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The Impact of the US Election Cycle and Partisan Factors on Dollar Exchange Rate Volatility

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Abstract. This study analyzes the daily volatility of the US dollar against the Japanese yen (JPY), euro (EUR), British pound (GBP), Canadian dollar (CAD), Swiss franc (CHF), and Swedish krona (SEK) over the period from 2004 to 2023. Using a VAR model, we enhance the literature by integrating the US election cycle, partisan dynamics, and macroeconomic factors into our analysis. Our findings indicate that: 1) the six currencies respond differently within the US election cycle; 2) the volatility of the US dollar exchange rate is partially influenced by partisan dynamics; 3) certain currencies are more sensitive to political factors; 4) the volatility of the US dollar exchange rate is impacted by certain macroeconomic factors. The findings offer valuable insights into how US election cycle and partisan factors influence dollar exchange rate volatility.

Keywords: Vector AutoRegression (VAR) Model, exchange rate volatility, US election cycle, partisan dynamics.

1. Introduction

Since the collapse of the Bretton Woods system in the 1970s, the volatility of the US dollar's exchange rate has been shaped by a complex interplay of political events, economic fundamentals, and monetary policy. As one of the world's largest economies, the United States wields significant international influence, whose political decisions play an important role in global economy. Therefore, this study aims to explore how the US election cycle and key partisan dynamics—both central aspects of American politics—affect the volatility of the US dollar's exchange rate. Inspired by the composition of the US Dollar Index, we specifically choose to examine the volatility of the dollar's exchange rate against six major currencies, including the Japanese yen (JPY), euro (EUR), British pound (GBP), Canadian dollar (CAD), Swiss franc (CHF), and Swedish krona (SEK).

Traditionally, studies on exchange rates have focused on how political events or political risks influence exchange rate volatility. Many studies have discovered that the volatility of exchange rates is affected by US political factors, including political news, elections, policies, and risks. Bachman discovered that political events, specifically elections, significantly impact the forward exchange bias[1].

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Blomberg and Hess showed that exchange rates are sensitive to political variables even when accounting for economic factors[2]. The impact of varying public and health policies during the pandemic on the US and Chinese economies has also been analyzed[3]. Del Bo found that exchange rate variability and political risk interact negatively, reinforcing each other's effects [4], and through the study of exchange rate fluctuations of four major currencies, it was found that the electoral cycle and the political party in office have an impact on them[5].

Scholars have also considered partisan factors, such as the influence of left-wing or right-wing presidents and the presence of a "divided government" where a party different from the president controls Congress. Berdiev, Kim, and Chang discovered that left-wing governments increase the likelihood of choosing a flexible regime, while more globalized countries are more likely to implement a fixed regime[6]. Zhu, Zhao, and Wang found that the political cycle's effect on exchange rates is not necessarily influenced by the party in power but is affected when the president and Congress are controlled by the same party[7]. It has also been observed that exchange rate volatility increases one month prior to an election and during periods of "divided government" [8].

However, a gap in the existing literature is the lack of a comprehensive analysis that simultaneously considers the US election cycle, partisan politics, and macroeconomic factors on the volatility of the US dollar's exchange rate. Building on previous research, we choose to address this gap by focusing on the US election cycle alongside partisan politics to study their impact on the volatility of the US dollar's exchange rate. Our interest in the US election cycle is inspired by studies about its impact on the stock market[9][10]. These studies utilized the four-year election cycle as a time series and found that presidents from different parties and different years in the cycle have distinct impacts on the stock market. Similarly, we define the election year as the first year of the cycle and the midterm election year as the third year, aiming to identify any patterns in exchange rate volatility. There is also evidence suggesting that political cycles can indeed influence exchange rate volatility[11]. We will also explore the short-term effects of general and midterm elections, such as two months or two weeks around the election. Additionally, partisan factors are included in our study. Except from factors already mentioned in previous literature, we also incorporate the distribution of electoral votes of the winning presidents' party.

In this study, we analyze daily data on the US dollar's exchange rate against a basket of major currencies, including the euro (EUR), British pound (GBP), Canadian dollar (CAD), Swiss franc (CHF), Swedish krona (SEK), and Japanese yen (JPY) from 2004 to 2023. In total five complete election cycles. A Parkinson Volatility formula is used to calculate the daily volatility. In order to accurately assess the impact of political variables on exchange rate volatility, we control for macroeconomic factors that could also influence exchange rates, aiming to minimize their influence on the analysis. After a comprehensive review of past literature and macroeconomic theory, 13 macroeconomic factors were selected, along with 8 election-related factors and 3 partisan factors. Then we applied the Johansen cointegration test to these variables to identify those suitable for further analysis through the Granger causality test[12]. After this, the Granger causality test was used to filter out variables that did not exhibit causality. In this way we refined our selection to the most relevant variables for model fitting[13]. We then utilized the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Hannan-Quinn Criterion (HQ) to determine the optimal order for our model[14]. With these preparations in place, we can employ the Vector AutoRegression (VAR) model. Unlike the GARCH and ARIMA models previously used by scholars, the VAR model offers a more comprehensive approach by capturing the dynamic interactions and feedback effects among multiple time series simultaneously. It is particularly well-suited for examining the complex interrelationships between exchange rate volatility and various factors [15]. We apply this model to elucidate the quantitative relationship between US election variables, partisan factors, and the volatility of the US dollar's exchange rate against the six major currencies. This study is trying to offer deeper insights into how US election politics can influence the currency economy.

DOI: 10.54254/2755-2721/132/2024.20849

2. Methodology

2.1. Variable Selection

To ensure the robustness of our findings, we controlled for 13 key macroeconomic variables: the Consumer Price Index (CPI), Gross Domestic Product at current prices (GDP), Industrial Production Index (IP), Inflation Rate (IR), Foreign Direct Investment Flows (FDII/FDIO), Money Supply (M2), Net Export (NX), Oil Prices (OILP), Foreign Portfolio Flows (Port_in/Port_out), Unemployment Rate (UNRATE), and the US Business Cycle Expansions and Contractions (USREC) indicator.

