

# Effect of Election on Currency Fluctuation\*

## Analysis of USD Exchange Rate Fluctuation during Inauguration week

Sandy Yu

April 15, 2024

This paper analyzes the effect of US Presidential Election Announcement and a change of political party on the USD exchange rate. Daily exchange rates gathered from FRED and past presidential inauguration dates from multiple government websites are used in a generalized linear regression model to estimate the effects. We find that election result announcement has an average negative effect on USD exchange rate whereas a change of political party contributes positively with a slightly larger magnitude. Our result suggests that exchange USD for another currency closely after a Presidential election with a change of political party could be profitable.

## Table of contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Data</b>	<b>3</b>
2.1	Data on Exchange Rate . . . . .	4
2.2	Data on Election Results . . . . .	4
2.2.1	Construction of Inauguration Week . . . . .	4
2.3	Final Dataset . . . . .	5
<b>3</b>	<b>Model</b>	<b>5</b>
3.1	Model set-up . . . . .	6
<b>4</b>	<b>Results</b>	<b>6</b>
4.1	Explanation for small $R^2$ . . . . .	8
<b>5</b>	<b>Discussion</b>	<b>8</b>
5.1	Expectation of the population . . . . .	8

---

\*Code and data are available at: <https://github.com/Jingying-yu/election-season-and-currency-fluctuation.git>

5.2	Change of Political Party . . . . .	8
5.3	Third discussion point . . . . .	8
5.4	Weaknesses and next steps . . . . .	8
<b>Appendix</b>		<b>9</b>
<b>A Additional data details</b>		<b>9</b>
<b>B Model details</b>		<b>9</b>
B.1	Posterior predictive check . . . . .	9
B.2	Diagnostics . . . . .	9
<b>References</b>		<b>11</b>

# 1 Introduction

USD is one of the most popular currency in circulation today. As a foreign buyer of USD product, the final price can vary greatly depending on the exchange rate between one's local currency and USD. Fluctuation of exchange rate can be attributed to multiple different factors. For example the difference in interest rate between two countries, inflation rate, etc. This paper will focus on one particular aspect that contributes to the change in USD exchange rate: the expectation of the populous on the future of the United States, perceived through the results of the US Presidential Election. The election of a new president is often one of the biggest political shift for a country, shifts in strategies and focus will cause many people to reevaluate their faith for their country.

This paper seeks to explore the effect that the US Presidential Election result announcements have on USD interest rate. USD v.s. CAD exchange rate from 1971 to 2024 is pulled from the Federal Reserve Bank of St. Louis (2023) website, and past presidential election results and inauguration dates are gathered and double-checked through (**Cencus?**) and Frank LaRose (2023). The estimand of the paper is how the announcement and inauguration of a new US president, and how a change in political party, influence the USD exchange rate.

The result of our analysis indicates that the announcement and inauguration of a new US president has an average negative effects on USD exchange rate within the time frame of 1971 to 2024. If a change of political party has occurred for the new election season, where the leading party this season is different from the previous, then an average positive effect occurs. The magnitude of effect for the two factors suggest that, if the new president belongs to a different party than the previous president, then the inauguration announcement will have a net positive effect on USD exchange rate.

Analyses and findings in this paper are structured into several sections: Section 2 – Data, Section 3 – Model, Section 4 – Results, and Section 5 – Discussion. The Data section examines all datasets and variables kept for analysis, followed by an explanation of their data

cleaning processes. The Model section defines linear models used for further analysis, explain its components, and presents model justifications. The Result section focuses on visualizing and presenting the model results through data presented in Data section. The Discussion section further evaluate the interpretations behind the model results presented in the previous section, and touches on any weaknesses and next steps.

## 2 Data

The USD exchange rate data, denoted DEXCAUS (Board of Governors of the Federal Reserve System 2023), is obtained through the FRED website (Federal Reserve Bank of St. Louis 2023). The source of the dataset is the US Board of Governors of the Federal Reserve System (Board of Governors of the Federal Reserve System 2023). The past US president inauguration dates are pulled from the US Census Bureau (U.S. Department of Commerce 2023) and cross-referenced with Frank LaRose Ohio Secretary of State (Frank LaRose 2023).

