Safe-haven currency behavior in crisis periods: The U.S. dollar, the Japanese yen, and the Swiss franc

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Abstract: A flight to quality occurs from risky currency assets to safe-haven currency assets in heightened volatile markets of crisis periods. A safe-haven currency gains its value against other currencies in such crisis periods. Traditionally, the U.S. dollar, the Japanese yen, and the Swiss franc have been long times considered safe-haven currencies in the investment community. We study the intra-safe haven currency behavior between these currencies in crisis periods including the Ukraine war period. Our study is motivated by the weakness of the Japanese yen during the Ukraine war in 2022. We find that the intra-safe haven currency behavior depends on whether the crisis is a financial or real (energy-related) one.

Keywords: flight to quality in currency markets, intra-safe haven behavior, interactive crisis dummy variables, financial crisis versus real crisis

JEL Classification codes: G01, F31

INTRODUCTION

Investors expect that safe-haven currencies would gain in value against other currencies in financial and/or geopolitical crisis periods. The safe-haven currency assets denominated in yen or Swiss franc typically yield low-interest rates. Investors borrow (short-sell) them and invest (take a long position) in high-interest-rate currency assets. Because of this carry trade, the safe-haven currencies depreciate in normal times. In times of stress, however, a flight to quality occurs from risky currency assets to safe-haven currency assets and investors unwind the carry trade position causing the safe-haven currencies' appreciation. We observe that on average, the safe-haven currencies depreciate in non-crisis periods and appreciate in crisis periods.

The U.S. dollar (USD), the Swiss franc (CHF), the Japanese yen (JPY), and to a lesser extent, the British pound (GBP), and the Euro (EUR) have been long time considered safe-haven currencies in the investment community. There are some studies in the literature which support this investment community's view (e.g., Ranaldo and Soberlind, 2010; Coudert et al., 2014; Fatum and Yamamoto, 2016).

The prior literature examined safe-haven currency behaviou during the global financial crisis period. We study intra-safe haven currency behavior in times of global stress, including the Ukraine war of 2022. Our study's period spans from 2000 to 2022. Our analysis focuses on the intra-safe haven currency behavior of three stress times: the global financial crisis period of 2007-2009, the early Covid-19 pandemic period of 2020, and the early Ukraine war period of 2022. By doing so, we extend the prior study of intra-safe haven currency behavior to the Covid-19 pandemic and the Ukraine war episode.

Our study is motivated by the weakness of the Japanese yen relative to other currencies right after the Ukraine war outbreak in late February of 2022. This weakness of the JPY in times of global stress came as quite a surprise to the investment community (endnote 1), considering the prior studies that the JPY is the "safest" of the safe currencies in the foreign exchange market (e.g., Ranaldo and Soberlind, 2010; Fatum and Yamamoto, 2016).

In this paper, we present an econometric model to study the intra-safe haven behavior across different times of stress. A novelty is that we include the dummies which interact with market volatility in crisis periods in our regression equations. The underlying premise is that the prices of the safe-haven currencies respond more to the change in volatility in crisis periods than in non-crisis periods. We find that the intra-safe haven currency behavior changes over time and depends on whether the crisis is financial or real (energy-related). We contribute to the literature because we offer a new finding on the intra-safe haven currency behavior across different times of stress in the foreign exchange market.

Our paper is organized as follows: Section 2 reviews the related literature to our study. Section 3 describes our data and conducts a preliminary study of the intra-safe haven currency behavior in crisis periods. We present an econometric method for our analysis in Section 4. We report our empirical results in Section 5. We discuss them and conclude our remarks in Section 6.

1 LITERATURE REVIEW

The safe-haven currency literature is closely related to the flight to quality literature. The safety-haven notion comes from the phenomenon that investors choose to park their wealth in assets that preserve their values in times of market stress. Hence, we observe that a flight to quality occurs from risky assets to quality/safe assets in crisis periods.

