

Read the timestamp. Then read the price.

A planned 30-minute lesson in market-data literacy. No account, API key or paid subscription is needed. Use the supplied data, a calculator and this worksheet. A spreadsheet is optional.

All prices, volumes and source timestamps in this exercise are **synthetic**. They demonstrate data handling, not actual market conditions. Do not trade on them. The session schedule below is a stated teaching assumption, not a market calendar.

Time	Activity	What you will produce
0-3 min	Read the setup	A clear distinction between snapshots and bars
3-11 min	Inspect a multi-asset snapshot	Freshness labels and market-session checks
11-23 min	Calculate returns from four bars	Three interval returns and an overall return
23-30 min	Explain your result	A two-sentence summary and discussion

1. Inspect the snapshot

Observation time: **2026-10-05 14:00:00 UTC**. A source timestamp describes the source observation, not when you opened this worksheet. Different rows need not be synchronized.

Instrument	Price (USD)	Source time (UTC)	Age / label
AAPL	200.00	13:59:58	_____
EURUSD	1.1000 per EUR	13:58:00	_____
BTCUSD	50,000.00	13:59:59	_____
XAUUSD	2,500.00 per troy oz	14:00:05	_____

Classroom rule: age = observation time - source time. An age from 0 through 60 seconds is within this exercise's freshness threshold; above 60 is stale; a negative age is clock-uncertain. These labels are a display policy, not an accuracy guarantee.

A. Fill in all four ages and labels. Which row requires a clock check?

B. Assume this equities training session runs from 13:30 UTC until 20:00 UTC, ending just before 20:00. Is it open at 14:00? At 20:15? Can a recently received price alone answer either question?

Calculate price returns.

2. Work with historical bars

Instrument: **DEMO-USD**, a fictional asset. Date: 2026-10-05. Each row is a completed 15-minute bar; the timestamp is the bar's start in UTC. Prices are USD. Volume is a synthetic count of base units. No row represents a full day.

Start UTC	Open	High	Low	Close	Volume
09:00	99	101	98	100	120
09:15	100	103	99	102	150
09:30	102	103	100	101	130
09:45	101	104	100	103	140

Interval return (%) = (current close / previous close - 1) * 100

Window return (%) = (last close / first close - 1) * 100

C. Calculate the three close-to-close interval returns. Keep at least six decimal places until the final answer, then display two decimal places. Start with the second row, since the first row has no previous close in this sample.

D. Calculate the return from the first supplied close to the last supplied close. Does it equal the sum of the three unrounded interval returns? What does compounding give instead?

E. If the 09:30 row were missing, what could you still compute from the endpoints? What could you no longer claim about the intervening price path? Do not invent or forward-fill the missing bar.

3. Write a two-sentence result

State the return between the first and last supplied closes and identify the time window. Then explain how missing bars affect the result, or how price freshness differs from market-open status. Focus on the data rather than investment recommendations.

Answer key

Snapshot and session answers

Row	Age	Expected interpretation
AAPL	2 seconds	Within the classroom freshness threshold.
EURUSD	120 seconds	Stale under the stated 60-second display rule.
BTCUSD	1 second	Within the classroom freshness threshold.
XAUUSD	-5 seconds	Clock-uncertain. Check clock alignment; do not silently call it fresh.

B. The assumed equities session is open at 14:00 UTC and closed at 20:15 UTC. A fresh timestamp is not evidence that regular trading is open: use market-status/session data. In a real integration, also account for timezone, holidays, early closes and instrument-specific sessions. A stale quote alone does not prove the market is closed.

Historical-bar answers

Calculation	Working	Answer
09:15 vs 09:00 close	$(102 / 100 - 1) \times 100$	2.00%
09:30 vs 09:15 close	$(101 / 102 - 1) \times 100$	-0.98%
09:45 vs 09:30 close	$(103 / 101 - 1) \times 100$	1.98%
Last vs first supplied close	$(103 / 100 - 1) \times 100$	3.00%

D. The sum of the unrounded interval returns is 2.999805863%, not exactly 3%. Compounding gives $(102/100) \times (101/102) \times (103/101) - 1 = 3\%$. Rounding both methods to two decimals hides this difference. Use ratios or unrounded returns in the calculation.

The first close belongs to the 09:00-09:15 bar; the last close belongs to the 09:45-10:00 bar. This is a return between those closes, not a daily return and not the return from the first open. The first-open-to-last-close result would be $(103/99 - 1) \times 100 = 4.04\%$.

E. The endpoint return remains 3% if the same endpoints are present. You cannot reconstruct the missing bar's OHLCV or the separate returns across it. A missing record is not proof of no trading.

Example summary: "In the supplied synthetic sample, the last close is 3.00% above the first supplied close. This compares the first and last closes in the sample; missing bars would limit what we could say about prices between them."

Instructor guide

Before the session

Give students pages 1-2 and keep page 3 as the answer key. Every required input is printed in the worksheet. A calculator is enough. If learners use a spreadsheet, enter the four historical rows with numeric prices; do not type percent signs into the source values.

For a spreadsheet, put Close in column E and the first data row at row 2. In G3 use `=E3/E2-1`, copy down to G5 and format as Percentage. Use `=E5/E2-1` for the endpoint return. Leave G2 blank. Do not multiply by 100 again when using Percentage formatting.

Suggested 30-minute facilitation

Minutes	Facilitator action
0-3	Explain synthetic data, source time and bar-start time.
3-11	Allow 5 minutes for A-B; use 3 minutes to compare freshness and sessions.
11-23	Allow 9 minutes for C-E; use 3 minutes to compare ratios, sums and gaps.
23-30	Allow 4 minutes for a written summary and 3 minutes for discussion.

Lesson pacing: this is a planned 30-minute lesson. Adjust the pace to your learners and allow extra discussion time as needed.

Optional: explore live data

[Market Data Export](#): choose Crypto, BTCUSD, 5-minute bars and the last 24 hours; select Show chart, then Download CSV. The guest tool works without an account. Availability varies by instrument and date range; the supplied worksheet remains sufficient to complete the lesson.

[Google Sheets watchlist guide](#): copy the template and follow its setup instructions only if you want a live watchlist. This optional path needs a Google account and your own SiftingIO API key. Review script permissions, keep the key out of shared cells/chat, and keep the working copy private or restricted to trusted editors. Each manual refresh uses the account's normal API allowance. Never share an instructor's key with the class.

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Teaching use

Prepared on 5 October 2026. All supplied sample values are original synthetic teaching examples; they are not redistributed market data. Educators may copy this worksheet and its sample for teaching with the synthetic-data labels intact. Not investment advice.