

EC1B1 Group Project – Spain and Bretton Woods

Please see the Jupyter Notebook titled “EC1B1_coursework_notebook.ipynb” on the GitHub repository found at: <https://github.com/andresoats/EC1B1-Coursework> for our Python code.

5.1 Comprehension and Warm Up

- What was the date that your country left the Bretton Woods system?

We believe Spain left the Bretton Woods system in August of 1971, as this was the first month in the continuous period of exchange rate fluctuations that followed. There was a singular month with exchange rate changes before this, in November of 1967, but this was a unique change that more likely represents a singular shift to nominal exchange rates, fixing them at a new level.

- Describe the sense in which the departure from Bretton Woods represents a “natural experiment” about the effects of real exchange rate fluctuations on the macroeconomy.

The departure from Bretton Wood represents a natural experiment because of how sudden it was. The transition from fixed exchange rates to volatile exchange rates occurring so suddenly means that other variables within the economy would not have had time to change and remain independent. This means that the post-shock outcomes on the larger economy are dependent only on the increased volatility of exchange rates.

5.2. Cleaning

- How many monthly observations are there in your dataset? Is this the number you were expecting?

There are 372 monthly observations in our dataset, this is what we expect since from January 1960 to December 1990 there are effectively 13 years worth of data and $13 \times 12 = 372$

- Why are we studying monthly data? Why not some lower-frequency such as quarterly or annual data?

We are studying monthly data as a higher frequency is ideal to see if there are any direct impacts of leaving a fixed exchange rate system. If we used quarterly or annual data we may not see the true impact as the economy may *correct* itself.

- What is industrial production? Why are we studying industrial production instead of another series, such as GDP?

Industrial production “refers to the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning” and is measured as an

index based on a reference point. We are studying industrial production because this sector, while contributing a small amount to GDP, is sensitive to interest rates and consumer demand. Using GDP may obscure the true impact of leaving the fixed exchange rate system because GDP takes into account other sectors of the economy that may be less sensitive to changes in demand.

- Why are you dropping outliers?

We are dropping outliers since outliers may obscure our analysis of data as we may infer a relationship that is not present and is instead simply the outlier. In our data, it seems there are virtually no outliers — *see the Data Cleaning Section of the Jupyter Notebook on GitHub for more information.*

- Discuss some pros and cons of the interpolation procedure we are using.

A pro of the interpolation procedure is that we are not removing months in which we do not have data but are instead attempting to correct these gaps by using an average between the prior and following period.

However, there are numerous cons. Firstly, by interpolating we may conduct analysis on data that has been interpolated and thus not completely accurate. Secondly, a major issue is that this interpolation means that in cases where there are multiple consecutive periods of missing data or, as in our case, where there is missing data at the beginning of the series we cannot interpolate using this method.

