

The Probability of Touching a Pivot Level Is a Restatement of the Distance to It [F009]

The touch rates — 76.1317% for P, 44.4306% for R1, 16.7095% for S2 — are simply ordered by distance; mixing in six nameless levels made by changing the ratio and sorting all eleven by distance puts three fakes among the nearest six, with a correlation of -0.9788 ; and once distance is held fixed, the upper and lower levels differ by a median of -0.7375 points

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Abstract

This paper asks whether a table of pivot touch probabilities says anything about the name of a level — the answer is that it does not. It claims neither a new mathematical theorem nor a new law.

First, measured on one-hour bars for four series, the median touch rates are **76.1317%** for P, **44.4306%** for R1, **42.6601%** for S1, **17.8443%** for R2 and **16.7095%** for S2. The median distances to those levels are **0.1614**, **0.4433**, **0.4520**, **0.8833** and **0.9054** in units of ATR, and **the correlation between distance and touch rate is -0.9791** (Section 3).

Second, and this is the core of the paper, six levels with **no name and no derivation** were built from the same days and the same previous-day ranges by multiplying by **0.37**, **0.73** and **1.13**, then all eleven levels were sorted by distance. **Three of the nearest six are fakes.** The correlation across the eleven is **-0.9788** , unchanged from the real levels alone (Section 4).

Third, cutting into quintiles of distance and comparing the upper levels (the R side) with the lower ones (the S side) inside each band, **the median difference across the 20 bands is -0.7375 points**, with a median absolute value of **1.6128 points**. **At the same distance, up and down are touched at the same rate** (Section 5).

Fourth, ⚠️ a touch probability and a trading win rate are **different pairs of barriers**. The touch rate for P is **76.1317%**, but a trade that buys at S1, targets P and stops at S2 has a theoretical win rate of **44.9638%** to **49.6298%**, measured at **34.3750%** to **50.4202%**. The median departure from theory is **−2.4555 points** (Section 6).

Fifth, the directional information from the bar of the touch onward has a median of **−0.7965 pips**. The median spread is **0.7500 pips**, and the daily t reaches 2 in absolute value in **0 of 4** cells (Section 7).

Sixth, repeating the measurement on synthetic series built from independent normal increments down to the movement inside each bar, the median difference in touch rate is **−0.3288 points**, with a median absolute value of **1.5313 points**. **A synthetic random walk has no previous day, no highs and lows that mean anything, and no pivots — and the same rates come out anyway** (Section 8).

Scope of this paper (scope note): No new mathematical theorem and no new law is claimed — the definition of pivots, the true range, the optional stopping theorem and random walks are all known. **No particular product or proponent is discussed** — no real course, author, or vendor is the subject here, and none is named. What is treated is the public drawing method itself. **Trading is not discussed** — what is measured is touch rates, win rates and directional information, not trading performance including commissions, fills and money management. **The scope is intraday and a small number of instruments** — four series, six years, one-hour bars. Monthly time-series momentum (dozens of markets, holding one to twelve months) is documented in the literature, and this paper does not contradict it. **The day boundary is fixed at midnight Coordinated Universal Time** — not the boundary brokers use (17:00 New York and so on). Moving the boundary moves the levels themselves, so this is a caveat (Section 10). **Equally spaced pivots and other variants are not treated. No forecast is claimed. Relation to earlier papers:** this series always reports, alongside a rate, what that rate would be by chance. F006 read a touch rate beside the position and F008 placed fake ratios in the same band — this paper applies both moves to levels that carry names. Paper 423 showed that a probability can be right while only the multiplication is wrong. What is added here is **building nameless levels from the same days and the same previous-day ranges and mixing them in, holding distance fixed and comparing up against down, and measuring the gap between one-sided and two-sided barriers directly, on the same days and the same levels.**

1. Notation and the question

From the previous trading day's high H , low L and close C , the following levels are drawn.

Level	How it is made	Usual name
P	$(H + L + C) \div 3$	pivot, the centre
R1	$2P - L$	first resistance
R2	$P + (H - L)$	second resistance
S1	$2P - H$	first support
S2	$P - (H - L)$	second support

Observation 1.1: ⚠️ **these are fixed by the previous day's values alone.** So they carry no look-ahead. That part is correct.

Observation 1.2: a common practice attaches to these levels a table saying "the probability of touching this today is such and such". **The numbers in that table are in fact right** (they were right here too). The question is what the right numbers are right about.

