Problem 1

1.Determine the fund financials with leverage

(1) ∵ the average return for 1 swap = $2M

∴ the average return for 100 swaps = $2 \times 100 = \$200M$

I When $0 < x \leq 1$,

∴ the fund financials $= \frac{2 \times 100}{2x \times 100} = \frac{1}{10x}$

II. When $x = 0$,

the fund financials $= +\infty$

2.Determine the Probability of Default.

(2) As for one swap,

$\sigma^2 = 0.75 \cdot (2-2)^2 + 0.125 \cdot (22-2)^2 + 0.125 \cdot (-18-2)^2$

$= 100 \Rightarrow \sigma = 10$

$\mu = 2$

Assuming that the total return of Snow Fund corresponds to normal distribution

∴ total return $\sim N(200, 10000)$

∵ when total return $< -200x \Rightarrow$ the fund will default

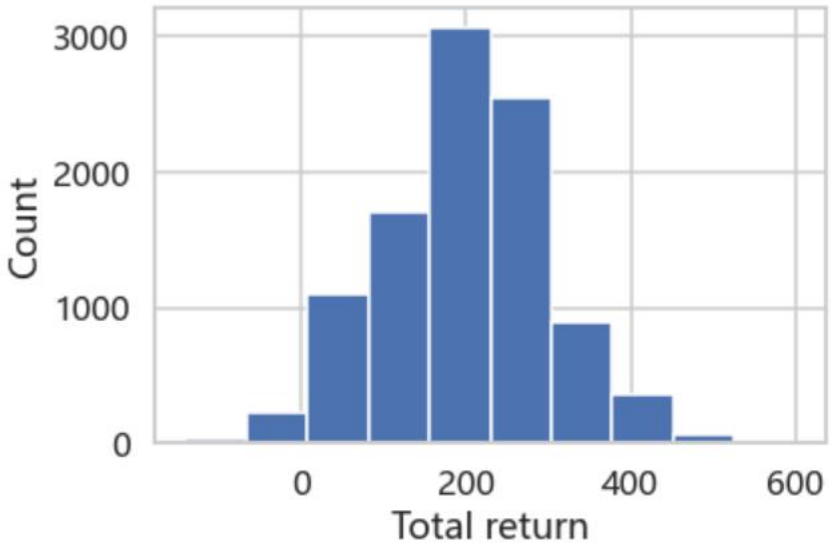
∴ $P(\text{Default}) = P\left(\frac{\text{total return} - 200}{100} < \frac{-200x - 200}{100}\right)$

$= P\left(\frac{\text{total return} - 200}{100} < -2x - 2\right)$

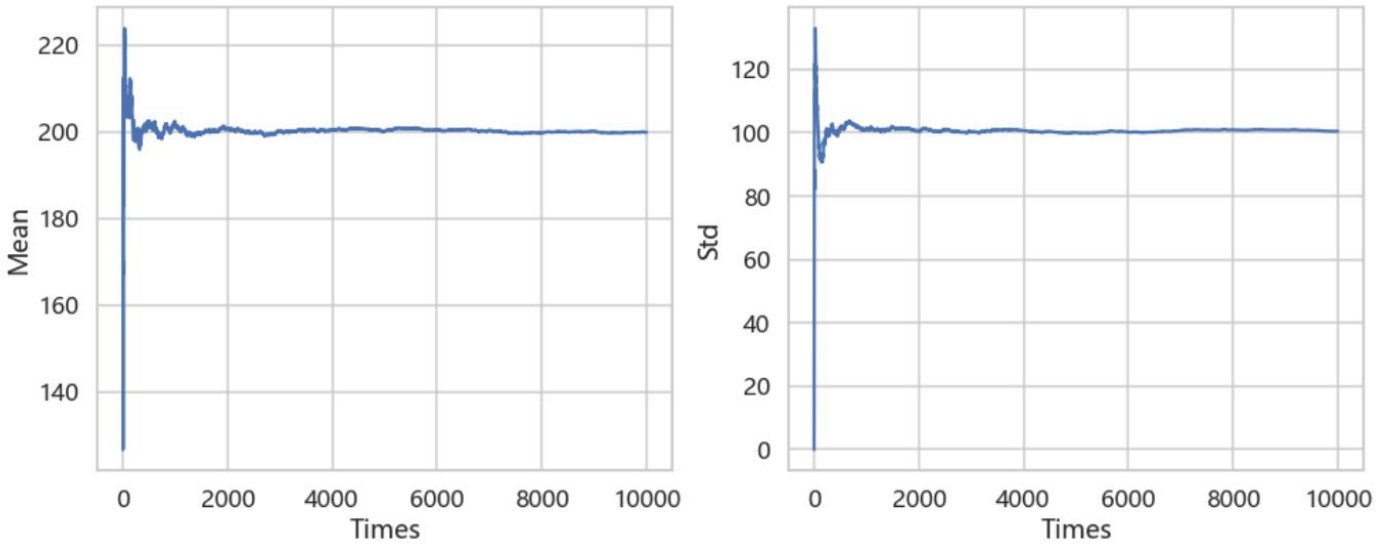
$= \Phi(-2x - 2)$

In this problem, we assume that the total return of Snow Fund corresponds to normal distribution, and calculate its μ as 200 and σ as 100. From another side, Monte Carlo simulation can be employed to verify our assumption of normal distribution and calculation of μ and σ.

The graphs below demonstrate its normal distribution , μ as 200 and σ as 100 with 10,000 times Monte Carlo simulation.



Graph 1-2-1 Distribution of total return with 10,000 times Monte Carlo simulation



Graph 1-2-2 μ and σ with 10,000 times Monte Carlo simulation

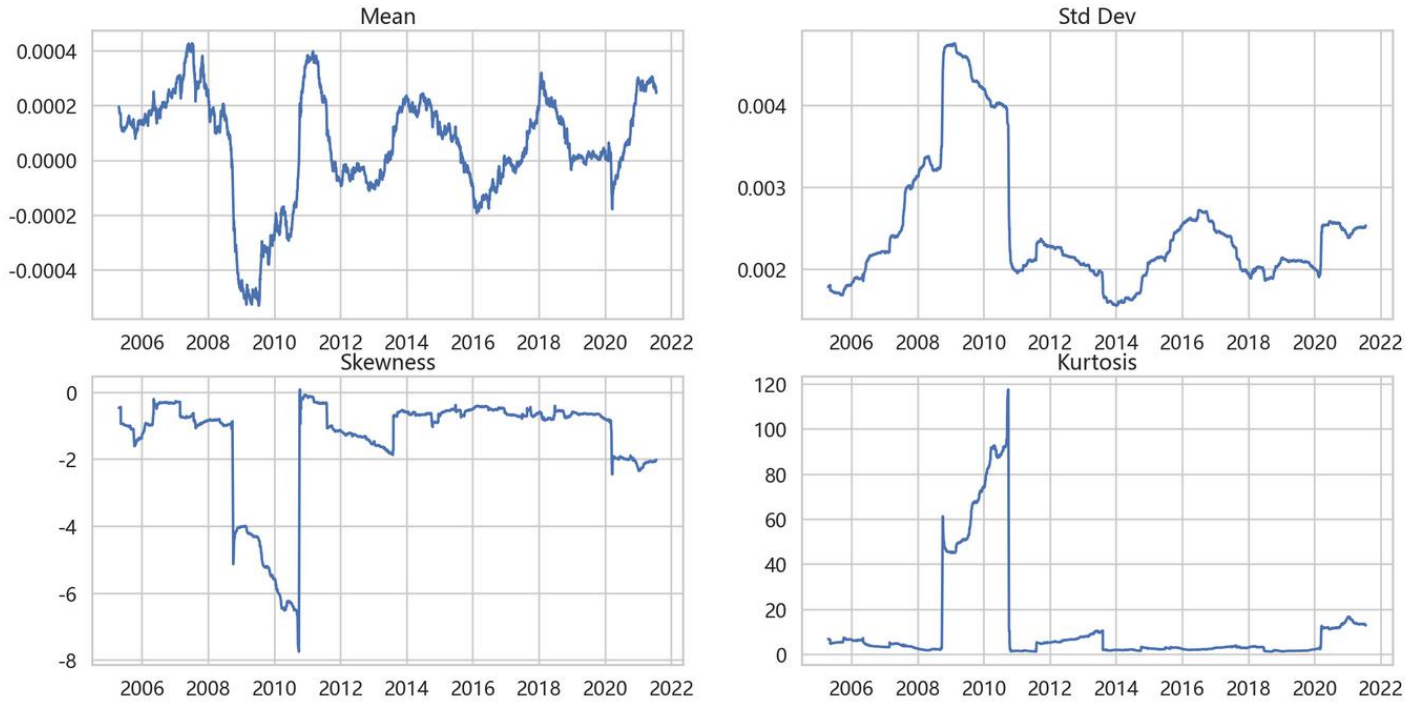
Problem 2

1.Mean, std, skewness and kurtosis, on a two year window, moving the window daily one day forward.

