SOFTWARE THESIS PRESENTATION

Stock Recommendation

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Summary of Topics

Description of Project

Background

Expected Outcomes

Project Report

System Design

System Outcomes

Iterative Filtering Background

MOTIVATION

What does IF aim to do?

METHODS

What IF methods have been examined?

PREVIOUS APPLICATIONS

What are the here-to-forth primary applications of IF?

Iterative Filtering Terminology

ELECTION

A collection of numerical datum about the same object

VOTER

A provider of information, e.g. temperature sensor, eBay voter, stock recommender

VOTE

A piece of information, e.g. temperature reading

Motivation

UNRELIABLE SOURCES

Aggregates information from sources of unknown variance

MINIMISE VARIANCE

Produces estimate with minimal variance

USE ALL INFORMATION

Uses votes cast in other elections

Methods

WHAT IF METHODS HAVE BEEN EXAMINED?

Negative Reciprocal

$$\left(\frac{\sum_{i:i \to j} (r_{i,j} - \mu_j)^2}{n-1} \right)^{-\alpha}, \ \alpha \in \mathbb{N}$$

Affine

$$\left(\sum_{i:i \to j} |r_{i,j} - \mu_j| \right)^{-1}$$

UNSW

$$\sum_{k,i:k \to i, j \to i} \frac{1}{\sqrt{2\pi V_k}} e^{-\frac{(r_{j,i} - r_{k,i})^2}{2V_k}}$$

Previous Applications

WHAT ARE THE HERE-TO-FORTH PRIMARY APPLICATIONS OF IF?

Financial Background

RECOMMENDATIONS

What does financial literature say?

FINANCIAL RIGOUR

What is required for a financial model to be considered robust?

QUANTITATIVE ANALYSIS

What typical industry strategies are used?

Recommendations

PRICES FOLLOW RECOMMENDATIONS

- Large, well-known firm are trusted, and get high viewership on their publications
- These publications can cause investment patterns
- A stock that is upgraded to "Strong Buy" will see a dramatic increase in price

Recommendations

EVENT STUDIES ON RECOMMENDATIONS

- Empirical backing for time-weighting
  - 90 days is good timeframe
  - Studies disagree on whether exponential or logarithmic decay is best, I got similar results from both

Financial Rigour

RISK ADJUSTMENT

- There is no point advertising an average 200% return if the 95% confidence interval is [-1000, 1200].
- To account for this the Sharpe ratio was created
- Effectively a t-test that returns are statistically significant to the risk-free rate

$$S_i = \frac{r_i - r_{rf}}{\sigma_i}$$

Financial Rigour

INVESTMENT CLASSES

- Several ratios are commonly used in finance to classify stocks
- One, Profit/Equity, measures profitability of stocks and can be used to classify stocks into "value" and "growth"
- Splitting investments between these two categories provides both stability and growth

Quantitative Strategies

TWO POSSIBLE MODELS FOR INVESTMENT STRATEGIES

- Relative Value
- Directional

Modifications to System

TIME-WEIGHTING

Based of empirical literature

CONSENSUS MAKING

Using the whole buffalo

Final System Main Design

TIME WEIGHTING

Weight observations according time since issue

CONSENSUS TAKING

Using IF averages

CONSENSUS MAKING

Using IF variance

Time-Weighting

EXPONENTIAL

$$weight = \begin{cases} 0.95^{dist}, & dist \leq 90 \\ 0, & dist > 90 \end{cases}$$

Time-Weighting

LOGARITHMIC

$$weight = max\left(\frac{ln(-(dist - 90 - 1))}{ln(90 + 1)}, 0\right)$$

Consensus Taking

MOTIVATION

- Skill in a field as complicated as finance is inherently abstract
- Examining mutual agreement through IF can provide a proxy for a talent based average

Consensus Taking

IMPLEMENTATION

- Use IF to find the consensus mean
  - Asymmetric loss function
  - Time weighted
- At each date order stocks by IF aggregated rating
- Invest in top n stocks

Consensus Making

MOTIVATION

- Investors can be lazy. If they aren't lazy they typically count on other investors being lazy.
- As a result, when a large and well known firm releases a 'Strong Buy' recommendation, many investors buy, driving the price up
- This is noticeable in both the SP100 universe and sector specific domains, such as the NASDAQ100