Observation 1.3: the question settles by placing two things alongside. One is a **nameless level** — built from the same days and the same previous-day ranges, with only the ratio changed. The other is **distance** — comparing the upper and lower levels at the same distance.

Question: does a table of pivot touch probabilities say anything about the name of a level?

2. Writing the quantity and the design in advance

Design (declared before running and unchanged at run time)

Item	Decision
Day boundary	midnight Coordinated Universal Time. Days with fewer than 12 bars are dropped
Real levels	P, R1, R2, S1, S2 (from the previous trading day's high, low and close)
Fake levels	$P \pm 0.37(H - L)$, $P \pm 0.73(H - L)$, $P \pm 1.13(H - L)$
Distance	absolute value of (level – the day's open) ÷ ATR (mean true range of the previous 14 days)
Touch rate	the share of days on which some bar's high and low straddled the level
Directional information	the price move in the bounce direction over 24 bars from the bar of the touch (pips)
Bars	one hour, mid price, completed bars only
Instruments	USDJPY, EURUSD, GBPUSD, XAUUSD
Period	2019–2024. Evaluation 2022–2024

Observation 2.1: ⚠️ **the ATR does not use the current day.** It is built from the previous 14 days. Putting today's range into the denominator of the distance would make the distance itself a look-ahead.

Observation 2.2: ⚠️ **the directional signal is placed on the bar of the touch.** Placing it before the touch puts "price moved toward the level" into the condition, so betting against that move loses by construction. **Measure from after the event used as the condition.**

Observation 2.3: the fake ratios are placed **away from the real ones and scattered across the same band.**

The bar and day counts are **36,534** bars and **1,555** days for USDJPY (**778** in evaluation), **36,554** and **1,555** for EURUSD (**778**), **36,535** and **1,555** for GBPUSD (**778**), and **34,892** and **1,524** for XAUUSD (**764**).

3. The touch rate of the five levels, and the distance to each

Calculation 3.1 Touch rate and distance (evaluation period, by instrument)

Instrument	Level	Days	Distance ÷ ATR	Touch rate
USDJPY	S2	778	0.9042	16.8380%
USDJPY	S1	778	0.4519	39.7172%
USDJPY	P	778	0.1565	73.2648%
USDJPY	R1	778	0.4036	45.7584%
USDJPY	R2	778	0.8119	20.3085%
EURUSD	S2	778	0.9026	16.5810%
EURUSD	S1	778	0.4521	44.3445%
EURUSD	P	778	0.1671	77.5064%
EURUSD	R1	778	0.4598	43.5733%
EURUSD	R2	778	0.9191	16.7095%
GBPUSD	S2	778	0.9148	17.8663%
GBPUSD	S1	778	0.4573	43.9589%
GBPUSD	P	778	0.1662	76.4781%
GBPUSD	R1	778	0.4459	42.0308%
GBPUSD	R2	778	0.8910	16.0668%
XAUUSD	S2	764	0.9066	16.4921%
XAUUSD	S1	764	0.4473	41.3613%

XAUUSD	P	764	0.1534	75.7853%
XAUUSD	R1	764	0.4406	45.2880%
XAUUSD	R2	764	0.8755	18.9791%

Calculation 3.2 Medians across the four series

Level	Median touch rate	Median distance
P	76.1317%	0.1614
R1	44.4306%	0.4433
S1	42.6601%	0.4520
R2	17.8443%	0.8833
S2	16.7095%	0.9054

Observation 3.3: read on their own, the touch rates say **price touches P on three days out of four**.

They agree well across the four series, from **73.2648%** to **77.5064%**.

Observation 3.4: but placing the distance beside them, the two orderings match. By touch rate the order is P, R1, S1, R2, S2; by nearness the order is also P, R1, S1, R2, S2. **The correlation between distance and touch rate is -0.9791 .**

Observation 3.5: ⚠️ this is unremarkable in itself. **A nearer level is more easily reached.** What this paper checks is whether **the name adds anything to that unremarkable fact.**

4. Mixing in nameless levels built from the same days and the same previous-day ranges

Calculation 4.1 All eleven levels sorted by distance (evaluation period, median of four series)

Level	Kind	Distance ÷ ATR	Median touch rate
P	real	0.1614	76.1317%
+0.37	fake	0.3033	58.0445%
− 0.37	fake	0.3176	55.0376%
R1	real	0.4433	44.4306%
S1	real	0.4520	42.6601%
+0.73	fake	0.6263	30.8179%
− 0.73	fake	0.6628	30.3342%
R2	real	0.8833	17.8443%
S2	real	0.9054	16.7095%
+1.13	fake	1.0063	13.9564%
− 1.13	fake	1.0284	12.4512%

Observation 4.2: three of the nearest six are fake levels. The real and the fake do not group by kind; they group by distance.