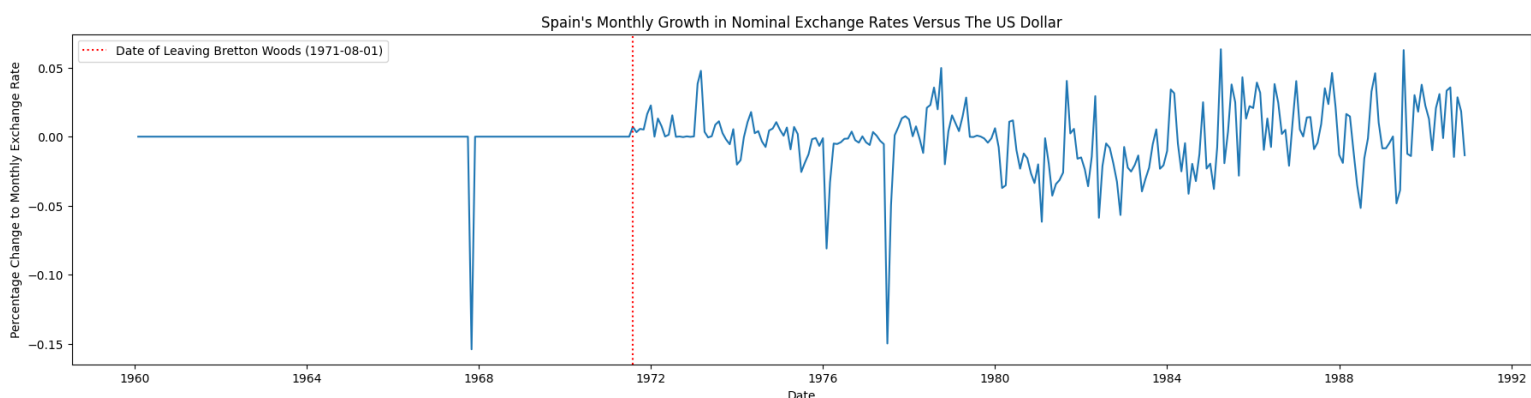
In our case, the measure of industrial production does not begin until 1961 and thus we have 12 months of no industrial production data. We choose to keep the missing values and also not interpolate because the only interpolation method that we could utilise is backwards filling the data, which we do not believe to be a good method of filling 12 months of data. By not filling the missing values, we have multiple columns with missing data at the beginning of the series (all the columns depending on industrial production), however these missing months do not affect our analysis. Instead, since our data for industrial production begins in 1961, we can simply begin our analysis of industrial production in 1961 without affecting our analysis of Spain leaving the Bretton Woods system as this is around 10 years before the end of the Bretton Woods.

5.3 Analysis

5.3.1 Exchange Rate and International Reserves Graphs

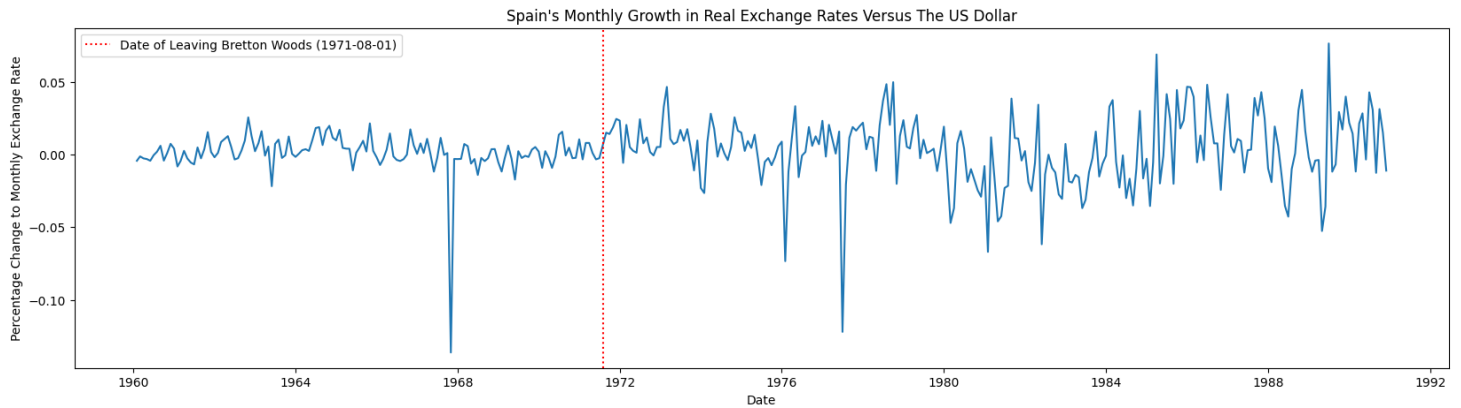
- Plot a time series graph of the monthly growth in nominal exchange rates of your country, versus the US dollar, for every month from the start to the end of the sample. Clearly indicate the time at which that country left the Bretton Woods system.