Consensus Making

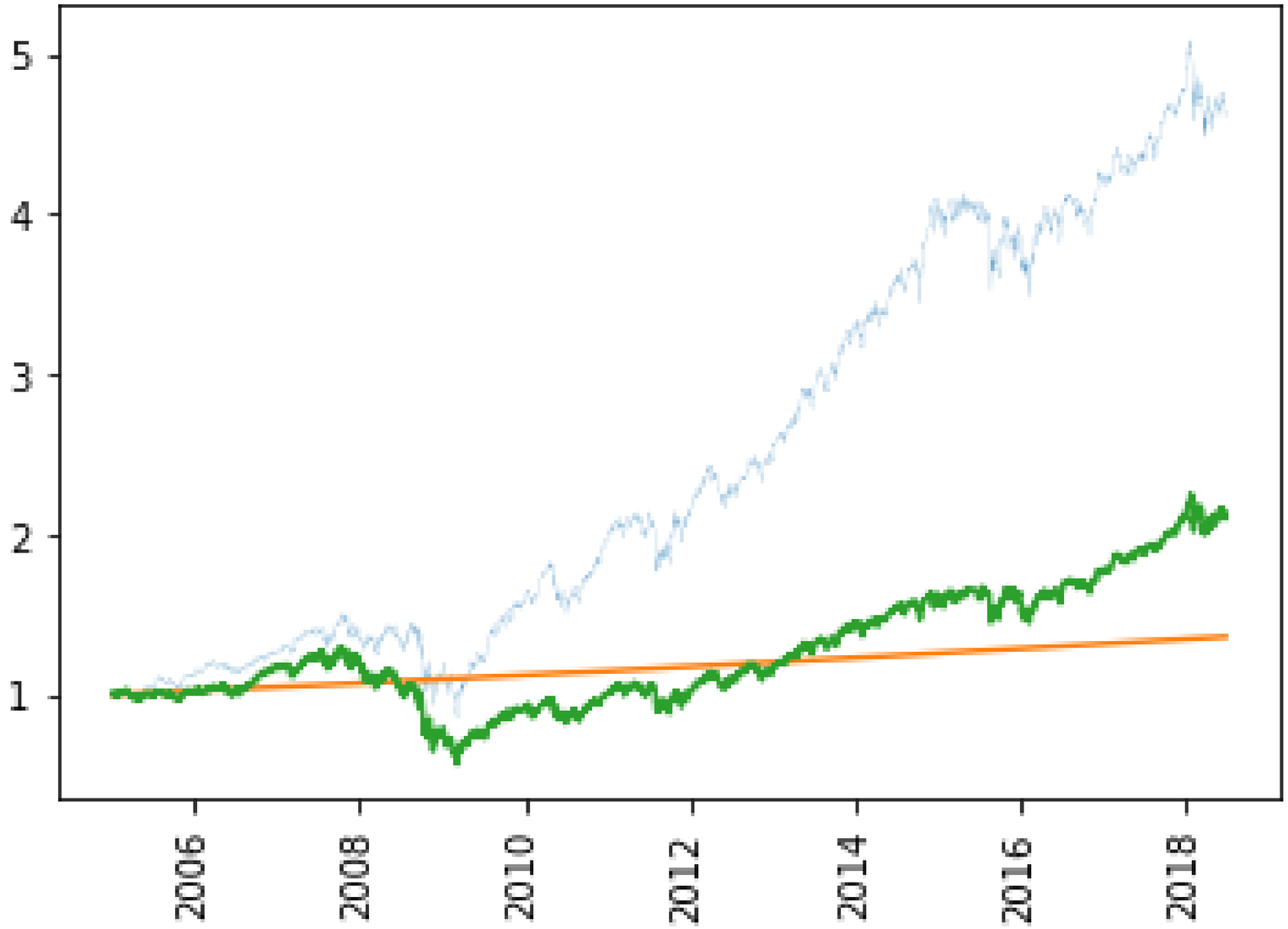
IMPLEMENTATION

- Use IF to find the "variance" of each analyst
- Remove all analysts with under a certain threshold of recommendations issued in the relevant time frame
- Sort analysts by "variance"
- When one of the top N analysts releases

