Which of the G10 Currencies is the Riskiest to Hold for a Swiss Resident?

Xiao Chen, Bosko Todorovic, Yannic Laube, Zhi Wang

University of Zurich

December 11, 2024

Table of Contents

Introduction

G10 currencies refer to the ten most heavily traded and liquid currencies in the world [1]:
United States Dollar (USD), Euro (EUR), British Pound (GBP), Japanese Yen (JPY), Australian Dollar (AUD), New Zealand Dollar (NZD), Canadian Dollar (CAD), Swiss Franc (CHF), Norwegian Krone (NOK), and Swedish Krona (SEK).

Literature Review

Trading and Investment

- Ease of Cross-Border Investment [2]: High-liquidity G10 currencies make it easier for Swiss residents to participate in global investment opportunities.

Asset Diversification

- The stability and liquidity of G10 currencies allow Swiss residents to diversify their assets. [3]

Saving and Payments

- Euro as a Key Currency: Switzerland is near the Euro Area, euro (EUR) is widely used for cross-border shopping, travel, and international payments [4].

Methodology

Methodology

The methods used include the calculation of **Expected Shortfall (ES)**, **Value-at-Risk (VaR)** through different models, the analysis of **volatilities**, and the investigation of the sensitivity of **exchange rate returns to interest rate** differentials.

Data

Data

Monthly Overnight Interest Rates

- January 2000 - October 2024
- Switzerland: Swiss National Bank's (SNB) official API [5]
- Sweden Swedish Riksbank's Interest Rates and Exchange Rates Statistics [6]
- Other countries: the Federal Reserve Economic Data (FRED) database [7]

Data

Daily Foreign Exchange Rates

- January 1, 2004 - October 21, 2024
- Data for G10 currencies against the Swiss Franc (CHF) were collected using the YFinance library [8].

Main Findings

Main Findings

Monthly Basic Risk Measures -Volatility

NZDCHF and USDCHF are the most volatile pairs, posing higher price uncertainty for investors. AUDCHF demonstrates the lowest volatility.

