

COST OF GOODS

RELEVANT JMP PLATFORMS AND STATISTICAL TECHNIQUES

Graph Builder : Time series graphs

PROBLEM STATEMENT

The U.S. Bureau of Labor Statistics retains historic data on the prices consumers pay for common goods such as food and utilities. Economists analyze these data to produce studies that help the government and financial institutions get visibility into the costs that families are incurring and how those costs are changing. This information is extremely valuable to guide various legislative and monetary policies.

One such summarized dataset consists of the average monthly prices on a set of goods averaged over a sample of locations across the country [1].



The focus of the analysis will be to examine and describe how prices of 11 different items has been changing from April 2003 – May 2023.

DATA SET

Cost_of_Goods.jmp

Month-Year	Month and Year (04/2003 – 05/2023)
Bananas	Average cost of a lb of bananas
Oranges	Average cost of a lb of navel oranges
Tomatoes	Average cost of a lb of field grown tomatoes
Bread	Average cost of a lb of white pan bread
Milk	Average cost of a gallon of whole fortified milk
Eggs	Average cost of a dozen of large eggs
Chicken	Average cost of a lb of whole chicken
Beef	Average cost of a lb of ground chuck beef
Electricity	Average cost of a KWH of electricity delivered as a home utility
Gas_Auto	Average cost of a gallon of regular unleaded automotive gasoline
Gas_Home	Average cost of a therm (100 cubic feet) of natural gas as home utility

Note: The U.S. BLS gathers a tremendous amount of cost data beyond just these items and it's a substantial effort to do so. As a result, it's not uncommon to have no data for a specific item in a specific time period.

EXERCISES

1. Create a time series graph for each of the items. Provide a few short sentences describing some of the key features these graphs display for each item (e.g., Describe the general trend. Describe the variation around that general trend. Is the variation large/small? Is the variation consistent in any way, or is it sporadic? Are there time periods when the prices significant decrease/increase much more than other time periods? Any seasonal patterns? Any time periods where prices stand out as being very different from the rest?

Instructions: Use Graph Builder. Place the Month-Year variable on the X axis, and one of the items on the Y. Choose to display both the points and a connect line by selecting those options in the Graph Palette. 

You can either make a separate time series graph for each item, or create one graph using the Column Switcher tool to change the item displayed on the Y axis. To do so, create a time series graph for one of the items (e.g., bananas). Then choose Redo > Column Switcher under the red triangle. Select that item along with all the others to use as the Replacement Columns.

2. Add a 'Line of Fit' to the time series graphs. Does this simple linear regression line do a reasonable job at modeling/describing the change in prices for any of these commodities? If so, describe what features are being captured by this type of model. Describe what

features are not being captured by these models? Would these models be useful at any level at predicting the price of these commodities in the future?

Instructions: In the graph, select the 'Line of Fit' icon  from the graph palette.

3. Create a new set of columns quantifying the % change in the price of each item from 12 months prior.

Instructions: Create a new column (Cols > New Columns). Select Column Properties >

Formula. In the formula editor, create the formula:

$$\left(\frac{\text{Bananas} - \text{Lag}(\text{Bananas}, 12)}{\text{Lag}(\text{Bananas}, 12)} \right) \cdot 100$$

Repeat for the remaining items.

4. Create a times bar chart of the 12-month % change for each of the items. Provide a few short sentences describing some of the key features these graphs display for each item (e.g., Which items tend to have the largest/smallest % change? Identify periods where there are very large changes (increase or decrease) in prices from 12 months prior. Identify periods where there is a very long period of increasing or decreasing before changing direction.

Instructions: Use Graph Builder. Place the Month-Year variable on the X axis, and one of the items on the Y. Choose the Bar Chart icon from the graph palette. You can either make a separate time series bar graph for each item, or create one graph using the Column Switcher tool to change the item displayed on the Y axis. To do so, create a time series graph for one of the items. Then choose Redo > Column Switcher under the red triangle. Select that item along with all the others to use as the Replacement Columns. For comparison purposes, it will be very helpful to lock the y axis scale to one setting. Scale the Y axis by dragging the top and bottom of the axis to little beyond -100 and 100. Choose 'Lock Scales' under the red triangle next to the Graph Builder title. Then choose 'Retain Axis Settings' under the red triangle for the Column Switcher.

COMPLIMENTARY MATERIALS

1. Average price data from U.S. Bureau of Labor Statistics
<https://www.bls.gov/charts/consumer-price-index/consumer-price-index-average-price-data.htm>

Note: Please adhere to any citation requirements for distribution and use of these data.