One strand of the flight to quality literature studies the negative relationship between stock and bond returns in crisis periods. Several researchers (e.g., Andersson et al., 2008; Baur and Lucey, 2009; Connolly et al., 2005) find that capital is moved from stock (risky asset) to bond (safe asset) in advanced economies in periods of elevated stock market uncertainty, and attribute the movement to the flight to the quality phenomenon. Studying emerging market economies, on the other hand, Johansson (2010) and Park et al. (2019) find that the flight to quality phenomenon in emerging markets differs from that in advanced economies. Johanson (2010) argues that the flight to quality occurs from domestic assets to foreign assets in emerging economies while Park et al. (2019) show that it depends on the origin of risk triggering the crisis in the emerging economies: Global risk vesus local risk.

Some researchers also examine gold as a flight to safety asset in crisis periods (e.g., Beckmann et al., 2015; Akhtaruzzaman et al., 2021), and find that gold serves as a safe-haven asset for stock markets during the early Covid-19 pandemic phase.

The safe-haven currency literature studies the flight to quality phenomenon in the currency market that capital is moved from risky currency assets to safe-haven currency assets in times of stress. As a result of this flight to quality phenomenon in the currency market, the safe-haven currency gains its value against other currencies.

Using the data from 1993 to 2008, Ranaldo and Soberlind (2010) document that the CHF and the JPY perform best among 6 currencies (CHF, DEM, EUR, JPY, GBP, and USD) in times of global financial stress, and the JPY's safe-haven properties are strongest during the global financial crisis period of 2007-2009. Coudert et al. (2014) find that the JPY and the USD displayed safe-haven properties among 26 currencies from 1999-2013. Fatum and Yamamoto (2016) study the intra-safe haven currency behavior between the USD, the JPY, and the CHF, and find that the JPY is the "safest" of safe currencies during the global financial crisis period.

2 DATA AND PRELIMINARY ANALYSIS

Our datasets span from January 2020 to June 2022. They include the daily spot rates of the USD, the JPY, and the CHF in terms of the KRW (Korean won). These spot rates measure the prices of three currencies, i.e., the USD, the JPY, and the CHF in terms of the common unit, the KRW. A safe-haven currency is a currency that gains its value against other currencies in crisis periods. We choose the KRW as the common unit considering that the KRW is a freely floating currency in the foreign exchange market and trades in a good market depth. The KRW is considered a relatively risky currency and tends to lose its value against safe-haven currencies during crisis periods. Hence, comparing the prices of the USD, the JPY, and the CHF in terms of the KRW is a good way to examine the intra-safe haven currency behavior between these currencies in crisis periods. (Endnote 2)

Our dataset also includes the daily VIX, the measure of market volatility implied from the S&P 500 index option. We use the VIX to proxy the extent of market uncertainty/stress (e.g., Fatum and Yamamoto, 2016).

Other data are the daily interest rates and WTI crude oil spot price. The interest rates are the rates on the 3-month eurodollar deposit, the 3-month euro yen deposit, the 3-month euro Swiss franc deposit, and KORIBOR. KORIBOR is a short-term won interest rate, a counterpart to LIBOR in Korea. These are the control variables of our regression equations for robustness check.

The data sources are: (1) the daily spot exchange rates data from the website (www.investing.com); (2) The VIX from the website (www.macrotrends.net); (3) The euro rates from the homepages of global-rates.com and Swiss National Bank; (4) KORIBO from the Bank of Korea's homepage; (5) WTI crude spot oil price from the website (www.investing.com).

Table 1 shows the summary statistics of the VIX for the whole period 2000-2022, the global financial crisis period (08/01/2007-01/30/2009), the early Covid-19 pandemic phase (01/02/2019-06/05/2020) and the early Ukraine war period (02/24/2022-06/30/2022), respectively. (Endnote 3) As we can see from Table 1, the VIX rose in three crisis periods. The means of the VIX are 25.8%, 32.7%, and 27.4% during the global financial crisis period, the early Covid-19 pandemic phase, and the early Ukraine war period, respectively. These means of the VIX in three crisis periods are much higher than the VIX's mean of 20.06 % for the whole period 2000-2022.