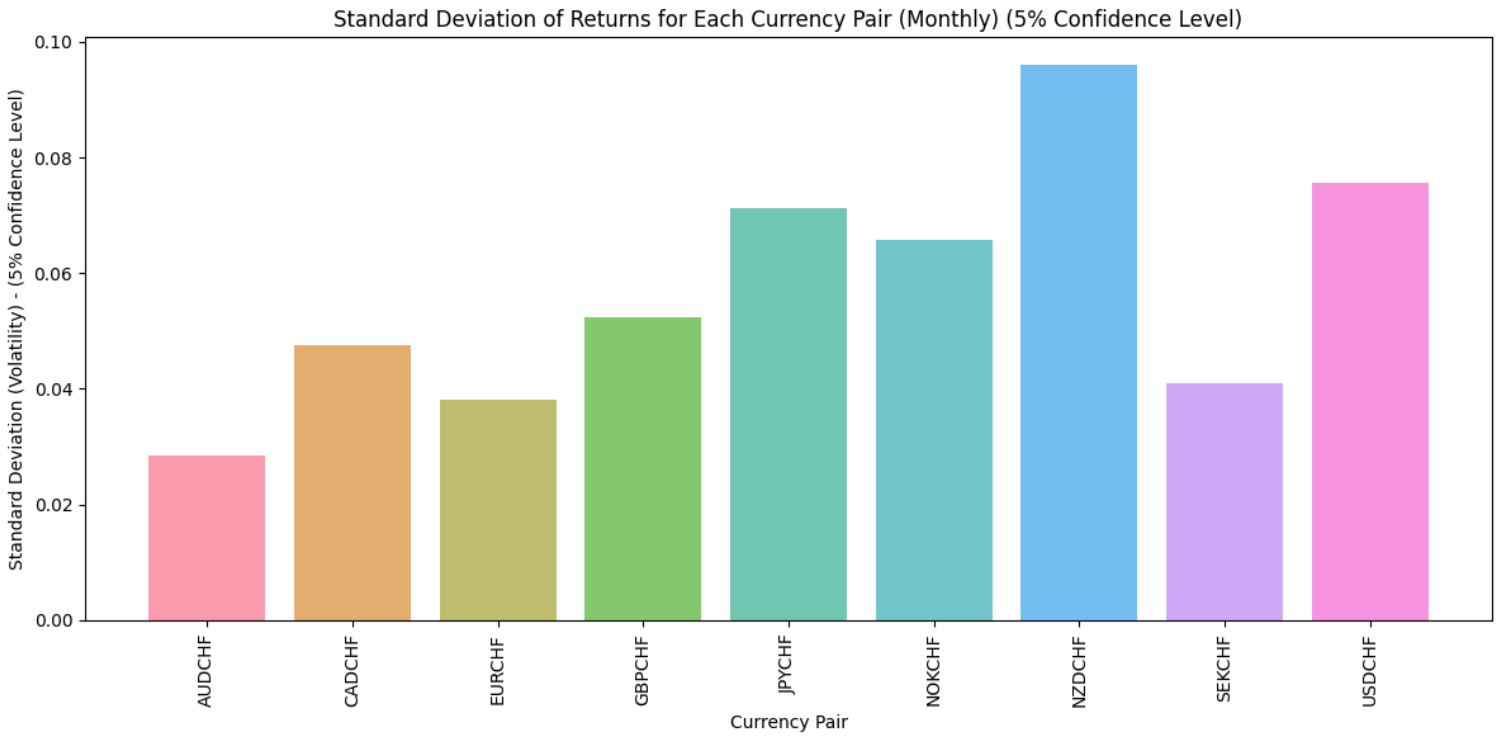

Figure 1: Standard Deviation of Returns for Each Currency Pair (Monthly).

Main Findings

Monthly Basic Risk Measures -VaR

NZDCHF and NOKCHF have the largest negative VaR values. EURCHF displays the smallest absolute VaR.