Results

CONSENSUS TAKING

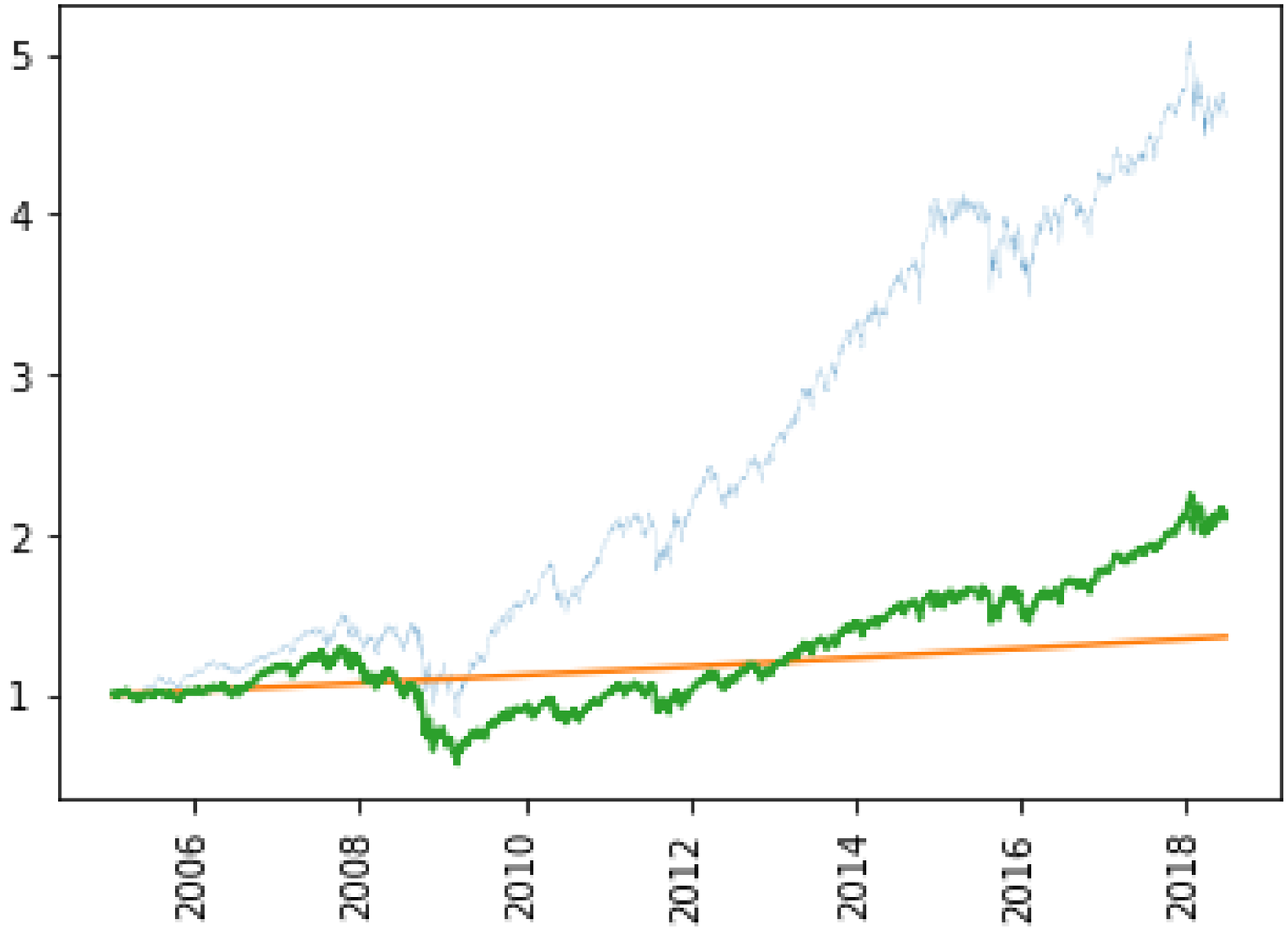
- Still affected by economic downturns
  - 2009, 2016
  - Could be alleviated by stop losses or