Figure 5.3.1.1



- Plot a time series graph of the monthly growth in real exchange rates of your country, versus the US dollar, for every month from the start to the end of the sample. Clearly indicate the time at which that country left the Bretton Woods system.

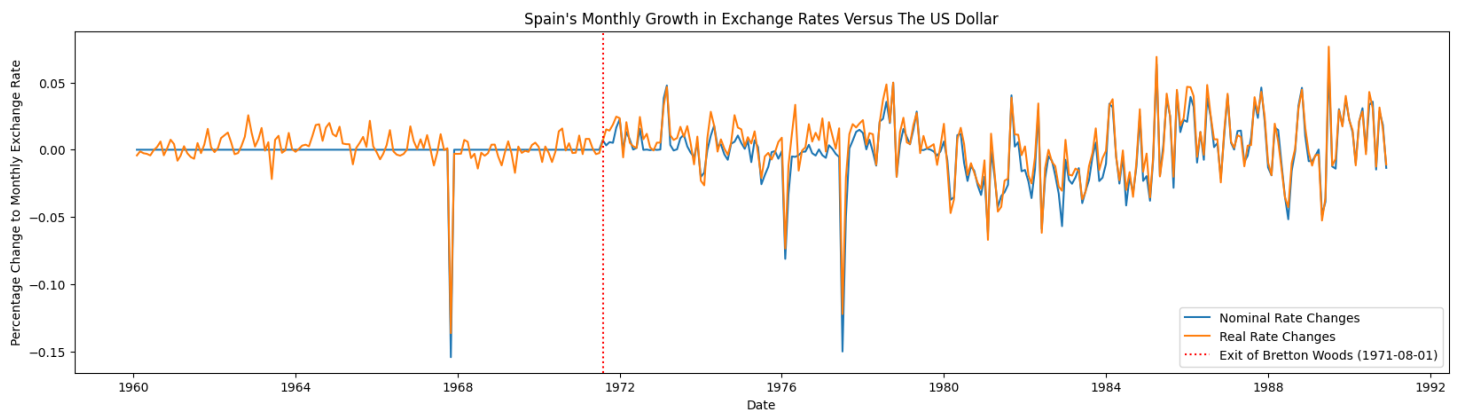
Figure 5.3.1.2



- Why is it useful to plot both real and nominal exchange rate growth?

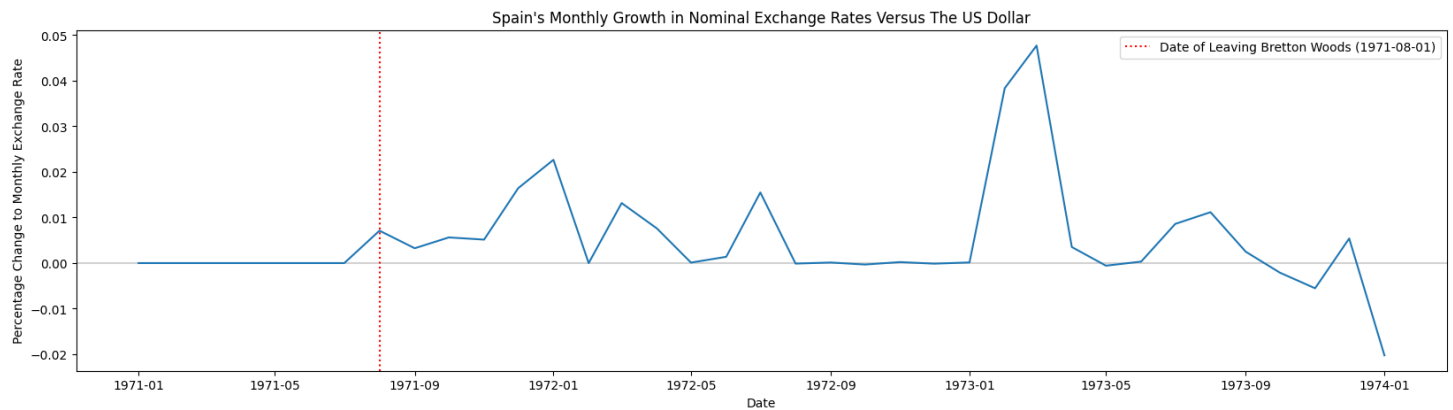
Plotting both real and nominal exchange rate growths is useful as it allows us to observe the relationship between the two, and identify how responsive nominal price changes were able to be to real changes, before and after Bretton Woods ended. For ease of comparison, the two can be plotted simultaneously (Figure 5.3.1.3)