Table 1 The Summary Statistics of the VIX

Period	whole period (01/03/2000-06/30/2022)	Global financial crisis (08/01/2007-01/30/2009)	Covid-19 pandemic (01/02/2020 06/05/2020)	Ukraine war (02/24/2022-06/30/2022)
Start of period	24.21%	12.00%	12.47%	30.32%
End of period	28.71%	44.84%	24.52%	28.71%
Percent change	18.59%	274%	96.63%	-5.31%
Mean	20.06%	25.84%	32.69%	27.35%
Maximum	82.69%	80.86%	82.69%	36.45%
Minimum	9.140%	9.89%	12.10%	18.57%
Std.Dev.	8.71%	14.46%	17.50%	4.37%

Note: The VIX measures the S&P 500 index's volatility per annum in percent.

Table 2 shows the intra-safe haven currency behavior in three crisis periods. During the global financial crisis period of 2007-2009, the JPY gained the most among three safe-haven currencies, the USD, the JPY, and the CHF. The JPY's rate went up by 45.63% annual rate while the USD's and the CHF's rates increased by 22.85% and 27.18%, respectively. The JPY's rate change was twice as much as the USD's rate change, and a little less than twice the CHF's rate change. Because of this intra-safe haven currency behavior during the global financial crisis period, Fatum and Yamamoto (2016) claim that the JPY is the "safest" of the safe currencies in the foreign exchange market.

During the early Covid-19 pandemic period, the USD's, the JPY's, and the CHF's rate changes were 9.42%, 7.08%, and 11.08% in annual rates, respectively. All three currencies gained their values against KRW, and indeed, acted as safe-haven currencies. However, it is not apparent which currency is dominantly the safest of the safe currencies during the early Covid-19 pandemic phase.

During the early Ukraine war phase, the USD's, the JPY's, and the CHF's rate changes were 20.28%, -26.01%, and 11.56% in annual rates, respectively. The USD and the CHF acted as safe-haven currencies, but the JPY lost its value against KRW by a large amount. The USD was the "safest" of safe-haven currencies, but the JPY even lost its safety-haven currency status during the early Ukraine war period.

Table 2 The Summary Statistics of the Prices of the USD, the JPY, and the CHF

Panel A The Price of the USD (KRW/USD)

Period	whole period (01/03/2000-06/30/2022)	Global financial crisis (08/01/2007-01/30/2009)	Covid-19 pandemic (01/02/2020) 06/05/2020)	Ukraine war (02/24/2022-06/30/2022)
Start of period	1,127.50	938.10	1,157.35	1,206.05
End of period	1,287.51	1,381.50	1,202.02	1,287.51

Percent change	14% (0.65%)	47% (22.85%)	4% (9.42%)	7% (20.28%)
Mean	1130.86	1027.50	1206.43	1248.74
Maximum	1570.65	1511.50	1272.50	1301.90
Minimum	900.80	900.80	1153.95	1197.57
Std.Dev.	99.18	155.48	26.84	28.82

Note: The numbers without % are in Won (the Korean currency unit). The percent changes without and with parenthesis are the percent changes over the period, and per annum, respectively. We convert the percent changes over the periods into the annual rates by multiplying the conversion factor, i.e., the number of days over the period/365.

Panel B The Price of the JPY (KRW/100 JPY)

Period	whole period (01/03/2000-06/30/2022)	Global financial crisis (08/01/2007-01/30/2009)	Covid-19 pandemic (01/02/2020) 06/05/2020)	Ukraine war (02/24/2022-06/30/2022)
Start of period	1109.85	789.98	1065.99	1044.02
end of period	948.58	1533.47	1096.93	948.58
Precents change	-15% (-0.69%)	94% (45.63%)	3% (7.08%)	-9% (-26.01%)
Mean	1073.02	953.58	1113.51	988.44
Maximum	1642.71	1605.79	1173.42	1068.73
Minimum	745.58	745.58	1049.71	936.24
Std.Dev.	171.32	231.64	32.84	33.23

Note: The numbers without % are in Won (the Korean currency unit). The percent changes with parenthesis are those in annual rates. We convert the percent changes over the periods into the annual rates by multiplying the conversion factor, i.e., the number of days over the period/365.