Results

CONSENSUS TAKING

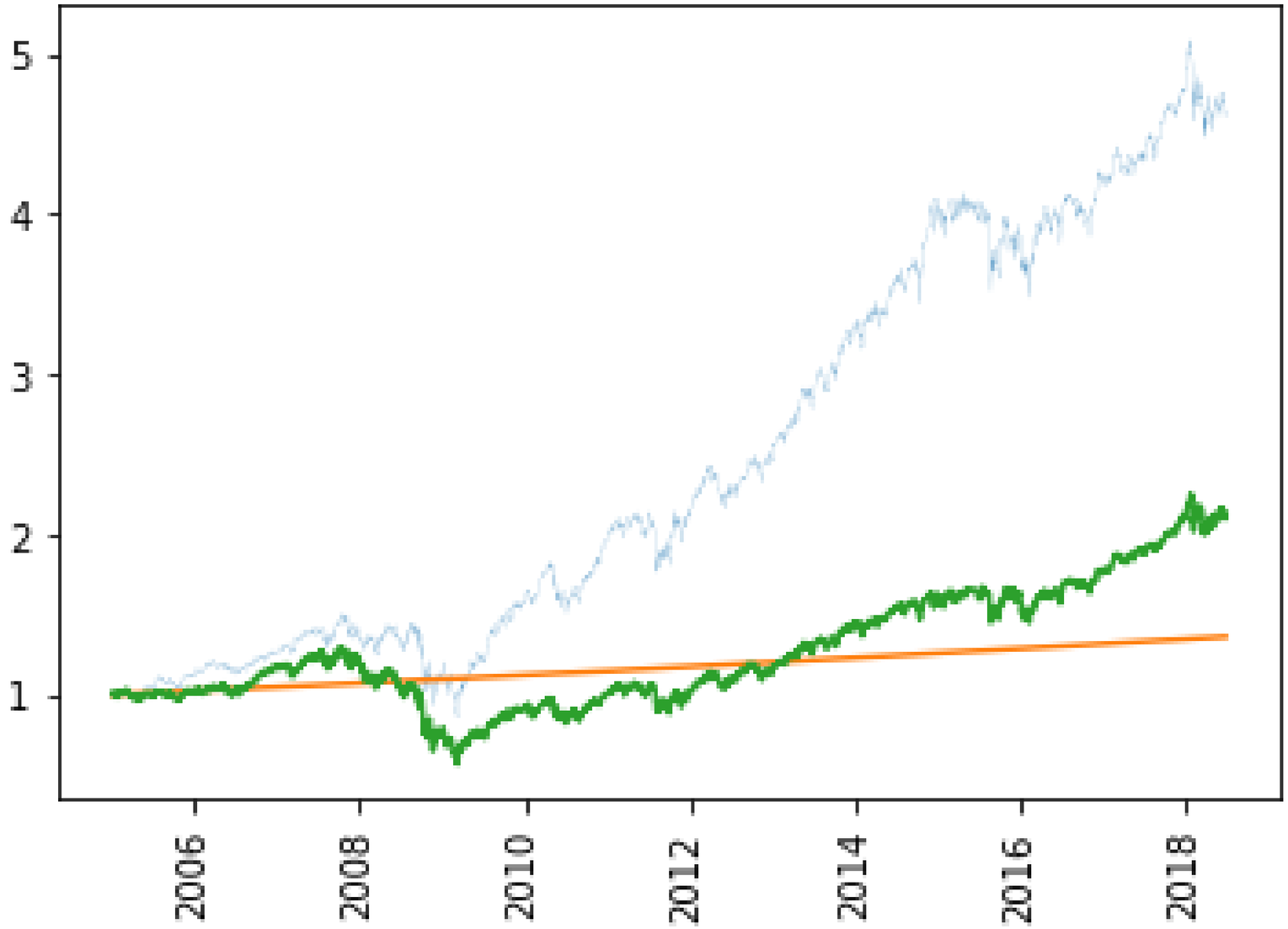
- Able to make good use of periods of economic growth
  - Even does well
  - Could be alleviated by stop losses or



Results

CONSENSUS TAKING

- Fiscally robust
  - $S^* = 2.53$
  - Statistically different to SP100 returns $p < 0.001$



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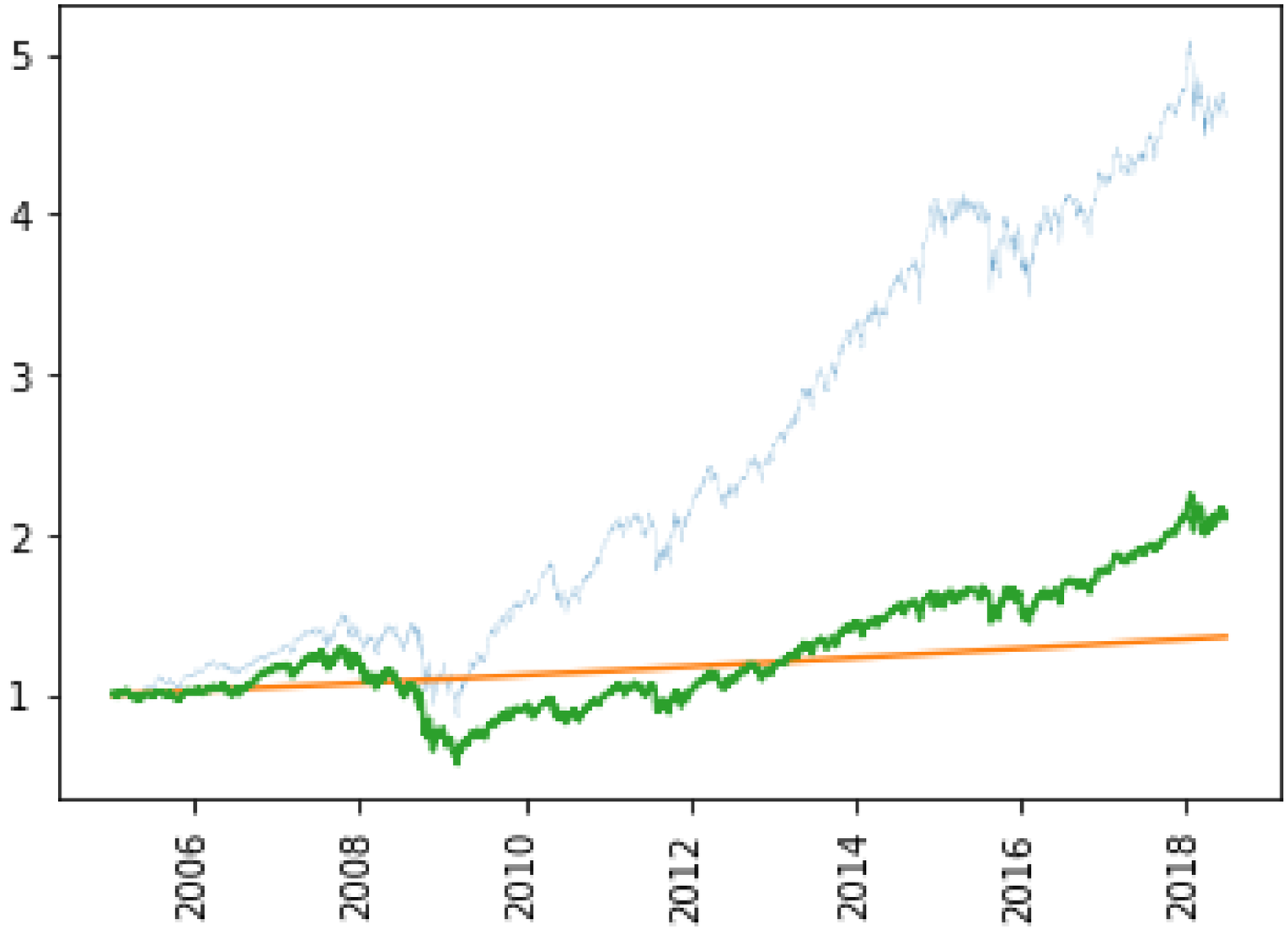

