Empirical Study on the Currency Exchange Market.

Determinants on the Exchange Rate of the U.S. Dollars and the Japanese Yen by the Regression Analysis.

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Abstract

It is widely known that in the exchange rate market there are three factors influential to determine the currency exchange rate between the related countries in theory; i.e., the interest rate, inflation, and expectation on the exchange rate.

This paper aims to find how the exchange rate between U.S. dollar and Japanese Yen, both of which are widely recognized as major currencies in the international financial market, are affected by the four key variables selected here in this paper related to these three factors under the recent inflationary economic environment; i.e., interest rate yield of the two year treasury bond, inflation rate, and the two moving average of the exchange rate to be considered as rational expectation on the movement of the exchange rate. As result it is our discovery that the selected predicator variables have been influential to the daily volatility and monthly movement of the exchange rate of the Japanese Yen /US $ with evidence the two different models of the regression analysis are able to show the exchange rate are significantly correlated with these four key variables and strongly affected by them.

Also, over 30-month study period, the interest rate parity or the purchasing power parity did not hold because of the strong US dollar and the continuous increase in interest rate yield during the rapid inflation in the US economy.

Keywords: Yen/$ exchange rate; interest rate differential; consumer price differential; moving average; regression analysis.

Introduction

The currency market is a popular topic in international economy and finance because of its exchange rate volatility. The relationship between the Japanese yen and US$ is no exception (Ref.15). Japan is well-known among the Group of Seven (G-7) nations for its unique monetary policy that is adopted by the Bank of Japan as the Federal Reserve System targeting the negative interest rate in the previous seven years. Hence, this study aims to analyze the impact of the influential factors on the exchange rate volatility between the US$ and the Japanese yen in the recent inflationary economy.

Analysis

In statistics, a regression method (Ref.3) can be used to analyze the relationship between independent variables and an objective variable and to test whether the independent variables can significantly predict the objective variable. The results of the multi-regression analysis using two different models are as follows:

Model I

The dataset on Model I include three independent variables: the interest yield differentials of the 2-year governmental treasury bond between the U.S. and Japan (Ref.7) and the 21- and 90-days moving average (Ref.8) of the Japanese yen/US$ daily spot exchange rates. The objective variable includes yen/US$ spot exchange rates (Ref.11). A total of 621 daily data points were examined for each variable during the period between January 2021 and July 2023.

To analyze the relationship between the three independent variables and one objective variable, as stated above, multiple linear regression analysis was conducted and the following results were obtained (Tables -1, -2, and -3).

Regression Statistics	
Multiple R	0.991945534
R Square	0.983955943
Adjusted R Square	0.983877933
Standard Error	1.709198889
Observations	621

Table 1. Summary Output
Source: Author

	df	SS	MS	F	Significance F
Regression	3	110543.14	36847.715	12613.2022	0.0000
Residual	618	1802.4796	2.9213608		
Total	621	112345.62			

Table 2. ANOVA (Analysis of Variance)
Source: Author

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	35.98823	2.51782	14.29339	0.00000	31.04368	40.93277
21-days Moving Average	1.03330	0.01997	51.736425	0.00000	0.99408	1.072524
90-days Moving Average	-0.37120	0.02447	-15.1707	0.00000	-0.41925	-0.32315
US & Japan TB 2-YR Interest Difference %	2.43661	0.17524	13.904706	0.00000	2.09247	2.780738

Table 3.
Source: Author

Model Fit

The first section (Summary Output; Table-4) shows several numbers that measure the regression model fit, that is, how well the regression model can "fit" the dataset.

Regression Statistics	
Multiple R	0.991945534
R Square	0.983955943
Adjusted R Square	0.983877933
Standard Error	1.709198889
Observations	621

Table 4. Summary Output
Source: Author

The interpretation of each of the numbers in Table-4 is as follows:

Multiple R: Correlation coefficient. It measures the strength of the linear relationship between independent and objective variables. An R multiple of 1 indicated a perfect linear relationship, whereas an R multiple of 0 indicated no linear relationship. The multiple R is the square root of the R-squared value. In Model I, the multiple R was 0.9919, indicating a strong linear relationship between the independent and objective variables.

R-Squared: This is often written as r^2 and is also known as the *coefficient of determination*. It is the proportion of the variance in the objective variable that can be explained by the independent variable. The R-squared value ranges from 0 to 1. A value of 0 indicates that the objective variable cannot be explained by the independent variables. A value of one indicates that the objective variable can be perfectly explained without error by the independent variables. In Model I, the R-squared value was 0.98395, indicating that 98% of the variance in the yen/US\$ exchange daily spot rates can be explained by the interest yield differentials of the 2-year treasury bond of the two countries and of the 21- and 90-days moving average of the yen/US\$ exchange spot rates.

Adjusted R-Squared: This is a modified version of the R-squared adjusted for the number of independent variables in the model. This value is always lower than the R-squared value. The adjusted R-squared value was used to compare the fit of the different regression models to one another. In Model I, the adjusted R-squared value was 0.98388.

Standard Error of the Regression: The standard error of the regression is the average distance at which the observed values fall from the regression line. In Model I, the observed values fell by an average of 1.709 units from the regression line.

Observations: This is the number of observations in the dataset. In Model I, the total number of observations was 621.

Test the Overall Significance of the Regression Model (1)

The next section (Table-5, ANOVA) shows the degrees of freedom, sum of squares, mean squares, F-statistics, and overall significance of the regression model.

	df	SS	MS	F	Significance F
Regression	3	110543.14	36847.715	12613.2022	0.0000
Residual	618	1802.4796	2.9213608		
Total	621	112345.62			

Table 5. ANOVA (Analysis of Variance)
Source: Author

The interpretation of each of the numbers shown in Table-5 is as follows:

Regression degrees of freedom(df): This number is equal to the number of regression coefficients: 1. In Model I, we have an intercept term and three independent variables; thus, we have four regression coefficients in total, implying that the regression degrees of freedom are 4 − 1 = 3.

Residual degrees of freedom: This number is equal to the total observations and the regression df. In Model I, the residual degrees of freedom were 621 – 3 = 618.

Mean Squares (MS): The regression mean squares were calculated by regression sum of squares (SS)/regression df. In Model I, the regression MS was 110,543/3 = 36,848. The residual mean squares were calculated using the residual SS/residual df. In Model I, the residual MS was 1,802/618 = 2.92.

F Statistic: The F-statistic is calculated as regression MS/residual MS. This statistic indicates whether the regression model provides a better fit to the data than a model that contains no independent variables. It essentially tests whether the regression model is useful as a whole. Generally, if none of the independent variables in the model are statistically significant, the overall F-statistic is also not statistically significant. A larger F-statistic may indicate that the model accounts for a substantial portion of the total variance, whereas a smaller F-statistic suggests that the model might not explain much of the variance, and thus might not be seen as useful. In Model I, the F statistic was 36,848 /2.92 = 12,613.

Significance of F (P-value): The last value in theTable-5 is the p-value associated with the F-statistic. To test whether the overall regression model is significant, the p-value can be compared to a significance level of 0.05, at the 95% confidence level selected in this study. If the p-value is less than the significance level, there is sufficient evidence to conclude that the regression model fits the data better than a model with no independent variables. This finding indicates that the independent variables in the model improve the fit of the model. In Model I, the p-value was 0.000, which was less than the significance level of 0.05. This indicates that the regression model is statistically significant; that is, the model fits the data better than the one with no independent variables.

Test the Overall Significance of the Regression Model (2)

This section (Table-6) presents the coefficient estimates, standard errors of the estimates, t-statistics, p-values, and confidence intervals for each term in the regression model.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	35.98823	2.51782	14.29339	0.00000	31.04368	40.93277
21 days Moving Average	1.03330	0.01997	51.736425	0.00000	0.99408	1.072524
90 days Moving Average	-0.37120	0.02447	-15.1707	0.00000	-0.41925	-0.32315
US & Japan TB 2 YR Interest Difference %	2.43661	0.17524	13.904706	0.00000	2.09247	2.780738

Table 6. Regression Model Assessment
Source: Author

The interpretation of each of the numbers shown in Table-6 is as follows:

Coefficients

The coefficients give us the numbers necessary to write the estimated regression equation. In Model I, the estimated regression equation is

Exchange rate = 35.988 + 1.033(21-days moving average) - 0.371(90-days moving average+ 2.4366(2-year TB interest yield difference between the U.S. and Japan)

Each individual coefficient is interpreted as the average increase in the objective variable for each unit increase in a given independent variable, assuming that all other independent variables are held constant.

The intercept is interpreted as the expected average exchange rate when both the interest yield differentials and the exchange rate moving average by 21 days and 90 days become zero. In Model I, the exchange rate is expected to become 35.988 yen/$ in such a case; however, interpreting the intercept of the regression output is not rational because there is no such case in which the moving average of the exchange rate becomes zero. This does not mean that the model is wrong; it simply means that the intercept should not be interpreted as meaningless.

Standard Error, t-stats, and p-values

Standard error is a measure of the uncertainty around the estimate of the coefficient for each variable. t-stat is the coefficient divided by the standard error. For example, the t-stat for the interest difference is 2.4366/0.17524 = 13.905.

The next column in Table-6 shows the p-values associated with t-stat. This indicates that a given objective variable is significant in the model. In Model I, the p-value for the

21-days moving average is 0.000, the p-value for the 90-days moving average is 0.000, and the p-value for interest differentials is 0.0000. The p-values for all three variables were less than 0.05, which indicated that the correlation between the objective variable and each independent variable was statistically significant.

Confidence Interval for Coefficient Estimates

The last two columns of Table-6 provide the lower and upper bounds of the 95% confidence interval for the coefficient estimates. In Model I, the coefficient estimate for 21 days Moving Average Exchange Rate is 1.0333; however, there is some uncertainty around this estimate. However, it is uncertain whether this is the exact coefficient. Thus, a 95% confidence interval gives us a range of likely values for the true coefficient; the 95% confidence interval for 21-days Moving Average Exchange Rate is (0.994, 1.0725). Thus, it is noted that this confidence interval does not contain the number "0," implying that the true value for the coefficient of 21-days Moving Average Exchange Rate is non-zero, that is, a positive number. Contrarily, the 95% confidence interval for 90-days Moving Average Exchange Rate is (-0.41925, -0.32315). This confidence interval does not contain the number "0," which means that the true value for the coefficient of 90-days Moving Average Exchange Rate is non-zero, that is, a negative number.

Model II

The dataset for Model II includes the interest yield differentials of the 2-year treasury bond between the U.S. and Japan and the difference in the monthly fluctuation rate of the Consumer Price Index (CPI) between the U.S. and Japan, starting from January 2021 until July 2023 (Ref.2 & 13) To analyze the relationship between the two independent variables and one objective variable as stated above, a multiple linear regression using these independent variables and objective variables was conducted with the following results (Tables -7, -8, and -9).