Observation 4.3: the correlation across the eleven levels is **−0.9788**. That is no different from the **−0.9791** measured on the real levels alone. Mixing in the fakes does not disturb the curve.

Observation 4.4: ⚠ a touch-probability table can be attached to the fake levels just as well: "the +0.37 level is touched 58.0445% of the time". **That number is right too.** Being right does not make the level

mean anything.

Observation 4.5: had the real levels stood off the curve, the names would have content. **None of the five stands off.**

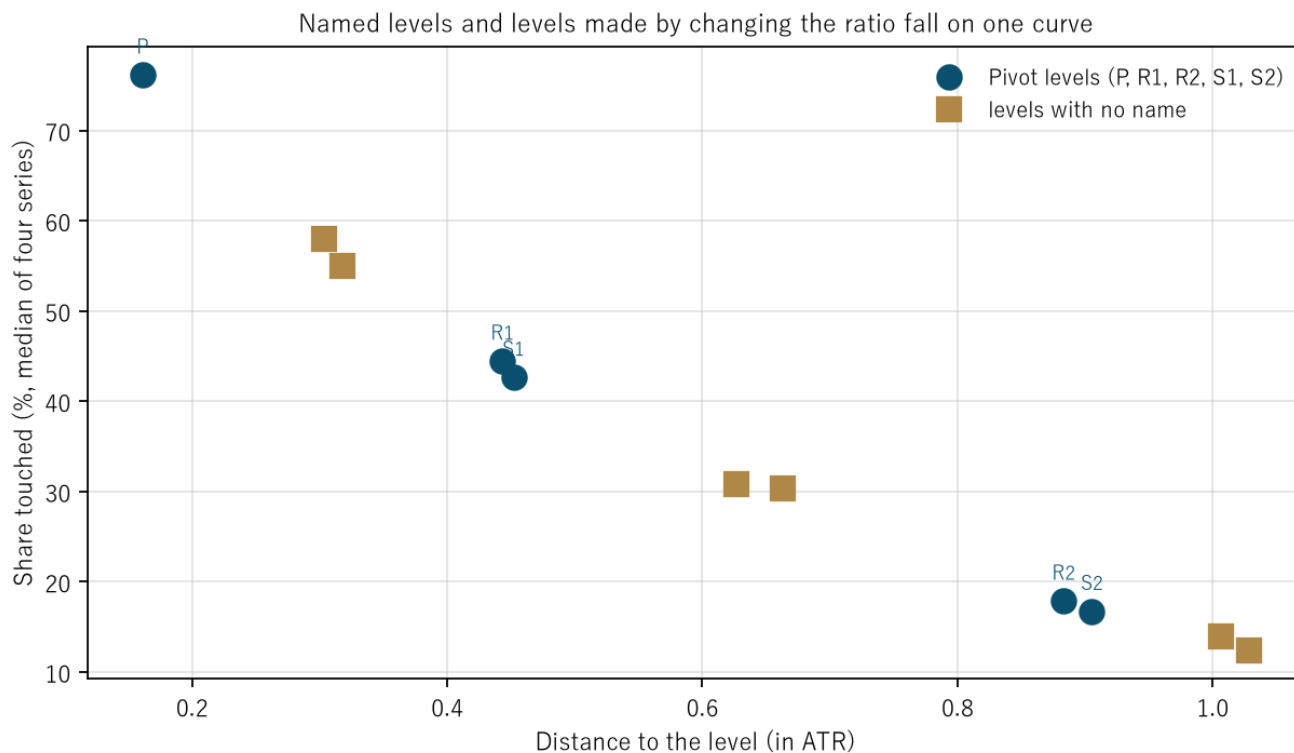


Figure 1: distance across, touch rate up. **The dark points (the pivot levels) and the light points (the nameless levels) lie on one and the same curve.**

5. Holding the distance fixed and comparing upper against lower levels

Calculation 5.1 Upper (R side) against lower (S side) within quintiles of distance (evaluation

period)