Data is cleaned and analyzed using the open source statistical programming language R (R Core Team 2023) and supporting packages tidyverse (Wickham et al. 2019), janitor (Firke 2023), rstanarm (Goodrich et al. 2022), arrow (Richardson et al. 2024), ggplot2 (Wickham 2016), and knitr (Xie 2023), with additional help from Microsoft Excel (Microsoft Corporation 2023). Detailed description of each dataset can be found in the subsections below.

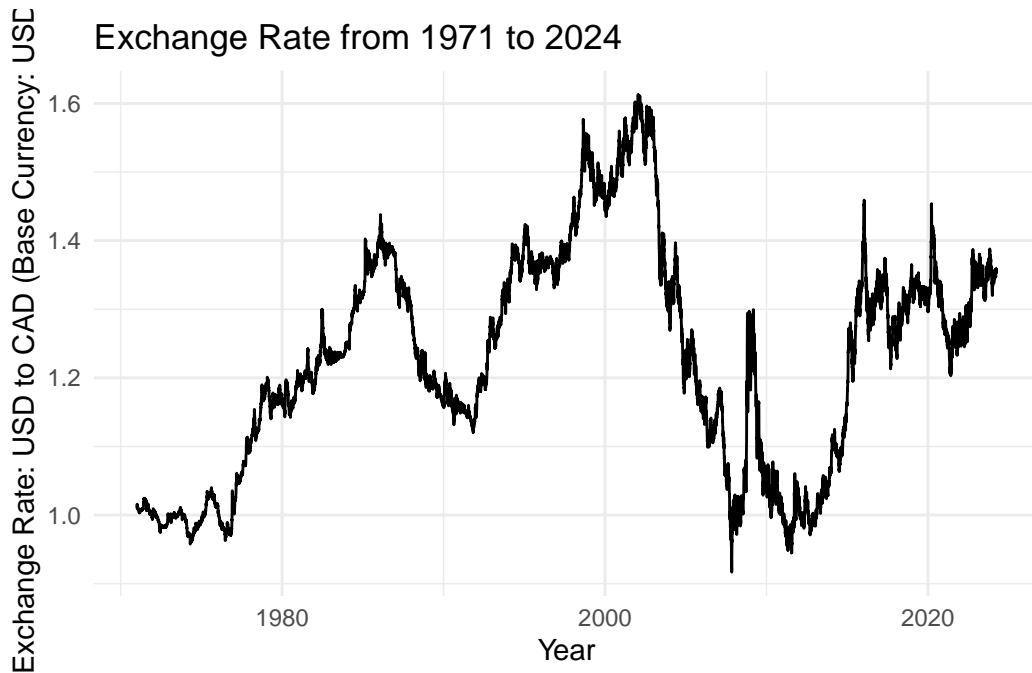


Figure 1: Exchange Rate from 1971 to 2024

## 2.1 Data on Exchange Rate

The DEXCAUS (Board of Governors of the Federal Reserve System 2023) dataset includes the daily exchange rate between USD and CAD (base USD = 1) from 1971-01-04 to 2024-03-29 (date the dataset is downloaded for the purpose of the paper). Raw data contains only the date and the corresponding exchange rate of the day. Exchange rate in this dataset is used as the estimate of this paper.

## 2.2 Data on Election Results

In order to measure the effect that the population’s faith to their country have on exchange rate, this paper focuses on one particular political event that will quickly change the population’s expectation for their country in a short amount of time, the presidential election. Analysis will be focused on the election result announcement and the inauguration period (please see specific definition of the term inauguration period in the subsection below Section 2.2.1). Data of past election results and inauguration dates are obtained through the US Census Bureau (U.S. Department of Commerce 2023) and cross-referenced with Frank LaRose Ohio Secretary of State (Frank LaRose 2023) for accuracy. The final dataset use the inauguration dates and political party information to determine the effect of having a new president on the USD exchange rate.