Regression Statistics	
Multiple R	0.953780113
R Square	0.909696503
Adjusted R Square	0.902750081
Standard Error	4.142046388
Observations	29

Table 7. Summary Output
Source: Author

	df	SS	MS	F	Significance F
Regression	2	4493.608402	2246.804201	130.958988	0.0000
Residual	26	446.0702552	17.15654828		
Total	28	4939.678657			

Table 8. ANOVA
Source: Author

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	100.14	2.75770464	36.3110	0.00000	94.46655759	105.80364
US /JAPAN CPI DIFFERENTIALS	138.63	43.33457027	3.1991	0.00361	49.55743514	227.7084
US /JAPAN INTEREST DIFFERENTIALS	480.71	88.49784351	5.4318	0.00001	298.7967969	662.61664

Table 9. Regression Model Assessment
Source: Author

The data shown in Tables -7, -8, and -9 are interpreted as follows:

The First Section (Summary Output)

Multiple R: In Model II, multiple R is 0.95378, which indicates a strong linear relationship between the independent and objective variables.

R-Squared: In this model, the R-squared value is 0.90969, which indicates that 90.97% of the variance in the yen/US$ exchange daily spot rates can be explained by the interest yield differentials of the 2-year treasury bond of the U.S. and Japan and CPI differentials between two countries.

Adjusted R-Squared: In Model II, the Adjusted R-squared value is 0.90275.

Standard Error of the Regression: In Model II, the observed values fell by an average of 4.142 units from the regression line.

Observations: The total number of observations in Model II was 29.

The 2nd Section (ANOVA)

Regression degrees of freedom(df): In Model II, we have an intercept term and two independent variables, so we have three regression coefficients in total, which means that the regression degrees of freedom are 3 − 1 = 2.

Residual degrees of freedom: In Model II, the residual degrees of freedom were 28 −2 = 26.

Mean Squares (MS): In Model Il, the regression MS was 4493.6/2 = 2246.8, and the residual mean squares are calculated by residual SS/residual df. In this model, the residual MS was 446.07/26 = 17.156.

F-statistic: In this model, the F-statistic was 2,246/17.1565 = 130.96.

Significance of F (P-value): To see if the overall regression model is significant, the p-value is compared to a significance level of 0.05 at the selected 95% confidence level. In Model II, the p-value was 0.000, which is less than the significance level of 0.05. This indicates that the regression model was statistically significant; that is, the model fits the data better than the model with no independent variables.

The 3rd Section

This section shows the coefficient estimates, standard error of the estimates, t-stat, p-values, and confidence intervals for each term in the regression model.

Coefficients: The coefficients give us the numbers necessary to write the estimated regression equation. In this model, the estimated regression equation is as follows:

Exchange rate = 100.14 + 138.63(CPI difference between the U.S. and Japan) + 480.71(TB interest yield difference between the U.S. and Japan).

Each individual coefficient is interpreted as the average increase in the objective variable for each unit increase in a given independent variable, assuming that all other independent variables are held constant. The intercept is interpreted as the expected average exchange rate when there is neither a CPI nor an interest difference between the two countries. In Model II, the exchange rate is expected to become 100.14 yen/$.

Standard Error, t-stats, and p-values: The standard error is a measure of the uncertainty around the estimate of the coefficient of each variable.

t-stat is simply the coefficient divided by the standard error. For example, the t-stat for the interest differential in Model II was 480.71/ 88.498 = 5.43.

The next column in Table-9 shows the p-values associated with t-stat. This indicates that a given objective variable is significant in the model. In Model II, we see that the p-value for the CPI differential is 0.00361, and the p-value for the interest differential is 0.00001. This indicates that the correlation between the objective variable and each independent variable was statistically significant.

Confidence Interval for Coefficient Estimates: The last two columns of Table-9 provide the lower and upper bounds of the 95% confidence interval for the coefficient

estimates. In Model II, the coefficient estimate for the CPI differential is 128.63; however, there is some uncertainty around this estimate. It is not known whether this is the exact coefficient. Thus, a 95% confidence interval gives us a range of likely values for the true coefficient; the 95% confidence intervals for CPI differentials is (49.556, 227.708), and the 95% confidence intervals for the interest rate differentials is (298.797, 662.617).

Summary

Two models are presented in this paper to identify the best-suited model that can ascertain the most influential factors for determining yen/$ exchange rates by applying regression analysis (Table-10).

1) The first model takes three independent parameters to run the regression analysis; that is, the interest rate (yield) differentials of the treasury bonds (2-year maturity) of the two countries and the moving average of the exchange spot rates; this is a well-known method for the analysis of stock chart patterns(Ref.8), which often signal transitions between rising and falling trends of the stock market (21-days and 90-days moving average of spot rates are applied in this model).

2) The second model takes two independent parameters using the monthly data in this model, that is, the CPI differentials of the two countries and the interest rate differential adopted for the independent parameters in the first model to run the regression analysis because CPI data are available monthly.

3) Results of the regression analysis by the two models

Model I: One group of the three independent variables, including daily interest differentials on the 2 years TB between the U.S. and Japan, and the 21- and 90- days moving average of the yen/$ exchange spot rates is correlated with the highest significance level and influence the objective variable (yen/$ exchange rate).

Model II: Another group of two independent variables, including monthly CPI data and monthly data on the same interest differentials, as applied in Model I, is significantly correlated and influences the objective variable (monthly average of the yen/$ exchange rate).

4) Comparison of two regression models is summarized in Table-10 together with graphs for each model.

		MODEL -I	MODEL -II
Period		January 4, 2021, through July 18, 2023	January 2021 through June 2023
Data Frequency		Daily	Monthly
Data Observation		621	29
Objective Variable	OV	yen/$ Exchange Rate	yen/$ Exchange Rate
Independent Variables	A	Interest Rate Yield Differentials between the U.S. and Japan on the 2-Years Treasury Bond	Interest Rate Yield Differentials between the U.S. and Japan on the 2-Years Treasury Bond
Independent Variables	B	21-Days Moving Average of Yen/$ Spot Rate	CPI Differentials between the U.S. and Japan
Independent Variables	C	90-Days Moving Average of Yen/$ Spot Rate	
	A	2.437	480.71
Coefficient	B	1.033	138.63
	C	-0.371	n/a
	Intercept	35.988	100.14
Model Equation		OV=2.437xA+1.033*B-0.371*C+35.988	OV=480.71*A+138.63*B+100.14
Adjusted R Square (model accountability)		0.9839	0.9028
Significance F (significance of a group of variables)		0.0000	0.0000
P-Value (significance of variable A)		0.0000	0.00001
P-Value (significance of variable B)		0.0000	0.00361
P-Value (significance of variable C)		0.0000	n/a

Table 10. Summary of Regression Model
Source: Author
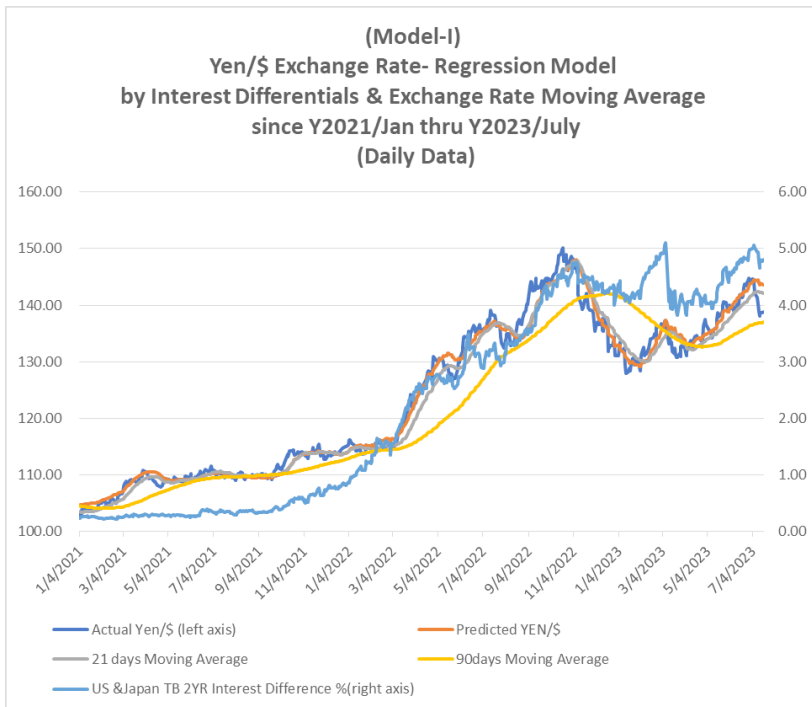
Figure 1.
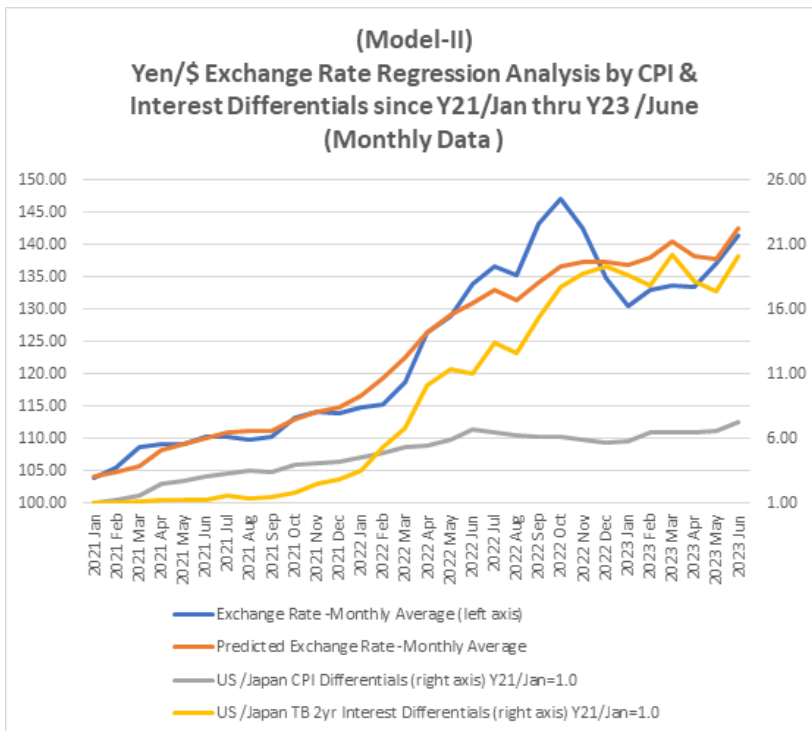
Figure 2.