Instrument	Band	Distance ÷ ATR	Upper count	Upper touch rate	Lower count	Lo
USDJPY	1	0.1582	919	78.8901%	793	
USDJPY	2	0.3740	860	49.6512%	851	
USDJPY	3	0.5774	839	32.4195%	873	
USDJPY	4	0.8395	784	16.9643%	927	
USDJPY	5	1.3959	775	5.8065%	937	
EURUSD	1	0.1766	863	79.4902%	849	
EURUSD	2	0.3972	853	47.7140%	858	
EURUSD	3	0.6023	839	31.9428%	873	
EURUSD	4	0.8554	863	16.8019%	848	
EURUSD	5	1.3085	870	4.2529%	842	
GBPUSD	1	0.1742	867	77.5087%	845	
GBPUSD	2	0.4004	863	48.0881%	848	
GBPUSD	3	0.6051	841	27.9429%	871	
GBPUSD	4	0.8584	861	15.7956%	850	
GBPUSD	5	1.3212	841	5.1130%	871	
XAUUSD	1	0.1717	858	78.9044%	823	
XAUUSD	2	0.3958	836	52.6316%	845	
XAUUSD	3	0.6009	875	33.0286%	805	
XAUUSD	4	0.8510	826	18.5230%	855	

XAUUSD	5	1.3346	788	4.1878%	893
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Observation 5.2: the median difference across the 20 bands is **−0.7375 points**, the median absolute value is **1.6128 points**, and the range runs from **−5.2373** to **+5.6493**.

Observation 5.3: ⚠️ **the signs do not agree across instruments.** USDJPY and XAUUSD have the upper side higher in the near bands, while GBPUSD has the lower side higher. **Not agreeing means this is noise, not direction.**

Observation 5.4: ⚠️ only the farthest band (the fifth) has the lower side higher in all four series (differences of **−1.0239**, **−0.9728**, **−0.7424** and **−2.9790**). That direction reads as **"a market falls faster than it rises"**, but the touch rates in the far band are only **4.1878%** to **7.1669%**, so the amounts are small. ⚠️ **This paper does not claim it. Only 1 of the 5 bands agreed across the four series.**

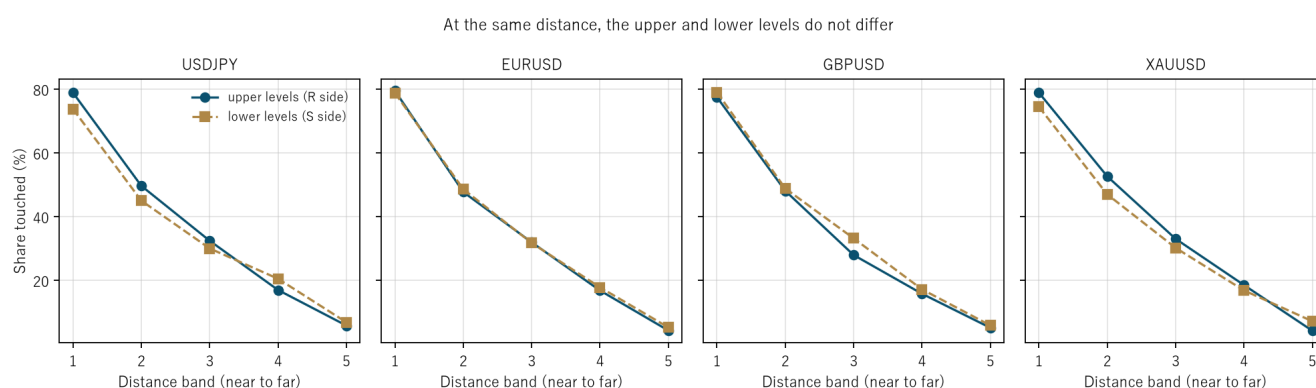


Figure 2: touch rate against distance band (near to far), one panel per instrument. **The two lines, upper (R side) and lower (S side), lie on top of each other.**

6. A touch probability and a win rate are different pairs of barriers

Design: on touching S1, buy, target P and stop at S2 (mirrored on the upper side). Only days resolved before the day ends are counted. By the optional stopping theorem the theoretical win rate is absolute value $(S1 - S2) \div \text{absolute value } (P - S2)$.