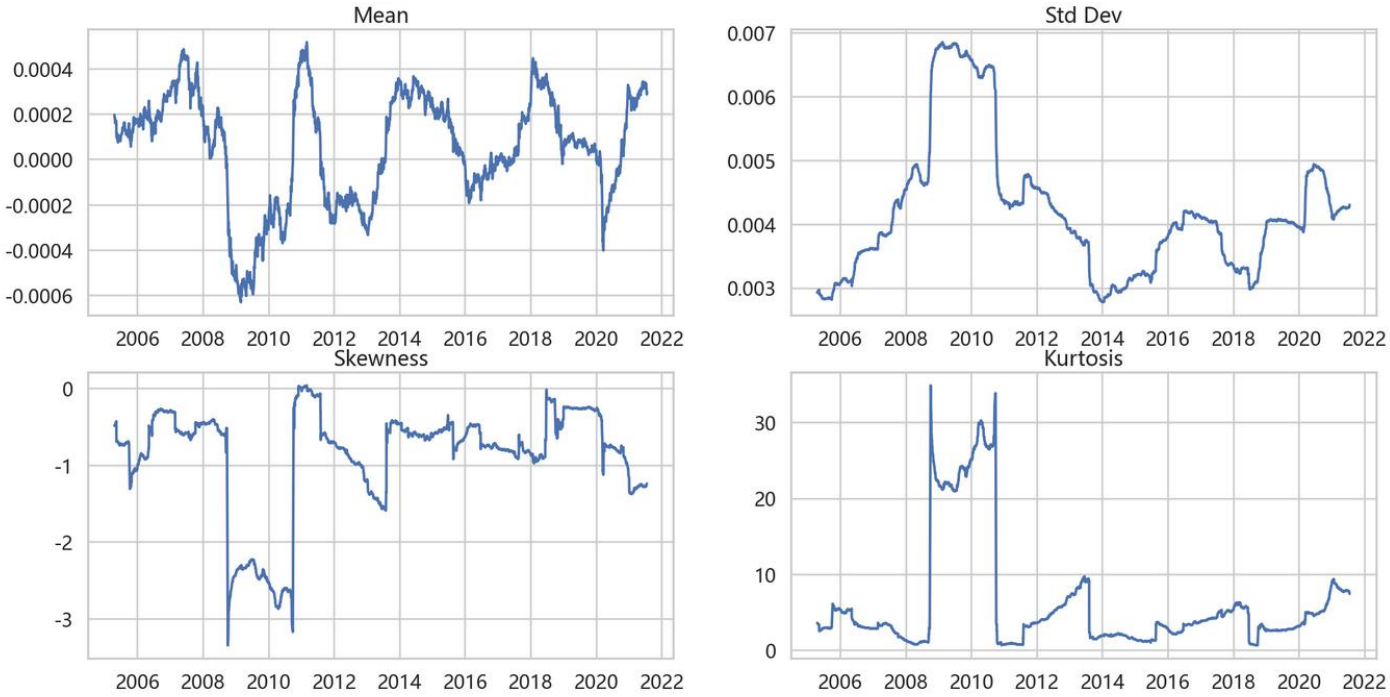
1.1 Graphs of nine financial variables

First, graphs of the four statistics for each of those financial variables are displayed. In addition, the Chinese stock as chosen as Gree electricity which is a famous air conditioner manufacturer in China.