5) In Model II, we observe that the U.S. $ appreciated against the Japanese yen over 30 months during the period between January 2021 and June 2023, with the continued inflation and increased interest rate in the U.S. that have been considerably higher than in Japan. This shows that the purchasing power parity(Ref.6 &12) and interest rate parity (Ref.1 & 4) did not hold during that period. It also implies that yen/$ exchange rate will move in the direction of U.S. $'s depreciation (yen's appreciation) toward 100 yen/$, which is the intercept value when there is no difference in both CPI between the U.S. and Japan and interest yield rate between the countries, as shown by Model II (Ref.9).

6) Remarks on further development of the yen/$ exchange market

Comparison between the monetary policy of the central banks in the US and Japan.

Incidentally, the important decision on the monetary policy was made by the central bank in the U.S. and Japan toward the end of July; that is, on July 27, 2023, the bank of Japan, which maintained ultra-low interest rates, announced that they would take steps to make its yield curve control policy more flexible, underscoring growing concerns over the rising side-effects of prolonged monetary easing. The central bank kept its short-term interest rate target unchanged at -0.1% and the 10-year government bond yield at around 0%, and it maintained guidance allowing the 10-year yield to move 0.5% around the 0% target, but stated that those would be "references" rather than "rigid limits" (Ref.13).

Contrarily, the Federal Open Market Committee of the US Federal Reserve has announced its statement to raise the interest rate by 0.25% from 5.25% to 5.5% effective from July 27 (Ref.5).

Interesting observations can be made regarding the effect on the yen /$ exchange market.

It has been observed that yen/$ value has increased by 4.3 % from 139 to 145 in the last two weeks from the end of July until middle of August due to the possible market speculation over the larger interest differentials in the future, while the predicted daily exchange rate has remained unchanged at the 143 yen/$ level or lower because the actual interest differentials between both countries were at the 4.97% level or lower (see Table-11).

DATE	Actual Yen/$	Predicted YEN/$ by Regression Analysis	21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
7/19/2023	139.64	143.47	141.92	137.05	4.81	4.77	(0.04)
7/20/2023	139.94	143.57	141.85	137.11	4.88	4.85	(0.04)
7/24/2023	141.51	143.52	141.85	137.19	4.88	4.85	(0.03)
7/25/2023	140.93	143.58	141.74	137.28	4.96	4.93	(0.04)
7/26/2023	140.48	143.27	141.59	137.38	4.91	4.88	(0.03)
7/27/2023	139.19	142.96	141.39	137.48	4.89	4.85	(0.04)
7/28/2023	141.15	142.99	141.26	137.55	4.97	4.93	(0.04)
7/31/2023	142.27	142.66	141.15	137.66	4.89	4.89	(0.01)
8/1/2023	142.91	142.49	141.07	137.79	4.88	4.89	0.01
8/2/2023	143.26	142.44	141.02	137.93	4.90	4.91	0.01
8/3/2023	142.50	142.21	140.91	138.06	4.87	4.89	0.02
8/4/2023	141.76	141.99	140.78	138.19	4.86	4.88	0.03
8/7/2023	142.43	141.60	140.70	138.29	4.74	4.77	0.03
8/8/2023	143.37	141.66	140.76	138.39	4.76	4.78	0.02
8/9/2023	143.67	141.69	140.87	138.51	4.74	4.76	0.02
8/10/2023	144.83	142.01	141.09	138.64	4.80	4.81	0.01
8/11/2023	144.91	142.34	141.38	138.78	4.83	4.85	0.02
8/14/2023	145.52	142.95	141.74	138.94	4.96	4.97	0.02

Table 11. Regression Data Set from July 19 through August 14, 2023
Source: Author

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | US &Japan TB 2-YR Interest Difference % | INTEREST DIFFERENTIALS | Japan TB 2-YR Interest Rate |
			21-days Moving Average	90-days Moving Average		US TB 2-YR Interest Rate	
1/4/2021	103.12	104.71	103.50	104.51	0.23	0.11	(0.12)
1/5/2021	102.72	104.71	103.44	104.49	0.26	0.13	(0.13)
1/6/2021	103.06	104.68	103.39	104.46	0.26	0.14	(0.12)
1/7/2021	103.86	104.68	103.38	104.44	0.26	0.14	(0.12)
1/8/2021	103.93	104.69	103.40	104.42	0.26	0.14	(0.12)
1/11/2021	104.22	104.80	103.47	104.39	0.26	0.14	(0.12)
1/12/2021	103.78	104.82	103.49	104.37	0.26	0.14	(0.12)
1/13/2021	103.87	104.86	103.52	104.35	0.26	0.14	(0.12)
1/14/2021	103.82	104.94	103.54	104.33	0.28	0.16	(0.12)
1/15/2021	103.91	104.89	103.56	104.31	0.25	0.13	(0.12)
1/19/2021	103.90	104.97	103.60	104.26	0.26	0.14	(0.12)
1/20/2021	103.57	104.98	103.60	104.24	0.26	0.13	(0.13)
1/21/2021	103.51	104.98	103.59	104.21	0.26	0.13	(0.13)
1/22/2021	103.77	105.00	103.60	104.18	0.26	0.13	(0.13)
1/25/2021	103.77	105.07	103.65	104.14	0.26	0.13	(0.13)
1/26/2021	103.64	105.05	103.67	104.13	0.24	0.11	(0.13)
1/27/2021	104.09	105.12	103.71	104.11	0.25	0.12	(0.13)
1/28/2021	104.24	105.17	103.76	104.09	0.25	0.12	(0.13)
1/29/2021	104.72	105.24	103.86	104.08	0.24	0.11	(0.13)
2/1/2021	104.95	105.37	103.99	104.07	0.23	0.11	(0.12)
2/2/2021	105.00	105.42	104.04	104.06	0.23	0.11	(0.12)
2/3/2021	105.03	105.48	104.09	104.05	0.23	0.11	(0.12)
2/4/2021	105.54	105.56	104.15	104.06	0.24	0.11	(0.13)
2/5/2021	105.36	105.59	104.23	104.07	0.22	0.09	(0.13)
2/8/2021	105.23	105.76	104.37	104.08	0.23	0.11	(0.12)
2/9/2021	104.58	105.79	104.40	104.08	0.23	0.11	(0.12)
2/10/2021	104.62	105.82	104.43	104.08	0.23	0.11	(0.12)
2/11/2021	104.75	105.89	104.48	104.09	0.24	0.11	(0.13)
2/12/2021	104.95	105.94	104.53	104.09	0.24	0.11	(0.13)
2/16/2021	106.10	106.25	104.79	104.10	0.25	0.13	(0.12)
2/17/2021	105.89	106.28	104.90	104.12	0.23	0.11	(0.12)
2/18/2021	105.70	106.37	104.99	104.14	0.23	0.11	(0.12)
2/19/2021	105.65	106.46	105.08	104.16	0.23	0.11	(0.12)
2/22/2021	105.06	106.55	105.20	104.21	0.22	0.11	(0.11)
2/23/2021	105.25	106.58	105.22	104.21	0.23	0.11	(0.12)
2/24/2021	105.88	106.65	105.28	104.21	0.23	0.12	(0.11)
2/25/2021	106.24	106.81	105.34	104.21	0.27	0.17	(0.10)
3/1/2021	106.77	106.94	105.55	104.27	0.24	0.13	(0.11)
3/2/2021	106.73	107.01	105.61	104.29	0.25	0.13	(0.12)
3/3/2021	107.01	107.09	105.69	104.32	0.25	0.14	(0.11)
3/4/2021	107.99	107.23	105.82	104.36	0.26	0.14	(0.12)
3/5/2021	108.41	107.42	106.01	104.40	0.27	0.14	(0.13)
3/8/2021	108.92	107.83	106.38	104.50	0.29	0.17	(0.12)