Based on this, we selected 11 election-related factors(8 election-related factors and 3 partisan factors): October and November of election years (electionOctNov), one week before and after the general election day (electionNovWeek), one week before and one week before and after the midterm election day (midtermWeek, midterm2Weeks), the presence of a Divided Government (DividedGov), the specific years within the election cycle (Y1, Y2, Y3, Y4), the political party of the sitting president (PresidentPar) and the distribution of the winning presidents' electoral votes (elecDistribution).

Political Variables To analyze the performance of different years within an election cycle, we define the election year—specifically 2004, 2008, 2012, 2016, and 2020—as the first year of the election cycle (Y1). The midterm election year is designated as the third year (Y3). Accordingly, we use dummy variables: for Y1, the years 2004, 2008, 2012, 2016, and 2020 are assigned a value of 1, while all other years are assigned a value of 0. Similarly, for Y2, the years 2005, 2009, 2013, 2017, and 2021 are coded as 1, with the remaining years coded as 0. This pattern continues for Y3 (2006, 2010, 2014, 2018, and 2022) and Y4 (2007, 2011, 2015, 2019, and 2023).

As discussed in the Introduction, exchange rate volatility may be influenced by short-term political events [1][3]. Given the study's focus on the influence of elections, we specifically examine periods of heightened political activity by including October and November of general election years, the week before and after election day (both general and midterm), and the week before midterm election day to detect any potential changes in volatility. Consequently, we introduce four additional dummy variables: electionOctNov, electionNovWeek, midtermWeek, and midterm2Weeks. For these specified periods, a value of 1 is assigned, with all other days coded as 0.

Regarding partisan factors, and based on prior literature discussed in the Introduction, we include Divided Government (DividedGov) as another dummy variable. This variable represents periods when the president's party differs from the majority party in either house of Congress. Specifically, the years 2007-2008, 2011-2012, 2015-2016, and 2019-2020 are marked as periods of divided government, with a value of 1 assigned from the election day following the preceding general election until the next general election day, and 0 otherwise. Additionally, we introduce the variable PresidentPar, which represents the president's party. This variable is assigned a value of 1 from the election day of a Republican president until the election day of a Democratic president, and 0 for other periods. To further analyze the influence of partisan power, we include another variable, elecDistribution, which represents the distribution of the winning president's electoral votes, capturing the strength of the winning party. Given that the influence of a general election may not persist for an extended period, elecDistribution is applied as a dummy variable, with a value of 1 during November and December of general election years and 0 during other periods.

Controlled Macroeconomic Variables To account for the various factors influencing exchange rate fluctuations, we conducted a comprehensive review of the literature to identify the key macroeconomic variables that should be included in our analysis.

Capital flow, which aggregates foreign portfolio investment (FPI) flows and foreign direct investment (FDI) flows, is influential on exchange rates. Brooks et al. (2004) highlighted that equity portfolio flows exert a notable influence on exchange rates over time[16], while Jongwanich et al. FDI infusions are more beneficial than other types of capital inflows in accelerating real exchange rate appreciation[17]. Therefore we have four variables about capital flow, FPI inflow/outflow and FDI inflow/outflow. A

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further consideration in our model is the effect of oil prices on exchange rates and their reciprocal relationship[18][19]. In particular, we use the WTI oil price to calculate the exchange rate between the US dollar and six other currencies. We also take into account the inflation rate in our study. Imimole et al. claim that depreciation of exchange rates can stabilize unstable rates of inflation, as evidenced by their research on Nigeria[20]. In certain research, the Consumer Price Index (CPI) has been utilized as a proxy for inflation; nevertheless, there is ongoing debate on the correlation between CPI and changes in exchange rates. For instance, studies have indicated that the CPI does not always affect exchange rates[21][22]. Because of the influence of the real exchange rate (RER), we have included data on unemployment rates in our model as well [23].

Furthermore, we include Gross Domestic Product (GDP), Industrial Production Index (IP), Money Supply (M2), and Net Exports (NX) to account for broader economic and monetary conditions. As part of our comprehensive analysis, we include the expansions and contractions of the US Business Cycle. When we consider expansions and contractions, we can identify patterns and predict volatility shifts more accurately. Forecasting exchange rate movements becomes more accurate and robust as a result.

2.2. Data

2.2.1. Data Sources The exchange rate data were obtained from Yahoo Finance. The macroeconomic variables, including the CPI, GDP, and IP were sourced from the International Monetary Fund (2024). Additionally, data on M2 money supply and inflation rates were retrieved from the World Bank Open Data (2024). Information regarding capital inflows and outflows was sourced from the United Nations Conference on Trade and Development (2024). For political variables, data on Presidential Elections was collected from the Federal Election Commission, while Congressional data was gathered from the United States House of Representatives.

2.2.2. Data Preparation To analyze the data, we first calculated the daily volatility of the USD/JPY, USD/EUR, USD/CHF, USD/CAD, USD/GBP, and USD/SEK exchange rates using Parkinson's Volatility method. Our dataset comprises two main categories of variables: political and macroeconomic. To ensure the accuracy and reliability of the data, we standardized all variables to a scale of [0,1]. Given that the exchange rate volatility data are recorded daily, we employed time series imputation to convert all variables to a daily frequency for better examination of their relationships.

Exchange Rate Volatility To calculate the volatility of the USD/JPY, USD/EUR, USD/CHF, USD/CAD, USD/GBP, and USD/SEK exchange rates, we use Parkinson Volatility, a method that utilizes the highest and lowest prices of the day to provide a more accurate representation of significant price movements, which are closely linked to volatility. The formula for Parkinson Volatility is given by:

$$\sigma_p = \sqrt{\frac{1}{4ln2} \cdot \frac{1}{n} \sum_{i=1}^{n} ln(\frac{H_i}{L_i})^2} \tag{1}$$

where H_i represents the highest price during period i, L_i represents the lowest price during period i, and n is the number of periods over which the volatility is calculated.

Data standardization and Outlier Checking Since all the data are in the different scales, we first standardized the data on the scale of [0,1], ensuring that all the data are at the same scale, making the analysis and comparison of the data fairer. The formula is given by

$$\frac{x - x.min()}{x.max() - x.min()} \tag{2}$$

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Next, we checked the outliers, finding that most of the data is distributed concentratedly except for some obvious outliers in the data of Port_in, Port_out, and FPI outflow. For those outliers, we assumed they might be caused by some specific events but still used linear interpolation to justify them.

