Exchange warnings and crypto prices: Evidence from monitoring tags

Online Resource 1

This Online Resource accompanies the main text. Table S1 defines the variables and reports summary statistics for the peers and the one-minute data. Table S2 reports the estimates of Table 2 under other treatments of extreme values and other matching rules. Table S3 reports trading venue shares and perpetual futures activity. Table S4 reports the randomization tests and the leave-one-out ranges for the main estimates. Table S5 reports the pooled regressions behind Table 2 with all coefficients. Table S6 reports the first announcement separately, the main estimates without it, the perpetual futures estimates with more controls, and log returns after the first day. Throughout, stars use the larger of the p-values from standard errors clustered by token and announcement date and from a wild cluster bootstrap by announcement date.

Table S1. Variable definitions and further summary statistics
Panel A. Definitions

	Definition
Dependent variables	
Ann	Log return over the minute that contains the official announcement time, from the close of the previous minute, in percent.
PreRel	Log return from the first trade of the announcement minute to the last trade before the release, in percent.
PostRel	Log return from the first trade after the release to the last trade of the announcement minute, in percent.
Post10	Log return from the first trade after the release to the last trade within 10 seconds after the release, in percent.
Post30	Log return from the first trade after the release to the last trade within 30 seconds after the release, in percent.
Jump5	Log return over the first five full minutes after the announcement, in percent.
To5	Sum of Ann and Jump5, in percent.
Hour1	Log return from the open of the first full minute after the announcement to 60 minutes later, in percent.
Day1	Log return from the open of the first full minute after the announcement to 1,440 minutes later, in percent.
Pre1	Log return over the last hour before the announcement minute, in percent.
Pre3	Log return over the last three hours before the announcement minute, in percent.
Pre6	Log return over the last six hours before the announcement minute, in percent.
CAR30	Simple return from the close of the day before the announcement to the close of day 29, minus the mean of the same return of the three matched tokens, in percent. A delisted token keeps its last traded price.
CAR60	Same as CAR30, to the close of day 59.
CAR90	Same as CAR30, to the close of day 89.
Delist90	One if Binance announces the delisting of the token within 90 days, and zero otherwise.

Delist180	One if Binance announces the delisting of the token within 180 days, and zero otherwise.

Explanatory variables

Perp	One if the token has a perpetual futures contract on Binance before the announcement, and zero otherwise.

Control variables

Ret1	Log return over the day before the announcement day, in percent.
Ret5	Log return over the 5 days before the announcement day, in percent.
Ret10	Log return over the 10 days before the announcement day, in percent.
Ret30	Log return over the 30 days before the announcement day, in percent.
Vol30	Standard deviation of daily log returns over the 30 days before the announcement day, in percent.
Range30	Mean daily log high minus log low price over the 30 days before the announcement day, in percent.
Volume	Natural logarithm of the average daily trading value in USDT over the 30 days before the announcement day. A value of 13.8 corresponds to about one million USDT per day.
Age	Natural logarithm of one plus the number of days since the token was listed on Binance. A value of 7.0 corresponds to about three years.

Token-minute and token-day variables

MinRet	Log return over one minute, in percent. A minute without trades has a return of zero.
MinValue	Trading value over one minute, in thousands of USDT.
MinTrades	Number of trades over one minute.
NoTrade	One if the minute has no trades, and zero otherwise.
Value	Daily trading value, in millions of USDT.
Idle	Percentage of minutes in the day without trades.
Range	Daily log high minus log low price, in percent.
Spread	Two-day high-low spread estimate, in percent.
Impact	Absolute daily log return in percent per million USDT of trading value.

Panel B. Peers

	Obs	Mean	SD	Min	P25	Med	P75	Max
Dependent variables								
Ann	500	-0.004	0.158	-0.599	0.000	0.000	0.000	0.445
PreRel	55	0.009	0.094	-0.260	0.000	0.000	0.015	0.240
PostRel	63	0.010	0.202	-0.546	-0.006	0.000	0.050	0.596
Post10	44	0.005	0.095	-0.355	0.000	0.000	0.000	0.290
Post30	70	-0.007	0.133	-0.450	0.000	0.000	0.000	0.361
Jump5	500	-0.020	0.364	-1.103	-0.217	0.000	0.145	0.995
To5	500	-0.035	0.398	-1.381	-0.234	0.000	0.147	1.183
Hour1	500	-0.160	1.104	-4.693	-0.654	0.000	0.425	2.494
Day1	500	-0.675	3.803	-11.89	-2.730	-0.718	1.271	11.72
Pre1	500	-0.016	0.779	-2.678	-0.428	0.000	0.450	2.412
Pre3	500	-0.029	1.434	-4.673	-0.741	0.000	0.692	5.524
Pre6	500	-0.201	2.738	-11.39	-1.126	0.000	0.982	8.409
Delist90	440	0.034	0.182	0.000	0.000	0.000	0.000	1.000