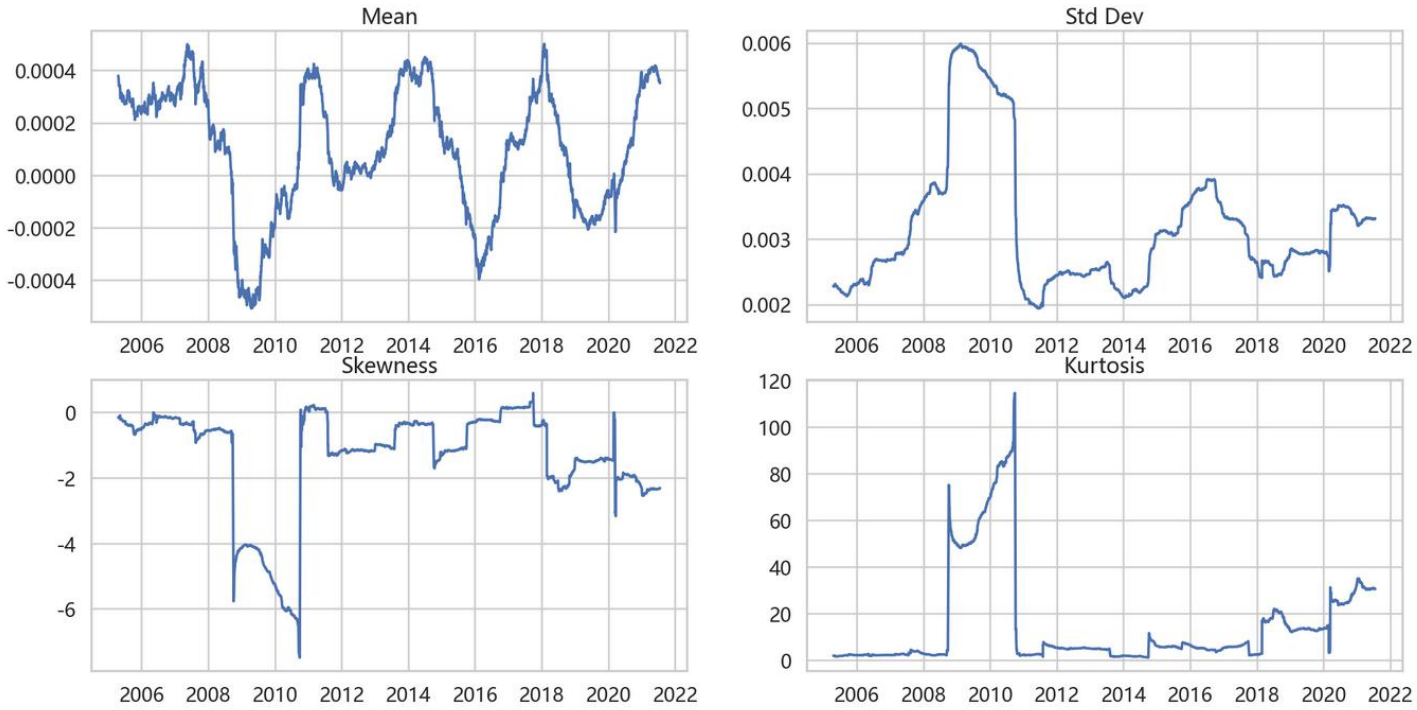
Graph 2-1-1 HFRX Global HFI



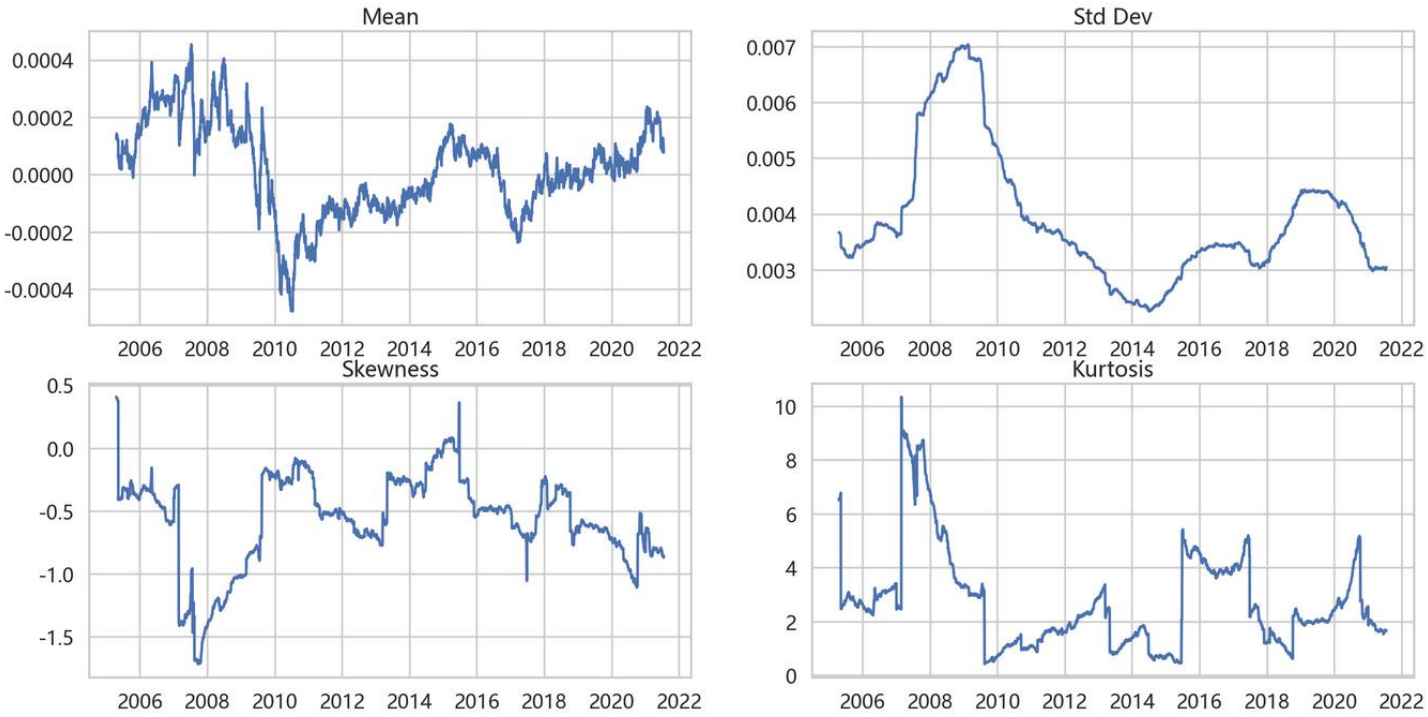
Graph 2-1-2 HFRX Equity Hedge



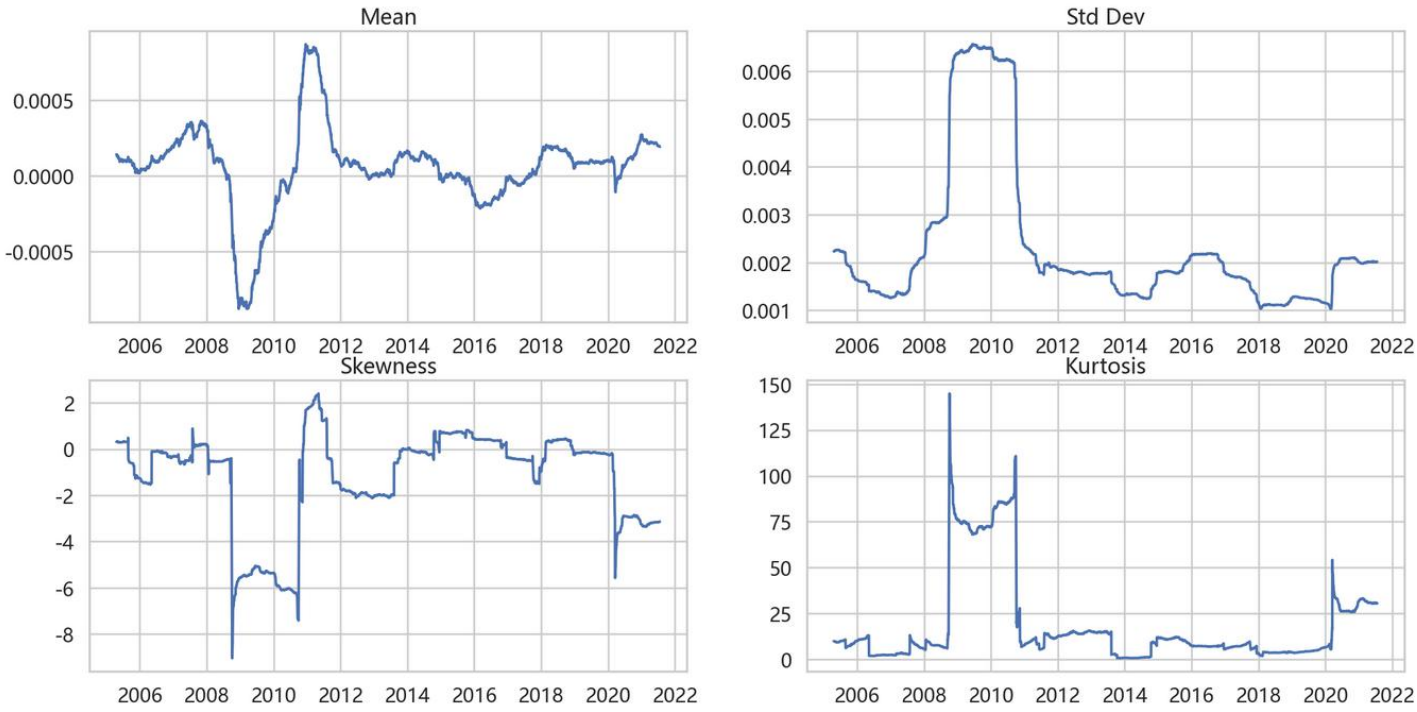
Graph 2-1-3 HFRX Event Driven