Calculation 6.1 Theory against measurement (evaluation period)

Instrument	Side	Count	Theoretical win rate	Measured win rate	Difference (points)
USDJPY	lower	215	49.6298%	45.5814%	− 4.0484
USDJPY	upper	224	44.9638%	34.3750%	− 10.5888
EURUSD	lower	212	48.3388%	44.3396%	− 3.9992
EURUSD	upper	238	47.7006%	50.4202%	+2.7195
GBPUSD	lower	235	48.9970%	48.0851%	− 0.9119
GBPUSD	upper	215	46.7442%	48.8372%	+2.0930
XAUUSD	lower	213	47.8966%	50.2347%	+2.3381
XAUUSD	upper	227	48.0822%	41.8502%	− 6.2320



Observation 6.2: the median departure from theory is **−2.4555 points**, with a range from **−10.5888** to **+2.7195**. With only **212** to **238** observations per case, that range is within noise.

Observation 6.3: ⚠ **this is where the confusion happens.** The touch rate for P is **76.1317%**, while the theoretical win rate of a trade targeting that same P is **44.9638%** to **49.6298%**. **The two numbers differ by thirty points.**

Observation 6.4: **what differs is the number of barriers.** The touch rate is one-sided: does price reach P starting from the open. The trade is two-sided: does price reach P from S1 before reaching S2. Seen from S1, P and S2 are about equally far away, and by the optional stopping theorem the win rate is therefore about one half.

Observation 6.5: the median touch rate is **43.7661%** while the median trading win rate is **46.8333%**. **These two are close in value but they are not the same quantity.** Closeness is no evidence of identity.

⚠ **It is precisely when values are close that one must check whether they are the same quantity.**

7. Directional information from the bar of the touch onward

Calculation 7.1 A signal placed on the bar that touches any of the five levels (evaluation period)

Instrument	Count	D (pips)	Dd (daily mean)	Daily t	Days	Per day	Spread	B
USDJPY	1,422	− 3.1690	− 2.9679	− 1.10	735	2.0	0.60	7
EURUSD	1,471	3.1891	2.2845	1.57	742	2.0	0.30	7
GBPUSD	1,461	1.5760	2.1260	1.03	743	2.0	0.90	7
XAUUSD	1,449	− 5.3562	− 3.8705	− 0.74	722	2.0	3.54	6



Observation 7.2: the median directional information is **−0.7965 pips**, against a median spread of **0.7500 pips**. The sign is negative, so the side betting on the bounce is losing.

Observation 7.3: the daily t reaches 2 in absolute value in **0 of 4** cells. Chance gives about **0.2**, so **this cannot be told apart from chance**.

Observation 7.4: the counts of buys and sells are nearly equal (**722/700, 738/733, 759/702, 698/751**). **Upper and lower levels come up about equally often**, which agrees with Section 5.

8. The baseline — a random walk has no previous day and no pivots

Calculation 8.1 Synthetic series whose within-bar movement is also random (10 realisations, evaluation period)

Instrument	Level	Measured	Random walk	Difference (points)
USDJPY	P	73.2648%	73.8046%	− 0.5398
USDJPY	R1	45.7584%	44.6658%	+1.0925
USDJPY	S1	39.7172%	44.4473%	− 4.7301
EURUSD	P	77.5064%	74.1774%	+3.3290
EURUSD	R1	43.5733%	45.0129%	− 1.4396
EURUSD	S1	44.3445%	44.3059%	+0.0386
GBPUSD	P	76.4781%	73.2519%	+3.2262
GBPUSD	R1	42.0308%	44.8972%	− 2.8663
GBPUSD	S1	43.9589%	44.7044%	− 0.7455
XAUUSD	P	75.7853%	74.1623%	+1.6230
XAUUSD	R1	45.2880%	45.4058%	− 0.1178
XAUUSD	S1	41.3613%	44.0707%	− 2.7094

Observation 8.2: the median difference between measurement and random walk is **−0.3288 points**, with a median absolute value of **1.5313 points**.

Observation 8.3:  on a synthetic random walk the previous day's high and low mean nothing, and there is no support and no resistance. **P is touched anyway, at 73.2519% to 74.1774%, and R1 and S1 at 44.0707% to 45.4058%.**

Observation 8.4: the touch rate therefore **says nothing about the market**. What it says is only how near the level is.

9. Splitting by session

Design: five **non-overlapping** bins in Coordinated Universal Time. The signal is the one from Section 7 (the bounce on the bar of the touch).

