The Currency Capsule: Interactive Historical Currency Explorer

Vandana Kalithkar

DATA 440: Automation and Workflows

Professor Ron Smith

May 5, 2025

Introduction and Motivation

My project is a data visualization web application called the Currency Capsule, a historical currency conversion tool that allows for input of a country, currency, and year to yield a nominal exchange rate for that currency at that time relative to the contemporaneous United States dollar (USD) (ie. how much of a foreign currency to exchange for one USD). In addition to an exchange rate, my web app provides a line chart that allows for tracking of that country's currency exchange rates relative to the USD over time. The third feature of the Currency Capsule is an interactive scatter-style timeline that provides context for the selected year within the selected country.

I elected to undergo this project because in my reading of historical novels and texts, I would often find myself confused at the worth of the mentioned currencies and the implication of their usage in the text's historical period. In order to satisfy this curiosity, a currency conversion tool seemed to be the quickest solution to gain a rudimentary understanding of the currency within its historical context, alongside a convenient timeline to deepen that context. Additionally, being from the United States myself, relating the currencies of other countries nominally to the USD that I am personally more familiar with seems like the most effective approach for conferring understanding and meaning.

Data Overview

The Currency Capsule uses two primary sources of data: a global currency exchange data set from the "Exchange Rates Between the United States Dollar and Forty-one Currencies" set on MeasuringWorth.com, and a documentation of global crisis data from Harvard Business School's Behavioral Finance & Financial Stability (BFFS) program's "Global Crises Data by County" (*Measuring Worth*, 2020; *Data - Global Crises Data by Country*, n.d.).

The exchange rate data set from MeasuringWorth sources its data from multiple highly reliable publications and bulletins, including the US Federal Reserve and the International Monetary Fund (IMF). This data contains 41 countries and all of the USD exchange rates available over many years. It's important to note that not all countries contain the same amount of data. For example, while the United Kingdom's data records begin in 1791, the data for Venezuela only begins in 1948. Also, exchange rate data from MeasuringWorth for certain European countries do not continue into the present, as many European nations eventually switched to the Euro as a shared currency for trade on or after 1999. Consequently, this data stores historical exchange information about the Euro under the country name "Europe". This data set is primarily used in the exchange rate output value and the country's historical currency line plot (*Measuring Worth*, 2020).

The Global Crises data set from Harvard Business School is highly interesting, containing information separated by country over many years concerning banking, currency, inflation, and systemic crises within 70 countries. Additional notes on domestic debt and external (international) affairs were also contained within this data. These notes and crisis markers are essential to the Currency Capsule's interactive timeline. The data was collected over many years as part of a research endeavor within the BFFS program (*Global Crises Data by Country*, n.d.).

For both data sources, data preprocessing was an essential step after acquisition. Outside of formatting and general transformations, decisions were made to frame the crisis data, limiting it to the given "crisis" fields. In reality, crises are more complicated, although ideally the notes serve to provide more nuance and context in the timeline.

For further details on the data used for the Currency Capsule, my repository on GitHub contains additional information and steps for preprocessing and transformation of the data (Kalithkar, 2025).