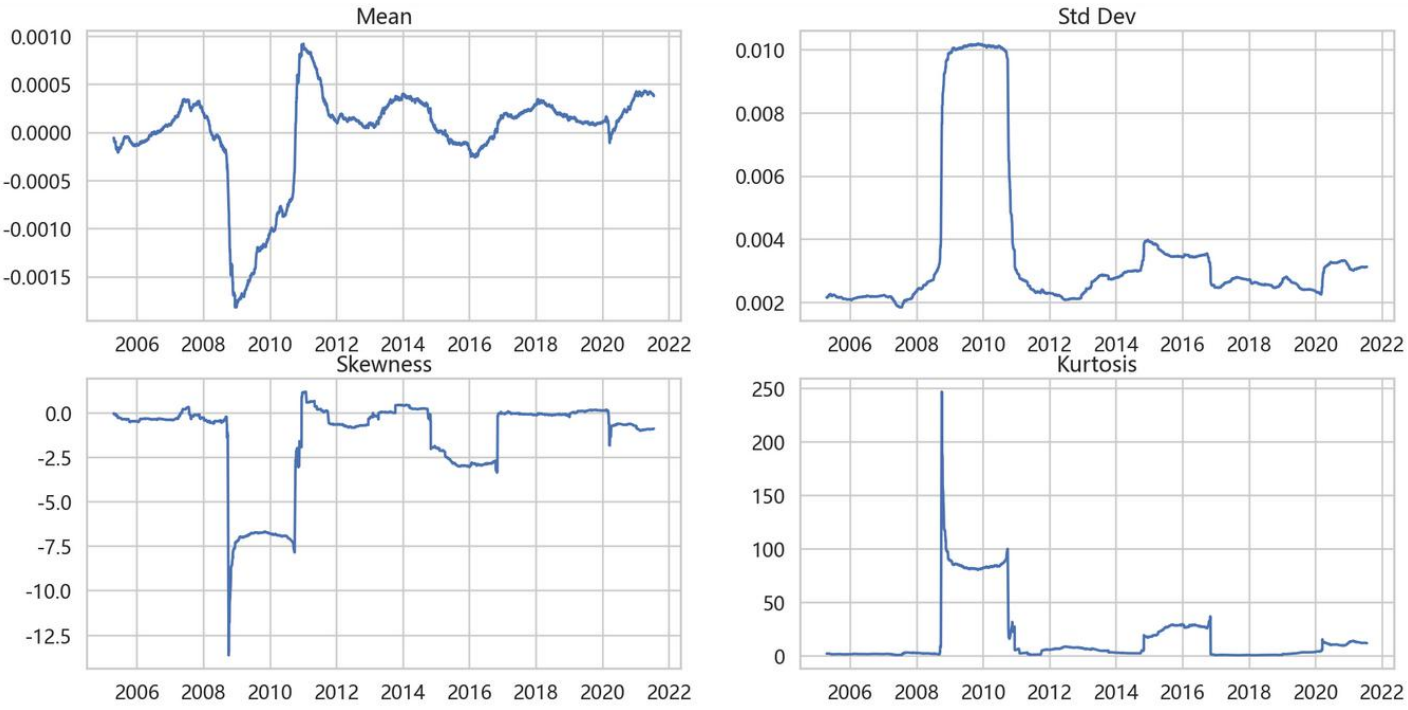
Graph 2-1-4 HFRX Macro/CTA



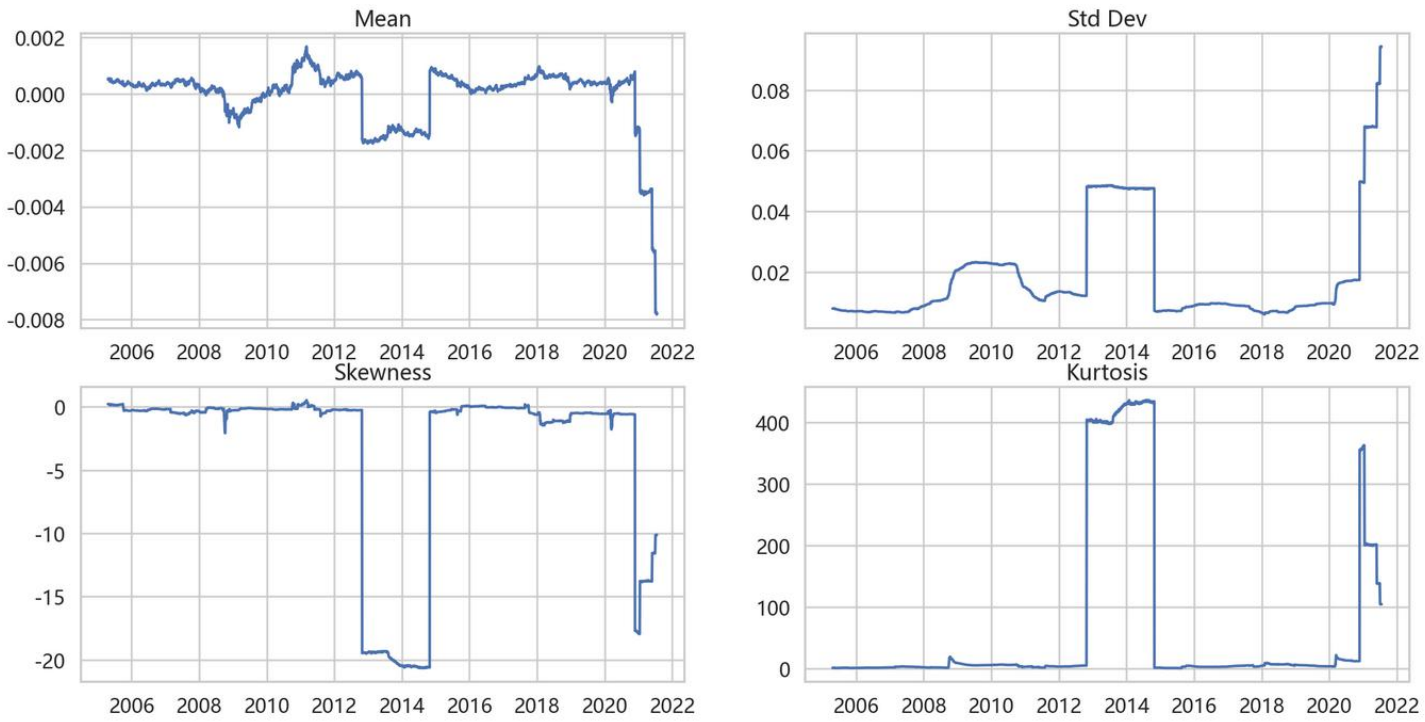
Graph 2-1-5 HFRX Relative Value



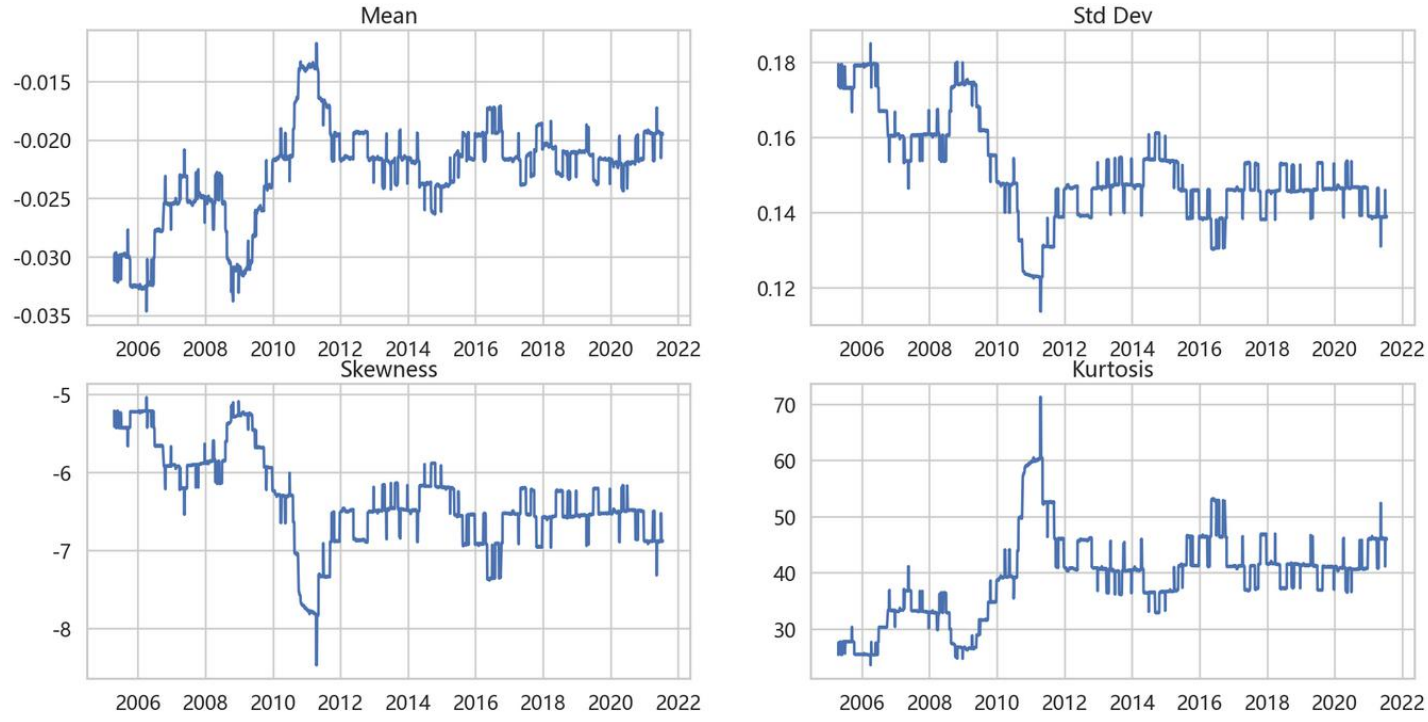
Graph 2-1-6 HFRX RV:FI Convertible Arbitrage