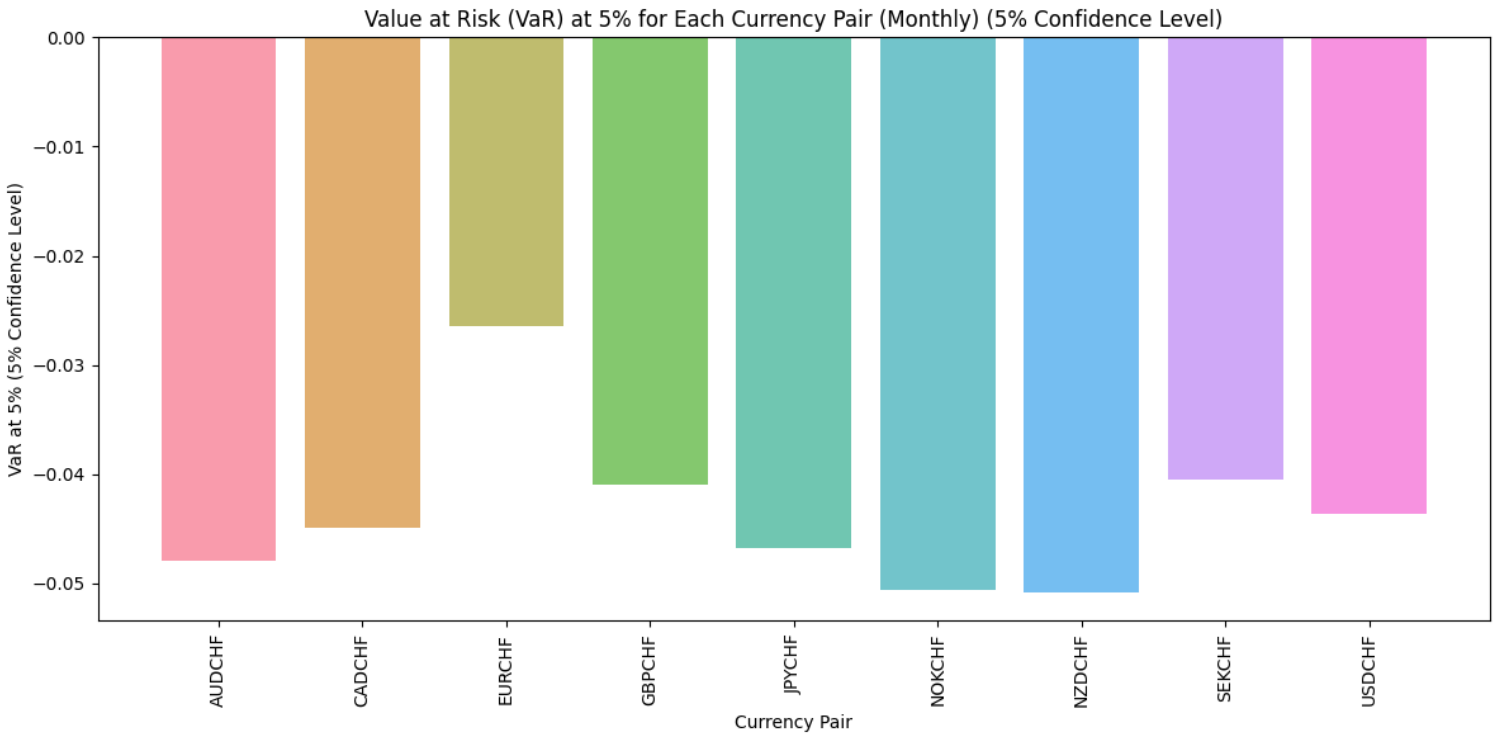

Figure 2: Value at Risk at 5% for Each Currency Pair (Monthly).

Main Findings

Monthly Basic Risk Measures -ES

NOKCHF again shows the largest ES value at -0.076, closely followed by CADCHF at -0.076, exhibiting the highest levels of risk under extreme market conditions. EURCHF has the smallest ES, emphasizing its relatively low-risk characteristics.

