

Do UBS and USD/CHF eventually converge?

Testing an intuitive stock–forex hypothesis using five years of market data

This project began with a simple idea.

UBS is associated with both the Swiss and United States stock markets, while USD/CHF connects the currencies of those two countries. I wondered whether the percentage movements of the UBS share and the USD/CHF exchange rate might temporarily diverge but later converge again.

A short initial graph appeared to show this behaviour. I therefore expanded the analysis to five years of data to see whether the pattern survived a larger sample.

It did not. The longer dataset showed almost no daily return correlation and a relative-performance series that trended rather than repeatedly returning to a stable level.

Why this project?

In my earlier data-analysis projects, I began with datasets whose variables already had fairly clear meanings. Here, I wanted to begin with a market idea of my own and see whether it survived contact with a larger dataset.

The original intuition was based on three observations:

1. UBS is connected with both the Swiss and United States equity markets.
2. USD/CHF measures the relative value of the US dollar and Swiss franc.
3. In a short graph, large differences between the daily UBS and USD/CHF percentage changes seemed to be followed by later convergence.

This led to the working hypothesis:

Initial hypothesis

When UBS and USD/CHF diverge, their relative cumulative performance will eventually move back together rather than separating indefinitely.

I did not begin with a formal economic model explaining why this had to happen. The project was exploratory: first visualise the relationship, then increase the sample size and test whether the visual impression remained convincing.

Important warning

This is a practice project

This report documents a beginner data-analysis exercise. It is not a trading recommendation, investment strategy, pricing model or professional market study.

The data were downloaded through `yfinance`, which uses publicly available market data. Such data may contain missing observations, vendor-specific adjustments, timestamp differences or later revisions.

Readers should reproduce the analysis, inspect the code and verify the data independently before relying on any numerical result or interpretation in this report.

Nothing in this project establishes that UBS should be bought or sold when USD/CHF moves in a particular direction. The purpose is to test one hypothesis and understand why the result did or did not support it.

How the question changed

My first exploration used 15-minute data over approximately 60 days. I restricted USD/CHF to the hours during which the New York Stock Exchange was open and compared each session's percentage movement with the UBS percentage movement over the same period.

That graph appeared to contain repeated divergence and convergence.

However, a 60-day sample was too short to evaluate a claim involving the word “eventually.” A divergence near the end of the dataset might simply not have enough time to reverse.

I therefore expanded the analysis to five years.

The five-year analysis is not identical to the first test

The long-period version uses daily adjusted closing prices because the free intraday history available through `yfinance` is much more limited.

The final analysis therefore tests the broader daily relationship between UBS and USD/CHF. It does not preserve the exact 9:30 a.m.–4:00 p.m. New York session used in the preliminary experiment.

This difference should be remembered when interpreting the conclusion.

Data used

The final dataset contained adjusted daily closing prices for:

- **UBS Group AG**, ticker UBS;
- **USD/CHF**, ticker CHF=X.

Only dates present in both series were retained.

Table 1: Scope of the final analysis.

Item	Choice used here
Stock series	UBS Group AG, ticker UBS
Currency series	USD/CHF, ticker CHF=X
Data source	Yahoo Finance data downloaded through <code>yfinance</code>
Price field	Adjusted daily closing price returned with <code>auto_adjust=True</code>
Date range	5 August 2021 to 4 August 2026
Common daily observations	1253
Weekly observations used in long-period plots	262
Main quantities	Daily percentage returns, normalized cumulative performance, rolling correlation and log relative performance

Analysis choices

Table 2: Decision log for the analysis.

Part	Choice	Value or method	Reason
Data period	Long sample	Five years	A 60-day sample was too short for assessing repeated convergence.
Frequency	Return calculation	Daily	Five years of freely accessible 15-minute data were not available through the source used.
Date alignment	Common dates only	Inner join	Prevented one series from contributing observations on dates missing from the other.
Return measure	Percentage change	<code>pct_change()</code>	Allowed daily movements in assets with different price units to be compared.
Long-period display	Weekly sampling	Final observation each Friday	Reduced visual clutter without changing the underlying daily calculations.
Cumulative comparison	Normalization	Both series begin at 100	Made their cumulative percentage performance directly comparable.
Short-term relationship	Pearson correlation	Daily returns	Measured the strength of their linear daily co-movement.
Changing relationship	Rolling correlation	60 trading days	Showed whether the correlation was stable through time.
Relative performance	Log ratio	$\ln(I_{\text{UBS}}/I_{\text{FX}})$	Tested whether the two cumulative paths repeatedly returned toward one another or separated persistently.
Visual smoothing	Moving average	13 weekly observations	Made the longer direction of relative performance easier to inspect.