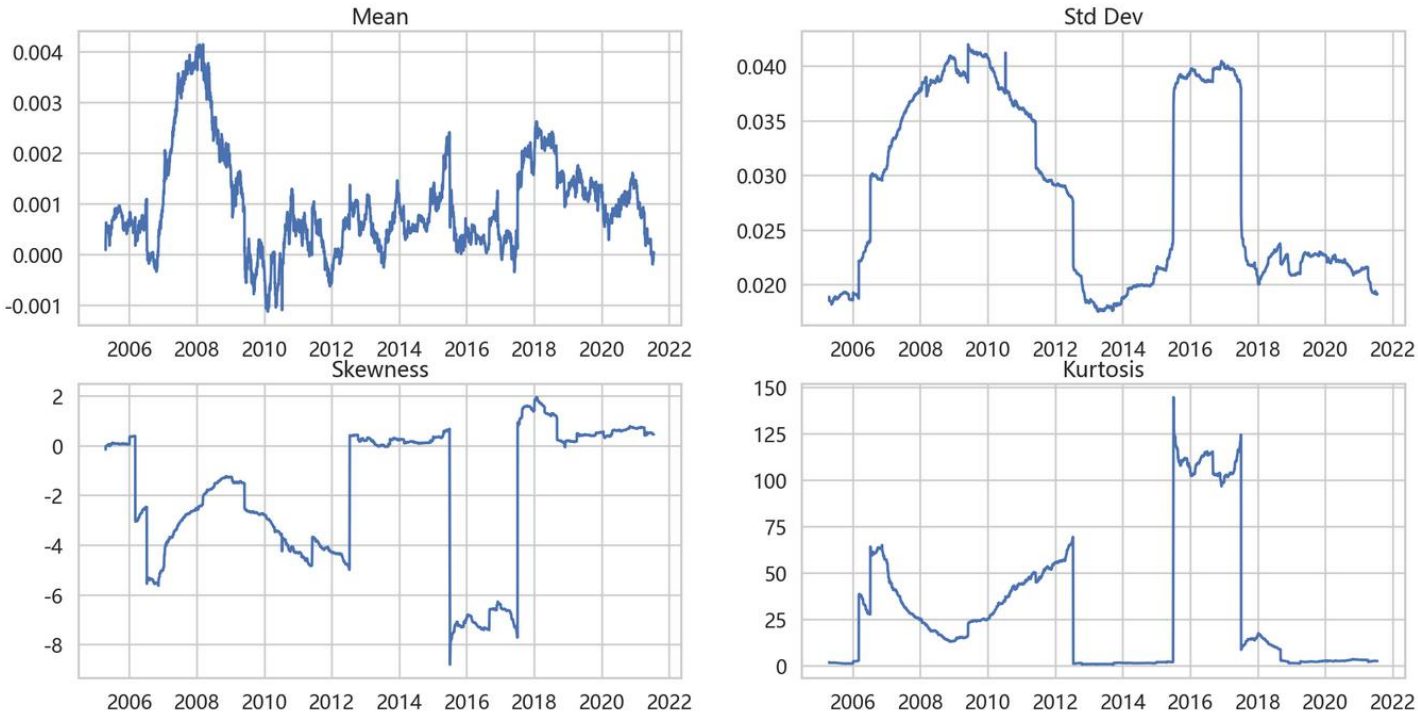
Graph 2-1-7 S&P500



Graph 2-1-8 HSI



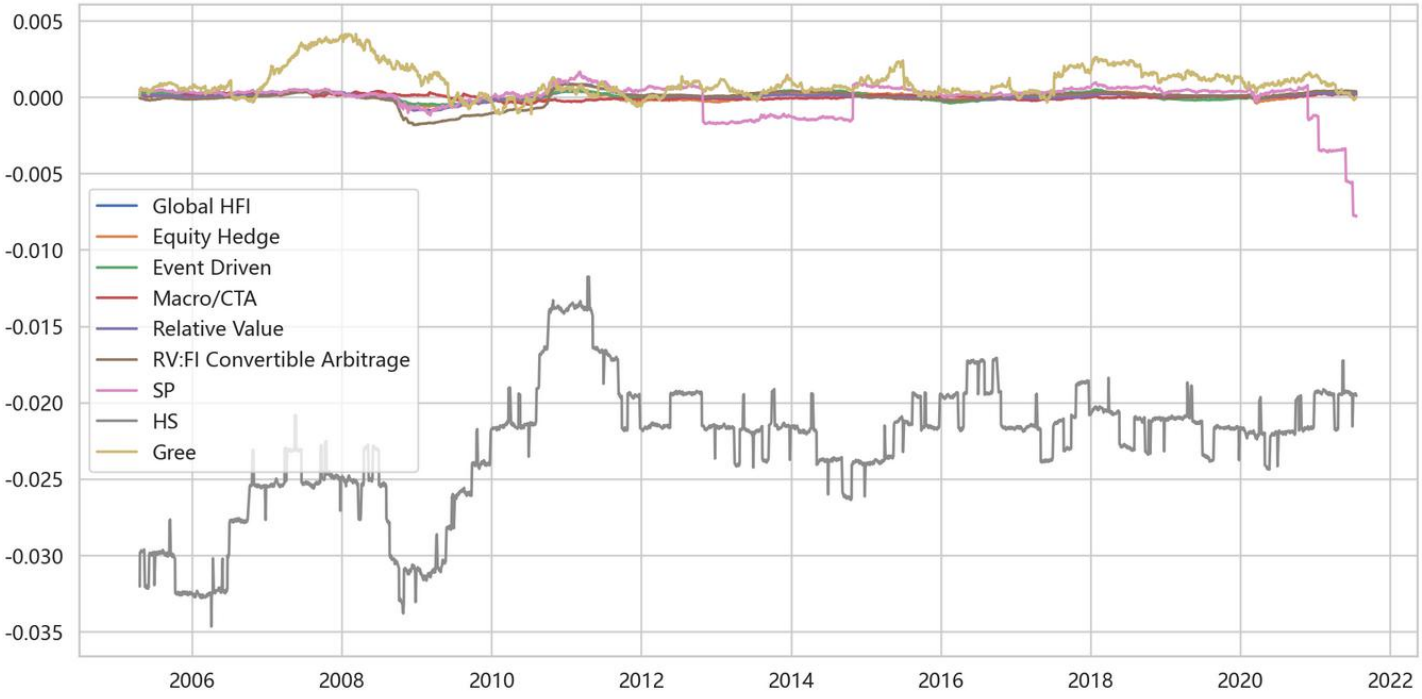
Graph 2-1-9 A Chinese stock: Gree Electricity