Table 1: Sample of past inauguration dates information

President	Party	Inauguration Date
Gerald R. Ford	Republican	1974-08-09
Jimmy Carter	Democrat	1977-01-20
Ronald Reagan	Republican	1981-01-20
George H.W. Bush	Republican	1989-01-20
Bill Clinton	Democrat	1993-01-20
George W. Bush	Republican	2001-01-20
Barack Obama	Democrat	2009-01-20
Donald J. Trump	Republican	2017-01-20
Joseph R. Biden, Jr.	Democrat	2021-01-20

### 2.2.1 Construction of Inauguration Week

Using the inauguration date information present in the dataset, we will construct an announcement period, allowing the news of the result to sink in and give time for the exchange rate to react to the announcement. This period needs to be relatively short to ensure that the change in exchange rate is causal by the election result announcement and **only** the announcement.

The final construction will be referred to as the *inauguration week* for the remainder of this paper. The inauguration week is a  $\pm 3$  days week centered on the original inauguration date for each past US president.

*Day1*   *Day2*   *Day3*   **Inauguration Day**   *Day5*   *Day6*   *Day7*

## 2.3 Final Dataset

The final dataset combines the date and exchange rate columns from the DEXCAUS (Board of Governors of the Federal Reserve System 2023) dataset and uses the inauguration week (constructed through the inauguration dates from the election results dataset, Section 2.2). The column *Inauguration Period* has a value of 1 if the date is within the inauguration week and 0 otherwise. A new column *Change Party* is added, it receives a value of 1 if the political party of the new president is different from the previous president's and 0 otherwise.

Table 2: Sample of the final dataset used for analysis

Date	Exchange Rate	Inauguration Period	Change Party
1977-01-12	1.0049	0	0
1977-01-13	1.0071	0	0
1977-01-14	1.0015	0	0
1977-01-17	1.0115	1	1
1977-01-18	1.0139	1	1

## 3 Model

The goal of our modelling strategy is twofold. Firstly, a binary indicator variable will estimate the magnitude of effect the US presidential announcement and inauguration have on the US exchange rate. Secondly, the influence of a change in political party between the an US president and their predecessor will also be estimated.

Magnitude of effect created by the helpline efforts can be estimated through linear models. Gaussian regression model is best suited for our analytical purposes. Other generalized linear models such as Logistic and Multilevel are not considered due to the nature of the variables in interest. Logistic regression model requires data that yields either an **yes** or **no** result, whereas multilevel model require more complexity between variables. Due to the nature of the Poisson function, the Poisson model requires count variable not available for our dataset. Background details and diagnostics are included in Appendix B.

### 3.1 Model set-up

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma)$$

$$\mu_i = \alpha + \beta_i + \omega_i$$

$$\alpha \sim \text{Normal}(0, 2.5)$$

$$\beta \sim \text{Normal}(0, 2.5)$$

$$\omega \sim \text{Normal}(0, 2.5)$$

$$\sigma \sim \text{Exponential}(1)$$

Where:

- $y_i$  is the daily exchange rate of USD v.s. CAD (base unit is USD = 1)
- $\beta_i$  is a dummy variable (value is either 0 or 1) indicating whether the date is within the inauguration week (see data section for definition of inauguration week). If date is within the inauguration week, then the variable has a value of 1, and 0 otherwise.
- $\omega_i$  is a dummy variable indicating whether a change of political party occurred in the corresponding election season. Each inauguration week receives identical value (the whole week is either all 1 or all 0). Value of 1 indicates that the elected president's political party is different from last season's president's, 0 otherwise.

We run the model in R (R Core Team 2023) using the `rstanarm` package of Goodrich et al. (2022). We use the default priors from `rstanarm`.

## 4 Results

Our results are summarized in Table 3.

Table 3: Explanatory models of flight time based on wing width and wing length

Inauguration model	
(Intercept)	1.23
	(0.00)
inauguration_period	−0.14
	(0.05)
change_party	0.18
	(0.06)
Num.Obs.	13 358
R2	0.001
Log.Lik.	5487.404