Data Conversion The data we collected come from various sources and are recorded on different time scales. For example, some macroeconomic variables, such as GDP and CPI, are typically recorded annually, while others, like oil prices, are recorded daily. Given that our research focuses on the volatility of the USD/JPY, USD/EUR, USD/CHF, USD/CAD, USD/GBP, and USD/SEK exchange rates—data that are recorded daily, we converted all variables to a daily frequency to ensure consistency across the dataset. For example, the daily data for GDP are replaced with the annual data for the current year.This approach ensures that the variables are consistently represented at the daily level while retaining their original temporal context.

Also, the values of daily USD/JPY, USD/EUR, USD/CHF, USD/CAD, USD/GBP and USD/SEK exchange rate volatility are quite small, making them difficult to interpret directly. To address this, we applied a common logarithmic transformation to these values, which allowed us to more effectively capture and analyze the data in our dataset.

2.3. VAR Model

The vector autoregressive (VAR) model we use is invented by Christopher A. Sims. This is an effective time series model for examining the dynamic interactions between several variables that are interdependent with one another. As a result of taking both the current value and the lag value into account, this model is able to deal with the endogeneity issue more effectively. Unlike other time series models such as GARCH and ARIMA, the VAR model accounts for the interdependencies among multiple variables, providing a more comprehensive understanding of the dynamics at play. Using a VAR model requires stationary time series variables, non-stationary series might cause problems with pseudo-regression and result in inaccurate results. When the variables show a cointegration relationship, they can be included jointly in a VAR model during the first phase of the test.

Cointegration Test To determine whether a cointegration relationship exists among the variables, we apply the Johansen cointegration test and apply 90% significence level as the benchmarck with the corresponding value 7.52. So for the variables whose T-value larger than 7.52, we conclude a cointegration relationship. The results of this test are presented in Table 1. According to Table 1, only the variables CPI, GDP, M2, OILP, Port_in, Port_out, USREC, electionOctNov, electionNovweek, midtermweek, DividedGov, Y1, Y2, Y3, and Y4, midterm2Weeks, elecDistribution show evidence of cointegration. Consequently, we proceed with the Granger causality test solely on these variables that passed the cointegration test.

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Table 1: Johansen Cointegration Test

Variable	T_{JPY}	T_{EUR}	T_{CHF}	T_{CAD}	T_{GBP}	T_{SEK}	Conclusion
CPI	12.14	12.16	12.16	12.21	12.14	12.18	cointegration
GDP	12.58	12.63	12.62	12.69	12.61	12.65	cointegration
IP	4.82	4.77	4.78	4.78	4.79	4.77	no cointegration
IR	5.4	5.38	5.39	5.37	5.37	5.38	no cointegration
FDII	6.99	7.00	7.00	6.99	7.00	7.00	no cointegration
FDIO	6.25	6.25	6.26	6.26	6.25	6.25	no cointegration
M2	50.73	50.73	50.69	50.41	50.60	50.75	cointegration
NX	3.13	3.11	3.12	3.11	3.10	3.10	no cointegration
OILP	8.62	8.60	8.60	8.61	8.61	8.61	cointegration
Port_in	130.37	129.79	130.50	130.42	129.75	130.04	cointegration
Port_out	129.58	129.60	129.32	129.56	129.41	129.49	cointegration
UNRATE	6.8	6.77	6.78	6.76	6.77	6.79	no cointegration
USREC	13.13	13.06	13.08	13.02	13.11	13.09	cointegration
electionOctNov	63.74	63.78	63.84	63.72	63.62	63.74	cointegration
electionNovweek	185.72	185.76	185.91	185.63	185.58	185.84	cointegration
midtermWeek	407.71	407.52	407.82	407.64	407.16	407.70	cointegration
DividedGov	8.34	8.37	8.36	8.36	8.38	8.37	cointegration
Y1	13.51	13.52	13.50	13.50	13.49	13.52	cointegration
Y2	13,47	13.41	13.40	13.40	13.40	13.40	cointegration
Y3	13,41	13.39	13.40	13.38	13.39	13.39	cointegration
Y4	10.84	10.85	10.89	10.84	10.85	10.86	cointegration
PresidentPar	3.62	3.63	3.62	3.64	3.64	3.63	no cointegration
midterm2Weeks	196.84	196.45	196.70	196.74	196.59	196.84	cointegration
elecDistribution	63.30	63.37	63.36	63.32	63.32	63.11	cointegration

Granger Causality Test The Granger causality test shows that GDP, Port_out, USREC and Y1 have significant p-values, indicating they are the Granger causes of all the currencies we study. CPI and M2 also have significant values among the currencies except for GBP and SEK. The specific results are concluded in the Table 2. Only the variables that pass the Granger Causality Test for corresponding currencies are included in the model fitting.

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Table 2: Granger Causality Test

Variables	F-statistic	p-value	Conclusion
CPI	32.821	6.841e-15***	Pass
GDP	38.454	2.2e-16 ***	Pass
M2	23.816	5.056e-11***	Pass
OILP	1.9921	0.1365	Fail
Port_in	1.1419	0.3193	Fail
Port_out	4.4893	0.01127 *	Pass
USREC	53.468	2.2e-16 ***	Pass
electionOctNov	1.7639	0.1715	Fail
electionNovweek	2.2921	0.1012	Fail
midterm-week	0.2452	0.7826	Fail
midterm2Weeks	0.7139	0.4898	Fail
elecDistribution	3.3107	0.03657*	Pass
DividedGov	4.0919	0.01676*	Pass
Y1	7.5694	0.0006937 ***	Pass
Y2	0.6421	0.5431	Fail
Y3	1.8351	0.1597	Fail
Y4	4.2812	0.01387 *	Pass

