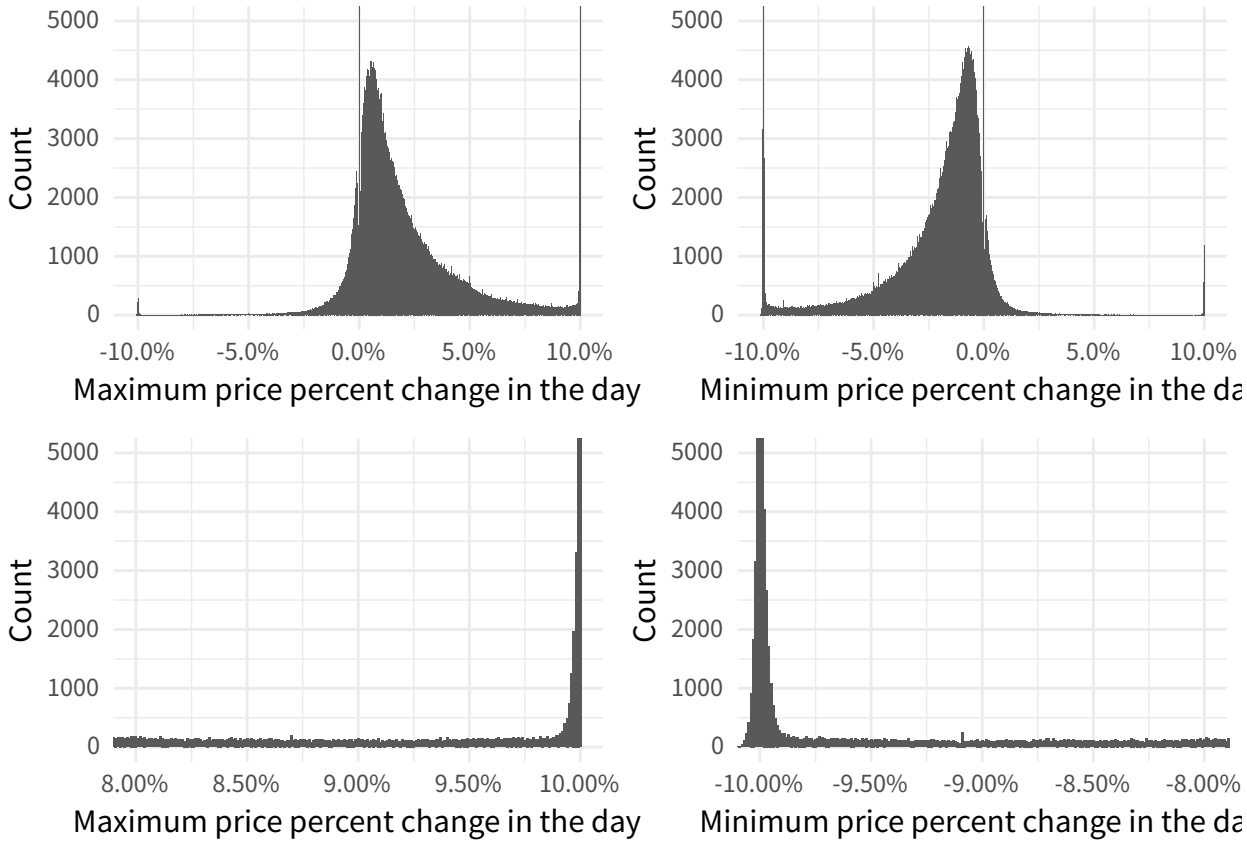
Contrived scale line as a collapsaro: evidence from China stock market's price limit rules

Background

Distribution of maximum and minimum daily price percent change



Type	Obs. All	Obs. Reach 9%	Obs. Reach Limit	Prob. Reach 9%	Prob. Reach Limit	Con. Prob. Reach Limit
All	1,205,361	85,683	60,575	7.1%	5.0%	70.7%
Upper	1,205,361	42,722	29,678	3.5%	2.5%	69.5%
Lower	1,205,361	44,842	31,817	3.7%	2.6%	71.0%

Data and methodology

methodology

Stock price movement is commonly presumed to follow a geometric Brownian motion (GBM). Let S be the stock price at time t, it's disrete time form is

$$\frac{\Delta S}{S} = \mu \Delta t + \sigma \epsilon \sqrt{\Delta t}$$

or

$$\Delta S = \mu S \Delta t + \sigma S \epsilon \sqrt{\Delta t}$$

Variable ΔS is the stock price change after a short time period Δt. ϵ follows a starndart normal distribution, whose expectaion is 0 and variance is 1. Parameter μ is the expected return of the stock in unit time while parameter σ is the volatility rate of the stock, both of which are assumed to be constants. The equation indicates that $\Delta S/S$ follows a normal distribution whose expection is $\mu \Delta t$ and standard deviation is $\sigma\sqrt{\Delta t}$. That is

$$\frac{\Delta S}{S} \sim \phi(\mu \Delta t, \sigma^2 \Delta t)$$

When $t \to 0$, we get the continuous time form

$$\frac{dS}{S} = \mu dt + \sigma dz$$

or

$$dS = \mu S dt + \sigma S dz$$

where z is Brownian motion.

A MCMC approach

The Monte Carlo simulatin of a stochastic process is a precedure to cast repititive random sampling of the process. The simulation process involves two parameters μ and σ. We estimate the parameters with historical stock price data. We use a 120 day rolling window for estimating the parameters of the day. Then we cast MCMC simulation.

Baseline results

REACH_LIMIT_mean	PROB_REACH_LIMIT_mean	diff	p.value
69.2%	66.8%	2.4%	0
69.7%	63.8%	5.9%	0

Robustness: daily v.s. intraday estimate

Hard-to-Value Firms

Investor Sentiment