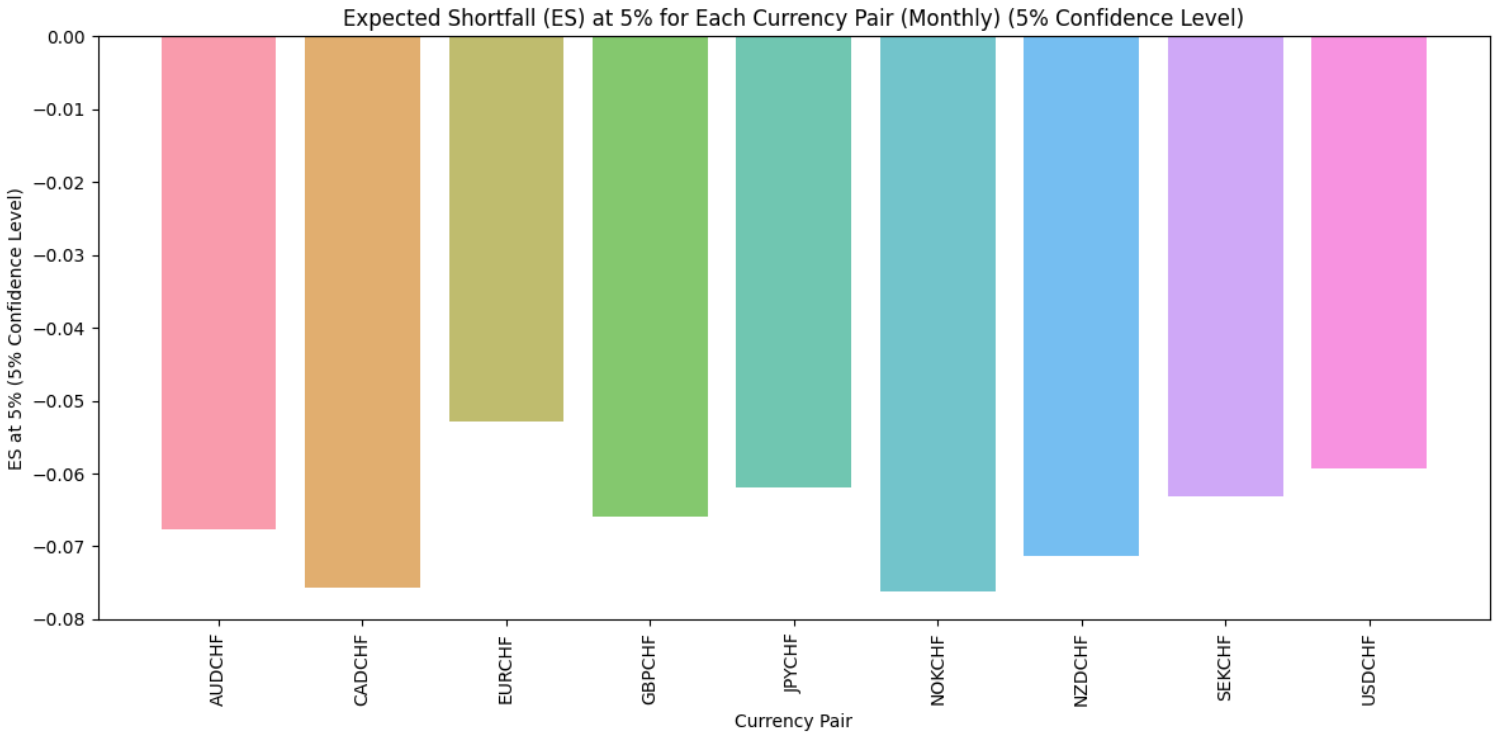

Figure 3: Expected Shortfall at 5% for Each Currency Pair (Monthly).

Main Findings

Daily VaR Calculation

In daily historical VaR analysis, AUDCHF, CADCHF, NOKCHF, and NZDCHF all showed losses exceeding 1%. In the Monte Carlo simulation, AUD and NZD still exhibit high risk persistence. JPY demonstrates very stable risk characteristics.

Table 1: Historical VaR (5%) and Monte Carlo VaR (5%) for each currency pair.

Currency Pair	Historical VaR	Monte Carlo VaR
AUDCHF	−0.011509	−0.016160
CADCHF	−0.010249	−0.009102
EURCHF	−0.005769	−0.005250
GBPCHF	−0.009200	−0.009942
JPYCHF	−0.009865	−0.009910
NOKCHF	−0.010415	−0.007992
NZDCHF	−0.011833	−0.012486
SEKCHF	−0.009086	−0.011836
USDCHF	−0.009715	−0.001895

Main Findings

Regression Analysis

Under the assumption of uncovered interest parity (UIP), we would expect $\alpha = 0$ and $\beta = -1$.

Table 2: Regression summaries of exchange rate returns on interest rate differentials.

Country	α	β	std.err_α	std.err_β	t-value_α	t-value_β	p-value_α	p-value_β
Australia	-0.0619	-1.4626	0.0200	0.6324	-3.0986	-2.3126	0.0024	0.0224
Canada	-0.0281	-0.7324	0.0163	0.8935	-1.7216	-0.8196	0.0877	0.4140
Germany	-0.0290	-0.6740	0.0077	0.7651	-3.7798	-0.8809	0.0002	0.3801
UK	-0.0437	-0.8895	0.0114	0.5722	-3.8264	-1.5545	0.0002	0.1227
Japan	-0.0400	-3.2504	0.0081	0.9480	-4.9300	-3.4287	0.0000	0.0008
Norway	-0.0045	2.1236	0.0205	1.0760	-0.2183	1.9736	0.8276	0.0507
New Zealand	-0.0138	0.1340	0.0195	0.5647	-0.7099	0.2374	0.4791	0.8128
Sweden	-0.0176	1.7871	0.0111	0.9607	-1.5787	1.8602	0.1170	0.0653
United States	-0.0364	-1.1620	0.0100	0.4989	-3.6296	-2.3290	0.0004	0.0215

The presence of a negative α for all G10 currencies when compared to the CHF implies the existence of a risk premium when holding foreign exchange exposures.

Main Findings

Daily Price Simulation

Volatility of AUDCHF is around 0.33, also reflecting considerable price uncertainty.