(a) Granger Causality Test for JPY

Variables	F-statistic	p-value	Conclusion
CPI	18.259	$1.253e-08^{***}$	Pass
GDP	24.622	$2.276e-11^{***}$	Pass
M2	16.131	$1.038e-07^{***}$	Pass
OILP	0.0533	0.9481	Fail
$Port\_in$	3.1825	0.04156^{*}	Pass
$Port\_out$	4.0733	0.01707^{*}	Pass
USREC	46.405	$2.2e-16^{***}$	Pass
electionOctNov	1.5879	0.2045	Fail
electionNovweek	1.3001	0.2726	Fail
midterm-week	0.0792	0.9238	Fail
midterm2Weeks	0.4561	0.6338	Fail
elecDistribution	1.8981	0.15	Fail
DividedGov	2.6697	0.06937	Fail
Y1	9.8358	$5.45e-05^{***}$	Pass
Y2	6.3964	0.001681^{**}	Pass
Y3	0.3165	0.7287	Fail
Y4	1.2692	0.2811	Fail

(b) Granger Causality Test for EUR

Variables	F-statistic	p-value	Conclusion
CPI	39.497	<2.2e-16***	Pass
GDP	45.727	<2.2e-16 ***	Pass
M2	35.953	3.108e-16***	Pass
OILP	1.4095	0.2444	Fail
Port_in	0.5041	0.6041	Fail
Port_out	3.9883	0.01859 *	Pass
USREC	56.967	2.2e-16 ***	Pass
electionOctNov	0.0858	0.9177	Fail
electionNovweek	0.4995	0.6069	Fail
midterm-week	0.1269	0.8808	Fail
midterm2Weeks	0.2244	0.799	Fail
elecDistribution	1.2713	0.2806	Fail
DividedGov	1.2667	0.2818	Fail
Y1	8.9003	0.0001384 ***	Pass
Y2	5.3277	0.004882**	Pass
Y3	0.9066	0.404	Fail
Y4	0.0521	0.9493	Fail

(c) Granger Causality Test for CHF

Variables	F-statistic	p-value	Conclusion
CPI	5.3386	0.004829**	Pass
GDP	8.1686	0.0002871***	Pass
M2	0.2953	0.7443	Fail
OILP	11.654	8.911e-06***	Pass
Port_in	5.9839	0.002536**	Pass
Port_out	5.2681	0.005181 **	Pass
USREC	53.468	2.2e-16 ***	Pass
electionOctNov	3.3271	0.03597*	Pass
electionNovweek	2.3145	0.09891	Fail
midterm-week	2.2473	0.1058	Fail
midterm2Weeks	0.7083	0.4925	Fail
elecDistribution	3.7864	0.02274*	Pass
DividedGov	4.3444	0.01303*	Pass
Y1	11.858	7.276e-06 ***	Pass
Y2	3.0094	0.04941*	Pass
Y3	0.0504	0.9508	Fail
Y4	3.92	0.0199 *	Pass

(d) Granger Causality Test for GBP

Variables	F-statistic	p-value	Conclusion
CPI	39.141	<2.2e-16***	Pass
GDP	41.728	<2.2e-16 ***	Pass
M2	35.5	4.86e-16***	Pass
OILP	0.7065	0.4934	Fail
Port_in	1.0528	0.349	Fail
Port_out	3.3798	0.03413 *	Pass
USREC	72.197	2.2e-16 ***	Pass
electionOctNov	2.288	0.1016	Fail
electionNovweek	1.015	0.3625	Fail
midterm-week	0.164	0.8488	Fail
midterm2Weeks	0.0265	0.9738	Fail
elecDistribution	1.7585	0.1724	Fail
DividedGov	1.2745	0.2797	Fail
Y1	11.217	1.377e-05 ***	Pass
Y2	1.8606	0.1557	Fail
Y3	0.5535	0.575	Fail
Y4	2.0386	0.1303	Fail

(e) Granger Causality Test for CAD

Variables	F-statistic	p-value	Conclusion
CPI	2.5623	0.07723	Fail
GDP	5.52	0.004029 **	Pass
M2	2.8331	0.05892	Fail
OILP	2.5599	0.07741	Fail
Port_in	3.4084	0.03317*	Pass
Port_out	5.1911	0.005595 **	Pass
USREC	61.143	2.2e-16 ***	Pass
electionOctNov	1.4878	0.226	Fail
electionNovweek	1.6743	0.1875	Fail
midterm-week	0.0696	0.9327	Fail
midterm2Weeks	0.6103	0.5432	Fail
elecDistribution	3.683	0.02521*	Pass
DividedGov	1.4325	0.2388	Fail
Y1	3.722	0.02425 *	Pass
Y2	2.9302	0.05347	Fail
Y3	0.2562	0.774	Fail
Y4	0.8657	0.4208	Fail

(f) Granger Causality Test for SEK

Model Parameter Estimation Before estimating the VAR model, it is essential to determine the optimal maximum lag order p for the model. For the USD/JPY, USD/EUR, USD/CHF, USD/CAD, and USD/SEK exchange rate volatilities, we selected a lag order of 2 based on the Bayesian Information Criterion (BIC) and the principle of simplicity. However, for the USD/GBP exchange rate volatility, a lag order of 1 was determined to be optimal. The results of our lag order selection process are summarized in Table 3.

Table 3: Order Test

p	AIC	BIC	HQ	M(p)	p-value
0	-30.0614	-30.0614	-300614	0.0000	0.0000
1	-72.3939	-72.2921	-72.3583	220015.1260	0.0000
2	-72.5142	-72.3105	-72.4430	784.5384	0.0000
3	-72.5231	-72.2175	-72.4162	206.6435	0.0000
4	-72.5090	-72.1016	-72.3665	87.6226	0.2881
5	-72.5087	-71.9994	-72.3306	158.3690	0.0000
6	-72.5032	-71.8921	-72.2895	131.7193	0.0003
7	-72.4839	-71.7709	-72.2345	60.3240	0.9586
8	-72.4619	-71.6471	-72.1769	46.5871	0.9992
9	-72.4387	-71.5221	-72.1182	40.3762	1.0000
10	-72.4342	-71.4157	-72.0780	135.5353	0.0001
11	-72.4194	-71.2990	-72.0275	82.8101	0.4233
12	-72.3955	-71.1733	-71.9681	36.5879	1.0000
13	-72.3715	-71.0475	-71.9084	35.8143	1.0000