Figure 5.3.1.3



- Was the US dollar over or undervalued in the Bretton Woods system? Refer to data or figures in your answer.

Figure 5.3.1.4



Under Bretton Woods, the US Dollar was **Overvalued** against the Spanish Peseta. We can see this by looking at figure 5.3.1.4, a closer view of figure 5.3.1.1 observing the immediate effect of exiting the Bretton Woods system on nominal exchange rates.

This figure shows that immediately after leaving, the nominal exchange rate $E_{\$/\text{Pes}}$ increased for several months, and save for a few minor adjustments in late 1972, kept generally increasing until late 1973, over 2 years after the exit.

As exiting Bretton wood lead nominal exchange rates to move freely, through the principle of no arbitrage we can suggest that these adjustments represented the transition from the nominal value of the dollar to its real value, which is also reflected by figure 5.3.1.3 mapping the nominal and real exchange rate changes very closely.

As the increases made more dollars affordable per Spanish Peseta, making a dollar comparatively cheaper, we can deduce that the US dollar used to be overvalued under Bretton Woods, at least compared to the Spanish Peseta. For a more comprehensive analysis of its valuation, we would have to observe the exchange rate changes relative to the other currencies it was fixed against.

- Plot a time series graph of the monthly indexed value of international reserves of your country and the US from January 1960 until the exit of the US from Bretton Woods.

I chose to plot the two graphs separately, as the magnitude of increase in Spanish gold relative to its index was so much larger than the magnitude of decrease in US gold reserves that the shared axis lost a lot of the clarity in changes for the US data

