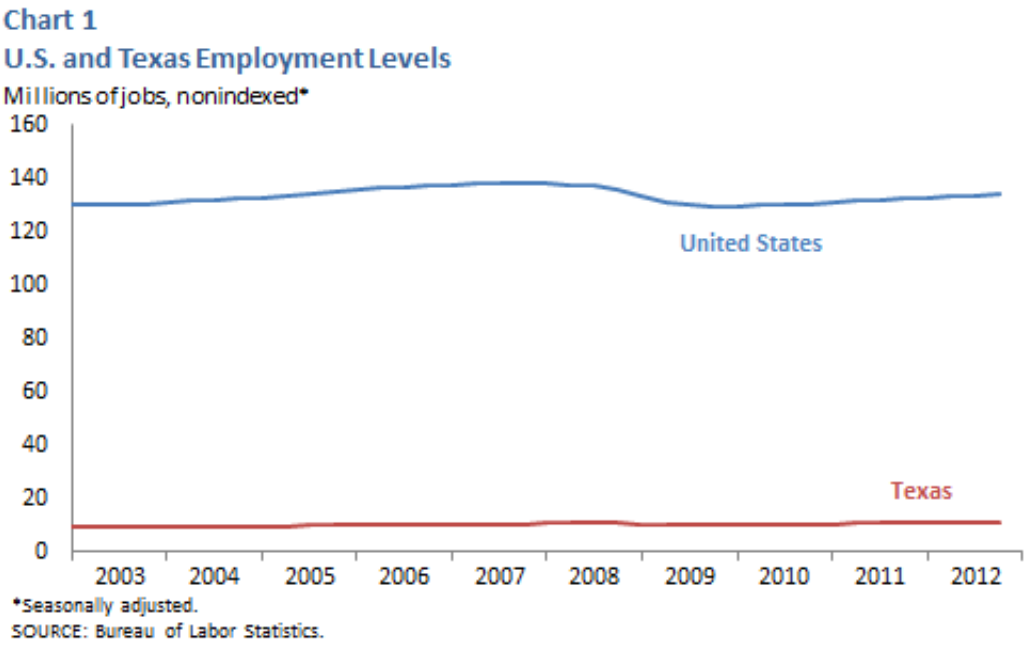
2. Using a single index:
    a. a concise summary of the data manipulation involved **(Amy)**: Indexing is useful for when we want to compare diverse numbers by comparing the relative change to some baseline or zero-based index value. Choose the index value of interest. Then, to find the relative change of the observation versus the index value, subtract the two values before dividing by the index value.
    b. the types of patterns or comparisons the manipulation makes easier for a viewer **(Amy/Miles)**: It is helpful to use indexing to compare values that are far apart or when we want to understand change with respect to a baseline.

c. an example of a graphic from outside of the book that illustrates the strategy **(Miles)**:

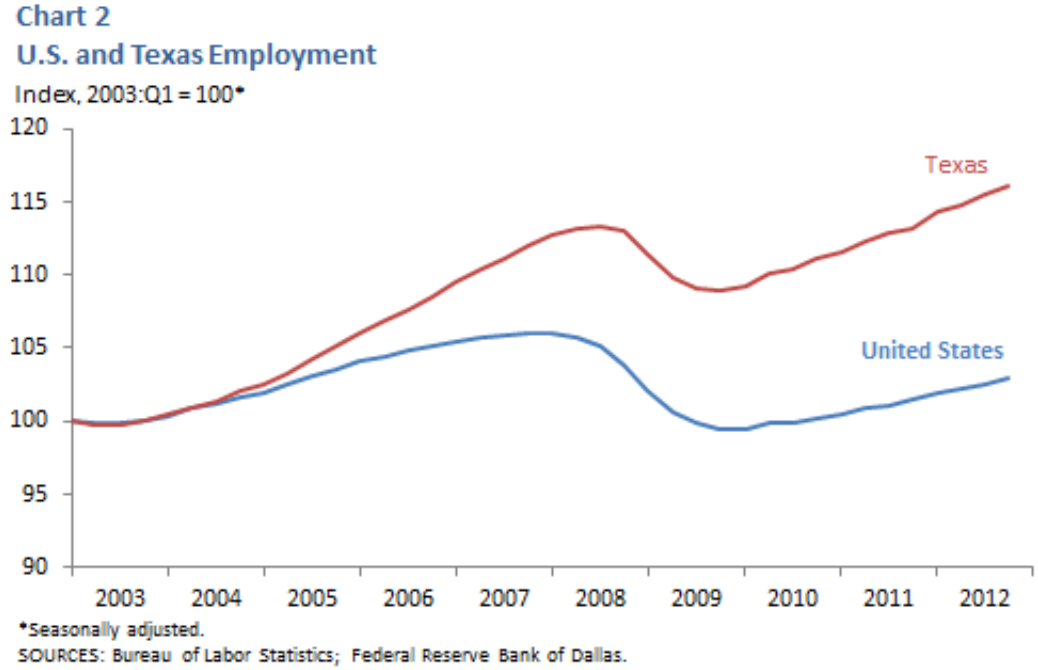
i. The following plot (source) shows how comparing change over time *between different groups* can be made easier by choosing a common point in time (an index) from which all other subsequent values of the series are made relative to

ii.