(a) Order Test for JPY

p	AIC	BIC	HQ	M(p)	p-value
0	-33.8202	-33.8202	-33.8202	0.0000	0.0000
1	-73.8480	-73.7461	-73.8124	208045.3309	0.0000
2	-74.0075	-73.8038	-73.9362	987.7373	0.0000
3	-74.0527	-73.7472	-73.9459	395.0527	0.0000
4	-74.0573	-73.6499	-73.9148	183.8682	0.0000
5	-74.0758	-73.5666	-73.8977	255.7159	0.0000
6	-74.0791	-73.4680	-73.8654	177.0122	0.0000
7	-74.0658	-73.3529	-73.8164	90.9887	0.2100
8	-74.0453	-73.2305	-73.7603	54.0186	0.9909
9	-74.0208	-73.1042	-73.7003	34.0243	1.0000
10	-74.0173	-72.9988	-73.6611	140.3960	0.0000
11	-74.0029	-72.8826	-73.6111	85.1426	0.3548
12	-73.9835	-72.7614	-73.5561	59.5123	0.9650
13	-73.9631	-72.6390	-73.5000	53.8560	0.9913

(b) Order Test for EUR

p	AIC	BIC	HQ	M(p)	p-value
0	-33.8710	-33.8710	-33.8710	0.0000	0.0000
1	-73.8883	-73.7864	-73.8527	207991.3002	0.0000
2	-74.0404	-73.8367	-73.9692	949.6566	0.0000
3	-74.0812	-73.7756	-73.9743	371.6915	0.0000
4	-74.0774	-73.6700	-73.9349	140.7328	0.0000
5	-74.0905	-73.5812	-73.9124	227.7707	0.0000
6	-74.0937	-73.4827	-73.8800	176.6485	0.0000
7	-74.0771	-73.3642	-73.8278	74.1685	0.6914
8	-74.0577	-73.2429	-73.7728	59.7513	0.9632
9	-74.0347	-73.1181	-73.7141	41.1165	0.9999
10	-74.0321	-73.0137	-73.6759	145.6973	0.0000
11	-74.0216	-72.9013	-73.6298	104.5495	0.0403
12	-74.0025	-72.7803	-73.5751	61.0190	0.9523
13	-73.9806	-72.6566	-73.5176	46.7797	0.9992

(c) Order Test for CHF

p	AIC	BIC	HQ	M(p)	p-value
0	-27.4613	-27.4613	-27.4613	0.0000	0.0000
1	-60.7526	-60.6910	-60.7311	173062.7163	0.0000
2	-60.8747	-60.7514	-60.8316	730.5977	0.0000
3	-60.9010	-60.7162	-60.8364	234.0777	0.0000
4	-60.9083	-60.6618	-60.8221	134.5842	0.0000
5	-60.9556	-60.6476	-60.8479	341.7465	0.0000
6	-60.9667	-60.5971	-60.8374	154.2929	0.0000
7	-60.9606	-60.5293	-60.8097	65.0427	0.0621
8	-60.9484	-60.4555	-60.7760	33.9711	0.9495
9	-60.9335	-60.3790	-60.7396	20.2976	0.9999
10	-60.9473	-60.3312	-60.7319	167.1884	0.0000
11	-60.9448	-60.2670	-60.7078	83.1200	0.0017
12	-60.9331	-60.1938	-60.6745	36.4664	0.9074
13	-60.9199	-60.1190	-60.6398	28.6177	0.9912

(d) Order Test for CAD

p	AIC	BIC	HQ	M(p)	p-value
0	-45.1112	-45.1112	-45.1112	0.0000	0.0000
1	-98.4059	-98.1934	-98.3316	276909.0111	0.0000
2	-98.5895	-98.1645	-98.4409	1286.0517	0.0000
3	-98.5999	-97.9624	-98.3770	388.0817	0.0000
4	-98.5719	-97.7219	-98.2746	189.5014	0.1337
5	-98.5647	-97.5022	-98.1931	295.6795	0.0000
6	-98.5246	-97.2496	-98.0787	126.7041	0.9936
7	-98.5317	-97.0442	-98.0115	367.4273	0.0000
8	-98.5163	-96.8164	-97.9218	251.9765	0.0000
9	-98.4706	-96.5581	-97.8017	96.6578	1.0000
10	-98.4338	-96.3088	-97.6906	142.1361	0.9345
11	-98.3902	-96.0527	-97.5727	107.1399	0.9999
12	-98.3502	-95.8002	-97.4584	125.0227	0.9954
13	-98.3134	-95.5509	-97.3472	140.8027	0.9443

(e) Order Test for GBP

p	AIC	BIC	HQ	M(p)	p-value
0	-23.6708	-23.6708	-23.6708	0.0000	0.0000
1	-49.2970	-49.2354	-49.2754	133238.4848	0.0000
2	-49.4203	-49.2970	-49.3772	737.2164	0.0000
3	-49.4650	-49.2802	-49.4003	329.0402	0.0000
4	-49.4759	-49.2294	-49.3897	153.4225	0.0000
5	-49.5020	-49.1939	-49.3942	232.0411	0.0000
6	-49.4942	-49.1246	-49.3650	57.0548	0.2006
7	-49.4874	-49.0562	-49.3366	61.7365	0.1046
8	-49.4771	-48.9843	-49.3048	43.7191	0.6865
9	-49.4644	-48.9099	-49.2705	31.2219	0.9775
10	-49.4669	-48.8508	-49.2515	109.2595	0.0000
11	-49.4550	-48.7773	-49.2180	34.9715	0.9347
12	-49.4429	-48.7036	-49.1843	34.3737	0.9438
13	-49.4323	-48.6313	-49.1521	41.5818	0.7650