Third party libraries such as the Dash, Pandas, and Numpy python packages were used in the creation of the Currency Capsule. Dash was the library used to easily build the web app, providing scaffolding and clear documentation for all of the elements created on the Currency capsule (*Plotly Python Graphing Library*, 2023). Pandas allowed for smooth preprocessing of the data as well as maintaining organization of the data while being manipulated for the web app's output (*User Guide — Pandas 1.0.1 Documentation*, 2014). Numpy allowed for easy processing of lists that allowed the creation of the two primary figures (*NumPy Documentation*, 2022).
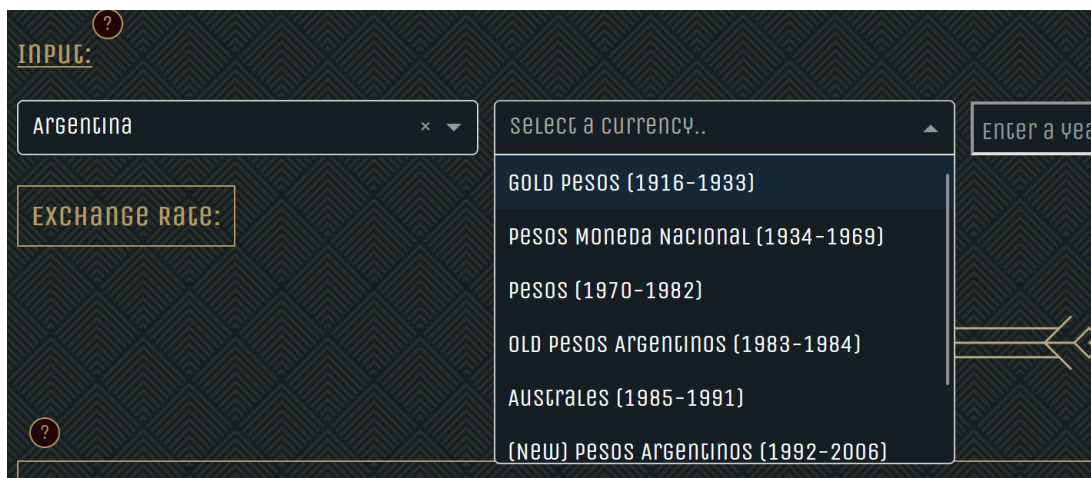
Demonstration

The below is the appearance of the input field of the Currency Capsule web app UI.
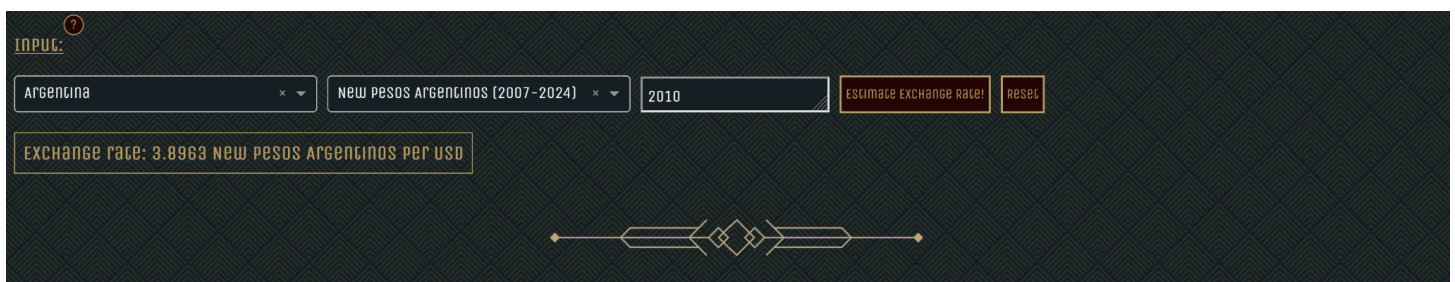