Panel C The Price of the CHF (KRW/CHF)

Period	whole period (01/03/2000-06/30/2022)	Global financial crisis (01/08/2007-01/30/2009)	Covid-19 pandemic (01/02/2020) 06/05/2020)	Ukraine war (02/24/2022-06/30/2022)
Start of period	720.54	758.55	1191.67	1302.57
end of period	1348.32	1184.72	1248.98	1348.32
Percent change	87% (4.04%)	56% (27.18%)	5% (11.80%)	4% (11.56%)
Mean	1043.66	906.61	1246.36	1308.01
Maximum	1501.24	1270.46	1301.48	1362.96
Minimum	622.05	746.31	1188.78	1274.91
Std.Dev.	195.52	152.13	29.51	18.70

Note: The numbers without % are in Won (the Korean currency unit). The percent changes with parenthesis are those in annual rates. We convert the percent changes over the periods into the annual rates by multiplying the conversion factor, i.e., the number of days over the period/365

3 METHODOLOGY

Baur and Lucey (2010), and Baur and McDermott (2010) define a safe-haven asset as "an asset that is uncorrelated or negatively correlated with another asset (e.g., stock) in times of market stress". This definition of a safe-haven asset is used when one examines gold and/or bond as a safe-haven asset for stock markets in times of market stress.

The foreign exchange rate is the relative price of currency A against currency B. Hence, an increase in currency A's value means a decrease in currency B's value. We define a safe-haven currency as a currency that gains its value against other currencies in times of market stress. This definition is more operational in examining the safe-haven currency property and is also consistent with Baur and Lucey's (2010) and Baur and Mcdermott's (2010) safe-haven asset definition.

Using our definition of safe-haven currency, we expect a positive relationship between the price of safe-haven currency and market volatility as follows:

$$\Delta \ln S_t = a_0 + a_1 \Delta VIX_t + a_2 \Delta \ln S_{t-1} + u_t, \quad (1)$$

where $\Delta \ln S_t$ is the log difference of the price of the safe-haven currency in terms of the KRW, and ΔVIX_t is the first difference of the VIX. u_t is an error term. We take the difference in variables for the stationarity of the time series. We include the lagged dependent variable, $\Delta \ln S_{t-1}$ as an explanatory variable to mitigate the endogeneity problem due to an omitted variable in the error term. We apply OLS with heteroscedasticity- and serial-correlation consistent standard error (HAC) to estimate (1).

Our primary interest is to study the change in the intra-safe haven currency behavior across different times of market stress. For that purpose, we offer the following econometric model of the interactions between dummy variables and quantitative variables ΔVIX_t across different times of stress (endnote 4):

$$\Delta \ln S_t = a_0 + a_1 \Delta VIX_t + a_2 D_1 \Delta VIX_t + a_3 D_2 \Delta VIX_t$$

$$+ a_4 D_3 \Delta VIX_t + a_5 \Delta \ln S_{t-1} + u_t, \quad (2)$$

where D_1 takes 1 during the global financial crisis period and otherwise 0; D_2 takes 1 during the early Covid-19 pandemic phase, and otherwise 0; D_3 takes 1 during the early Ukraine war period, and otherwise 0.

The underlying premise of (2) is that the price of safe-haven currency responds more to the change in market volatility during crisis periods than in normal times. The interactive terms in (2) capture an extra safe-haven currency effect during each crisis period. We expect that the signs of $a_{2,}$ $a_{3,}$ and a_4 are positive.

For robustness, we further include the control variables to (2) as follows:

$$\Delta \ln S_t = a_0 + a_1 \Delta VIX_t + a_2 D_1 \Delta VIX_t + a_3 D_2 \Delta VIX_t$$
$$+ a_4 D_3 \Delta VIX_t + a_5 \Delta X_{1,t} + a_6 \Delta X_{2,t} + a_7 \Delta \ln S_{t-1} + u_t, \qquad (3)$$

where $\Delta X_{1,t}$ and $\Delta X_{2,t}$ are the control variables of interest rate differentials between the safe-haven currency and the Korean won, and the change in WTI crude oil spot price, respectively. Interest rate differential supposedly influences the exchange rate via its effect on capital accounts. Crude oil price affects trade accounts, and hence the exchange rate. In early 2022 the Ukraine war, crude oil prices jumped to over $100 per barrel, which pushed Japan into a big trade deficit. For the interest rate variables, we use the 3-month rates on the eurodollar deposit, euro yen deposit, and euro Swiss franc deposit. For the Korean short-term interest rate, we use KORIBO which is a counterpart in Korea to LIBOR