(f) Order Test for CEK

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Modeling Given that the optimal lag order is determined to be 2 for most of the exchange rates (except for USD/GBP), modeling the volatility of USD/JPY, USD/EUR, USD/CHF, USD/CAD, and USD/SEK exchange rates requires incorporating the exchange rate values from the two preceding periods (denoted as $t-1$ and $t-2$) along with the lagged values of other variables that passed the two tests for those periods. Additionally, the model includes a constant term (constant m) and a trend term (trend). For the USD/GBP exchange rate volatility, with a lag order of 1, only the values from the preceding period ($t-1$) are considered. The general fitting formula we obtain is as follows:

$$\begin{aligned}\text{v(USD/Currency)} =& a_1 \cdot \text{v(USD/Currency)}_{t-1} + b_1 \cdot \text{CPI}_{t-1} + c_1 \cdot \text{GDP}_{t-1} + \alpha_1 \cdot \text{M2}_{t-1} \\ &+ \beta_1 \cdot \text{OILP}_{t-1} + \zeta_1 \cdot \text{port\_in}_{t-1} + \delta_1 \cdot \text{port\_out}_{t-1} + \gamma_1 \cdot \text{USREC}_{t-1} \\ &+ \xi_1 \cdot \text{electionOctNov}_{t-1} + \sigma_1 \cdot \text{elecDistribution}_{t-1} \\ &+ \theta_1 \cdot \text{DividedGov}_{t-1} + \mu_1 \cdot \text{Y1}_{t-1} + \phi_1 \cdot \text{Y2}_{t-1} + \lambda_1 \cdot \text{Y4}_{t-1} \\ &+ a_2 \cdot \text{v(USD/Currency)}_{t-2} + b_2 \cdot \text{CPI}_{t-2} + c_2 \cdot \text{GDP}_{t-2} + \alpha_2 \cdot \text{M2}_{t-2} \\ &+ \beta_2 \cdot \text{OILP}_{t-2} + \zeta_2 \cdot \text{port\_in}_{t-2} + \delta_2 \cdot \text{port\_out}_{t-2} + \gamma_2 \cdot \text{USREC}_{t-2} \\ &+ \xi_2 \cdot \text{electionOctNov}_{t-2} + \sigma_2 \cdot \text{elecDistribution}_{t-2} \\ &+ \theta_2 \cdot \text{DividedGov}_{t-2} + \mu_2 \cdot \text{Y1}_{t-2} + \phi_2 \cdot \text{Y2}_{t-2} + \lambda_2 \cdot \text{Y4}_{t-2} + m \\ &+ n \cdot \text{trend}\end{aligned}$$

3. Results

For our analysis of the daily volatility of the USD/JPY, USD/EUR, USD/CHF, USD/CAD, USD/GBP and USD/SEK exchange rate from 2004 to 2023, we focused on five general elections and five midterm elections. In total five complete election cycles were examined.

The result equations of fitted VAR model after filtering the variables are given in Table 4:

Table 4: Exchange Rate Volatility Equations

	v(**USD/JPY**)	v(**USD/EUR**)	v(**USD/CHF**)	v(**USD/CAD**)	v(**USD/GBP**)	v(**USD/SEK**)
$v(\text{USD/currency}_{t-1})$	0.28043	0.25669	0.23811	0.26515	0.37907	0.27320
CPI_{t-1}	-0.76541	-2.86216	-0.13152	-1.61707	0.35510	/
GDP_{t-1}	5.67669	6.86541	3.64981	3.64318	-0.14143	2.21133
M2_{t-1}	-1.54350	-0.22320	-1.04298	1.18034	/	/
oil_price_{t-1}	/	/	/	/	-0.27085	/
port_in_{t-1}	/	-0.04187	-0.05520	/	-0.06110	-0.04123
port_out_{t-1}	0.00161	0.00210	0.01102	-0.05175	-0.05044	-0.04857
USREC_{t-1}	0.17102	0.11777	0.17116	0.03219	0.15435	0.12768
$\text{electionOctNov}_{t-1}$	/	/	/	/	0.00888	/
DividedGov_{t-1}	-0.25080	/	/	/	-0.01078	/
Y1_{t-1}	0.24929	0.03029	-0.02057	-0.13463	-0.00846	-0.18515
Y2_{t-1}	/	0.00493	-0.08407	/	-0.03115	/
Y4_{t-1}	0.06460	/	/	/	-0.01848	/
$\text{elecDistribution}_{t-1}$	-0.38146	/	/	/	0.02156	0.22398
$v(\text{USD/currency}_{t-2})$	0.24893	0.28786	0.26547	0.27434	/	0.28167
CPI_{t-2}	1.17175	3.29784	0.57202	1.59619	/	/
GDP_{t-2}	-5.57982	-7.52304	-4.20452	-3.71502	/	-2.05020
M2_{t-2}	1.42208	0.45164	1.27912	-0.98594	/	/
port_in_{t-2}	/	-0.03702	0.01693	/	/	-0.00282
port_out_{t-2}	-0.04628	-0.04708	-0.05368	0.00302	/	-0.00204
USREC_{t-2}	-0.08330	-0.03119	-0.07087	0.09049	/	-0.02039
DividedGov_{t-2}	0.23497	/	/	/	/	/
Y1_{t-2}	-0.23168	-0.04051	0.00772	0.12933	/	0.16733
Y2_{t-2}	/	-0.04445	0.04794	/	/	/
Y4_{t-2}	-0.07613	/	/	/	/	/
$\text{elecDistribution}_{t-2}$	0.39652	/	/	/	/	-0.15539
constant	-1.09982	-0.82812	-0.93540	-1.01476	-1.22939	-0.98993
trend	-0.00007	-0.00004	-0.00006	-0.00004	-0.00004	-0.00003

Every column stands for an equation of a different currency, with coefficients for variables on the left. In these equations, $t-1$ and $t-2$ represent lagged values of the variables, where $t-1$ corresponds to the value of the variable in the previous day, and $t-2$ corresponds to the value two days prior. The

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term $constant$ represents the constant or intercept of the equation, which accounts for any fixed baseline level of the dependent variable (volatility) that is not explained by the other variables. The $trend$ term captures any linear trend over time, accounting for systematic changes in the exchange rate volatility that occur over the period being analyzed.