Quantities calculated

Daily percentage return

For each series, the daily percentage return was calculated as

$$r_t = \left(\frac{P_t}{P_{t-1}} - 1 \right) \times 100,$$

where P_t is the adjusted closing price on day t .

This converts UBS prices and exchange-rate values into the same unit: percentage movement per day.

Normalized cumulative performance

Each price series was rescaled so that its first value equalled 100:

$$I_t = 100 \frac{P_t}{P_0}.$$

A value of 130 therefore means that the series is 30% above its initial value over the selected period.

Log relative performance

The relative-performance measure was

$$S_t = \ln \left(\frac{I_{\text{UBS},t}}{I_{\text{USD/CHF},t}} \right).$$

When S_t rises, UBS is outperforming USD/CHF over the period beginning at the chosen starting date. When S_t falls, USD/CHF is outperforming UBS.

This is not an arbitrage spread

The quantity S_t is a comparison of two different assets. It is not the pricing difference between the Swiss and US listings of the same UBS share.
Calling it a relative-performance series does not imply that it must be stationary or mean-reverting.

Cumulative performance

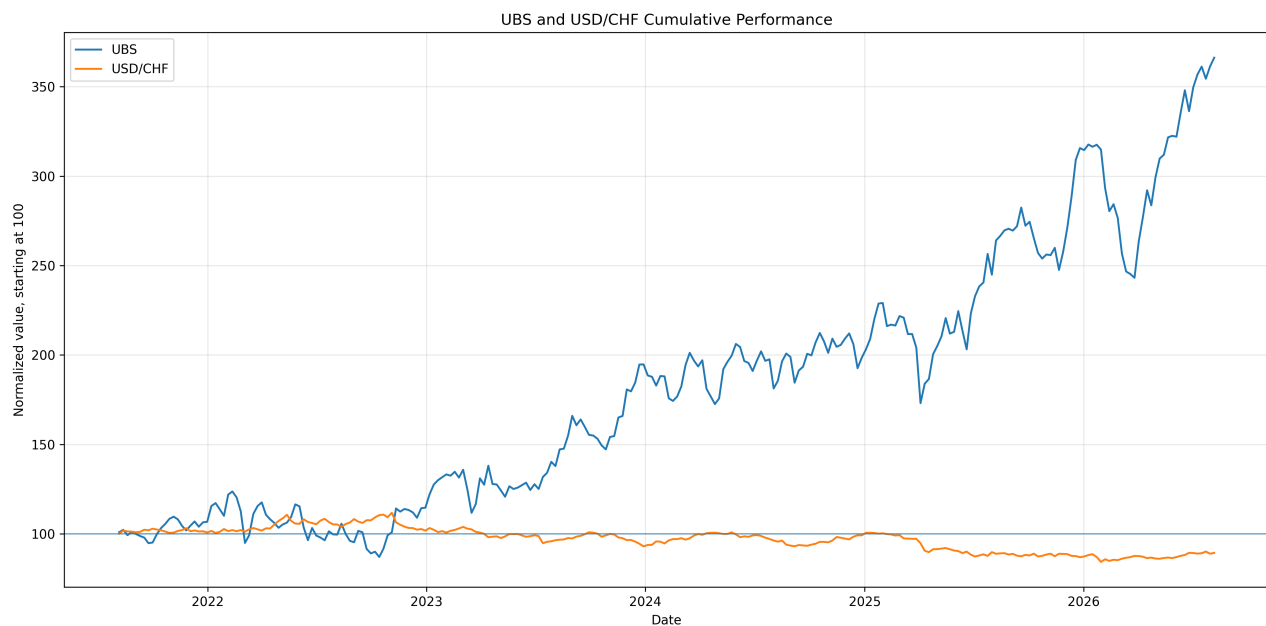


Figure 1: Weekly observations of normalized cumulative performance. Both series begin at 100. The graph compares long-period performance rather than claiming that the two assets should have equal numerical prices.