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | | INTEREST DIFFERENTIALS | |
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
3/9/2021	108.52	107.97	106.55	104.55	0.28	0.17	(0.11)
3/10/2021	108.41	108.11	106.72	104.60	0.28	0.16	(0.12)
3/11/2021	108.52	108.21	106.87	104.64	0.26	0.14	(0.12)
3/12/2021	108.99	108.35	107.01	104.69	0.27	0.14	(0.13)
3/15/2021	109.13	108.65	107.32	104.80	0.28	0.14	(0.14)
3/16/2021	109.01	108.84	107.48	104.85	0.29	0.15	(0.14)
3/17/2021	108.85	108.92	107.63	104.90	0.27	0.13	(0.14)
3/18/2021	108.95	109.17	107.82	104.95	0.30	0.16	(0.14)
3/19/2021	108.92	109.32	107.99	105.01	0.30	0.16	(0.14)
3/22/2021	108.81	109.55	108.26	105.11	0.29	0.15	(0.14)
3/23/2021	108.61	109.61	108.35	105.17	0.28	0.15	(0.13)
3/24/2021	108.75	109.68	108.46	105.22	0.28	0.14	(0.14)
3/25/2021	109.17	109.76	108.57	105.27	0.27	0.14	(0.13)
3/26/2021	109.61	109.88	108.71	105.32	0.27	0.14	(0.13)
3/29/2021	109.80	110.07	108.92	105.45	0.28	0.14	(0.14)
3/30/2021	110.39	110.20	109.01	105.51	0.30	0.16	(0.14)
3/31/2021	110.77	110.24	109.13	105.58	0.28	0.16	(0.12)
4/1/2021	110.60	110.31	109.21	105.67	0.29	0.17	(0.12)
4/2/2021	110.71	110.44	109.31	105.75	0.31	0.19	(0.12)
4/5/2021	110.22	110.52	109.50	105.91	0.29	0.17	(0.12)
4/6/2021	109.77	110.51	109.54	105.99	0.28	0.16	(0.12)
4/7/2021	109.85	110.52	109.58	106.06	0.28	0.16	(0.12)
4/8/2021	109.33	110.48	109.59	106.13	0.27	0.14	(0.13)
4/9/2021	109.66	110.53	109.62	106.19	0.28	0.16	(0.12)
4/12/2021	109.39	110.59	109.68	106.33	0.30	0.18	(0.12)
4/13/2021	109.04	110.53	109.68	106.39	0.29	0.16	(0.13)
4/14/2021	108.95	110.51	109.69	106.45	0.29	0.16	(0.13)
4/15/2021	108.72	110.49	109.68	106.51	0.29	0.16	(0.13)
4/16/2021	108.82	110.47	109.69	106.58	0.29	0.16	(0.13)
4/19/2021	108.15	110.38	109.65	106.70	0.29	0.16	(0.13)
4/20/2021	108.11	110.26	109.57	106.76	0.28	0.15	(0.13)
4/21/2021	108.04	110.16	109.50	106.82	0.28	0.15	(0.13)
4/22/2021	107.99	110.08	109.41	106.87	0.29	0.16	(0.13)
4/23/2021	107.88	109.94	109.29	106.92	0.29	0.16	(0.13)
4/26/2021	108.19	109.69	109.04	107.00	0.31	0.18	(0.13)
4/27/2021	108.75	109.55	108.95	107.05	0.30	0.17	(0.13)
4/28/2021	108.54	109.43	108.84	107.10	0.30	0.17	(0.13)
4/29/2021	108.91	109.31	108.78	107.16	0.29	0.16	(0.13)
4/30/2021	109.30	109.27	108.76	107.21	0.28	0.16	(0.12)
5/5/2021	109.20	109.11	108.68	107.45	0.29	0.16	(0.13)
5/6/2021	109.09	109.06	108.67	107.51	0.28	0.16	(0.12)
5/7/2021	108.59	108.97	108.65	107.58	0.27	0.14	(0.13)
5/10/2021	108.81	108.97	108.64	107.68	0.29	0.16	(0.13)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE			INTEREST DIFFERENTIALS	
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
5/11/2021	108.66	108.94	108.63	107.74	0.29	0.16	(0.13)
5/12/2021	109.67	108.96	108.67	107.80	0.29	0.16	(0.13)
5/13/2021	109.48	108.99	108.73	107.86	0.28	0.16	(0.12)
5/14/2021	109.38	109.05	108.79	107.92	0.29	0.16	(0.13)
5/17/2021	109.20	109.13	108.91	108.02	0.29	0.16	(0.13)
5/18/2021	108.89	109.16	108.96	108.07	0.29	0.16	(0.13)
5/19/2021	109.21	109.21	109.02	108.11	0.29	0.16	(0.13)
5/20/2021	108.83	109.19	109.05	108.16	0.27	0.15	(0.12)
5/21/2021	108.93	109.24	109.06	108.19	0.29	0.17	(0.12)
5/24/2021	108.81	109.18	109.08	108.27	0.28	0.15	(0.13)
5/25/2021	108.77	109.14	109.05	108.31	0.28	0.15	(0.13)
5/26/2021	109.12	109.09	109.04	108.36	0.27	0.14	(0.13)
5/27/2021	109.85	109.12	109.08	108.41	0.27	0.14	(0.13)
5/28/2021	109.86	109.12	109.11	108.46	0.27	0.14	(0.13)
6/1/2021	109.48	109.19	109.20	108.62	0.28	0.16	(0.12)
6/2/2021	109.59	109.15	109.25	108.66	0.25	0.13	(0.12)
6/3/2021	110.30	109.29	109.32	108.70	0.28	0.16	(0.12)
6/4/2021	109.55	109.26	109.36	108.75	0.26	0.14	(0.12)
6/7/2021	109.26	109.26	109.35	108.84	0.28	0.16	(0.12)
6/8/2021	109.49	109.19	109.35	108.88	0.26	0.14	(0.12)
6/9/2021	109.64	109.24	109.36	108.93	0.28	0.16	(0.12)
6/10/2021	109.39	109.19	109.37	108.97	0.26	0.14	(0.12)
6/11/2021	109.67	109.27	109.41	109.01	0.28	0.16	(0.12)
6/14/2021	110.06	109.32	109.49	109.08	0.28	0.16	(0.12)
6/15/2021	110.06	109.36	109.54	109.11	0.28	0.16	(0.12)
6/16/2021	110.70	109.56	109.63	109.15	0.33	0.21	(0.12)
6/17/2021	110.28	109.66	109.70	109.19	0.35	0.23	(0.12)
6/18/2021	110.22	109.79	109.77	109.22	0.38	0.26	(0.12)
6/21/2021	110.33	109.86	109.82	109.24	0.39	0.27	(0.12)
6/22/2021	110.65	109.84	109.86	109.26	0.36	0.25	(0.11)
6/23/2021	110.96	109.90	109.92	109.28	0.37	0.26	(0.11)
6/24/2021	110.87	109.95	109.96	109.30	0.37	0.26	(0.11)
6/25/2021	110.78	110.05	110.02	109.33	0.39	0.28	(0.11)
6/28/2021	110.59	110.01	110.08	109.36	0.36	0.25	(0.11)
6/29/2021	110.52	110.11	110.12	109.37	0.38	0.27	(0.11)
6/30/2021	111.11	110.09	110.16	109.39	0.36	0.25	(0.11)
7/1/2021	111.54	110.19	110.25	109.41	0.37	0.25	(0.12)
7/2/2021	111.00	110.22	110.32	109.44	0.35	0.24	(0.11)
7/6/2021	110.64	110.28	110.46	109.49	0.33	0.22	(0.11)
7/7/2021	110.60	110.34	110.50	109.51	0.33	0.22	(0.11)
7/8/2021	109.79	110.28	110.52	109.52	0.30	0.19	(0.11)
7/9/2021	110.20	110.40	110.55	109.54	0.35	0.23	(0.12)
7/12/2021	110.34	110.43	110.58	109.55	0.35	0.23	(0.12)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE 21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	INTEREST DIFFERENTIALS US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
7/13/2021	110.60	110.53	110.60	109.57	0.38	0.26	(0.12)
7/14/2021	109.99	110.46	110.60	109.59	0.36	0.23	(0.13)
7/15/2021	109.82	110.41	110.56	109.59	0.36	0.23	(0.13)
7/16/2021	110.08	110.45	110.55	109.59	0.38	0.25	(0.13)
7/19/2021	109.45	110.27	110.45	109.58	0.34	0.21	(0.13)
7/21/2021	110.16	110.26	110.42	109.57	0.35	0.22	(0.13)
7/26/2021	110.38	110.15	110.31	109.57	0.35	0.22	(0.13)
7/27/2021	109.77	110.01	110.22	109.58	0.33	0.20	(0.13)
7/28/2021	109.90	109.95	110.17	109.58	0.33	0.20	(0.13)
7/29/2021	109.46	109.88	110.10	109.58	0.33	0.20	(0.13)
7/30/2021	109.69	109.80	110.06	109.59	0.31	0.19	(0.12)
8/2/2021	109.33	109.69	110.00	109.59	0.30	0.17	(0.13)
8/3/2021	109.02	109.65	109.96	109.60	0.30	0.17	(0.13)
8/4/2021	109.49	109.62	109.93	109.60	0.30	0.17	(0.13)
8/5/2021	109.79	109.70	109.90	109.61	0.34	0.21	(0.13)
8/6/2021	110.23	109.68	109.88	109.62	0.34	0.21	(0.13)
8/9/2021	110.30	109.73	109.90	109.64	0.36	0.23	(0.13)
8/10/2021	110.56	109.77	109.93	109.67	0.37	0.24	(0.13)
8/11/2021	110.44	109.76	109.95	109.69	0.36	0.23	(0.13)
8/12/2021	110.40	109.79	109.99	109.72	0.36	0.23	(0.13)
8/13/2021	109.59	109.76	109.96	109.75	0.36	0.23	(0.13)
8/16/2021	109.25	109.71	109.95	109.77	0.35	0.21	(0.14)
8/17/2021	109.59	109.72	109.93	109.78	0.37	0.23	(0.14)
8/18/2021	109.81	109.70	109.89	109.79	0.37	0.23	(0.14)
8/19/2021	109.77	109.62	109.85	109.80	0.36	0.22	(0.14)
8/20/2021	109.79	109.61	109.82	109.81	0.37	0.23	(0.14)
8/23/2021	109.68	109.60	109.82	109.82	0.37	0.23	(0.14)
8/24/2021	109.69	109.58	109.79	109.82	0.37	0.24	(0.13)
8/25/2021	109.99	109.56	109.80	109.83	0.36	0.23	(0.13)
8/26/2021	110.05	109.61	109.80	109.84	0.38	0.25	(0.13)
8/27/2021	109.83	109.54	109.82	109.85	0.35	0.22	(0.13)
8/30/2021	109.98	109.51	109.84	109.85	0.33	0.20	(0.13)
8/31/2021	109.99	109.54	109.87	109.87	0.33	0.20	(0.13)
9/1/2021	110.04	109.57	109.92	109.89	0.33	0.20	(0.13)
9/2/2021	109.95	109.58	109.94	109.90	0.33	0.20	(0.13)
9/3/2021	109.71	109.60	109.93	109.91	0.33	0.21	(0.12)
9/7/2021	110.28	109.55	109.87	109.92	0.34	0.22	(0.12)
9/8/2021	110.25	109.54	109.87	109.93	0.34	0.22	(0.12)
9/9/2021	109.78	109.53	109.84	109.94	0.35	0.23	(0.12)
9/10/2021	109.93	109.55	109.85	109.95	0.36	0.23	(0.13)
9/13/2021	110.04	109.54	109.89	109.96	0.34	0.21	(0.13)
9/14/2021	109.74	109.54	109.90	109.97	0.34	0.21	(0.13)
9/15/2021	109.28	109.52	109.87	109.98	0.34	0.21	(0.13)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE		INTEREST DIFFERENTIALS		
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
9/16/2021	109.73	109.56	109.87	109.99	0.36	0.23	(0.13)
9/17/2021	109.93	109.56	109.88	110.00	0.36	0.23	(0.13)
9/20/2021	109.42	109.57	109.88	110.02	0.36	0.23	(0.13)
9/21/2021	109.24	109.50	109.84	110.02	0.35	0.22	(0.13)
9/22/2021	109.78	109.56	109.83	110.01	0.38	0.25	(0.13)
9/23/2021	110.30	109.64	109.85	110.01	0.40	0.27	(0.13)
9/24/2021	110.75	109.72	109.89	110.02	0.42	0.29	(0.13)
9/27/2021	111.00	109.83	109.97	110.04	0.44	0.31	(0.13)
9/28/2021	111.54	109.90	110.04	110.05	0.43	0.31	(0.12)
9/29/2021	111.91	109.98	110.15	110.07	0.43	0.30	(0.13)
9/30/2021	111.35	110.00	110.23	110.10	0.40	0.28	(0.12)
10/1/2021	111.08	110.02	110.29	110.12	0.39	0.27	(0.12)
10/4/2021	110.97	110.09	110.36	110.16	0.39	0.27	(0.12)
10/5/2021	111.49	110.18	110.44	110.17	0.40	0.28	(0.12)
10/6/2021	111.44	110.29	110.51	110.19	0.42	0.30	(0.12)
10/7/2021	111.66	110.42	110.59	110.21	0.44	0.32	(0.12)
10/8/2021	112.23	110.53	110.71	110.23	0.44	0.32	(0.12)
10/12/2021	113.59	110.80	110.91	110.26	0.47	0.35	(0.12)
10/13/2021	113.24	111.02	111.08	110.29	0.49	0.37	(0.12)
10/14/2021	113.72	111.16	111.26	110.32	0.48	0.36	(0.12)
10/15/2021	114.26	111.49	111.47	110.36	0.53	0.41	(0.12)
10/18/2021	114.29	112.01	111.94	110.44	0.56	0.44	(0.12)
10/19/2021	114.38	112.15	112.16	110.48	0.53	0.41	(0.12)
10/20/2021	114.39	112.31	112.36	110.52	0.51	0.40	(0.11)
10/21/2021	114.00	112.58	112.51	110.56	0.56	0.45	(0.11)
10/22/2021	113.57	112.77	112.65	110.60	0.59	0.48	(0.11)
10/25/2021	113.73	112.96	112.87	110.66	0.58	0.47	(0.11)
10/26/2021	114.16	113.05	112.98	110.68	0.58	0.47	(0.11)
10/27/2021	113.80	113.23	113.10	110.72	0.61	0.50	(0.11)
10/28/2021	113.57	113.32	113.22	110.75	0.60	0.50	(0.10)
10/29/2021	113.94	113.41	113.35	110.78	0.58	0.48	(0.10)
11/1/2021	114.06	113.59	113.50	110.82	0.60	0.50	(0.10)
11/2/2021	113.97	113.60	113.62	110.87	0.56	0.46	(0.10)
11/3/2021	113.98	113.74	113.74	110.91	0.57	0.47	(0.10)
11/4/2021	113.82	113.68	113.84	110.95	0.51	0.41	(0.10)
11/5/2021	113.42	113.70	113.90	110.99	0.50	0.39	(0.11)
11/8/2021	113.25	113.83	113.88	111.02	0.57	0.45	(0.12)
11/9/2021	112.91	113.70	113.87	111.06	0.52	0.41	(0.11)
11/10/2021	113.87	113.94	113.87	111.09	0.63	0.51	(0.12)
11/12/2021	113.87	113.92	113.84	111.19	0.65	0.53	(0.12)
11/15/2021	114.14	113.90	113.83	111.23	0.65	0.53	(0.12)
11/16/2021	114.82	113.93	113.85	111.28	0.66	0.54	(0.12)
11/17/2021	114.14	113.87	113.84	111.33	0.64	0.52	(0.12)