Currencies Exhibit Varied Responses Within a US Election Cycle Analysis of the political variables reveals that the general election year variable ($Y1$) consistently influences exchange rate volatility, appearing in every equation. During the general election year ($Y1$), the USD exchange rates of the EUR, CAD, GBP, SEK, and CHF generally show an decrease in volatility, while the JPY exhibits an increase. Although $Y1_{t-1}$ and $Y1_{t-2}$ have opposite signs, we can assess their impacts by comparing the absolute values of their coefficients. This approach is valid because $Y1$, as a dummy variable, consistently takes the value of 1 within a given year. This pattern suggests that the JPY tends to be more unpredictable during the US general election years, whereas the EUR, CAD, GBP, SEK, and CHF show the opposite trend. In terms of the extent of these impacts, the USD/JPY and USD/SEK exchange rate volatility are the most significantly influenced, with coefficients of two lags combined larger than others', as indicated by Table 4.

The year preceding ($Y4$) and the year following ($Y2$) the general election year also influence a few currencies—$Y4$ affects USD/JPY and USD/GBP volatility, while $Y2$ impacts USD/EUR, USD/CHF, and USD/GBP volatility—and these effects are similar. The volatility of USD against the impacted currencies generally shows a decrease during these years.

Interestingly, the midterm year ($Y3$) is the only period within the election cycle that does not significantly impact the exchange rate volatility of any of the six currencies. As shown in Table 5, $Y3$ fails to pass the Cointegration or Granger Causality tests for any currency's exchange rate volatility. Additionally, the short-term effects of US elections, whether general or midterm, are not significant. The only exception is the USD/GBP, which shows increased volatility during Oct.&Nov. of general election years. For other currencies, all short-term variables, including one week before and after the election day and Oct.&Nov. of general election years, do not pass the tests, as shown in Table 5.

Table 5: Results of Whether Passing Both Cointegration and Granger Causality Tests for Political Variables

Variable	JPY	EUR	CHF	CAD	GBP	SEK
electionOctNov	Fail	Fail	Fail	Fail	Pass	Fail
electionNovWeek	Fail	Fail	Fail	Fail	Fail	Fail
midtermWeek	Fail	Fail	Fail	Fail	Fail	Fail
midterm2Weeks	Fail	Fail	Fail	Fail	Fail	Fail
elecDistribution	Pass	Fail	Fail	Fail	Pass	Pass
DividedGov	Pass	Fail	Fail	Fail	Pass	Fail
Y1	Pass	Pass	Pass	Pass	Pass	Pass
Y2	Fail	Pass	Pass	Fail	Pass	Fail
Y3	Fail	Fail	Fail	Fail	Fail	Fail
Y4	Pass	Fail	Fail	Fail	Pass	Fail
PresidentPar	Fail	Fail	Fail	Fail	Fail	Fail

USD Exchange Rate Volatility is Partly Affected by Partisan Dynamics Among the partisan factors examined, only the presence of a Divided Government (*DividedGov*) and the distribution of winning presidents' electoral votes (*elecDistribution*) have statistically significant effects on the volatility of certain exchange rates. Since these two variables consistently hold a value of 1 during specific time periods and 0 outside of those periods, we can directly compare the coefficients of the different lags. As shown in Table 4, if we consider the coefficients of two lagged variables together, the volatility of

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USD/JPY shows a decrease during the period of a divided government (*DividedGov*) while a larger distribution of winning electoral votes (*elecDistribution*) tends to increase the volatility of this exchange rate during November and December of general election years. These variables influence the general election year variable ($Y1$) to a similar extent, with coefficients that are nearly additive.

For USD/GBP, the Divided Government variable also tends to reduce volatility when considering its lagged effects, and a larger distribution of winning electoral votes correlates with an increased volatility as well. The $elecDistribution$ variable exhibits a similar effect on USD/SEK, where a higher distribution of electoral votes results in overall increased volatility. However, the USD/SEK exchange rate is not significantly influenced by the $DividedGov$ variable.

Interestingly, the political party of the winning president (*PresidentPar*) does not significantly affect the volatility of any of the six exchange rates analyzed. As shown in Table 5, this variable fails to pass the Cointegration or Granger Causality tests, indicating its lack of influence on exchange rate volatility.

Some Currencies Are More Sensitive to Political Factors Among the six exchange rates studied, the USD/GBP exchange rate volatility is influenced by the largest number of political factors, with USD/JPY the second. As shown in Table 4, the USD/GBP exchange rate is affected by six political variables, including the periods of October and November during a general election year (*electionOctNov*), the first, second, and fourth years of the election cycle ($Y1$, $Y2$, and $Y4$), and the distribution of the winning president's electoral votes (*elecDistribution*). In contrast, while the USD/JPY exchange rate volatility is impacted by four political variables, the other currency pairs are influenced by no more than two political variables each. In terms of number of political variables, GBP and JPY exhibit greater sensitivity to political factors than other 4 currencies overall. Notably, the USD/GBP exchange rate has the lowest volatility order, indicating that the influence of variables on this exchange rate is both simpler and shorter in duration compared to others.

Certain Macroeconomic Factors Broadly Affect Exchange Rate Volatility Several key macroeconomic factors, including GDP, USREC, CPI, FPI Flows, and Money Supply, broadly influence exchange rate volatility across multiple currency pairs. Gross Domestic Product at current prices (GDP) and the US Business Cycle Expansions and Contractions ($USREC$) are the most consistently impactful variables, appearing in the equations for all six exchange rates analyzed.

A higher GDP from the previous period(day) (GDP_{t-1}) generally increases exchange rate volatility for the CAD, SEK, JPY, EUR, and CHF. However, GDP from two periods(two days) prior (GDP_{t-2}) tends to have the opposite effect, reducing volatility for these currencies. The USD/GBP exchange rate is an exception. Here, rising GDP consistently leads to reduced volatility. The USREC indicator (a dummy variable), representing the US business cycle, tends to increase exchange rate volatility overall, indicating that economic expansions and contractions in the US have a lasting impact on currency markets. Several other factors also play significant roles. The Consumer Price Index (CPI), Money Supply ($M2$), and Foreign Portfolio Flows ($Port\_in/Port\_out$) all influence exchange rate volatility. The effects of these factors vary across different currencies, reflecting the diverse ways in which US macroeconomic dynamics influence exchange rates.