Calculation 9.1 Directional information in each of the five bins (evaluation period)

Instrument	Tokyo 0–7	London 7–12	Overlap 12–16	NY late 16–21	Night 21–24
USDJPY	− 3.09 (t − 0.85)	− 3.49 (t − 0.79)	0.24 (t − 0.18)	− 9.73 (t − 0.63)	too few
EURUSD	6.20 (t 2.38)	− 0.42 (t − 0.25)	3.93 (t 1.76)	2.24 (t 0.42)	too few
GBPUSD	3.07 (t 0.95)	− 0.64 (t 0.60)	1.71 (t 0.91)	3.75 (t 0.68)	too few
XAUUSD	− 7.15 (t − 0.62)	− 4.79 (t − 0.15)	− 12.60 (t − 0.86)	34.70 (t 1.79)	too few

Observation 9.2: the daily t reaches 2 in absolute value in **1 of 16** cells. Chance gives about **0.7**, so the measurement is **about what chance gives**.

Observation 9.3: ⚠ the one that looks significant is EURUSD in the Tokyo bin (t **2.38**). **Trying five bins across four series guarantees that one will look like this**. What to read is not the individual cell but whether the number of significant cells exceeds chance.

Observation 9.4: ⚠ the night bin had fewer than 30 signals and could not be measured in any of the four series. **Levels are touched mostly while the market is moving**, which is itself consistent with touch rates being set by distance.

10. Limitations

1. ★ **The day boundary is fixed at midnight Coordinated Universal Time.** In practice pivots are usually built on a broker's boundary (17:00 New York and so on). **Changing the boundary changes the previous day's high and low, and so moves the levels themselves.** Only one boundary was tried here. ⚠ The conclusions of Sections 4 and 5 (distance rather than name) follow from a level being, under any boundary, one line at some distance, so they should not depend on the boundary. **But that was not measured.**
2. **Equally spaced pivots and other variants are not treated.** Variants exist that multiply the previous day's range by 0.5 or 1.0. ⚠ The fake levels used here (0.37, 0.73, 1.13) are built the same way. In other words, **the variants belong to the side this paper measured as "levels with no name".**
3. **Section 6 counts only days resolved before the day ends.** Days that reach neither barrier are dropped. **Because of that truncation, the comparison with theory is that much looser.**
4. **Section 6 has 212 to 238 observations per case.** Differences of a few points are not visible.
5. **The distance uses ATR in the denominator.** Another scale (the previous day's range itself, say) gives different values. ⚠ The same scale is used for real and fake, so the comparison stands.
6. **The synthetic baseline uses independent normal increments.** Volatility clustering is not included.
7. **Four instruments over six years.** Nothing is said about other markets or other periods.

Conclusion

A table of pivot touch probabilities is right. P is touched **76.1317%** of the time, R1 **44.4306%**, S2 **16.7095%**. **Right across four series and six years, and in good agreement between them.**

But a table of the same accuracy can be built for levels with no name and no derivation, made by multiplying the previous day's range by **0.37**, **0.73** and **1.13**. Sorting all eleven by distance puts **three fakes among the nearest six**, with a correlation of **-0.9788**. Holding distance fixed collapses the difference between up and down to a median of **-0.7375 points**, and a synthetic random walk gives the same rates.

What is right is the distance to the level, not the name of the level.

And the touch rate of **76.1317%** and the theoretical win rate of **44.9638%** to **49.6298%** for a trade targeting that level belong to different pairs of barriers. **A rate measured on one side cannot be used as a win rate on two.**

Data and reproduction

Data	Currency ticks from Dukascopy (agreement to the millisecond, bid and ask, verified from 2019 onward). Gold from Dukascopy
Period	2019–2024 (six years). Evaluation 2022–2024
Instruments	USDJPY, EURUSD, GBPUSD, XAUUSD
Bars	One hour, mid price, closing value of completed bars only. Bars with no ticks are not created
Day boundary	Midnight Coordinated Universal Time. Days with fewer than 12 bars are dropped
Verification	<code>検算/F009.py</code> (with <code>--zu</code> it also writes the figures). Every number in the text is taken from <code>検算/F009_output.txt</code>
Figures	<code>図/F009_zu1</code> , <code>図/F009_zu2</code> (png, svg, English versions)
Random seeds	Fixed at 0–9. Re-running gives the same values
Audit of the foundation	<code>_ツール/audit_bars.py</code> (look-ahead in the bars, daylight saving, the day boundary). The record is <code>_土台の検査.txt</code>

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