Delist180	360	0.103	0.304	0.000	0.000	0.000	0.000	1.000
Explanatory variables								
Perp	500	0.274	0.446	0.000	0.000	0.000	1.000	1.000
Control variables								
Ret1	500	-1.735	5.660	-25.94	-3.664	-1.133	1.982	21.66
Ret5	500	-3.622	8.503	-29.70	-8.668	-2.012	1.586	26.44
Ret10	500	-6.758	11.53	-44.17	-14.48	-5.250	0.867	28.28
Ret30	500	-9.712	23.60	-78.23	-25.22	-10.23	2.585	80.51
Vol30	500	5.064	3.145	1.288	3.009	3.999	5.986	16.76
Range30	500	8.713	4.154	2.122	5.859	7.568	10.49	23.63
Volume	500	13.66	1.544	11.14	12.61	13.22	14.60	18.31
Age	500	7.190	0.641	3.638	7.041	7.367	7.525	7.994

Panel C. One-minute data

	Obs	Mean	SD	Min	P25	Med	P75	Max
Tagged tokens, day before the announcement								
MinRet	204,480	-0.003	0.196	-0.788	-0.033	0.000	0.027	0.734
MinValue	204,480	1.499	4.685	0.000	0.000	0.079	0.677	33.83
MinTrades	204,480	14.35	33.06	0.000	0.000	3.000	11.00	218.0
NoTrade	204,480	0.278	0.448	0.000	0.000	0.000	1.000	1.000
Tagged tokens, day after the announcement								
MinRet	204,480	-0.005	0.305	-1.143	-0.084	0.000	0.079	1.098
MinValue	204,480	3.148	8.380	0.000	0.041	0.414	2.160	59.70
MinTrades	204,480	30.72	64.39	0.000	2.000	8.000	28.00	439.0
NoTrade	204,480	0.156	0.363	0.000	0.000	0.000	0.000	1.000
Matched tokens, day before the announcement								
MinRet	613,440	-0.001	0.148	-0.508	-0.024	0.000	0.020	0.510
MinValue	613,440	1.132	3.390	0.000	0.000	0.068	0.573	24.32
MinTrades	613,440	11.74	26.45	0.000	0.000	3.000	10.00	175.0
NoTrade	613,440	0.293	0.455	0.000	0.000	0.000	1.000	1.000
Matched tokens, day after the announcement								
MinRet	613,440	-0.001	0.141	-0.482	-0.016	0.000	0.000	0.482
MinValue	613,440	0.855	2.374	0.000	0.000	0.062	0.503	16.55
MinTrades	613,440	9.502	19.58	0.000	0.000	2.000	9.000	125.0
NoTrade	613,440	0.300	0.458	0.000	0.000	0.000	1.000	1.000
Peers, day before the announcement								
MinRet	720,000	-0.001	0.171	-0.581	-0.047	0.000	0.044	0.571
MinValue	720,000	1.252	4.259	0.000	0.008	0.063	0.417	31.46
MinTrades	720,000	13.07	31.91	0.000	1.000	3.000	10.00	224.0
NoTrade	720,000	0.217	0.412	0.000	0.000	0.000	0.000	1.000
Peers, day after the announcement								
MinRet	720,000	0.000	0.170	-0.564	-0.046	0.000	0.042	0.572
MinValue	720,000	1.201	4.242	0.000	0.008	0.062	0.404	32.13

MinTrades	720,000	12.70	32.51	0.000	1.000	3.000	9.000	238.0
NoTrade	720,000	0.219	0.414	0.000	0.000	0.000	0.000	1.000

Notes. In Panel B, each observation is a token in one announcement, and in Panel C, each observation is a token-minute in the 1,440 minutes before or the 1,440 minutes after the announcement time. Panel A defines the variables, and Panel B reports summary statistics for the peers, which are the 20 untagged tokens with the highest tag probability in each announcement, with 500 token-announcements. In Panel C, the tagged tokens contribute 204,480 token-minutes to each window, the matched tokens 613,440 from 228 distinct tokens, and the peers 720,000 from 158 distinct tokens. *MinRet*, *MinValue*, and *MinTrades* are winsorized at the 1st and 99th percentiles within each group and window.