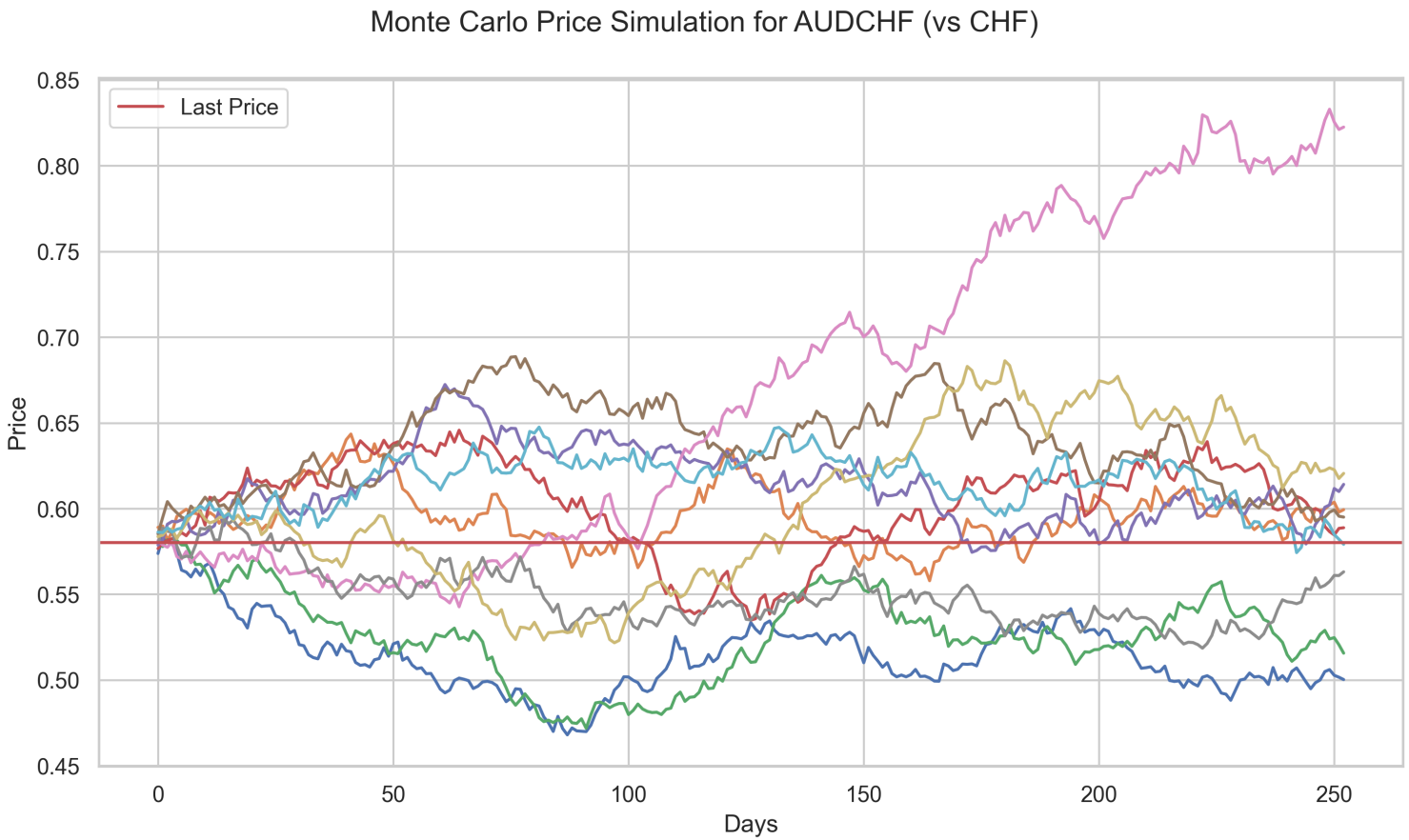

Figure 4: Monte Carlo Price Simulation of AUDCHF vs. CHF

Main Findings

Daily Price Simulation

JPY has the lowest price volatility 0.0022, indicating extremely low future price fluctuations.

