Sample Python Project: S&P 500 (^GSPC) vs Gold (GC=F) — Monthly Comparison

Key Features
- Automated Data Ingestion – Fetches real historical data from Yahoo Finance (yfinance).
- Preprocessing Pipeline – Aligns series, groups by month, and normalises to an index (100 = first trading day).
- Interactive Visualisations – Monthly line charts with Plotly (Red = S&P 500, Gold = Gold Futures).
- Summary Tables – For each month: start, end, absolute change, and % change.
- Single Reproducible Artefact – A consolidated HTML report with embedded charts and navigation.

Each monthly chart normalises both series to the **Index (100 = first trading day)** to make relative movement directly comparable. A concise summary table (start, end, absolute change, % change) accompanies each month.

Methodology
- Download adjusted closing prices for both tickers.
- Align both series on common trading days.
- Group by calendar month.
- Normalise each month to 100 on the first trading day.
- Compute changes (absolute and %).
- Render interactive Plotly charts plus tables into a single HTML file.

What's Included
- : spx_gold_monthly_report.py → main script.
- output/spx_gold_monthly_report.html → generated HTML report.
- output/ folder → stores artefacts.

Installation & Usage
Requirements: Python 3.9+

```
python -m venv .venv
source .venv/bin/activate   # Windows: .venv\Scripts\activate
pip install --upgrade pip
pip install yfinance pandas plotly
```

Run:

```
python spx_gold_monthly_report.py
# Output: output/spx_gold_monthly_report.html
```

Assumptions & Limitations
- Gold proxy: defaults to GC=F futures; alternatives include GLD (ETF) or XAUUSD=X (spot).
- Adjusted Close is used when available.
- Only common trading days are kept (inner join).
- Normalisation conveys relative changes, not absolute volatility.

Possible Extensions
- Matrix heatmap of monthly returns.
- Robustness checks across different gold proxies.
- Export CSV/Excel appendices with raw computations.
- Add statistical tests (rolling correlations, regression diagnostics).

Licensing & Ethics
- Data: Yahoo Finance via yfinance, for educational use only.
- Code: provided as an academic demonstration

Closing note
This sample is not meant to be a full research project, but a demonstration of method and mindset. My aim is to show how I approach operational questions with structured, transparent, and reproducible Python code.

Citation
Please cite as:
Dev Panu. “S&P 500 vs Gold — Monthly Comparison (Real Yahoo Finance Data).” 2025. Code sample for PhD application.