The two cumulative paths do not remain close.

Over the five-year period, UBS rises much more strongly than USD/CHF. The distance between the two series expands rather than repeatedly disappearing.

This was the first clear indication that the original convergence idea was unlikely to survive the longer dataset.

What this graph establishes

The graph shows persistent relative outperformance by UBS over the selected period. It does not by itself explain why UBS performed differently, and it does not establish that the same behaviour must continue in the future.

Daily return relationship

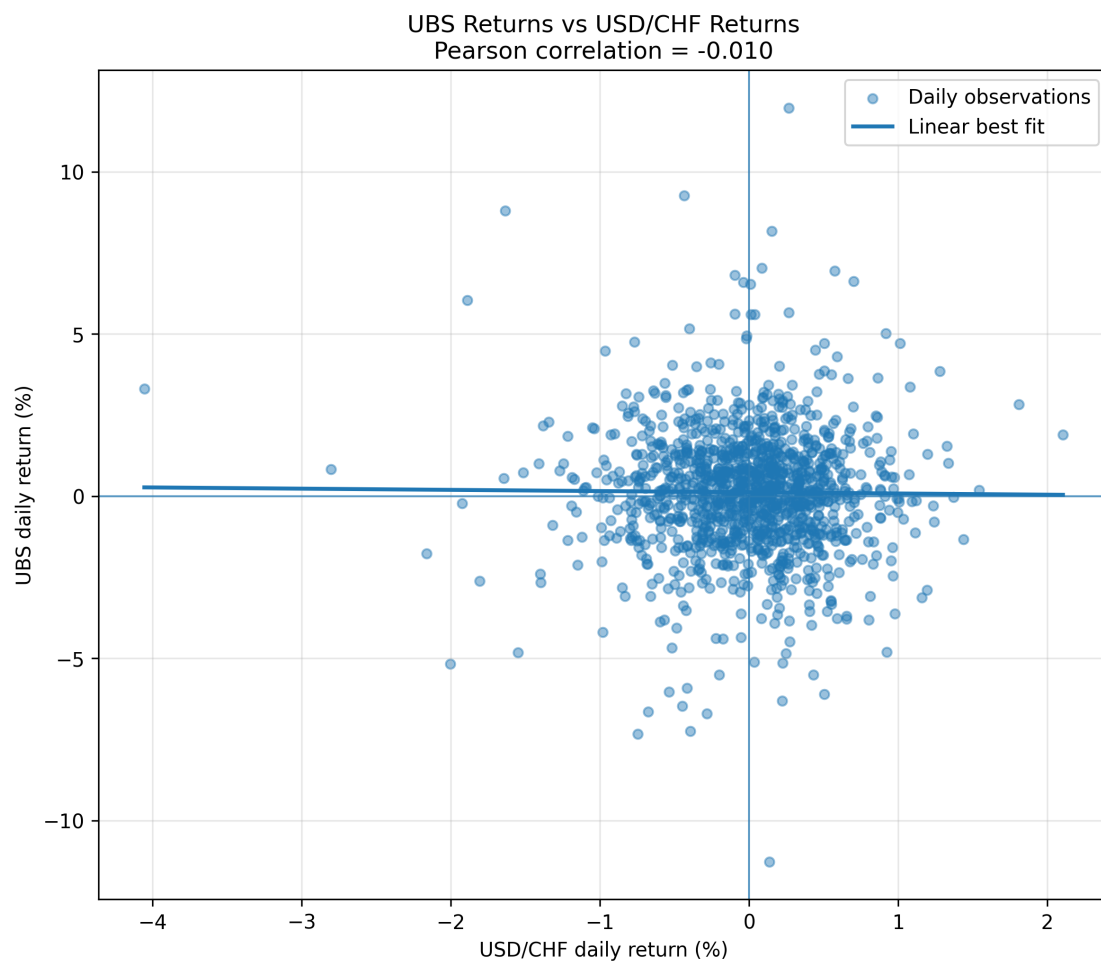


Figure 2: Scatter plot of daily UBS returns against daily USD/CHF returns. Each point represents one common trading date. The fitted line is almost flat, matching the near-zero Pearson correlation.