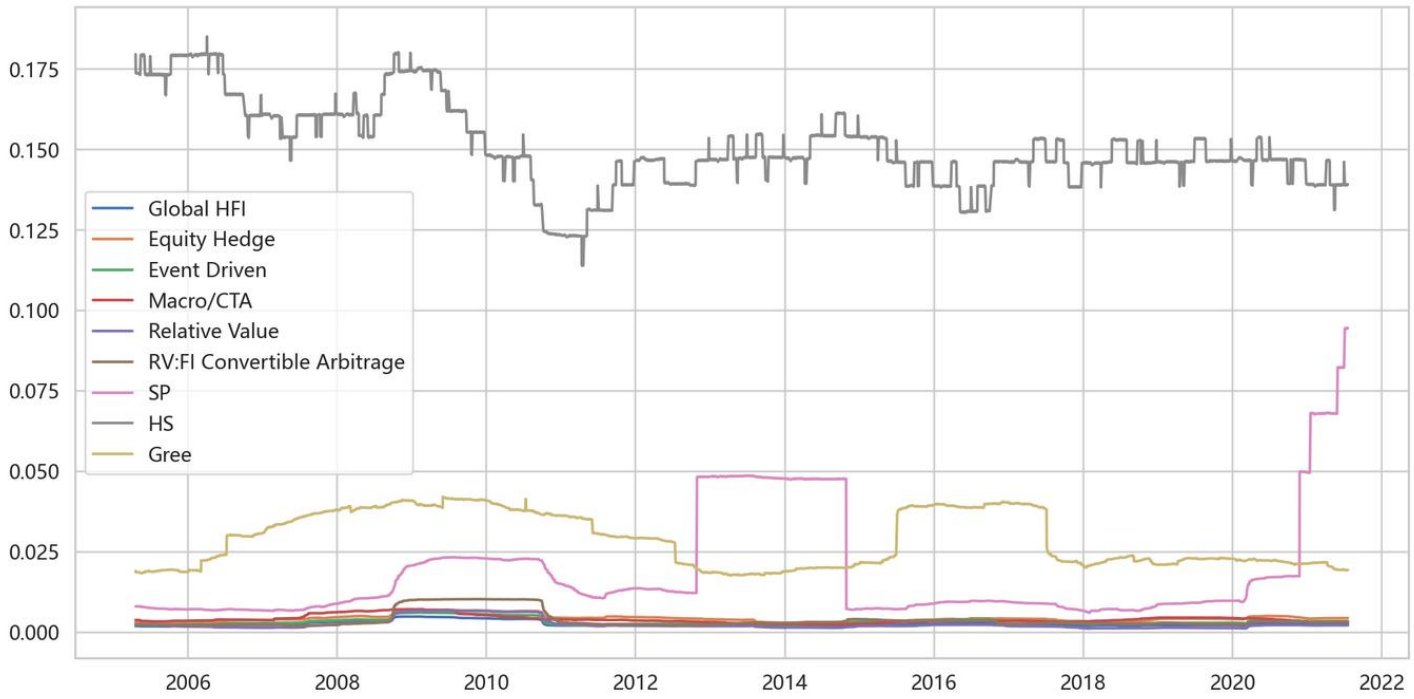
1.2 Graphs of four statistics

Then, four graphs of statistics for those nine financial variables are as follows.