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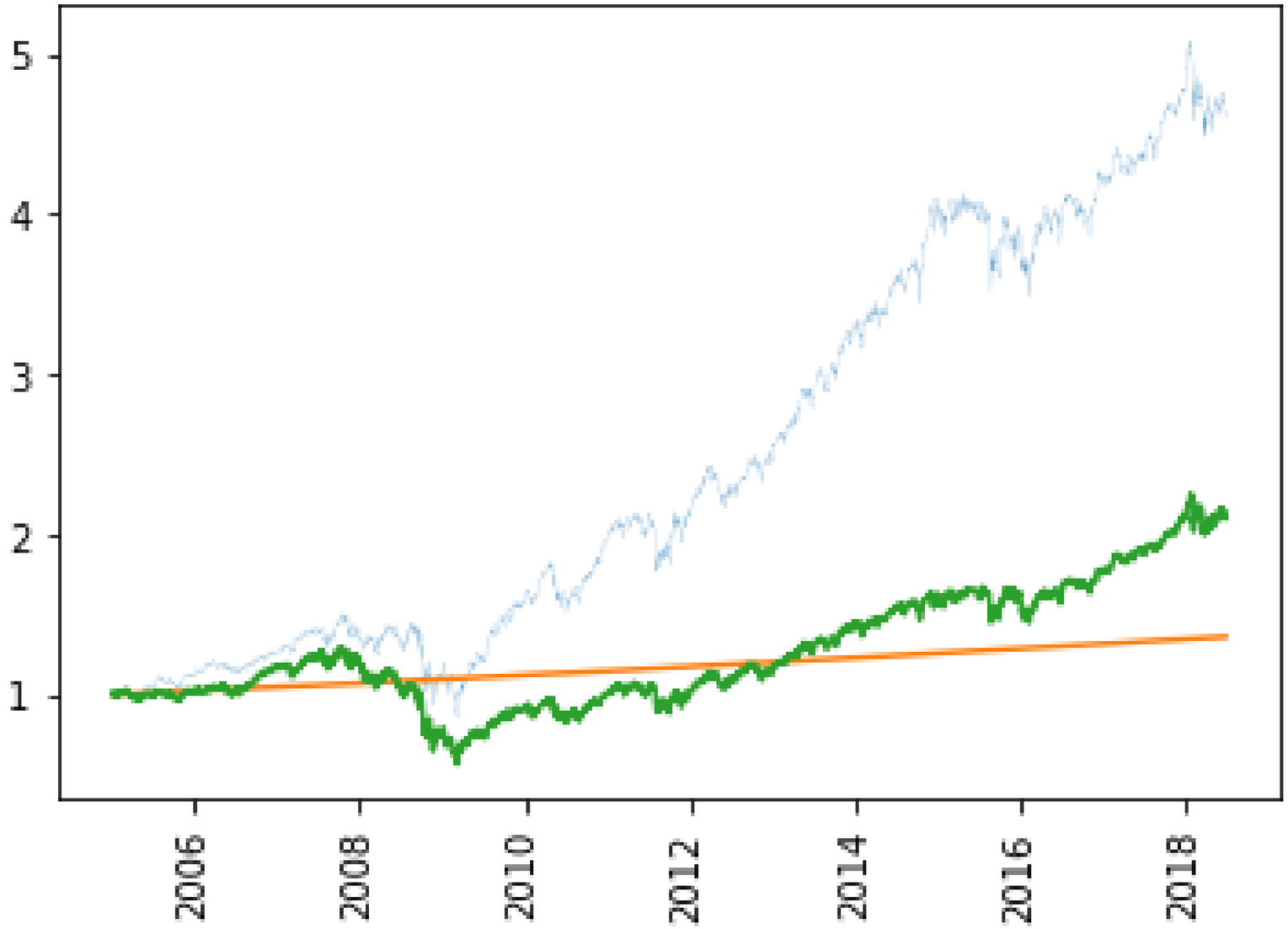