The measured Pearson correlation was approximately

$$\rho = -0.01.$$

A correlation of -0.01 is practically zero for this exploratory analysis.

The scatter plot also shows no obvious rising or falling linear structure. Large positive or negative UBS movements occurred across many different USD/CHF return values.

DAILY OBSERVATIONS
1253
common market dates

RETURN CORRELATION
-0.01
approximately no linear relationship

Was the relationship stable through time?

A full-period correlation can hide shorter periods in which two assets behave differently. I therefore calculated a rolling 60-day Pearson correlation.

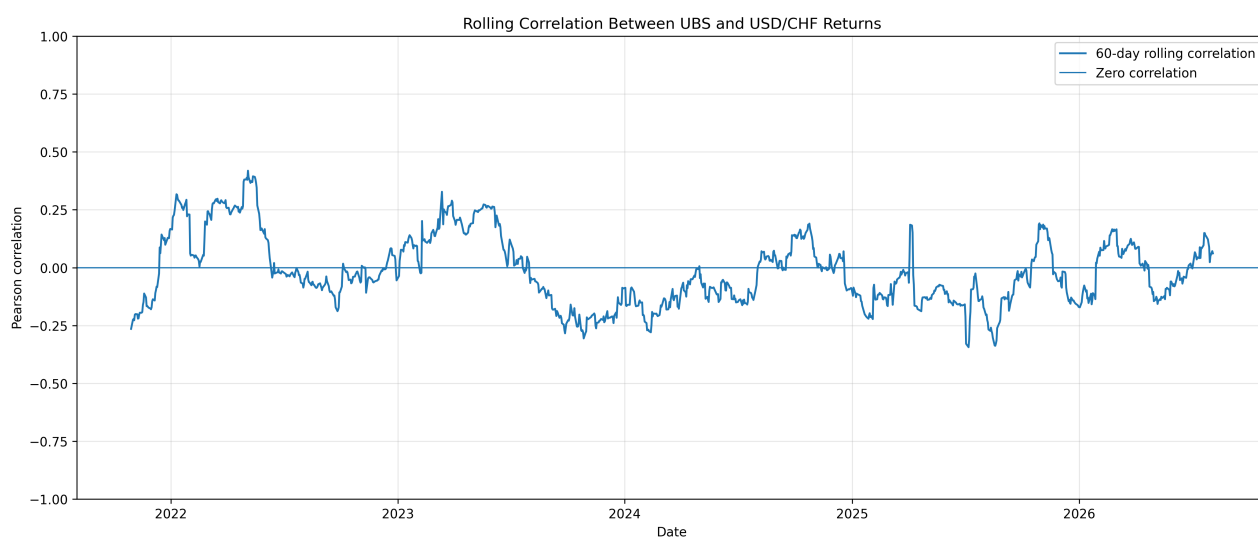


Figure 3: Sixty-day rolling correlation between UBS and USD/CHF daily returns. The relationship changes through time but does not remain consistently positive or consistently negative.

The rolling correlation moves above and below zero. There may be temporary periods of positive or negative co-movement, but the sign and strength are not stable.

This matters because a useful convergence hypothesis would normally require some persistent structure. A relationship that repeatedly changes sign is less consistent with a simple rule such as:

“When one rises relative to the other, they will reliably move back together.”

Testing the convergence idea directly

The main graph for the original hypothesis is the log relative-performance series.