4 EMPIRICAL RESULTS

Table 3 reports the regression results of (1), (2), and (3) for the USD (Panel A), the JPY (Panel B), and the CHF (Panel C). In Table 3, we name (1), (2), and (3) as model 1, model 2, and model 3, respectively. First, we look at model 1's results for the USD (Panel A), the JPY (Panel B), and the CHF (Panel C). The coefficient a_1 of the regressor ΔVIX_t is all statistically significant at the 1% level (p<0.01) for the USD, the JPY, and the CHF. The sign of a_1 is all positive as we expect. The volatility increases more; the safe-haven currency gains its value at a higher rate. Specifically, when the volatility increases by one percentage point, the USD's, the JPY's, and the CHF's values go up, on average, by 0.077%, 0.170%, and 0.099% during the whole period 2000 January-2022 June, respectively.

Now we turn to model 2 in Table 3. Model 2 differs from model 1 in that it includes the dummies which interact with the volatility in each crisis period. These interactive terms pick up an extra effect on intra-safe haven currency behavior during the crisis periods. Notice that the coefficient a_1 of the regressor ΔVIX_t is again all statistically significant in model 2 at the 1% level (p<0.01) for the USD, the JPY, and the CHF. The magnitudes of a_1 in model 2 are slightly less than those in model 1 for the USD, the JPY, and the CHF. This is due to the absorbing effects of the interactive terms on the exchange rate changes during the crisis periods. The coefficient a_2 of the interactive term $D_1 \Delta VIX_t$ is statistically significant (p<1%) for the JPY, but not statistically significant for the USD and the CHF. This implies that the JPY is the safest of the safe currencies during the global financial crisis period (e.g., Fatum and Yamamoto, 2016). The sum of a_1 and a_2 in model 2 is 0.0029 for the JPY during the global financial crisis period. The JPY gains its value by 0.29% for a one percent increase in volatility during the global financial crisis period. However, the JPY lost the safest of the safe currencies status during the early Ukraine war. The coefficient a_4 of the interactive term $D_3 \Delta VIX_t$ is not statistically significant for the JPY. This time, the coefficient a_4 is statistically significant (p<1%) for the USD. The sum of a_1 and a_4 in model 2 is 0.00147 for the USD, which is slightly greater than a_1 in model 2 for the JPY. It suggests that the JPY is no longer the safest of the safe currencies during the early Ukraine war period. All coefficients of the interactive terms are not statistically significant for the CHF, and hence we do not reject the hypothesis that the CHF has no extra effect during the crisis periods.

Model 3 in Table 3 is for robustness check and includes two control variables $\Delta X_{1,t}$ the interest rate differentials and $\Delta X_{2,t}$ the changes in the crude oil price. Controlling the effects of $\Delta X_{1,t}$ and $\Delta X_{2,t}$ on $\Delta \ln S_t$, we find that the overall relationships between the changes in volatility and the prices of the USD, the JPY, and the CHF are largely unaltered in model 3. The coefficient a_1 of the regressor ΔVIX_t is all statistically significant at the 1% level (p<0.01) for the USD, the JPY, and the CHF. The magnitudes of a_1 in model 3 are slightly less than those in model 1 for the USD, the JPY, and the CHF. The JPY has an extra safe-haven currency effect during the global financial crisis period , and the USD has an extra safe-haven currency effect during the early Ukraine war period. The coefficient a_2 of the interactive term $D_1 \Delta VIX_t$ is statistically significant at the 1% level (p<0.01) for the JPY, and the coefficient a_4 of the interactive term $D_3 \Delta VIX_t$ is statistically significant at the 5% level (p<5%) for the USD. The control variable $\Delta X_{2,t}$ has a negative effect on the JPY (p<0.01%) and the USD (p<0.01%). The U.S. and Japan are both sensitive to energy prices. We do not find any statistically significant effect on the CHF of the two control variables.