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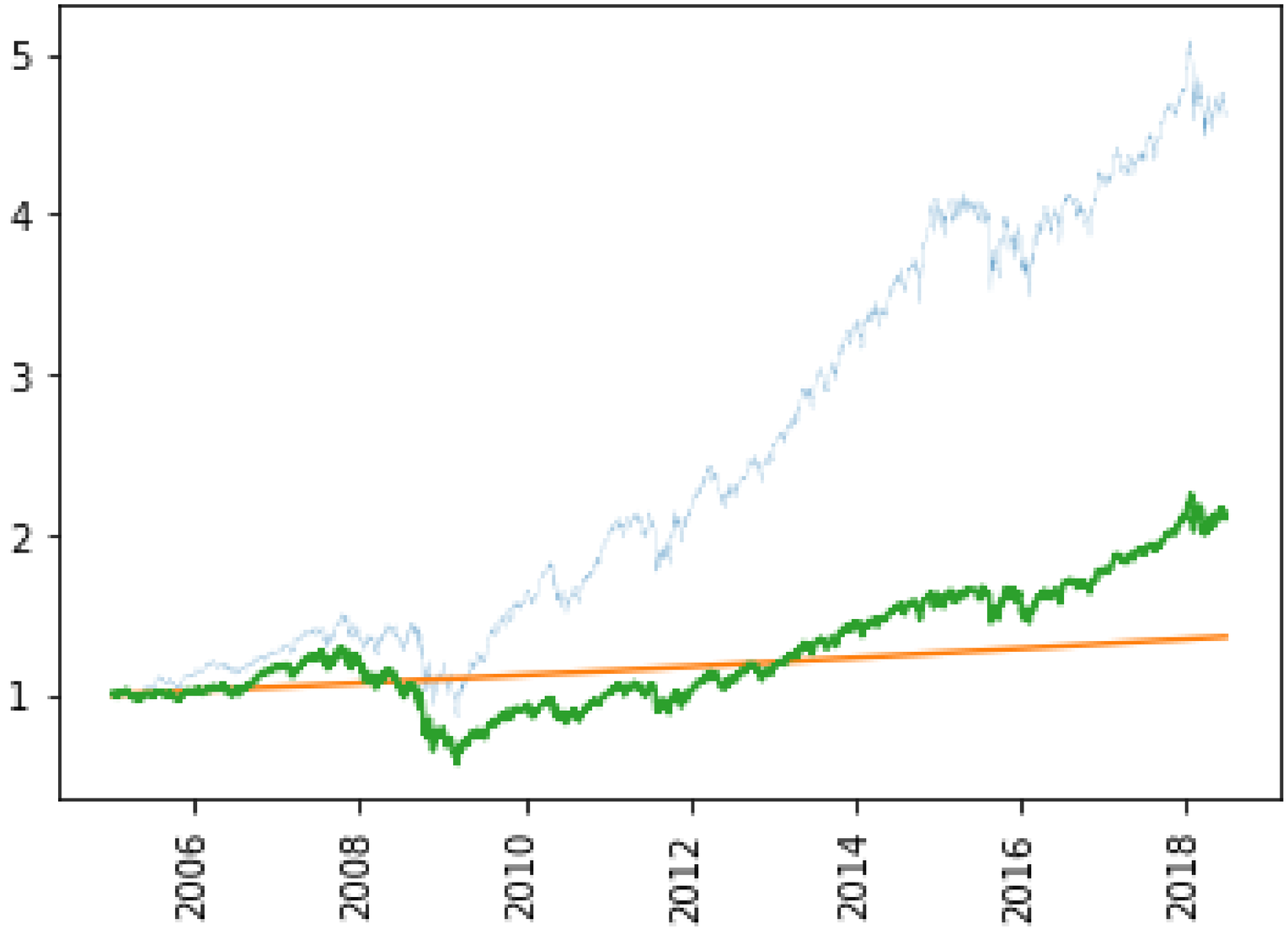


What is added?