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | INTEREST DIFFERENTIALS | | |
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
11/18/2021	114.26	113.85	113.85	111.37	0.64	0.52	(0.12)
11/19/2021	114.02	113.87	113.87	111.41	0.64	0.52	(0.12)
11/22/2021	114.84	114.19	113.94	111.46	0.76	0.63	(0.13)
11/23/2021	115.13	114.18	114.00	111.51	0.73	0.60	(0.13)
11/24/2021	115.42	114.31	114.06	111.57	0.77	0.64	(0.13)
11/26/2021	113.37	113.99	114.13	111.69	0.63	0.50	(0.13)
11/29/2021	113.61	113.93	114.08	111.78	0.64	0.51	(0.13)
11/30/2021	113.19	113.89	114.04	111.83	0.65	0.52	(0.13)
12/1/2021	112.77	113.88	113.98	111.87	0.67	0.56	(0.11)
12/2/2021	113.21	114.01	113.95	111.90	0.74	0.63	(0.11)
12/3/2021	112.81	113.90	113.92	111.94	0.72	0.60	(0.12)
12/6/2021	113.50	114.02	113.94	111.96	0.77	0.65	(0.12)
12/7/2021	113.57	114.16	113.97	112.00	0.81	0.70	(0.11)
12/8/2021	113.74	114.10	113.96	112.03	0.80	0.68	(0.12)
12/9/2021	113.47	114.09	113.93	112.07	0.81	0.70	(0.11)
12/10/2021	113.39	113.96	113.91	112.11	0.78	0.67	(0.11)
12/13/2021	113.59	113.90	113.88	112.16	0.77	0.66	(0.11)
12/14/2021	113.74	113.86	113.83	112.20	0.78	0.67	(0.11)
12/15/2021	114.03	113.89	113.83	112.25	0.80	0.69	(0.11)
12/16/2021	113.73	113.72	113.80	112.29	0.75	0.64	(0.11)
12/17/2021	113.72	113.73	113.79	112.34	0.77	0.66	(0.11)
12/20/2021	113.64	113.65	113.73	112.38	0.76	0.65	(0.11)
12/21/2021	114.08	113.68	113.68	112.43	0.80	0.70	(0.10)
12/22/2021	114.12	113.54	113.62	112.47	0.78	0.68	(0.10)
12/23/2021	114.44	113.55	113.58	112.52	0.81	0.71	(0.10)
12/27/2021	114.88	113.75	113.70	112.62	0.85	0.76	(0.09)
12/28/2021	114.81	113.74	113.75	112.67	0.83	0.74	(0.09)
12/29/2021	114.97	113.83	113.84	112.72	0.84	0.75	(0.09)
12/30/2021	115.06	113.86	113.95	112.78	0.82	0.73	(0.09)
1/3/2022	115.32	114.15	114.16	112.90	0.87	0.78	(0.09)
1/4/2022	116.15	114.24	114.28	112.96	0.86	0.77	(0.09)
1/5/2022	116.14	114.48	114.41	113.03	0.92	0.83	(0.09)
1/6/2022	115.85	114.67	114.51	113.09	0.96	0.88	(0.08)
1/7/2022	115.53	114.72	114.60	113.16	0.95	0.87	(0.08)
1/10/2022	115.22	114.90	114.69	113.22	1.00	0.92	(0.08)
1/11/2022	115.32	114.91	114.77	113.28	0.97	0.90	(0.07)
1/12/2022	114.69	114.99	114.82	113.34	1.00	0.92	(0.08)
1/13/2022	114.19	114.96	114.83	113.40	0.99	0.91	(0.08)
1/14/2022	114.20	115.13	114.85	113.45	1.06	0.99	(0.07)
1/18/2022	114.60	115.35	114.94	113.60	1.13	1.06	(0.07)
1/19/2022	114.36	115.30	114.96	113.66	1.12	1.04	(0.08)
1/20/2022	114.10	115.35	114.94	113.71	1.15	1.08	(0.07)
1/21/2022	113.67	115.13	114.91	113.76	1.08	1.01	(0.07)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE 21-days Moving Average	90-days Moving Average	INTEREST DIFFERENTIALS US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
1/25/2022	113.87	114.96	114.76	113.85	1.09	1.02	(0.07)
1/26/2022	114.67	115.20	114.74	113.88	1.20	1.13	(0.07)
1/27/2022	115.31	115.29	114.75	113.91	1.24	1.18	(0.06)
1/28/2022	115.22	115.18	114.74	113.95	1.20	1.15	(0.05)
1/31/2022	115.14	115.18	114.69	114.00	1.23	1.18	(0.05)
2/1/2022	114.70	115.08	114.63	114.05	1.23	1.18	(0.05)
2/2/2022	114.45	114.96	114.56	114.09	1.21	1.16	(0.05)
2/3/2022	114.97	114.99	114.53	114.12	1.24	1.19	(0.05)
2/4/2022	115.23	115.26	114.53	114.16	1.36	1.31	(0.05)
2/7/2022	115.09	115.21	114.52	114.20	1.34	1.30	(0.04)
2/8/2022	115.55	115.35	114.56	114.23	1.39	1.35	(0.04)
2/9/2022	115.54	115.43	114.63	114.25	1.40	1.36	(0.04)
2/10/2022	116.04	116.11	114.71	114.28	1.65	1.61	(0.04)
2/14/2022	115.55	116.12	114.82	114.32	1.61	1.58	(0.03)
2/15/2022	115.61	116.16	114.87	114.33	1.61	1.58	(0.03)
2/16/2022	115.46	116.05	114.92	114.35	1.54	1.52	(0.02)
2/17/2022	114.94	115.99	114.96	114.36	1.50	1.49	(0.01)
2/18/2022	115.00	116.01	115.03	114.36	1.48	1.47	(0.01)
2/22/2022	115.05	116.32	115.09	114.38	1.58	1.56	(0.02)
2/23/2022	115.00	116.41	115.14	114.39	1.60	1.58	(0.02)
2/24/2022	115.50	116.40	115.22	114.41	1.57	1.54	(0.03)
2/25/2022	115.56	116.45	115.26	114.43	1.58	1.55	(0.03)
2/28/2022	115.00	116.17	115.25	114.44	1.47	1.44	(0.03)
3/1/2022	114.90	115.87	115.23	114.46	1.35	1.31	(0.04)
3/2/2022	115.52	116.35	115.25	114.47	1.55	1.50	(0.05)
3/3/2022	115.47	116.43	115.29	114.49	1.57	1.53	(0.04)
3/4/2022	114.85	116.38	115.31	114.50	1.54	1.50	(0.04)
3/7/2022	115.34	116.55	115.32	114.51	1.60	1.55	(0.05)
3/8/2022	115.66	116.74	115.34	114.53	1.68	1.63	(0.05)
3/9/2022	115.87	116.89	115.38	114.55	1.72	1.68	(0.04)
3/10/2022	116.13	116.97	115.41	114.58	1.75	1.72	(0.03)
3/11/2022	117.32	117.14	115.49	114.61	1.79	1.75	(0.04)
3/14/2022	118.26	117.57	115.68	114.70	1.90	1.87	(0.03)
3/15/2022	118.31	117.63	115.81	114.74	1.87	1.85	(0.02)
3/16/2022	118.86	118.02	115.97	114.79	1.98	1.95	(0.03)
3/17/2022	118.56	118.13	116.11	114.84	1.97	1.94	(0.03)
3/18/2022	119.21	118.39	116.32	114.89	1.99	1.97	(0.02)
3/21/2022	119.47	119.00	116.53	114.94	2.16	2.14	(0.02)
3/22/2022	121.24	119.37	116.83	115.00	2.20	2.18	(0.02)
3/23/2022	121.08	119.54	117.11	115.08	2.16	2.13	(0.03)
3/24/2022	122.38	119.85	117.44	115.15	2.16	2.13	(0.03)
3/25/2022	122.09	120.55	117.75	115.23	2.33	2.30	(0.03)
3/28/2022	124.18	121.09	118.19	115.30	2.37	2.35	(0.02)