Table 3 Empirical Results for the USD, the JPY, and the CHF

Panel A Regression Results for the USD

	Model 1		Model 2		Model 3	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Coefficient	0.00002 (8.E-05)	0.763	0.00002 (8.E-05)	0.774	0.00005 (9.E-05)	0.956
ΔVIX_t	0.00077 (8.E-05)	0.000	0.00070 (7.E-05)	0.000	0.00076 (9.E-05)	0.000
lnS_{t-1}	0.02077 (0.036)	0.560	0.01947 (0.034)	0.569	0.03317 (0.041)	0.420
$D1 * \Delta VIX_t$			0.00033 (2.E-04)	0.156	0.00025 (2.E-04)	0.231
$D2 * \Delta VIX_t$			-0.00016 (1.E-04)	0.129	-0.00028 (1.E-04)	0.016
$D3 * \Delta VIX_t$			0.00076 (3.E-04)	0.003	0.00071 (3.E-04)	0.040
$\Delta X_{1,t}$					-0.00485 (7.E-03)	0.517
$\Delta X_{2,t}$					-0.00045 (1.E-04)	0.000
R-squared	0.049		0.052		0.083	
Adjusted R-squared	0.048		0.051		0.081	
F-statistic	143.883		61.179		51.345	
Prob(F-statistic)	0.000		0.000		0.000	
Durbin-Watson stat	2.065		2.077		2.088	

Note: The dependent variable $\Delta \ln S_t$ is the log change of the price of the USD in terms of the KRW. ΔVIX_t is the change in volatility. D_1, D_2 and D_3 are the dummy variables for the global financial crisis period, the early Covid-19 pandemic phase, and the early Ukraine war period, respectively. The control variable $\Delta X_{1,t}$ is the 3-month eurodollar rate minus KORIBOR. The control variable $\Delta X_{2,t}$ is the change in the WTI crude spot oil price. The numbers in parenthesis are the heteroscedasticity- and serial-correlation consistent standard error (HAC) of the coefficients.

Panel B Regression Results for the JPY

	Model 1		Model 2		Model 3	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Coefficient	-0.00002 (1.E-04)	0.795	-0.00030 (9.E-05)	0.727	-0.00014 (1.E-04)	0.250
ΔVIX_t	2.E-03 (1.E-04)	0.000	0,00145 (1.E-04)	0.000	0.00161 (2.E-04)	0.000
lnS_{t-1}	-0.00515 (0.034)	0.878	-0.00590 (0.030)	0.846	0.02853 (0.036)	0.430
$D1 * \Delta VIX_t$			0.00142 (3.E-04)	0.000	0.00119 (3.E-04)	0.000
$D2 * \Delta VIX_t$			-0.00005 (2.E-04)	0.981	-0.00023 (2.E-04)	0.327
$D3 * \Delta VIX_t$			0.00048 (4.E-04)	0.215	0.00048 (5.E-04)	0.360
$\Delta X_{1,t}$					0.01050 (9.E-03)	0.257
$\Delta X_{2,t}$					-0.00055 (1.E-04)	0.000
R-squared	0.141		0.156		0.202	
Adjusted R-squared	0.140		0.155		0.201	
F-statistic	461.314		208.158		144.502	
Prob(F-statistic)	0.000		0.000		0.000	
Durbin-Watson stat	2.078		2.109		2.113	

Note: The dependent variable $\Delta \ln S_t$ is the log change of the price of the JPY in terms of the KRW. ΔVIX_t is the change in volatility. D_1, D_2 and D_3 are the dummy variables for the global financial crisis period, the early Covid-19 pandemic phase, and the early Ukraine war period, respectively. The control variable $\Delta X_{1,t}$ is the 3-month euro yen rate minus KORIBOR. The control variable $\Delta X_{2,t}$ is the change in the WTI crude spot oil price. The numbers in parenthesis are the heteroscedasticity- and serial-correlation consistent standard error (HAC) of the coefficients.