Table S2. Announcement returns under other choices

	Ann	Jump5	To5	Day1
	(1)	(2)	(3)	(4)
Panel A. Tagged tokens				
Raw	-3.184***	-1.504*	-4.698***	-9.438***
	(-4.05)	(-1.95)	(-4.52)	(-4.28)
W995	-3.161***	-2.048*	-5.219***	-9.737***
	(-4.19)	(-2.03)	(-4.41)	(-4.42)
Panel B. Matched differences				
Raw	-3.163***	-1.477*	-4.643***	-8.329***
	(-4.04)	(-1.95)	(-4.54)	(-4.17)
W995	-3.144***	-2.006*	-5.151***	-8.730***
	(-4.22)	(-2.00)	(-4.41)	(-4.30)
Match5	-3.272***	-1.644**	-4.943***	-8.428***
	(-4.35)	(-2.51)	(-5.52)	(-4.47)
Distance	-3.044***	-2.082**	-5.154***	-8.808***
	(-3.93)	(-2.49)	(-4.64)	(-4.40)

Notes. Each observation is a tagged token in one announcement, and returns are in percent. *Raw* repeats the matching and estimation without winsorizing characteristics or returns, with 137 tags, *W*995 uses cutoffs at the 0.5th and 99.5th percentiles in both steps, with 140 tags, and *Match*5 uses five matched tokens instead of three, with 135 tags. *Distance* matches each tagged token, without a caliper, to the three untagged tokens with the same *Perp* status and the smallest Mahalanobis distance in *Ret*30, *Vol*30, *Range*30, *Volume*, and *Age*, with 155 tags. Values in parentheses are *t*-statistics from standard errors clustered by token and announcement date, and ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table S3. Trading venue and perpetual futures

	Share	OI	Funding
	(1)	(2)	(3)
Change	0.015	21.77***	-0.075***
	(0.01)	(6.20)	(-3.01)

Notes. Each observation is a tagged token in one announcement, and each cell is in excess of the same change for matched tokens. *Share* is the trading value on Binance as a percentage of the trading value on the observed exchanges, over the 30 days after minus the 30 days before the announcement, for the 46 tags with complete windows on Binance and on at least one other exchange. *OI* is the change in the log open interest of the Binance perpetual futures from the announcement to 24 hours later, in percent, for the 87 tags with perpetual futures and open interest data, and *Funding* is the change in the sum of funding rates over the 24 hours after

relative to the 24 hours before the announcement, in percentage points, for the 91 tags with funding rate data. Values in parentheses are *t*-statistics from standard errors clustered by token and announcement date, and *** denotes significance at the 1% level.

Table S4. Randomization tests and leave-one-out ranges

	Ann	To5	Day1
	(1)	(2)	(3)
Effect	-3.149	-5.062	-8.790
Rand_p	0.0002	0.0002	0.0002
MinBatch	-3.455	-5.601	-9.517
MaxBatch	-2.733	-4.301	-6.935
MaxP	0.001	0.001	0.001

Notes. Each observation is a token in one announcement, and the randomization uses 4,567 token-announcements in strata with tags, including 142 tags. *Effect* is the mean return of tagged tokens minus that of untagged tokens in the risk set, within strata of tag probability quintiles in each announcement, in percent, and *Rand_p* is the share of 5,000 random reassignments of the tag within strata that give an effect at least as large in absolute value, with one added to the numerator and the denominator. *MinBatch* and *MaxBatch* are the smallest and largest matched differences when one announcement is dropped at a time, and dropping one calendar month at a time instead gives the same extremes. *MaxP* is the largest p-value used for stars across all these drops.