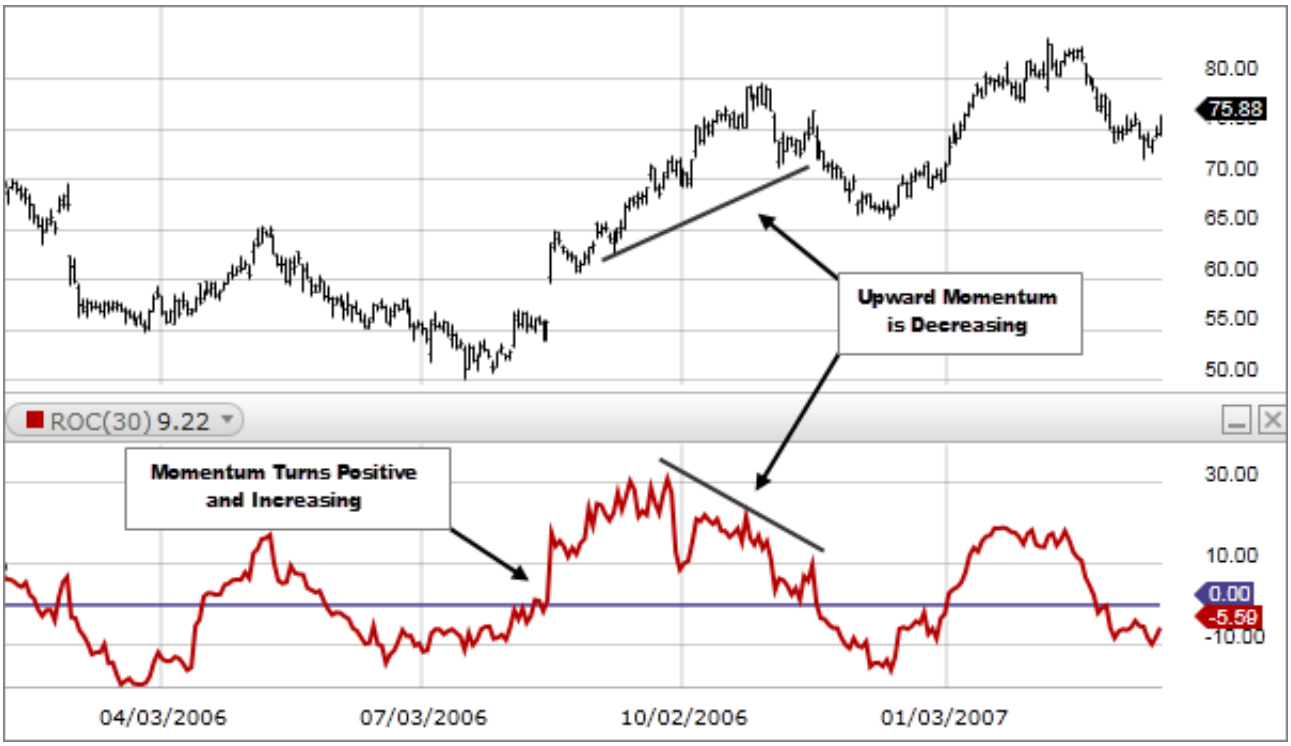
Original Time Series



Indexed Time Series



3. Using a rate of change:
    a. a concise summary of the data manipulation involved **(Abraham)**: Rate of change is useful when we are interested in comparing two or more periods. When calculating the rate of change between two periods we use the following formula (change rate = New Period /Previous Period). Some data manipulation is required at times when we are trying to visualize change rate using the logarithmic scale. At times data can become so convoluted when dealing with large numbers thus, "manipulating" such data using a logarithmic scale/transformation can more easily help distinguish the actual change rate.
    b. the types of patterns or comparisons the manipulation makes easier for a viewer **(Brandon/Abraham)**:
    Rate of change plots can be useful for tracking the trend or momentum of a value of interest over time. This is useful if you want to see if a value of interest in growing exponentially or not. Some of the obvious plots that would benefit from rate of change manipulation is when one is dealing with extremely large numbers with large scales such as bacterium growth. As well as stated above, when we are interested in tracking trends such as population growth, income change, inflation, etc. Viewers would benefit by looking over change of rate versus the actual numbers.
    a. an example of a graphic from outside of the book that illustrates the strategy **(Brandon)**:
    Rate of Change (ROC) Plot:
    Below is a rate of change plot used to asses the momentum of stock prices. An upward surge in the Rate-of-Change reflects a sharp price advance. A downward plunge indicates a steep price decline.
    https://www.fidelity.com/learning-center/trading-investing/technical-analysis/technical-indicator-guide/roc


80.00
75.88
70.00
65.00
60.00
55.00
50.00
Upward Momentum
is Decreasing
ROC(30) 9.22
Momentum Turns Positive
and Increasing
30.00
10.00
0.00
-5.59
-10.00
04/03/2006
07/03/2006
10/02/2006
01/03/2007