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | US &Japan TB 2-YR Interest Difference % | INTEREST DIFFERENTIALS | Japan TB 2-YR Interest Rate |
			21-days Moving Average	90-days Moving Average		US TB 2-YR Interest Rate	
3/29/2022	122.99	121.46	118.58	115.40	2.37	2.35	(0.02)
3/30/2022	121.91	121.66	118.88	115.51	2.34	2.31	(0.03)
3/31/2022	121.72	121.88	119.18	115.60	2.32	2.28	(0.04)
4/1/2022	122.51	122.59	119.54	115.69	2.47	2.44	(0.03)
4/4/2022	122.74	122.91	119.90	115.80	2.47	2.43	(0.04)
4/5/2022	123.58	123.45	120.27	115.91	2.55	2.51	(0.04)
4/6/2022	123.86	123.77	120.65	116.02	2.53	2.50	(0.03)
4/7/2022	124.15	124.06	121.03	116.15	2.51	2.47	(0.04)
4/8/2022	124.30	124.60	121.37	116.26	2.61	2.53	(0.08)
4/11/2022	125.48	124.90	121.76	116.38	2.59	2.50	(0.09)
4/12/2022	125.40	124.92	122.10	116.51	2.47	2.39	(0.08)
4/13/2022	125.57	125.14	122.44	116.65	2.44	2.37	(0.07)
4/14/2022	125.93	125.68	122.78	116.78	2.53	2.47	(0.06)
4/18/2022	127.06	126.32	123.53	117.06	2.52	2.46	(0.06)
4/19/2022	127.11	126.98	123.89	117.21	2.66	2.61	(0.05)
4/20/2022	127.99	127.22	124.21	117.35	2.64	2.60	(0.04)
4/21/2022	128.37	127.74	124.56	117.51	2.73	2.68	(0.05)
4/25/2022	128.02	127.83	124.83	117.68	2.68	2.63	(0.05)
4/26/2022	127.10	127.80	125.07	117.83	2.59	2.54	(0.05)
4/27/2022	128.51	128.07	125.27	117.98	2.64	2.58	(0.06)
4/28/2022	130.88	128.51	125.65	118.13	2.68	2.63	(0.05)
5/2/2022	130.13	129.42	126.42	118.48	2.78	2.73	(0.05)
5/5/2022	130.14	130.20	127.42	118.98	2.76	2.71	(0.05)
5/6/2022	130.57	130.49	127.74	119.15	2.77	2.72	(0.05)
5/9/2022	130.51	130.48	128.04	119.32	2.66	2.61	(0.05)
5/10/2022	130.35	130.74	128.33	119.47	2.67	2.62	(0.05)
5/11/2022	129.91	131.00	128.54	119.63	2.71	2.66	(0.05)
5/12/2022	128.49	130.85	128.69	119.79	2.61	2.56	(0.05)
5/13/2022	129.27	131.12	128.86	119.93	2.67	2.61	(0.06)
5/16/2022	129.05	131.14	129.01	120.09	2.63	2.58	(0.05)
5/17/2022	129.40	131.54	129.15	120.24	2.77	2.71	(0.06)
5/18/2022	128.35	131.47	129.21	120.41	2.73	2.68	(0.05)
5/19/2022	127.72	131.32	129.24	120.56	2.69	2.63	(0.06)
5/20/2022	127.94	131.20	129.24	120.71	2.66	2.60	(0.06)
5/23/2022	127.86	131.25	129.22	120.86	2.71	2.65	(0.06)
5/24/2022	126.80	130.79	129.16	121.01	2.57	2.50	(0.07)
5/25/2022	127.21	130.70	129.16	121.15	2.55	2.48	(0.07)
5/26/2022	127.06	130.51	129.09	121.29	2.52	2.46	(0.06)
5/27/2022	127.10	130.30	128.91	121.43	2.54	2.47	(0.07)
5/31/2022	128.74	130.35	128.86	121.58	2.60	2.53	(0.07)
6/1/2022	130.12	130.60	128.86	121.75	2.73	2.66	(0.07)
6/2/2022	129.88	130.50	128.85	121.93	2.72	2.65	(0.07)
6/3/2022	130.83	130.53	128.92	122.11	2.73	2.66	(0.07)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE			INTEREST DIFFERENTIALS	
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
6/6/2022	131.93	130.66	129.01	122.46	2.80	2.73	(0.07)
6/7/2022	132.68	130.75	129.12	122.65	2.82	2.75	(0.07)
6/8/2022	134.37	130.96	129.31	122.84	2.86	2.78	(0.08)
6/9/2022	134.45	131.23	129.53	123.06	2.91	2.83	(0.08)
6/10/2022	134.40	132.01	129.81	123.28	3.14	3.06	(0.08)
6/13/2022	134.33	132.94	130.05	123.50	3.45	3.40	(0.05)
6/14/2022	135.42	133.29	130.35	123.71	3.50	3.45	(0.05)
6/15/2022	134.16	132.85	130.58	123.94	3.26	3.20	(0.06)
6/16/2022	132.70	132.88	130.79	124.14	3.21	3.14	(0.07)
6/17/2022	134.96	133.23	131.13	124.33	3.24	3.17	(0.07)
6/21/2022	136.50	133.93	131.88	124.76	3.27	3.21	(0.06)
6/22/2022	136.09	133.96	132.33	124.99	3.14	3.06	(0.08)
6/23/2022	136.00	134.22	132.74	125.22	3.10	3.01	(0.09)
6/24/2022	135.21	134.60	133.13	125.45	3.12	3.04	(0.08)
6/27/2022	135.38	134.98	133.53	125.67	3.15	3.08	(0.07)
6/28/2022	136.14	135.27	133.88	125.90	3.15	3.10	(0.05)
6/29/2022	136.58	135.39	134.19	126.13	3.10	3.06	(0.04)
6/30/2022	135.73	135.28	134.47	126.37	2.98	2.92	(0.06)
7/1/2022	135.23	135.23	134.67	126.60	2.90	2.84	(0.06)
7/5/2022	135.77	135.43	135.09	127.05	2.88	2.82	(0.06)
7/6/2022	135.97	135.89	135.25	127.28	3.04	2.97	(0.07)
7/7/2022	136.01	136.04	135.32	127.51	3.10	3.03	(0.07)
7/8/2022	136.12	136.26	135.40	127.73	3.19	3.12	(0.07)
7/11/2022	137.44	136.20	135.55	127.97	3.14	3.07	(0.07)
7/12/2022	137.18	136.15	135.68	128.22	3.10	3.03	(0.07)
7/13/2022	137.44	136.43	135.78	128.46	3.21	3.13	(0.08)
7/14/2022	139.04	136.58	136.01	128.70	3.21	3.15	(0.06)
7/15/2022	138.53	136.73	136.29	128.95	3.19	3.13	(0.06)
7/18/2022	138.24	136.86	136.45	129.19	3.22	3.15	(0.07)
7/19/2022	138.16	137.14	136.59	129.42	3.30	3.23	(0.07)
7/20/2022	138.29	137.20	136.68	129.64	3.33	3.25	(0.08)
7/21/2022	137.45	136.82	136.74	129.86	3.18	3.10	(0.08)
7/22/2022	136.27	136.46	136.75	130.07	3.06	2.98	(0.08)
7/25/2022	136.56	136.50	136.82	130.26	3.07	3.00	(0.07)
7/26/2022	136.85	136.55	136.89	130.46	3.09	3.02	(0.07)
7/27/2022	136.51	136.35	136.91	130.65	3.03	2.96	(0.07)
7/28/2022	134.32	135.92	136.80	130.82	2.93	2.85	(0.08)
7/29/2022	133.25	135.85	136.68	130.97	2.97	2.89	(0.08)
8/1/2022	132.48	135.70	136.55	131.09	2.98	2.90	(0.08)
8/2/2022	133.01	135.91	136.42	131.20	3.14	3.06	(0.08)
8/3/2022	133.95	135.87	136.33	131.30	3.18	3.10	(0.08)
8/4/2022	132.94	135.54	136.19	131.42	3.12	3.03	(0.09)
8/5/2022	134.92	135.97	136.14	131.55	3.34	3.24	(0.10)