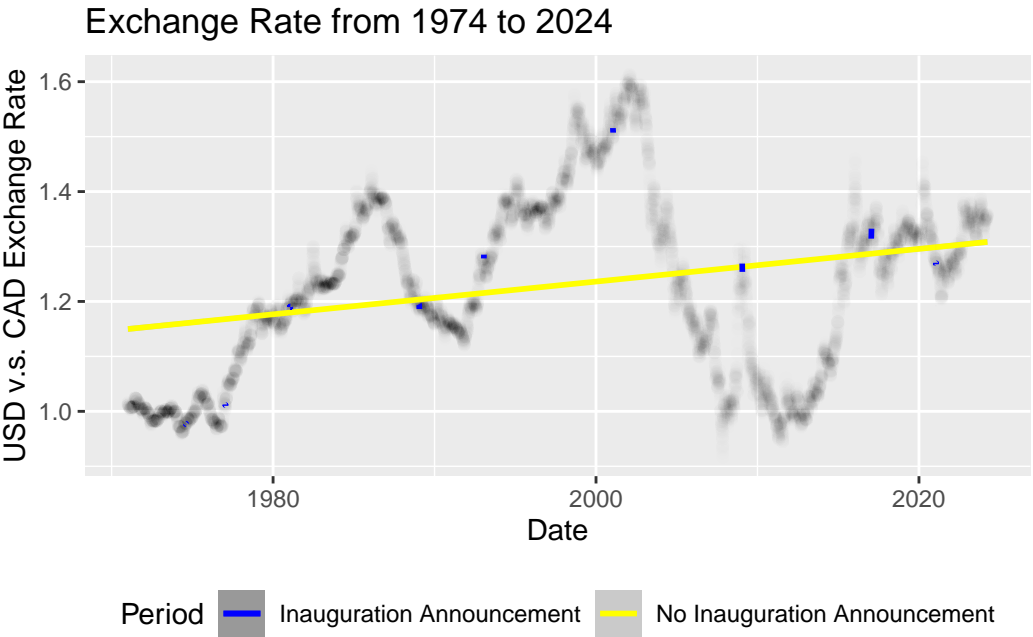


Figure 2: Estimate average change in Exchange Rate

#### **4.1 Explanation for small $R^2$**

### **5 Discussion**

#### **5.1 Expectation of the population**

If my paper were 10 pages, then should be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

#### **5.2 Change of Political Party**

#### **5.3 Third discussion point**

#### **5.4 Weaknesses and next steps**

Weaknesses and next steps should also be included.



## Appendix

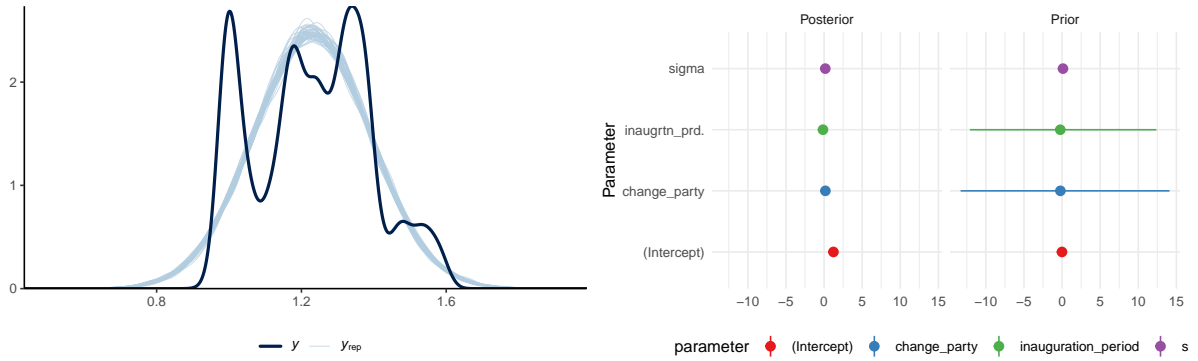
### A Additional data details

### B Model details

#### B.1 Posterior predictive check

In Figure 3a we implement a posterior predictive check. We can see that the regression outcome from our data and the simulation created by the posterior distribution are not closely matched. This is because our predictor variables only contribute to a small section of the data (40 out of 13358 observations has `inauguration_period == 1`, 30 out of 13358 has `change_party == 1`).

In Figure 3b we compare the posterior with the prior. We can see that the estimation parameters shifts minimally after taking data into account. This suggests that good prior parameters were set.