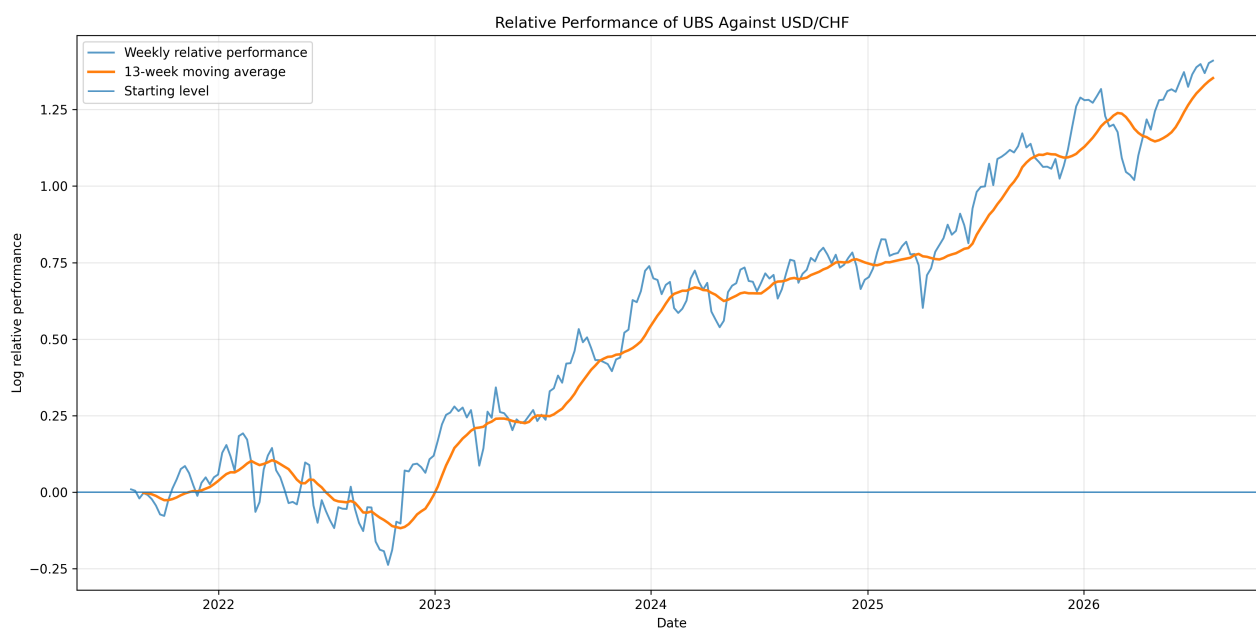


Figure 4: Weekly log relative performance of UBS against USD/CHF, together with a 13-week moving average. A stationary, mean-reverting relationship would be expected to fluctuate around a broadly stable level. Instead, the series displays a strong upward trend over the sample.

The series does contain temporary declines. However, those declines occur inside a much larger upward movement.

The 13-week moving average makes the long-period direction particularly clear. Rather than oscillating around zero or another stable level, it rises from near zero to well above one.

Therefore, the apparent short-sample convergence was not a stable feature of the five-year daily dataset.

Main result

For this five-year daily specification, the data do not support the hypothesis that UBS and USD/CHF repeatedly diverge and then return to a stable relative level. Daily returns have approximately zero linear correlation, and cumulative relative performance trends strongly rather than mean-reverting.

Why the original intuition failed

The mistake in the initial intuition was subtle.

A share traded in both Switzerland and the United States does create a currency-adjusted relationship between the **two listings of that share**. In simplified form, one might expect

$$\text{US-listed UBS value} \approx \text{Swiss-listed UBS value converted through USD/CHF.}$$

However, that does not imply

$$\text{UBS stock return} \approx \text{USD/CHF return.}$$

UBS equity and USD/CHF are different assets.

UBS can move because of:

- company earnings and expectations,
- banking-sector conditions,
- interest rates and credit conditions,
- regulation,
- company-specific news,
- and broad equity-market sentiment.

USD/CHF measures the relative market value of two currencies. Its movement does not have to match the movement of one Swiss financial company.

The dual listing explains why the same UBS share should be priced consistently across two exchanges after currency conversion. It does not create a reason for the UBS share itself to converge with the exchange rate.

