Financial Data Analysis

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02418 Statistical Modelling: Theory and practice
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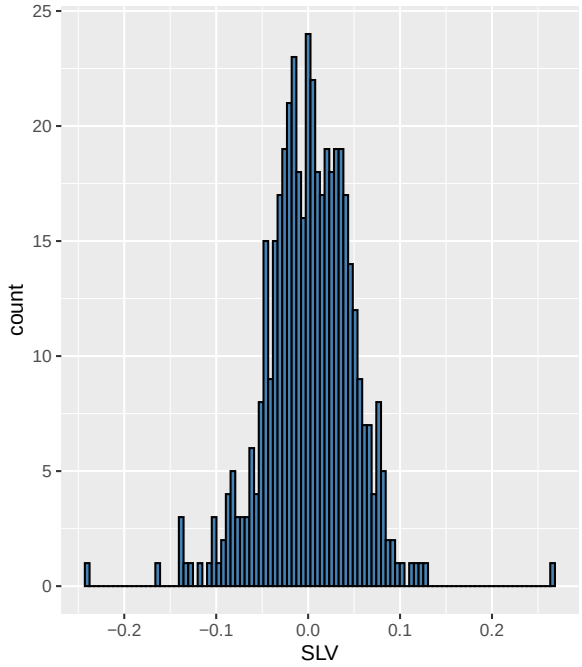
Overview

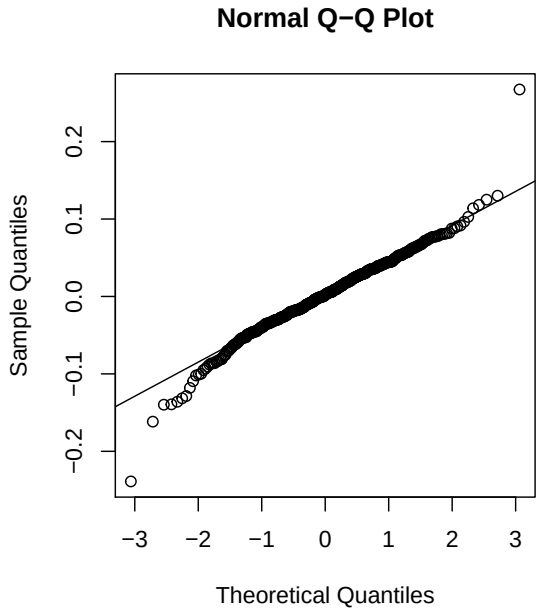
Analysis of Finance Data

The weekly returns for an ETF is analyzed and modeled.
Methods of analysis:

- Finance Data Parameters and Distribution
- Cauchy distribution
- Mixture Model
- HMM
- Parameters for chosen HMM