Figure 5.3.1.5

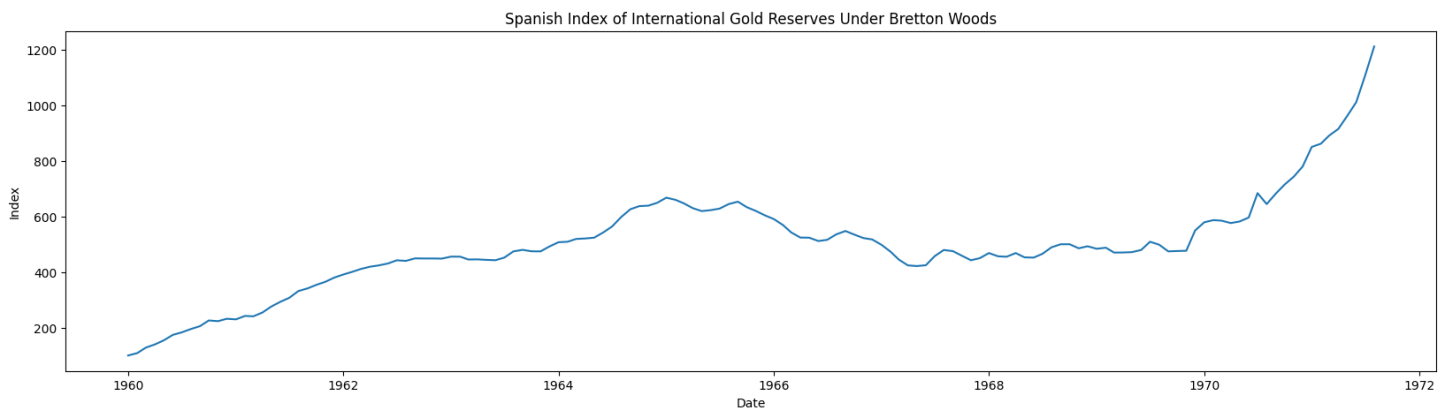
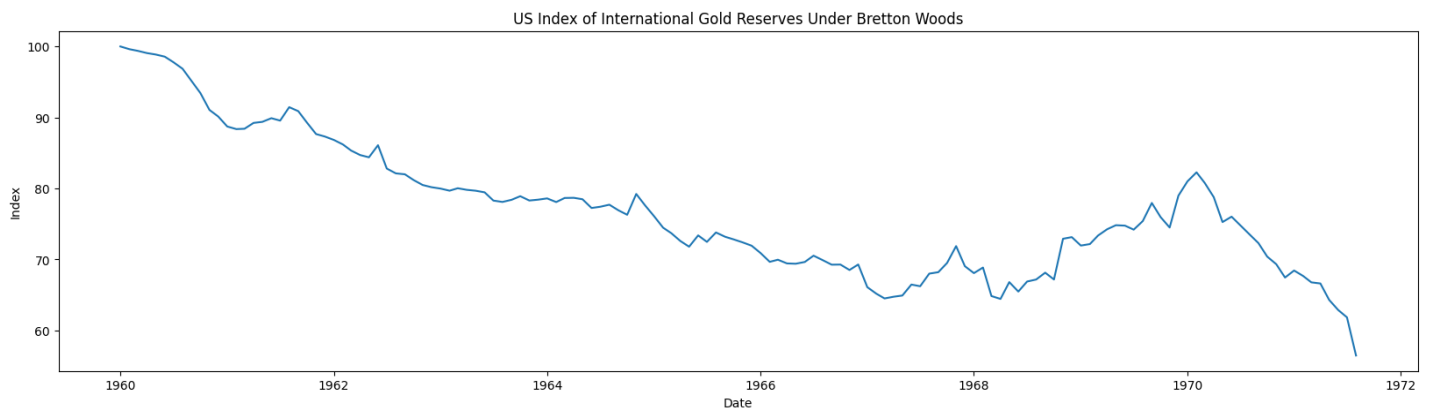


Figure 5.3.1.6



- Using your graph of international reserves over time, explain one reason for the US's departure from the Bretton Woods system.

In the 11 years represented by figure 5.3.1.6, The US's Gold reserves decreased by roughly 45%, as the overvalued USD made imports cheaper over this period, so gold flowed out of the nation.

This reduction would have led to a lower gold cover ratio, and the currency being overvalued relative to the gold that backed it. This would have been difficult to recover, and it appears that an attempt to do so in 1969-1970 was semi-successful but short lived. Knowing this, there was a high risk of runs on the USD as people may have wished to purchase other currencies with more stable gold backings. If the entire nation's currency was run-on there would be no way to bail out the US, and so exiting the Bretton Woods System and removing the gold backing was a solution to prevent this.

5.3.2 Inflation and Industrial Production Graphs

5.3.3 Comparison Statistics

Table 1

	SD Before	SD After	Ratio of SD before vs after
Nominal Exchange Rate	0.013468	0.025096	1.863387
Real Exchange Rate	0.014438	0.024909	1.725252
Inflation Rate in Spain	0.734174	0.735608	1.001953
Difference in Inflation between Spain and US	0.797628	0.742377	0.93073
12 Month Industrial Production Growth	5.099472	4.544481	0.891167

- Data from 10 months before and after the time Spain left the Bretton Woods system (here we have taken this date to be August 1971, when the US unilaterally declared its abandoning of Bretton Woods) is ignored as at this time the shock decision led to increased volatility for our variables of interest. Therefore, we ignore the data from this point to reflect the true impact on the variables from using the Bretton Woods system.