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | US &Japan TB 2-YR Interest Difference % | INTEREST DIFFERENTIALS | Japan TB 2-YR Interest Rate |
			21-days Moving Average	90-days Moving Average		US TB 2-YR Interest Rate	
8/8/2022	135.02	135.79	136.09	131.69	3.31	3.21	(0.10)
8/10/2022	132.85	135.54	135.87	131.83	3.32	3.23	(0.09)
8/11/2022	132.96	135.29	135.67	131.94	3.32	3.23	(0.09)
8/12/2022	133.44	135.08	135.48	132.05	3.33	3.25	(0.08)
8/15/2022	133.14	134.64	135.20	132.15	3.29	3.20	(0.09)
8/16/2022	134.28	134.52	134.99	132.25	3.34	3.25	(0.09)
8/17/2022	135.09	134.40	134.84	132.36	3.37	3.28	(0.09)
8/18/2022	135.87	134.10	134.73	132.47	3.31	3.22	(0.09)
8/19/2022	136.86	134.06	134.67	132.59	3.34	3.25	(0.09)
8/22/2022	137.45	134.17	134.67	132.71	3.40	3.32	(0.08)
8/23/2022	136.69	134.08	134.69	132.84	3.38	3.29	(0.09)
8/24/2022	137.05	134.24	134.71	132.96	3.45	3.36	(0.09)
8/25/2022	136.51	134.15	134.69	133.07	3.44	3.35	(0.09)
8/26/2022	137.66	134.21	134.75	133.17	3.46	3.37	(0.09)
8/29/2022	138.68	134.48	134.96	133.28	3.50	3.42	(0.08)
8/30/2022	138.78	134.85	135.22	133.39	3.55	3.46	(0.09)
8/31/2022	139.05	135.09	135.53	133.51	3.53	3.45	(0.08)
9/1/2022	140.19	135.51	135.88	133.64	3.58	3.51	(0.07)
9/2/2022	140.21	135.51	136.17	133.77	3.48	3.40	(0.08)
9/6/2022	143.46	136.47	136.94	134.00	3.58	3.50	(0.08)
9/7/2022	144.12	136.73	137.37	134.15	3.53	3.45	(0.08)
9/8/2022	143.99	137.30	137.90	134.30	3.56	3.48	(0.08)
9/9/2022	142.51	137.90	138.36	134.46	3.63	3.56	(0.07)
9/12/2022	142.73	138.34	138.80	134.60	3.65	3.58	(0.07)
9/13/2022	144.82	139.28	139.36	134.73	3.82	3.75	(0.07)
9/14/2022	143.03	139.73	139.77	134.89	3.85	3.78	(0.07)
9/15/2022	143.38	140.30	140.17	135.03	3.94	3.87	(0.07)
9/16/2022	142.93	140.53	140.50	135.18	3.92	3.85	(0.07)
9/19/2022	143.28	141.05	140.81	135.34	4.02	3.95	(0.07)
9/20/2022	143.67	141.30	141.11	135.50	4.03	3.96	(0.07)
9/21/2022	144.38	141.73	141.47	135.66	4.07	4.02	(0.05)
9/22/2022	142.43	142.18	141.73	135.83	4.17	4.11	(0.06)
9/26/2022	144.62	143.11	142.38	136.16	4.33	4.27	(0.06)
9/27/2022	144.81	143.38	142.68	136.35	4.34	4.30	(0.04)
9/28/2022	144.21	143.01	142.93	136.53	4.11	4.07	(0.04)
9/29/2022	144.43	143.43	143.19	136.73	4.20	4.16	(0.04)
9/30/2022	144.74	143.75	143.41	136.92	4.27	4.22	(0.05)
10/3/2022	144.52	143.65	143.61	137.11	4.17	4.12	(0.05)
10/4/2022	144.12	143.73	143.79	137.31	4.16	4.10	(0.06)
10/5/2022	144.50	143.85	143.84	137.48	4.22	4.15	(0.07)
10/6/2022	145.03	144.05	143.88	137.64	4.30	4.23	(0.07)
10/7/2022	145.40	144.21	143.95	137.81	4.37	4.30	(0.07)
10/11/2022	145.82	144.37	144.24	138.13	4.36	4.30	(0.06)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE		INTEREST DIFFERENTIALS		
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
10/12/2022	146.79	144.36	144.34	138.29	4.34	4.28	(0.06)
10/13/2022	147.24	144.96	144.54	138.45	4.52	4.47	(0.05)
10/14/2022	148.79	145.21	144.80	138.59	4.53	4.48	(0.05)
10/17/2022	148.97	145.36	145.08	138.75	4.50	4.45	(0.05)
10/18/2022	149.19	145.55	145.36	138.91	4.48	4.43	(0.05)
10/19/2022	149.81	146.06	145.66	139.07	4.59	4.55	(0.04)
10/20/2022	150.14	146.41	145.93	139.23	4.64	4.62	(0.02)
10/21/2022	147.68	146.25	146.18	139.41	4.50	4.49	(0.01)
10/24/2022	148.91	146.47	146.45	139.58	4.50	4.50	(0.00)
10/25/2022	148.19	146.42	146.62	139.73	4.43	4.42	(0.01)
10/26/2022	146.32	146.40	146.69	139.88	4.42	4.39	(0.03)
10/27/2022	146.12	146.28	146.78	139.99	4.35	4.30	(0.05)
10/28/2022	147.46	146.65	146.92	140.10	4.46	4.41	(0.05)
10/31/2022	148.64	147.03	147.11	140.23	4.55	4.51	(0.04)
11/1/2022	148.19	147.24	147.28	140.38	4.58	4.54	(0.04)
11/2/2022	147.95	147.54	147.47	140.52	4.65	4.61	(0.04)
11/3/2022	148.20	147.91	147.64	140.65	4.75	4.71	(0.04)
11/4/2022	146.61	147.82	147.72	140.78	4.70	4.66	(0.04)
11/7/2022	146.61	147.98	147.78	140.90	4.76	4.72	(0.04)
11/8/2022	145.68	147.82	147.78	141.03	4.71	4.67	(0.04)
11/9/2022	146.45	147.68	147.81	141.14	4.66	4.61	(0.05)
11/10/2022	141.72	146.73	147.56	141.26	4.39	4.34	(0.05)
11/14/2022	140.05	146.00	146.75	141.35	4.45	4.40	(0.05)
11/15/2022	139.30	145.42	146.29	141.39	4.42	4.37	(0.05)
11/16/2022	139.49	144.88	145.82	141.41	4.39	4.35	(0.04)
11/17/2022	140.28	144.57	145.37	141.44	4.46	4.43	(0.03)
11/18/2022	140.35	144.24	144.90	141.47	4.53	4.51	(0.02)
11/21/2022	142.12	143.87	144.64	141.49	4.49	4.48	(0.01)
11/22/2022	141.19	143.47	144.27	141.53	4.49	4.47	(0.02)
11/23/2022	139.59	143.02	143.86	141.56	4.49	4.46	(0.03)
11/25/2022	139.13	142.19	143.16	141.58	4.44	4.42	(0.02)
11/28/2022	139.13	141.87	142.76	141.60	4.48	4.46	(0.02)
11/29/2022	138.90	141.44	142.30	141.63	4.51	4.48	(0.03)
11/30/2022	138.68	140.71	141.85	141.65	4.40	4.38	(0.02)
12/2/2022	135.33	139.24	140.77	141.69	4.27	4.28	0.02
12/5/2022	136.74	139.12	140.30	141.70	4.42	4.40	(0.02)
12/6/2022	137.00	138.54	139.84	141.74	4.38	4.37	(0.02)
12/7/2022	136.54	137.82	139.40	141.79	4.27	4.26	(0.01)
12/8/2022	136.65	137.44	138.94	141.83	4.32	4.31	(0.01)
12/9/2022	136.57	137.26	138.69	141.86	4.36	4.34	(0.02)
12/12/2022	137.57	137.27	138.63	141.90	4.39	4.38	(0.01)
12/13/2022	135.47	136.63	138.41	141.93	4.23	4.21	(0.01)
12/14/2022	135.43	136.45	138.23	141.94	4.23	4.22	(0.02)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE			INTEREST DIFFERENTIALS	
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
12/15/2022	137.75	136.41	138.15	141.97	4.26	4.24	(0.02)
12/16/2022	136.71	136.08	137.98	142.02	4.20	4.18	(0.02)
12/19/2022	136.88	136.07	137.81	142.06	4.27	4.26	(0.01)
12/20/2022	131.77	135.49	137.32	142.10	4.25	4.27	0.01
12/21/2022	132.36	135.00	136.90	142.07	4.22	4.22	(0.00)
12/22/2022	132.41	134.79	136.56	142.04	4.28	4.28	0.00
12/23/2022	132.86	134.62	136.28	142.00	4.32	4.33	0.01
12/26/2022	132.91	134.29	135.99	141.96	4.30	4.33	0.03
12/27/2022	133.47	134.15	135.72	141.91	4.35	4.38	0.03
12/28/2022	134.36	133.85	135.50	141.87	4.31	4.36	0.05
12/29/2022	133.97	132.85	135.28	141.84	3.99	4.04	0.05
12/30/2022	131.12	132.75	134.95	141.81	4.09	4.12	0.03
1/3/2023	131.01	132.98	134.45	141.65	4.37	4.40	0.03
1/4/2023	132.41	132.69	134.24	141.56	4.33	4.36	0.03
1/5/2023	133.42	132.81	134.09	141.49	4.43	4.45	0.02
1/6/2023	132.09	132.11	133.87	141.42	4.22	4.24	0.02
1/9/2023	131.90	131.81	133.65	141.32	4.18	4.19	0.01
1/10/2023	132.19	131.66	133.39	141.23	4.21	4.24	0.03
1/11/2023	132.44	131.46	133.25	141.10	4.17	4.20	0.03
1/12/2023	129.29	130.98	132.95	140.97	4.08	4.12	0.04
1/13/2023	127.90	130.81	132.48	140.81	4.18	4.22	0.04
1/17/2023	128.23	130.33	132.08	140.65	4.13	4.18	0.05
1/18/2023	128.77	129.78	131.69	140.49	4.05	4.06	0.01
1/19/2023	128.42	129.78	131.53	140.31	4.09	4.09	0.00
1/20/2023	129.56	129.84	131.40	140.15	4.15	4.14	(0.01)
1/23/2023	130.61	130.01	131.32	139.99	4.23	4.21	(0.02)
1/24/2023	130.18	129.69	131.19	139.86	4.13	4.12	(0.01)
1/25/2023	129.51	129.55	131.03	139.71	4.12	4.11	(0.01)
1/26/2023	130.14	129.59	130.87	139.55	4.18	4.17	(0.01)
1/27/2023	129.89	129.48	130.65	139.40	4.20	4.19	(0.01)
1/30/2023	130.38	129.47	130.48	139.26	4.25	4.24	(0.01)
1/31/2023	130.09	129.42	130.43	139.11	4.22	4.21	(0.02)
2/1/2023	128.93	129.12	130.35	138.95	4.11	4.10	(0.01)
2/2/2023	128.40	129.08	130.23	138.77	4.12	4.10	(0.02)
2/3/2023	131.20	129.56	130.17	138.60	4.32	4.29	(0.03)
2/6/2023	132.63	130.02	130.13	138.45	4.50	4.47	(0.02)
2/7/2023	131.07	130.01	130.08	138.32	4.49	4.47	(0.03)
2/8/2023	131.36	129.95	130.06	138.17	4.46	4.43	(0.03)
2/9/2023	131.47	130.11	130.02	138.03	4.52	4.48	(0.03)
2/10/2023	131.43	130.24	129.97	137.88	4.57	4.53	(0.04)
2/13/2023	132.43	130.48	130.12	137.73	4.58	4.52	(0.06)
2/14/2023	133.09	131.02	130.37	137.59	4.67	4.62	(0.05)
2/15/2023	134.00	131.37	130.64	137.45	4.68	4.63	(0.05)