(a) Posterior prediction check

(b) Comparing the posterior with the prior

Figure 3: Examining how the model fits, and is affected by, the data

#### B.2 Diagnostics

Figure 4a is a trace plot. Trace plots are often used to diagnose abnormalities of models. For both plots, lines are oscillating vertically and maintains an overall horizontal trend. This suggests that there is nothing out of the ordinary for our model.

Figure 4b is a Rhat plot. Rhat plot is a valuable tool for assessing convergence in Bayesian regression models, helping ensure the reliability and validity of the model's inference results.

Both both plots, all data points are close to 1. This suggest that there is nothing out of the ordinary for our model.

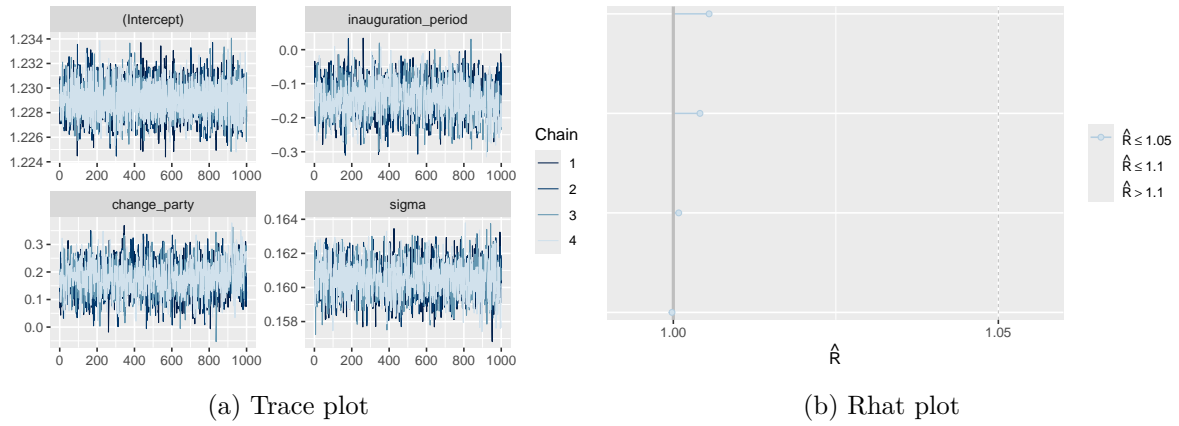


Figure 4: Checking the convergence of the MCMC algorithm

## References

- Board of Governors of the Federal Reserve System. 2023. *Federal Reserve*. Washington, D.C., USA: Federal Reserve. <https://www.federalreserve.gov>.
- Federal Reserve Bank of St. Louis. 2023. *Federal Reserve Economic Data (FRED)*. St. Louis, Missouri, USA: Federal Reserve Bank of St. Louis. <https://fred.stlouisfed.org>.
- Firke, Sam. 2023. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. <https://github.com/sfirke/janitor>.
- Frank LaRose. 2023. *Ohio Secretary of State*. Columbus, Ohio, USA: Office of the Ohio Secretary of State. <https://www.ohiosos.gov/elections/election-results-and-data/historical-election-comparisons/presidents-of-the-united-states-of-america/>.
- Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. “Rstanarm: Bayesian Applied Regression Modeling via Stan.” <https://mc-stan.org/rstanarm/>.
- Microsoft Corporation. 2023. *Microsoft Excel*. Redmond, Washington, USA: Microsoft. <https://www.microsoft.com/en-us/microsoft-365/excel>.
- R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Richardson, Neal, Ian Cook, Nic Crane, Dewey Dunnington, Romain François, Jonathan Keane, Dragoş Moldovan-Grünfeld, Jeroen Ooms, Jacob Wujciak-Jens, and Apache Arrow. 2024. *Arrow: Integration to 'Apache' 'Arrow'*. <https://github.com/apache/arrow/>.
- U.S. Department of Commerce. 2023. *United States Census Bureau*. Washington, D.C., USA: United States Census Bureau. <https://www.census.gov>.
- Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. <https://ggplot2.tidyverse.org>.
- Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D’Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.
- Xie, Yihui. 2023. *Knitr: A General-Purpose Package for Dynamic Report Generation in r*. <https://yihui.org/knitr/>.