As detailed in Table 6, other macroeconomic factors like the Industrial Production Index (IP), Inflation Rate (IR), Foreign Direct Investment Inflows ($FDII$), Net Export (NX), and Unemployment Rate ($UNRATE$) do not have significant impacts on the volatility of any of the six currencies. However, Oil Prices ($OILP$) does impact the volatility of one or several currencies, indicating that certain factors have more targeted effects depending on the specific economic and market conditions.

4. Discussion

There are some similarities between the results of this study and those of previous research, but there are also some differences. Same with Blomberg and Hess, we also discovered that exchange rates are

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Table 6: Results of Whether Passing Both Cointegration and Granger Causality Tests for Macroeconomic Variables

Variable	JPY	EUR	CHF	CAD	GBP	SEK
CPI	Pass	Pass	Pass	Pass	Pass	Fail
GDP	Pass	Pass	Pass	Pass	Pass	Pass
IP	Fail	Fail	Fail	Fail	Fail	Fail
IR	Fail	Fail	Fail	Fail	Fail	Fail
FDII	Fail	Fail	Fail	Fail	Fail	Fail
FDIO	Fail	Fail	Fail	Fail	Fail	Fail
M2	Pass	Pass	Pass	Pass	Fail	Fail
NX	Fail	Fail	Fail	Fail	Fail	Fail
OILP	Fail	Fail	Fail	Fail	Pass	Fail
Port_in	Fail	Pass	Fail	Fail	Pass	Pass
Port_out	Pass	Pass	Pass	Pass	Pass	Pass
UNRATE	Fail	Fail	Fail	Fail	Fail	Fail
USREC	Pass	Pass	Pass	Pass	Pass	Pass

sensitive to political variables even when economic factors are taken into account [2]. Similar to Lobo and Tufte's findings, we found that the British Pound, Canadian Dollar, and Japanese Yen exchange rates are influenced by electoral cycles [5]. Yet contrary to some of their findings, we did not find a significant relationship between political party and exchange rate volatility. In line with Bachman's findings, our study supports the statement that US elections significantly impact the forward exchange bias [1], as we observed the general influence of the general election year on exchange rate volatility. Opposite to findings of Alexiou, Vogiazas, and Kane, our study found little evidence of short-term impacts from US elections—both general and midterm—within 1 month or 1 week before and after election day[24]. Moreover, our results differ from their statement about "divided government". We found it generally reducing the exchange rate volatility instead of increasing it[24]. Our finding also supports Zhu, Zhao and Wang's study, which claims that exchange rates are not necessarily determined by the party in power but influenced when the presidency and Congress are controlled by the same party[7].

5. Conclusion

A number of studies have identified the influence of US election cycles and partisan politics on exchange rate volatility in the past, but they often lack a comprehensive analysis that takes into account partisan politics, the US election cycle, and macroeconomic factors. This study addresses this gap by incorporating these variables into a VAR model. Specifically, we examine the daily volatility of the US dollar against six major currencies over the period 2004-2023: the euro (EUR), the British pound (GBP), the Canadian dollar (CAD), the Swiss franc (CHF), the Swedish krona (SEK), and the Japanese yen (JPY).

Our analysis focused on the key aspects of the US election cycle and significant partisan factors. According to the findings: (1) The six currencies respond differently to the US election cycle, with the general election year ($Y1$) having the greatest impact, while the midterm election year ($Y3$) does not have a significant impact; (2) Partisan dynamics contribute to the volatility of the US dollar exchange rate, with factors such as a divided government and the distribution of electoral votes affecting some currencies; (3) Certain currencies are more sensitive to political factors, with the British pound and Japanese yen being more affected by political factors. (4) Certain macroeconomic factors, such as GDP, CPI, foreign portfolio flows, money supply, and business cycle expansions and contractions, broadly affect the volatility of the US dollar exchange rate.

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For possible explanations of the results, we propose that the different responses of the six currencies within a US election cycle are due to their varying degrees of economic and political interdependence with the US. During the general election year ($Y1$), the consistent impact can be attributed to uncertainty about possible changes in US policy. This uncertainty prompts market participants to reevaluate their positions, which influences exchange rate volatility. Midterm elections ($Y3$), on the other hand, may be perceived as having a less direct effect on policy changes. In terms of partisan dynamics, a divided government can cause legislative gridlock, creating uncertainty about future policies, so exchange rate volatility will be influenced by it. The sensitivity of GBP and JPY may be due to the UK's close financial ties with the US and Japan's substantial holdings of US debt, making them more susceptible to changes in US politics.

6. Limitations and Scope For Future Research

Limitations Although this study provides valuable insights into the impact of US political variables on exchange rate volatility, there are several limitations. 1) The accuracy of the analysis may be compromised since annual data may not capture fine-grained fluctuations in daily exchange rates. Therefore, relying on annual data may overlook important short-term market dynamics, potentially affecting the robustness of the results and the validity of the conclusions. 2) The significance level for cointegration tests was set at 90%, rather than the more commonly used 95%. As a lower significance level increases the risk of Type I errors, where variables are incorrectly identified as significant, a lower significance level could affect the robustness of the results. 3) The study does not thoroughly explore the intricate effects of political party dynamics on exchange rates. The influence of party-specific policy agendas on currencies may be more complex than the direct relationship between the political party in office and currency fluctuations. 4)This study may not adequately address nonlinear relationships or structural breaks that could be influenced by specific political factors. Exploring the long-term effects of sustained political polarization on exchange rate trends, including potential structural changes in currency markets, could offer valuable insights for investors.

Future Research The findings of this study can be used to guide future research in several directions. Currency movements could be better understood by analyzing exchange rate volatility in response to specific political events or geopolitical crises. The impact of policies under different political parties on exchange rate volatility also merits investigation. Additionally, in the context of extreme external shocks (such as COVID-19), the reaction of currency markets to political uncertainty is worth exploring. Furthermore, emerging market currencies may react differently to US political variables than major currencies. Exchange rate movements among various currencies, not limited to the US dollar, could also be influenced by specific political factors. Investigating the long-term effects of sustained political polarization on exchange rate trends could provide valuable insights for policymakers and investors.

It is also possible to improve the robustness of results related to macroeconomic and political factors by incorporating more advanced econometric models with nonlinearities or structural breaks. By better understanding the complex dynamics influenced by political events, such models might improve future exchange rate predictions.

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