| DATE | Actual Yen/$ | Predicted YEN/$ by Regression Model | YEN/$ EXCHANGE RATE | | INTEREST DIFFERENTIALS | | |
			21-days Moving Average	90-days Moving Average	US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
2/16/2023	133.97	131.69	130.89	137.31	4.69	4.64	(0.04)
2/17/2023	134.11	131.95	131.16	137.17	4.66	4.62	(0.04)
2/20/2023	134.35	132.35	131.39	137.03	4.70	4.66	(0.04)
2/21/2023	134.99	132.76	131.60	136.87	4.76	4.73	(0.03)
2/22/2023	134.93	132.96	131.83	136.71	4.72	4.70	(0.02)
2/23/2023	134.63	133.30	132.07	136.55	4.73	4.70	(0.03)
2/24/2023	136.40	133.98	132.37	136.38	4.86	4.83	(0.03)
2/27/2023	136.21	134.21	132.67	136.23	4.80	4.78	(0.02)
2/28/2023	136.20	134.67	132.95	136.10	4.85	4.82	(0.04)
3/1/2023	136.12	135.14	133.23	135.96	4.91	4.88	(0.03)
3/2/2023	136.72	135.62	133.60	135.83	4.92	4.89	(0.03)
3/3/2023	135.85	135.98	133.96	135.72	4.90	4.86	(0.04)
3/6/2023	135.94	136.30	134.18	135.61	4.92	4.89	(0.04)
3/7/2023	137.11	136.90	134.40	135.48	5.06	5.01	(0.04)
3/8/2023	137.30	137.37	134.69	135.35	5.11	5.07	(0.04)
3/9/2023	136.16	137.12	134.92	135.23	4.89	4.87	(0.02)
3/10/2023	135.00	136.69	135.09	135.10	4.62	4.59	(0.03)
3/13/2023	133.21	135.47	135.18	134.95	4.06	4.02	(0.05)
3/14/2023	134.24	136.15	135.26	134.80	4.28	4.25	(0.04)
3/15/2023	133.34	135.38	135.27	134.67	3.94	3.89	(0.05)
3/16/2023	133.49	136.14	135.25	134.53	4.24	4.17	(0.07)
3/17/2023	131.85	135.32	135.15	134.38	3.92	3.85	(0.08)
3/20/2023	131.41	135.51	135.02	134.28	4.04	3.97	(0.07)
3/21/2023	132.35	135.95	134.93	134.19	4.25	4.18	(0.07)
3/22/2023	131.22	135.22	134.75	134.11	4.01	3.96	(0.05)
3/23/2023	130.84	134.74	134.55	134.02	3.88	3.83	(0.06)
3/24/2023	130.75	134.44	134.37	133.92	3.83	3.77	(0.06)
3/27/2023	131.47	134.86	134.13	133.82	4.08	4.01	(0.07)
3/28/2023	130.85	134.78	133.88	133.72	4.14	4.08	(0.06)
3/29/2023	132.67	134.72	133.71	133.59	4.17	4.10	(0.07)
3/30/2023	132.86	134.67	133.55	133.50	4.20	4.12	(0.08)
3/31/2023	132.78	134.24	133.37	133.42	4.09	4.04	(0.06)
4/3/2023	132.35	133.88	133.20	133.36	4.01	3.97	(0.04)
4/4/2023	131.68	133.32	133.00	133.28	3.85	3.82	(0.03)
4/5/2023	131.12	132.98	132.71	133.20	3.82	3.79	(0.03)
4/6/2023	131.84	132.89	132.45	133.11	3.88	3.83	(0.05)
4/7/2023	132.16	133.15	132.26	133.04	4.05	3.99	(0.06)
4/10/2023	133.53	133.11	132.19	132.97	4.06	4.01	(0.05)
4/11/2023	133.79	133.19	132.22	132.95	4.08	4.03	(0.04)
4/12/2023	133.05	132.99	132.16	132.92	4.01	3.97	(0.04)
4/13/2023	132.59	132.98	132.13	132.87	4.02	3.97	(0.05)
4/14/2023	133.83	133.32	132.14	132.83	4.14	4.10	(0.04)
4/17/2023	134.46	133.70	132.27	132.80	4.24	4.21	(0.04)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE 21-days Moving Average	90-days Moving Average	INTEREST DIFFERENTIALS US &Japan TB 2-YR Interest Difference %	US TB 2-YR Interest Rate	Japan TB 2-YR Interest Rate
4/18/2023	134.04	133.84	132.39	132.78	4.24	4.20	(0.04)
4/19/2023	134.72	134.08	132.50	132.74	4.29	4.25	(0.04)
4/20/2023	134.17	133.99	132.64	132.73	4.19	4.15	(0.04)
4/21/2023	134.17	134.22	132.80	132.71	4.21	4.18	(0.03)
4/24/2023	134.11	134.23	132.96	132.67	4.14	4.11	(0.04)
4/25/2023	133.72	133.96	133.07	132.65	3.99	3.95	(0.04)
4/26/2023	133.58	134.12	133.20	132.61	3.99	3.95	(0.04)
4/27/2023	133.91	134.48	133.26	132.63	4.11	4.08	(0.03)
4/28/2023	136.31	134.50	133.42	132.65	4.06	4.02	(0.04)
5/1/2023	137.45	135.01	133.65	132.69	4.18	4.14	(0.04)
5/2/2023	136.53	134.82	133.85	132.74	4.03	3.99	(0.03)
5/8/2023	135.01	135.41	134.41	132.80	4.03	4.00	(0.03)
5/9/2023	135.24	135.54	134.50	132.85	4.06	4.03	(0.03)
5/10/2023	134.19	135.27	134.51	132.90	3.95	3.91	(0.04)
5/11/2023	134.52	135.32	134.58	132.93	3.94	3.90	(0.05)
5/12/2023	135.75	135.71	134.74	132.96	4.04	3.99	(0.05)
5/15/2023	136.02	135.84	134.84	132.98	4.06	4.01	(0.05)
5/16/2023	136.26	136.11	134.93	133.03	4.14	4.08	(0.05)
5/17/2023	137.59	136.47	135.09	133.07	4.22	4.16	(0.06)
5/18/2023	138.66	136.87	135.28	133.13	4.32	4.26	(0.06)
5/19/2023	137.97	137.08	135.46	133.20	4.34	4.28	(0.06)
5/22/2023	138.57	137.37	135.67	133.30	4.38	4.32	(0.06)
5/23/2023	138.53	137.54	135.88	133.42	4.38	4.32	(0.06)
5/24/2023	139.20	137.92	136.14	133.53	4.44	4.38	(0.06)
5/25/2023	139.94	138.58	136.45	133.65	4.60	4.54	(0.06)
5/26/2023	140.66	138.94	136.77	133.78	4.63	4.57	(0.06)
5/29/2023	140.48	139.17	136.97	133.90	4.66	4.60	(0.06)
5/30/2023	139.77	138.90	137.08	134.01	4.52	4.46	(0.06)
5/31/2023	139.19	138.85	137.20	134.12	4.46	4.41	(0.05)
6/1/2023	138.76	138.87	137.40	134.22	4.40	4.34	(0.06)
6/2/2023	139.95	139.54	137.67	134.32	4.58	4.51	(0.07)
6/5/2023	139.45	139.63	137.89	134.43	4.54	4.47	(0.07)
6/6/2023	139.60	139.87	138.11	134.53	4.56	4.50	(0.06)
6/7/2023	140.03	140.20	138.34	134.64	4.62	4.55	(0.06)
6/8/2023	138.89	140.29	138.56	134.76	4.58	4.52	(0.06)
6/9/2023	139.41	140.67	138.79	134.88	4.65	4.60	(0.06)
6/12/2023	139.56	140.81	138.97	134.97	4.65	4.59	(0.06)
6/13/2023	140.15	141.24	139.17	135.05	4.75	4.68	(0.07)
6/14/2023	140.03	141.42	139.35	135.15	4.76	4.69	(0.07)
6/15/2023	140.14	141.41	139.47	135.24	4.72	4.65	(0.07)
6/16/2023	141.85	141.69	139.62	135.34	4.79	4.72	(0.07)
6/19/2023	141.91	141.93	139.81	135.46	4.82	4.76	(0.07)
6/20/2023	141.35	141.86	139.94	135.56	4.76	4.69	(0.07)

DATE	Actual Yen/$	Predicted YEN/$ by Regression Model	YEN/$ EXCHANGE RATE		US &Japan TB 2-YR Interest Difference %	INTEREST DIFFERENTIALS	Japan TB 2-YR Interest Rate
			21-days Moving Average	90-days Moving Average		US TB 2-YR Interest Rate	
6/21/2023	141.69	142.05	140.09	135.65	4.78	4.72	(0.06)
6/22/2023	143.07	142.38	140.28	135.74	4.86	4.79	(0.06)
6/23/2023	143.70	142.44	140.46	135.84	4.82	4.75	(0.07)
6/26/2023	143.40	142.53	140.59	135.95	4.82	4.74	(0.07)
6/27/2023	143.96	142.72	140.75	136.05	4.84	4.76	(0.08)
6/28/2023	144.40	142.80	140.97	136.15	4.79	4.71	(0.08)
6/29/2023	144.76	143.39	141.24	136.25	4.94	4.86	(0.08)
6/30/2023	144.31	143.71	141.50	136.36	4.98	4.90	(0.07)
7/3/2023	144.68	143.98	141.73	136.45	5.00	4.94	(0.06)
7/5/2023	144.55	144.23	141.97	136.55	5.02	4.95	(0.07)
7/6/2023	144.07	144.50	142.18	136.64	5.06	4.99	(0.07)
7/7/2023	142.10	144.49	142.28	136.73	5.02	4.95	(0.07)
7/10/2023	141.31	144.37	142.40	136.79	4.93	4.86	(0.07)
7/11/2023	140.23	144.42	142.44	136.85	4.94	4.89	(0.06)
7/12/2023	138.87	143.94	142.40	136.89	4.77	4.73	(0.04)
7/13/2023	138.03	143.56	142.30	136.91	4.66	4.63	(0.03)
7/14/2023	138.70	143.85	142.24	136.92	4.81	4.77	(0.04)
7/17/2023	138.72	143.71	142.17	136.95	4.78	4.74	(0.04)
7/18/2023	138.83	143.59	142.03	136.99	4.80	4.76	(0.03)

Exhibit-A for Model-I
Source: Author

MONTH	Exchange Rate -Monthly Average	Predicted Exchange Rate -Monthly Average	US /Japan CPI Differentials -actual data	US /Japan TB 2yr Interest Differentials- actual data
2021 Jan	103.79	104.02	2.00%	0.23%
2021 Feb	105.38	104.64	2.45%	0.23%
2021 Mar	108.70	105.57	3.08%	0.24%
2021 Apr	109.04	108.20	4.82%	0.29%
2021 May	109.11	109.08	5.45%	0.29%
2021 Jun	110.11	109.97	6.12%	0.28%
2021 Jul	110.21	110.93	6.52%	0.37%
2021 Aug	109.85	111.13	6.84%	0.31%
2021 Sep	110.16	111.06	6.73%	0.33%
2021 Oct	113.12	112.91	7.81%	0.40%
2021 Nov	113.97	114.08	8.04%	0.58%
2021 Dec	113.83	114.71	8.27%	0.65%
2022 Jan	114.83	116.67	9.08%	0.82%
2022 Feb	115.28	119.33	9.58%	1.23%
2022 Mar	118.58	122.48	10.65%	1.58%
2022 Apr	126.37	126.48	10.88%	2.34%
2022 May	128.85	129.20	11.81%	2.64%
2022 Jun	133.96	130.87	13.37%	2.54%
2022 Jul	136.71	132.88	12.86%	3.10%
2022 Aug	135.28	131.44	12.42%	2.93%
2022 Sep	143.28	134.20	12.26%	3.55%
2022 Oct	147.05	136.69	12.13%	4.11%
2022 Nov	142.45	137.40	11.82%	4.35%
2022 Dec	134.91	137.29	11.26%	4.48%
2023 Jan	130.45	136.94	11.58%	4.32%
2023 Feb	133.05	137.90	12.93%	4.13%
2023 Mar	133.66	140.57	12.92%	4.69%
2023 Apr	133.47	138.20	12.81%	4.22%
2023 May	137.05	137.67	13.11%	4.03%
2023 Jun	141.36	142.64	14.50%	4.66%

Exhibit-B for Model-II
Source: Author

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