ASSYMETRIC LOSS FUNCTION

Weight observations according

TIME WEIGHTING OF VOTES

Highly applicable in dynamic systems with infrequent appraisals

UTILISATION OF IF "VARIANCE"

Use of "uniqueness" score

Areas of future research

ASSYMETRIC LOSS FUNCTION

Further implications

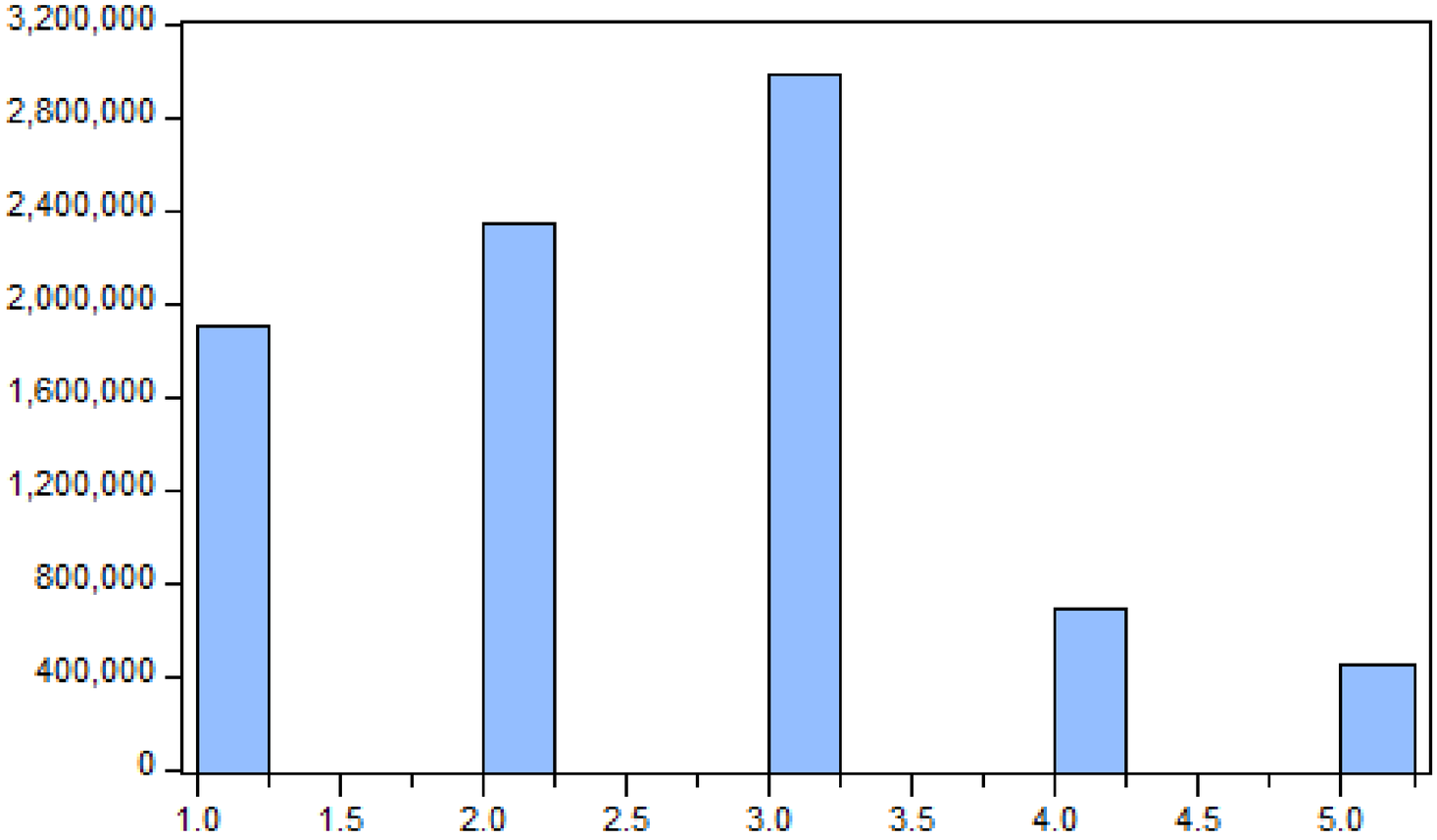
COMPATIBILITY

What other financial strategies can work in conjunction with IF

GENERALISATION

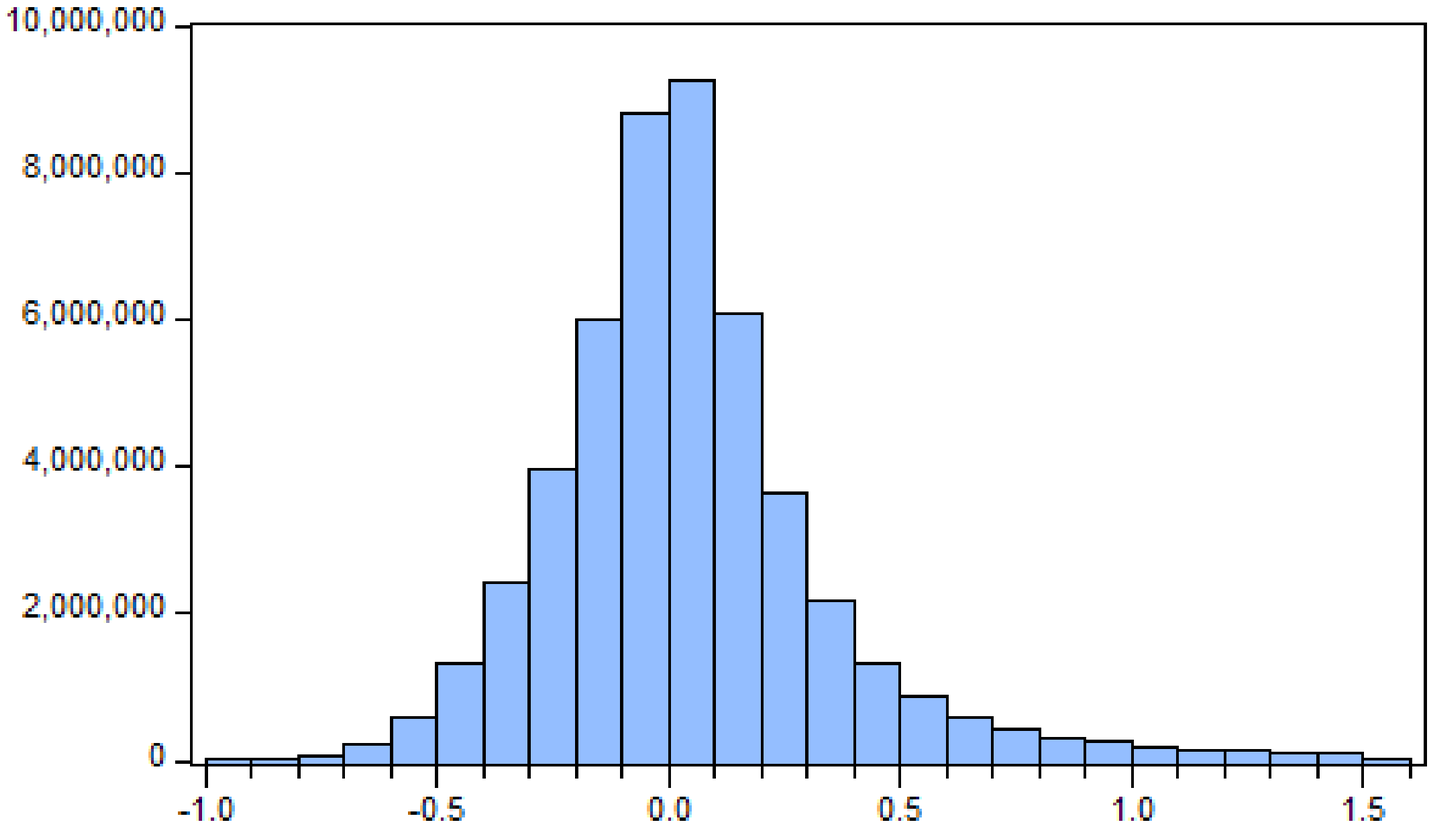
What other fields is IF suitable for?

Thank you



Series: REC
Sample 1 8352401 IF REC<>0
Observations 8352235

Mean	2.453480
Median	2.000000
Maximum	5.000000
Minimum	1.000000
Std. Dev.	1.088104
Skewness	0.399564
Kurtosis	2.680412
Jarque-Bera	257785.4
Probability	0.000000



Series: DPRICES	
Sample 1 49959749 IF DPRICES<1.5	
Observations 49110514	
Mean	0.036815
Median	0.010112
Maximum	1.500000
Minimum	-0.993643
Std. Dev.	0.296549
Skewness	1.104840
Kurtosis	6.080519
Jarque-Bera	29409599
Probability	0.000000