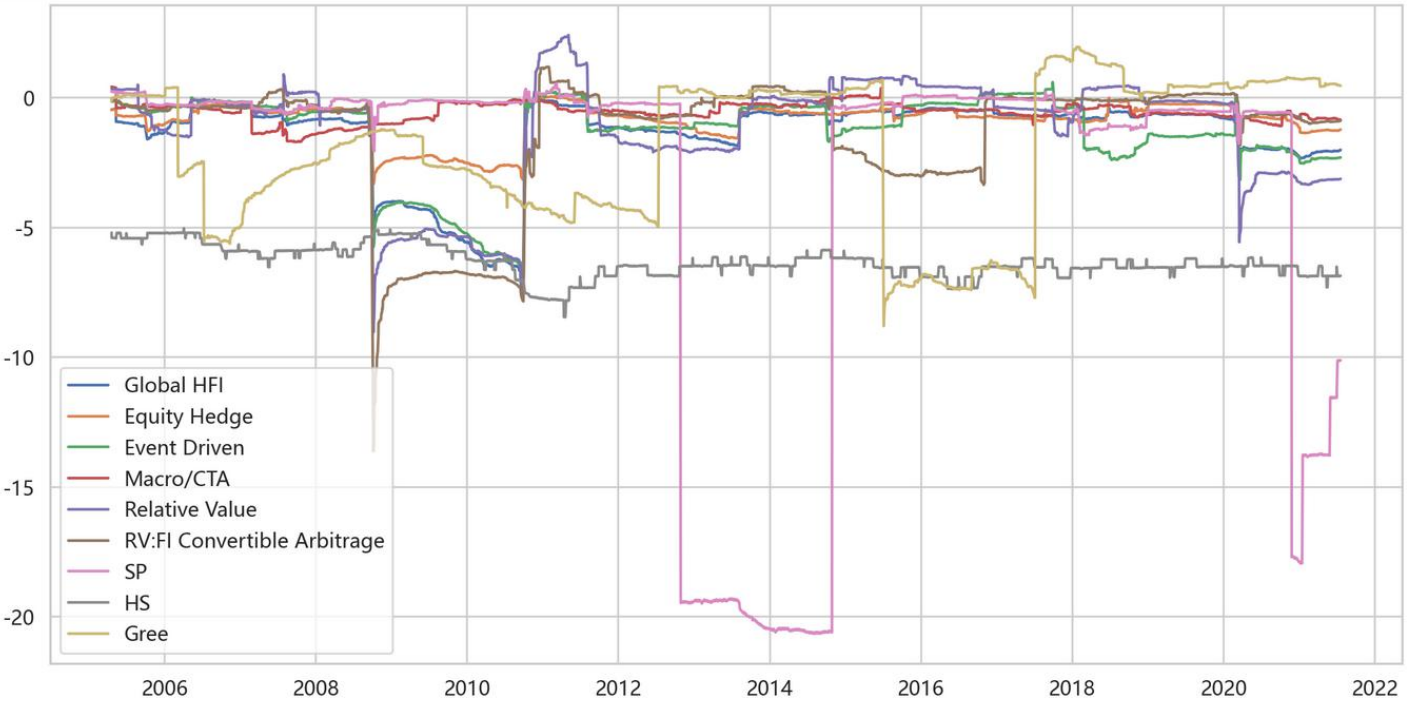
Graph 2-1-10 Mean



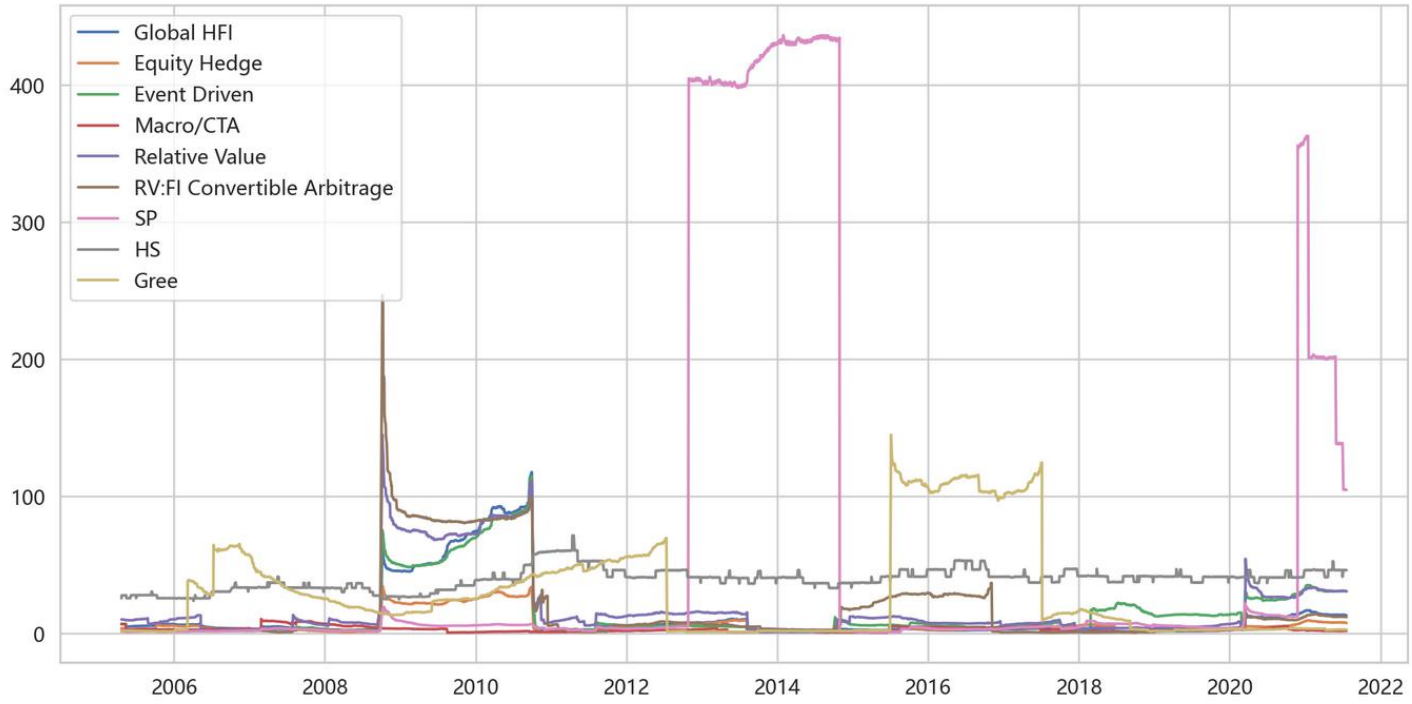
Graph 2-1-11 Std



Graph 2-1-12 Skewness



Graph 2-1-13 Kurtosis



2.Alphas and betas of Gree, and HFRX indices to the S&P500 and HSI

	alpha	beta_S&P500	beta_HSI
Global HFI	0.0001070	0.0146548	0.0006622
Equity Hedge	0.0001383	0.0282853	0.0010506
Event Driven	0.0001696	0.0180229	0.0008163
Macro/CTA	0.0000361	0.0027320	0.0000224
Relative Value	0.0000956	0.0075822	0.0006842
RV:FI Convertible Arbitrage	0.0000221	0.0026778	0.0001920
Gree	0.0011115	0.0289401	0.0091438

Table 2-2-1 Alphas and betas based on daily returns

	alpha	beta_S&P500	beta_HSI
Global HFI	952.6163	0.0301170	0.009067
Equity Hedge	965.0227	0.0295290	0.007376
Event Driven	874.4110	0.0879180	0.018605
Macro/CTA	1089.2525	-0.0579130	0.009363
Relative Value	882.9312	0.0450390	0.008624
RV:FI Convertible Arbitrage	985.7461	0.0932720	-0.015655
Gree	-20.0917	0.0092140	0.001492

Table 2-2-2 Alphas and betas based on daily prices

3. Correlation matrix between the HFRX indices. Correlation Histogram

3.1 Correlation matrix

	Global HFI	Equity Hedge	Event Driven	Macro/CTA	Relative Value	RV:FI Convertible

						Arbitrage
Global HFI	1.000	0.906	0.849	0.466	0.675	0.363
Equity Hedge	0.906	1.000	0.748	0.244	0.492	0.229
Event Driven	0.849	0.748	1.000	0.177	0.542	0.298
Macro/CTA	0.466	0.244	0.177	1.000	0.094	0.007
Relative Value	0.675	0.492	0.542	0.094	1.000	0.557
RV:FI Convertible Arbitrage	0.363	0.229	0.298	0.007	0.557	1.000

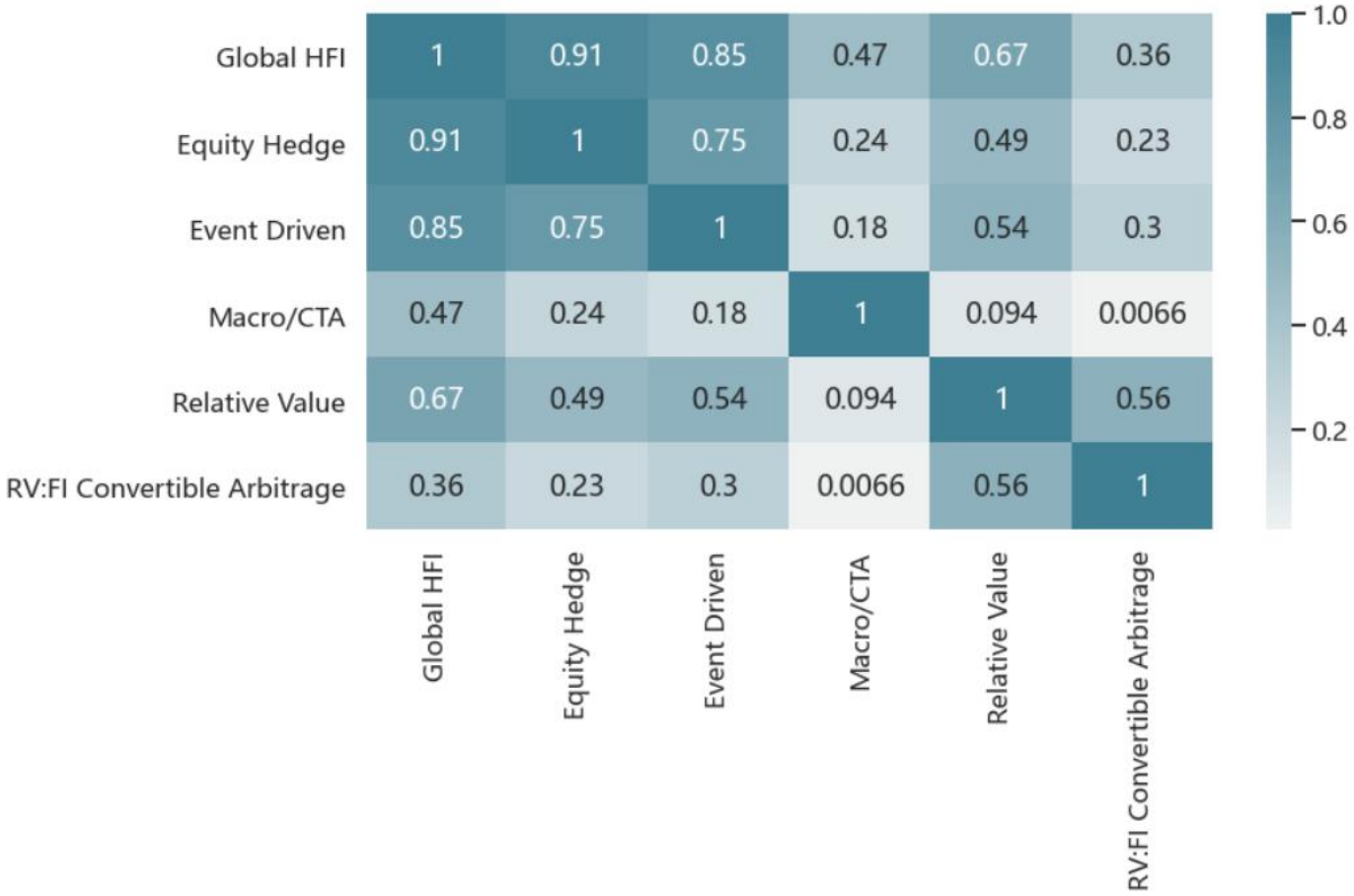
Table 2-3-1 Correlation matrix based on daily returns