To use this web app, first, successively fill out the three input fields in the order of: Country, Currency, Year. Upon selecting a country, only then will a filtered list of currencies appear. For example, pictured below is a list of currencies associated with the country of Argentina.
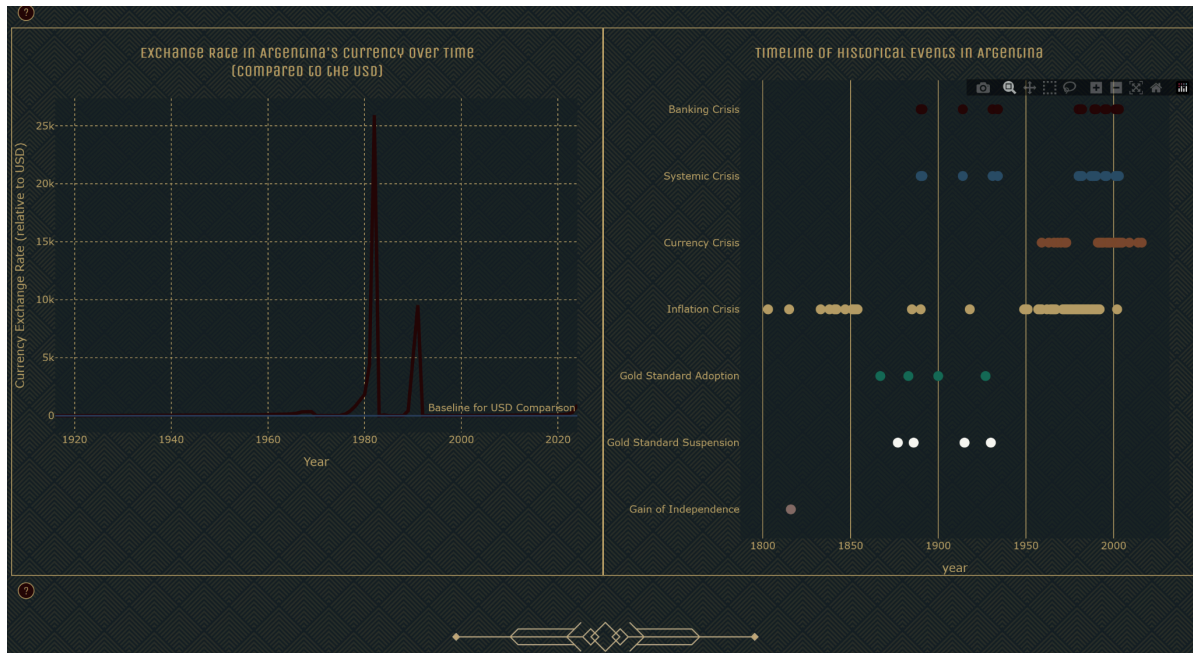

Type a desired year from which the conversion will occur. Select the "Estimate Exchange Rate" button, and the converted exchange rate will appear. Now we know how many New Pesos Argentinos could have been exchanged for 1 USD in 2010.

In addition to the exchange rate, two plots will also appear. The plot on the left is a line plot showing the selected country's exchange rate over time. The plot on the right is an interactive timeline containing this country's historical crises. Both plots can be zoomed into and panned.

The interactive timeline contains points that can be hovered over for additional detail and notes on the point itself.

The intended usage for the Currency Capsule is for a user wishing to contextualize a given currency from a country into a nominal exchange rate relative to the USD, while wanting to understand the major details that might have led to such circumstances. I have found utility in this combination of tools in understanding the effects of major economic events, such as hyperinflation or an economic recession, by contextualizing it with a dollar value.

References

Data - Global Crises Data by Country. (n.d.). HBS - Behavioral Finance & Financial Stability; Harvard Business School. Retrieved May 5, 2025, from https://www.hbs.edu/behavioral-finance-and-financial-stability/data/Pages/global.aspx

Kalithkar, V. (2025, March 26). *Vkalithkar/Currency-Conversion-Project*. GitHub. https://github.com/vkalithkar/Currency-Conversion-Project

Measuring Worth - Measures of worth, inflation rates, saving calculator, relative value, worth of a dollar, worth of a pound, purchasing power, gold prices, GDP, history of wages, average wage. (2020). Measuringworth.com. https://www.measuringworth.com/datasets/exchangeglobal/

NumPy Documentation. (2022). Numpy.org; NumPy. https://numpy.org/doc/

Plotly Python Graphing Library. (2023). Plotly Open Source Graphing Library for Python; Plotly - Graphing Libraries. https://plotly.com/python/

User Guide — pandas 1.0.1 documentation. (2014). Pydata.org; Pandas. https://pandas.pydata.org/docs/user_guide/index.html