Finance Data Parameters and Distribution



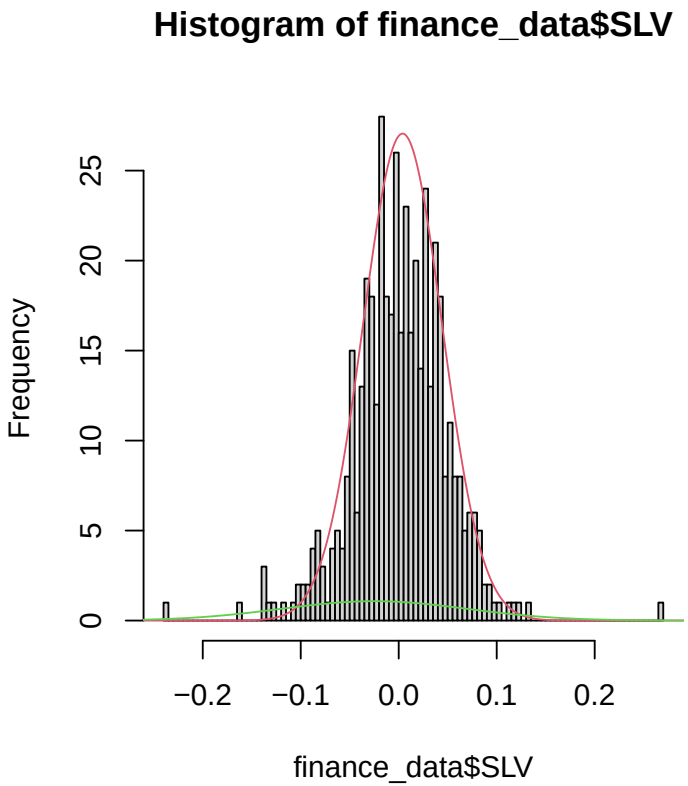


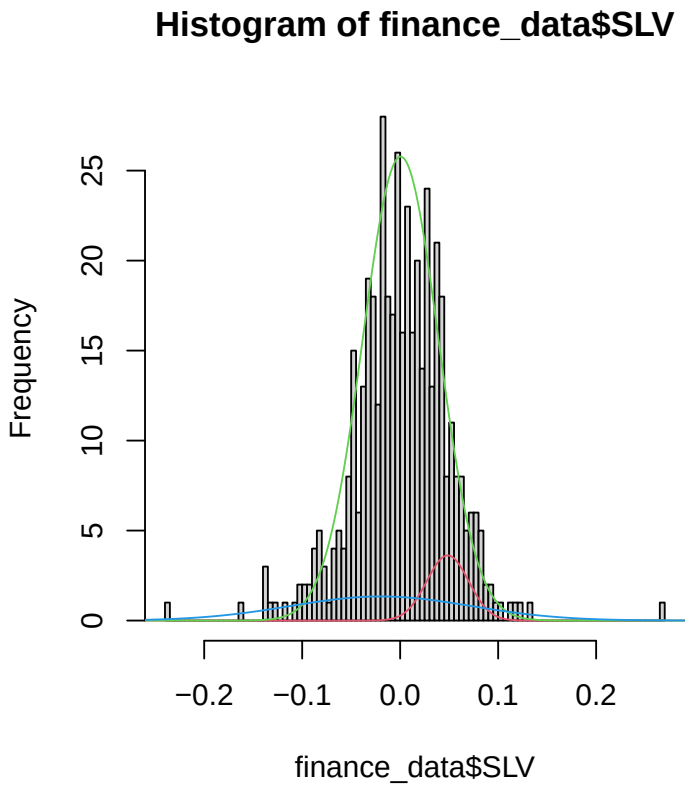
Summary statistics						
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	Stddev
-0.24	-0.026	0.002	0.0014	0.033	0.27	0.048

Conclusion

There are a couple outliers on both sides so it is not normal. Due to the tail probabilities, I would choose to fit a Cauchy distribution as it has a taller peak than the normal distribution and more importantly it heavy tails. This distribution is referred to being more "stable" which is ideal for voltatile financial data.

Gaussian Mixture Model





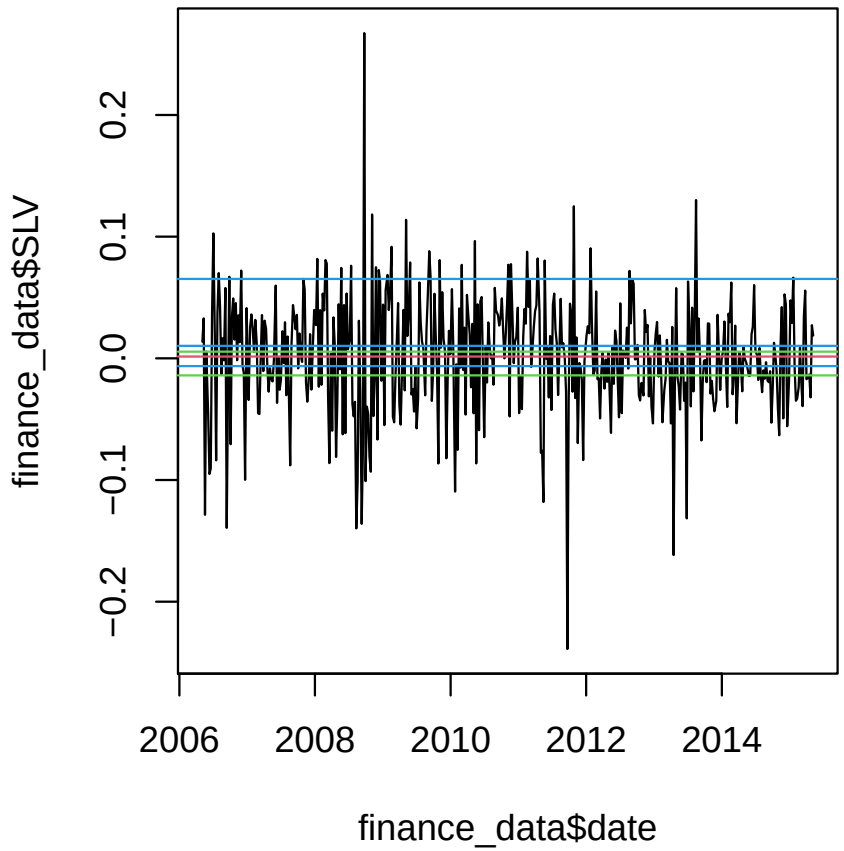
AIC		
m = 1	m = 2	m = 3
-1458.0	-1489.6	-1484.3

Conclusion

The mixture model with m = 2 or 2 distributions is the best based on lowest AIC.

Hidden Markov Model

Fit two and three state normal Hidden Markov Models to the data and conclude on the best choice



HMMs plotted:

- One-state normal HMM
- Two-state normal HMM
- Three-state normal HMM

AIC:

- -1459.99 (one-state)
- -1499.36 (two-state)
- -1415.361 (three-state)

Conclusion

The two-state normal HMM is the best model because it has the lowest AIC.

Working parameters for chosen HMM

Using the boot-strap method:

Mu (μ)	
Value	95% CI
0.0055	[1.66e-06, 1.07e-02]
-0.0140	[-0.07, 0.66]

Sigma (σ)	
Value	95% CI
0.037	[0.03,0.05]
0.074	[0.01,0.08]

Gamma (γ)	
Value	95% CI
0.931	[0.918, 0.993]
0.069	[0.007 0.082]
0.238	[0.008, 0.613]
0.761	[0.387, 0.992]