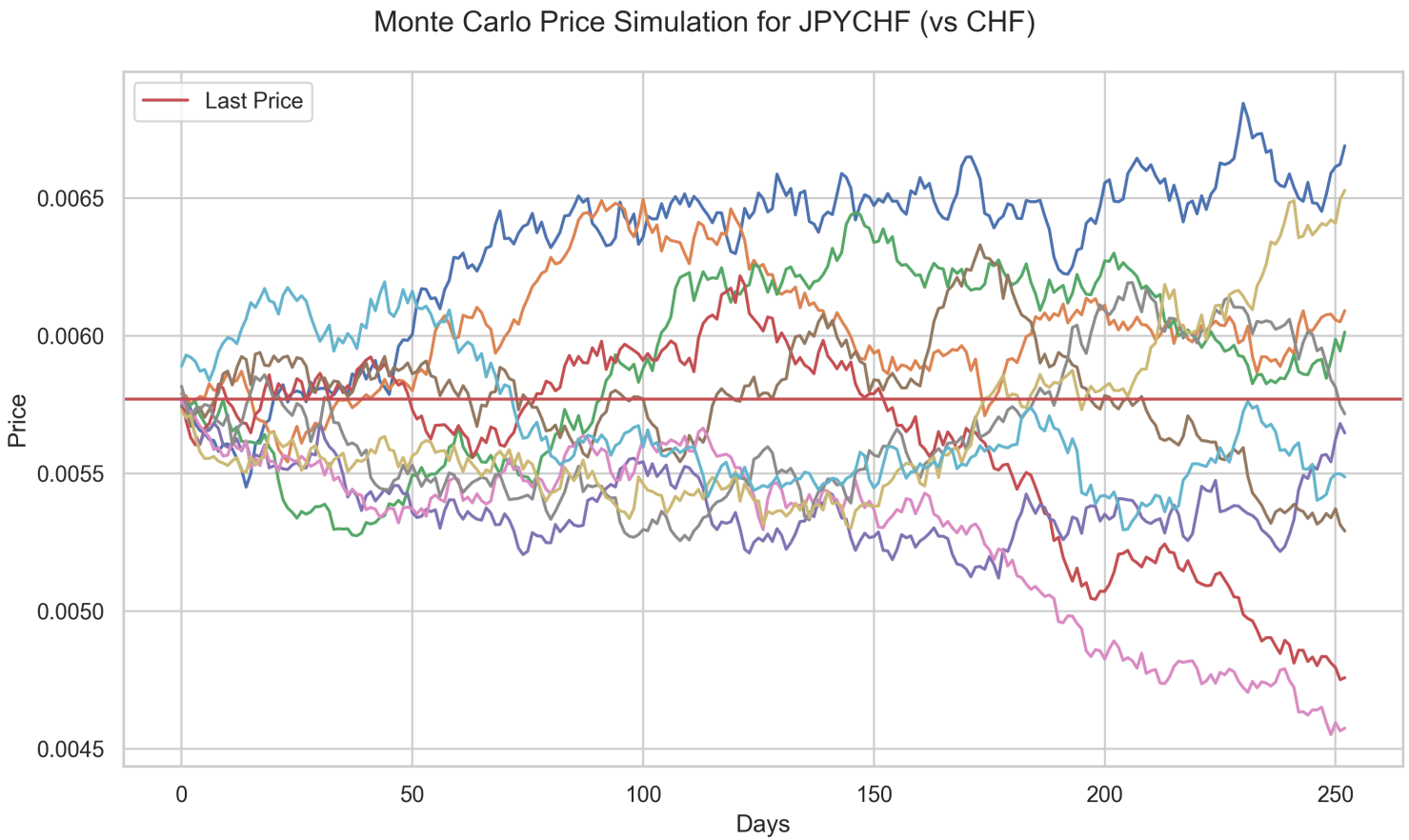

Figure 5: Monte Carlo price siulation for JPY-CHF.

Conclusion

Conclusion

- NZD/CHF consistently emerged as the riskiest currency pair. It exhibited the highest volatility at 0.096, the largest VaR at -0.0508, and significant ES values at -0.0712.
- JPY/CHF and EUR/CHF appear to be the least risky, exhibiting lower volatility and more stable exchange rate movements against the Swiss Franc.
- Regression results show that all G10 currencies are likely to offer some degree of risk premium when held in a cash account by a Swiss investor.
- Further research is needed to assess the systematic FX risk compensation for Swiss investors across various asset classes (e.g. equity)

References

[1] Bank for International Settlements (BIS). *Triennial Central Bank Survey: Foreign Exchange Turnover in April 2022*. 2022. URL: https://www.bis.org/statistics/rpfx22.htm.

[2] Kenneth S Rogoff and Maurice Obstfeld. "The six major puzzles in international macroeconomics: Is there a common cause?" In: (2000).

[3] Hiro Ito and Robert N McCauley. "Currency composition of foreign exchange reserves". In: *Journal of International Money and Finance* 102 (2020), p. 102104.

[4] State Secretariat for International Finance (SIF). *IMF Reports and Statistics: Switzerland*. https://www.sif.admin.ch/en/imf-reports-statistics-switzerland. June 2024.

[5] Swiss National Bank (SNB). *Swiss National Bank Data API*. https://data.snb.ch/. 2024.

[6] Swedish Riksbank. *Interest Rates and Exchange Rates Statistics*. https://www.riksbank.se/en-gb/statistics/interest-rates-and-exchange-rates/. 2024.

[7] Federal Reserve Economic Data (FRED). *Federal Reserve Economic Data*. https://fred.stlouisfed.org/. 2024.

[8] Yahoo Finance. *Foreign Exchange Rates*. Retrieved using the yfinance Python library from https://finance.yahoo.com/. 2024.