Table S5. Announcement returns in pooled regressions

	Ann		To5		Day1	
	(1)	(2)	(3)	(4)	(5)	(6)
Tag	-3.121***	-3.099***	-5.081***	-5.065***	-8.770***	-8.745***
	(-4.35)	(-4.28)	(-4.71)	(-4.65)	(-4.27)	(-4.38)
Ret1	-0.024	-0.004	0.000	0.014	-0.020	0.032
	(-0.92)	(-0.17)	(-0.01)	(0.33)	(-0.17)	(0.35)
Ret5	0.031	0.033	0.034	0.011	-0.089	-0.127
	(0.93)	(0.83)	(1.17)	(0.25)	(-0.79)	(-1.36)
Ret10	0.009	-0.007	0.027	0.012	0.076	0.078
	(0.63)	(-0.49)	(1.17)	(0.55)	(0.84)	(1.41)
Ret30	-0.015	-0.006	-0.006	-0.002	0.028	-0.025
	(-1.89)	(-0.93)	(-0.66)	(-0.20)	(0.98)	(-0.89)
Vol30	0.203*	0.236*	0.386	0.428	0.224	0.487
	(2.04)	(1.95)	(1.54)	(1.62)	(0.53)	(1.56)
Range30	-0.241**	-0.249***	-0.490*	-0.483*	-0.558	-0.584*
	(-2.50)	(-2.79)	(-2.04)	(-1.85)	(-1.39)	(-1.78)
Volume	0.481***	0.330***	0.767***	0.487***	0.230	0.119
	(3.94)	(3.86)	(4.41)	(4.85)	(0.37)	(0.22)
Age	0.260**	0.267**	-0.137	-0.037	-0.950	-0.143
	(2.25)	(2.39)	(-0.68)	(-0.17)	(-1.62)	(-0.42)
Perp	-1.067***	-0.747***	-0.453	-0.301	1.767	1.382*
	(-5.32)	(-3.88)	(-1.15)	(-0.81)	(1.97)	(2.17)
Event_FE	No	Yes	No	Yes	No	Yes
Obs	568	568	568	568	568	568
R^2	0.357	0.428	0.380	0.448	0.278	0.463

Notes. Each observation is a tagged or matched token in one announcement, and the sample

pools the 142 tagged tokens and their three matched tokens each. The dependent variable is *Ann*, *To*5, or *Day*1, in percent, *Tag* is one for tagged tokens and zero for matched tokens, and *Event_FE* denotes announcement fixed effects, which R^2 includes. *Ret*1 to *Range*30 are in percent, so their coefficients are the change in the dependent variable, in percentage points, for an increase of one percentage point, and *Volume* and *Age* are in natural logarithms. Values in parentheses are *t*-statistics from standard errors clustered by token and announcement date, and ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table S6. Further checks

Panel A. First announcement

	Ann	To5	Day1
	(1)	(2)	(3)
First	-0.027	-0.041	0.304
	(-0.68)	(-0.66)	(0.44)
Rest	-3.455***	-5.601***	-9.517***
	(-4.70)	(-5.33)	(-4.99)
Obs	13 / 129	13 / 129	13 / 129

Panel B. Perpetual futures

	Ann		Day1	
	(1)	(2)	(3)	(4)
ExFirst	-3.912***	-2.701**	8.368***	7.035***
	(-4.90)	(-2.76)	(4.99)	(3.45)
MoreCtrl	-3.062***	-1.876**	9.581***	6.835***
	(-3.94)	(-2.28)	(5.27)	(2.96)
Event_FE	No	Yes	No	Yes
Obs	129 / 142	129 / 142	129 / 142	129 / 142

Panel C. Log returns after the first day

	Common	All
	(1)	(2)
Log30	-12.65**	-13.24**
	(-2.14)	(-2.39)
Obs	131	140

Notes. Each observation is a tagged token in one announcement, and in Panel C, *Log*30 is the matched difference in log returns from the close of day 1 to the close of day 30, in percent, for the tags of Table 5 on day 30 (*Common*) or for all tags with complete windows (*All*), with delisted tokens at their last traded price. In Panel A, *First* is the mean matched difference for the 13 matched tags of the first announcement, with a *t*-statistic that treats the tags as independent because the panel has one announcement, *Rest* is the mean matched difference for the other 129 matched tags, and *Obs* gives the two sample sizes. Panel B reports the coefficient on *Perp* from Eq. (7) for the matched difference in *Ann* in columns (1) and (2) and in *Day*1 in columns (3) and (4), in percent, where *ExFirst* repeats the estimation without the first announcement, *MoreCtrl* adds *Ret*1, *Ret*5, *Ret*10, and the log odds of the tag from Eq. (2) to Eq. (7) in the full sample, and *Event_FE* denotes announcement fixed effects. Values in parentheses are *t*-statistics from standard errors clustered by token and announcement date, except for *First*, and *** and ** denote significance at the 1% and 5% levels.