	Global HFI	Equity Hedge	Event Driven	Macro/CTA	Relative Value	RV:FI Convertible Arbitrage
Global HFI	1.000	0.905	0.861	0.287	0.867	0.370
Equity Hedge	0.905	1.000	0.633	0.289	0.674	0.567
Event Driven	0.861	0.633	1.000	0.085	0.811	0.002
Macro/CTA	0.287	0.289	0.085	1.000	-0.085	-0.176
Relative Value	0.867	0.674	0.811	-0.085	1.000	0.341
RV:FI Convertible Arbitrage	0.370	0.567	0.002	-0.176	0.341	1.000

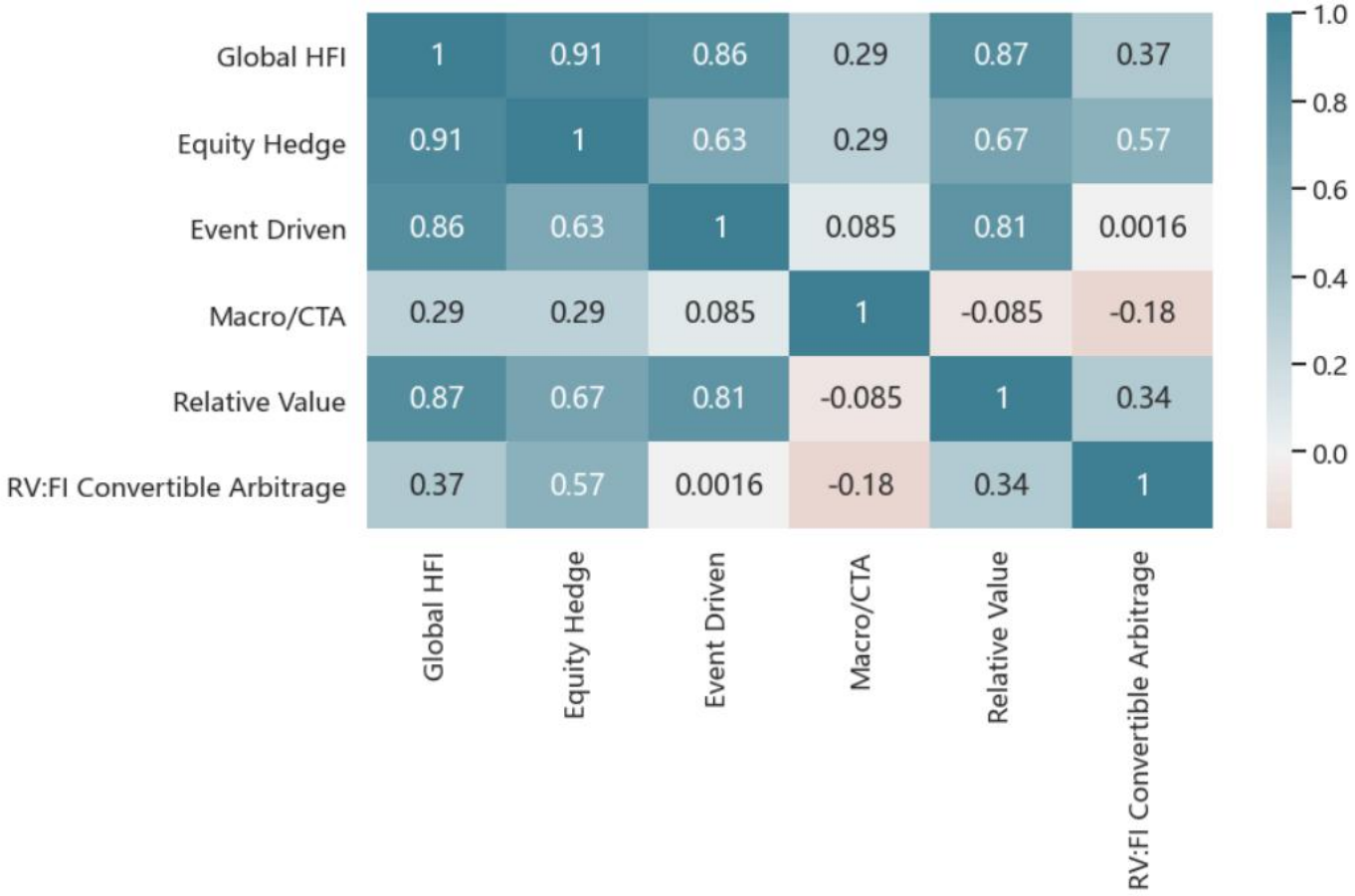
Table 2-3-1 Correlation matrix based on daily prices

3.2 Correlation heatmap

Graph 2-3-1 Correlation matrix heatmap based on daily returns

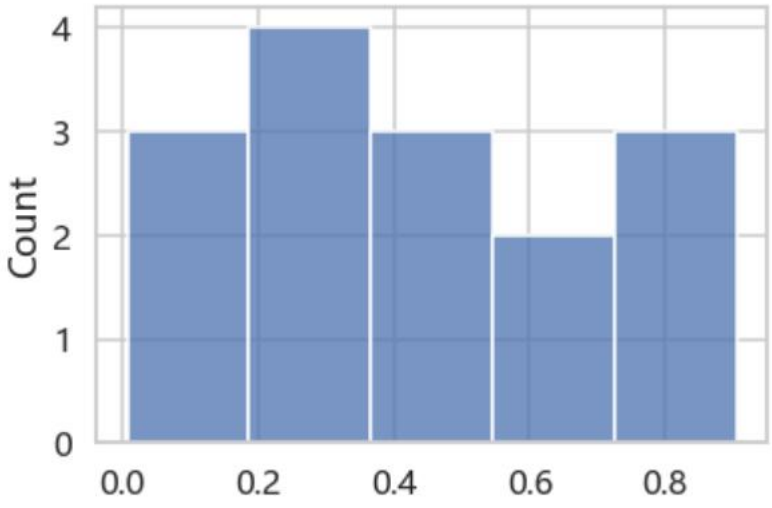


Graph 2-3-2 Correlation matrix heatmap based on daily prices

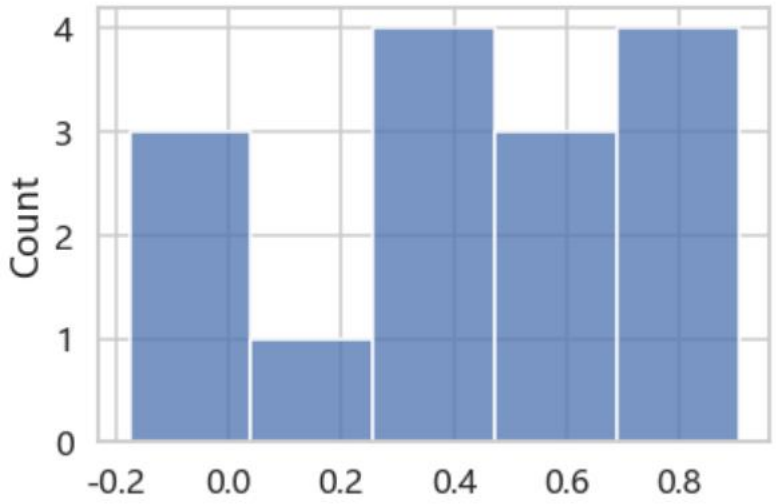


3.3 Correlation histogram

Graph 2-3-3 Correlation histogram based on daily returns



Graph 2-3-4 Correlation histogram based on daily returns



4. Correlation matrix between the Chinese stock and equity indices

Table 2-4-1 Correlation matrix between Gree and equity indices based on daily returns

	SP	HS	Gree
SP	1.000	0.004	0.037
HS	0.004	1.000	0.049
Gree	0.037	0.049	1.000

Table 2-4-2 Correlation matrix between Gree and equity indices based on daily prices

	SP	HS	Gree
SP	1.000	0.749	0.811
HS	0.749	1.000	0.818
Gree	0.811	0.818	1.000