Panel C Regression Results for the CHF

	Model 1		Model 2		Model 3	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Coefficient	0.00012 (1.E-04)	0.241	0.00012 (1.E-04)	0.249	0.00016 (1.E-04)	0.187
ΔVIX_t	0.00099 (9.E-05)	0.000	0.00092 (1.E-04)	0.000	0.00083 (1.E-04)	0.000
lnS_{t-1}	-0.05021 (0.028)	0.076	-0.05071 (0.028)	0.067	-0.02655 (0.034)	0.432
$D1 * \Delta VIX_t$			0.00031 (3.E-04)	0.251	0.00047 (3.E-04)	0.084
$D2 * \Delta VIX_t$			-0.00002 (2.E-04)	0.886	0.00007 (2.E-04)	0.669
$D3 * \Delta VIX_t$			0.00011 (4.E-04)	0.766	0.00020 (4.E-04)	0.607

$\Delta X_{1,t}$			0.00318 (7.E-03)	0.646
$\Delta X_{2,t}$			0.00005 (1.E-04)	0.638
R-squared	0.046	0.047	0.049	
Adjusted R-squared	0.045	0.046	0.047	
F-statistic	135.093	54.948	29.367	
Prob(F-statistic)	0.000	0.000	0.000	
Durbin-Watson stat	2.048	2.053	2.062	

Note: The dependent variable $\Delta \ln S_t$ is the log change of the price of the CHF in terms of the KRW. ΔVIX_t is the change in volatility. D_1, D_2 and D_3 are the dummy variables for the global financial crisis period, the early Covid-19 pandemic phase, and the early Ukraine war period, respectively. The control variable $\Delta X_{1,t}$ is the 3-month euro Swiss franc rate minus KORIBOR. The control variable $\Delta X_{2,t}$ is the change in the WTI crude spot oil price. The numbers in parenthesis are the heteroscedasticity- and serial-correlation consistent standard errors (HAC) of the coefficients.

DISCUSSION AND CONCLUSION

Many researchers think that low-interest rates, higher liquidity, and net foreign investment positions are the common fundamental factors determining the safe-haven status of the JPY and the CHF. The U.S. owes a large foreign debt, but the USD is an exception to the above statement because it is the international reserve currency.

Several researchers claim that the JPY is the safest of the safe currencies in the foreign exchange market (e.g., Ranaldo and Soberlind, 2010; Fatum and Yamamoto, 2016). They draw the claim from the evidence during the global financial crisis period. In this paper, however, we show that the JPY is no longer the safest of the safe currencies during the early Ukraine war period.

Our premise is that the price of safe-haven currency is more sensitive to the change in volatility in crisis periods. We model this by incorporating the dummies which interact with volatility in the crisis period into our regression equations.

Conducting a regression analysis of our model, we find that the safe-haven currency status changes across different crisis times. The JPY is the safest during the global financial crisis period, but the USD is much safer than the JPY during the early Ukraine war period. The energy price went up over $100 per barrel in the early Ukraine war period. Japan is known for its largest net foreign investment position. At the same time, Japan is heavily dependent on oil imports from abroad, and hence greatly sensitive to energy prices. Japan is strong in the global financial crisis but weak in the energy-related crisis. The JPY was the strongest during the global financial crisis period , but the weakest during the early Ukraine war among the USD, the CHF, and the JPY. We conclude that the intra-safe haven currency behavior depends on whether the crisis is a financial one or a real (energy-related) one.

Endnote

1. An investment bank's analyst even says that the JPY may be no longer a safe-haven currency.

2. The safe-haven currency literature examines the exchange rates in terms of the USD (e.g., Fatum, R., Yamamoto Y., 2016). In that event, the price of the USD measured in dollars is

always one. When one compares the prices of the USD, the JPY, and CHF to examine the intra-safe haven currency behavior including the USD itself, it is more sensible to measure the prices of three currencies in units of other (common) currency, e.g., the KRW.

3. The global financial crisis period from August 1, 2007, to January 31, 2009, follows the crisis period definition by Melvin and Taylor (2009). Fatum and Yamamoto (2016) use the same definition to set the global financial crisis period. The Covid-19 pandemic and the Ukraine war are still ongoing events. The VIX dropped to a normal level sometimes after two crises broke out. We choose the early phases of two crises during which the VIX stayed at a higher level for our analysis.

4. For example, Fair (1996) applied an econometric model of interactions among qualitative (e.g., dummy) and quantitative variables.

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