What the analysis does and does not establish

Supported by this exercise	Not established by this exercise
UBS and USD/CHF daily returns had a Pearson correlation of approximately -0.01 over the selected period.	UBS and USD/CHF can never be related under any market condition or time frequency.
The daily-return scatter plot contained no clear linear pattern.	There are no nonlinear, delayed or regime-specific relationships.
The rolling correlation changed sign and was not stable.	Every temporary correlation movement is meaningless.
The log relative-performance series trended strongly upward rather than remaining near a stable level.	The series can never fall or converge in a future period.
The original convergence hypothesis was not supported for this specific five-year daily analysis.	The same result automatically applies to every dual-listed company and every currency pair.
The project revealed that dual-listing parity and stock–forex correlation are different questions.	The analysis tests the exact price parity between UBS shares traded in Switzerland and the United States.

Limitations

1. Daily timestamps are not perfectly synchronized.

The UBS daily close and the forex daily observation may not represent exactly the same instant.

2. The final analysis does not preserve NYSE-session hours.

The preliminary short-period test used matched New York trading hours, while the five-year test used daily data.

3. One company was studied.

A conclusion about UBS cannot automatically be extended to all internationally listed shares.

4. Correlation measures only linear contemporaneous movement.

A correlation near zero does not rule out nonlinear effects, lead-lag behaviour or relationships that occur only under particular conditions.

5. The relative-performance measure depends on the starting date.

Both cumulative series were normalized to 100 at the beginning of the selected sample. A different starting date changes the numerical level of the comparison.

6. No formal stationarity test was performed.

The conclusion about the trending relative series is based on the graph and descriptive analysis. A more developed project could use an augmented Dickey-Fuller test, alternative specifications and out-of-sample checks.

7. Data quality was not independently audited.

The downloaded values were not compared against an institutional market database.

What I learned

1. A pattern that appears convincing over 60 days may disappear when the sample is expanded to five years.
2. Returning close to zero on a daily-return graph is not the same as cumulative convergence.
3. Daily return differences and cumulative relative performance answer different questions.
4. A dual listing connects two versions of the same equity through currency conversion. It does not force the equity return to follow the exchange rate.
5. Correlation and convergence are different concepts. Two assets can have low return correlation while their relative cumulative performance trends strongly.
6. A moving average can make the direction of a noisy long-period series easier to inspect, but it does not create statistical evidence by itself.
7. A rejected hypothesis is still a useful result when the method and limitations are documented honestly.
8. The most valuable part of an exploratory project may be discovering that the original question was based on a mistaken assumption.

AI use declaration

I used ChatGPT extensively as a tutor and coding assistant during this project.

ChatGPT helped me:

- identify possible internationally listed equities for the initial exploration;
- construct and review Python code for downloading, aligning and plotting UBS and USD/CHF data;
- distinguish daily percentage-change divergence from cumulative relative performance;
- understand why a lag-one correlation did not directly test my original claim;
- construct normalized cumulative series, rolling correlations and the log relative-performance measure;
- interpret the difference between dual-listing price parity and a direct stock–forex relationship;
- and organise and edit this report.

The analysis was not produced by accepting every AI response without review. During the project, I repeatedly corrected the description of my hypothesis when the suggested analysis did not match the question I intended to ask.

I selected the stock and currency pair, ran the Python code, inspected the graphs, increased the sample from approximately 60 days to five years, and accepted that the larger dataset did not support my original hypothesis.

ChatGPT can produce incorrect code, misleading interpretations and overconfident explanations. The code, calculations and claims in this report should therefore be checked independently.

The final responsibility for the analysis, reported values, limitations and conclusion is mine.

Data, code and sources

Tools used:

Python, pandas, NumPy, Matplotlib and yfinance.

Market series:

- [Yahoo Finance: UBS Group AG](#)
- [Yahoo Finance: USD/CHF](#)

Useful documentation:

- [yfinance documentation](#)
- [pandas documentation: DataFrame.pct_change](#)
- [pandas documentation: correlation](#)
- [pandas documentation: resampling](#)
- [NumPy documentation: numpy.log](#)
- [Matplotlib documentation](#)

Code and processed data:

The complete Python code, processed CSV file, generated figures and numerical summary will be made available through the Data Analysis page of my website and its linked GitHub repository.

This is a learning project, not a peer-reviewed financial study or investment recommendation. It documents an exploratory hypothesis test using publicly available market data. Readers should reproduce the calculations and verify the data independently.