VaR Without Correlation Matrix

a new approach to risk management
by Giovanni Barone-Adesi and
Kostas Giannopoulos

1996

Advantages of our methodology

- Easy to understand
- Allows for an unlimited number of assets
- Reflects immediately changing market volatility
- Provides currency translation
- Verifies normality of portfolio returns, stability of correlations and diversification gains. Provides stress testing.

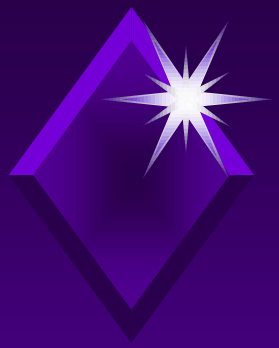
Derivative Securities

- Use zero-coupon discount bonds to model swaps
- Use current hedge ratios to replace options with their equivalent portfolios
- Modest changes in duration in the estimation period are reflected in estimates
- Other contracts' risk may not be evaluated as simply

VaR Methodologies

- Multivariate ES
- Requires N*(N+1)/2 parameter estimates
- Inconsistent estimates may result
- Estimates track change in market conditions over weeks

- Univariate Garch
- Number of parameters increases with N,not N*N
- estimates are always consistent
- Estimates track change in market conditions daily



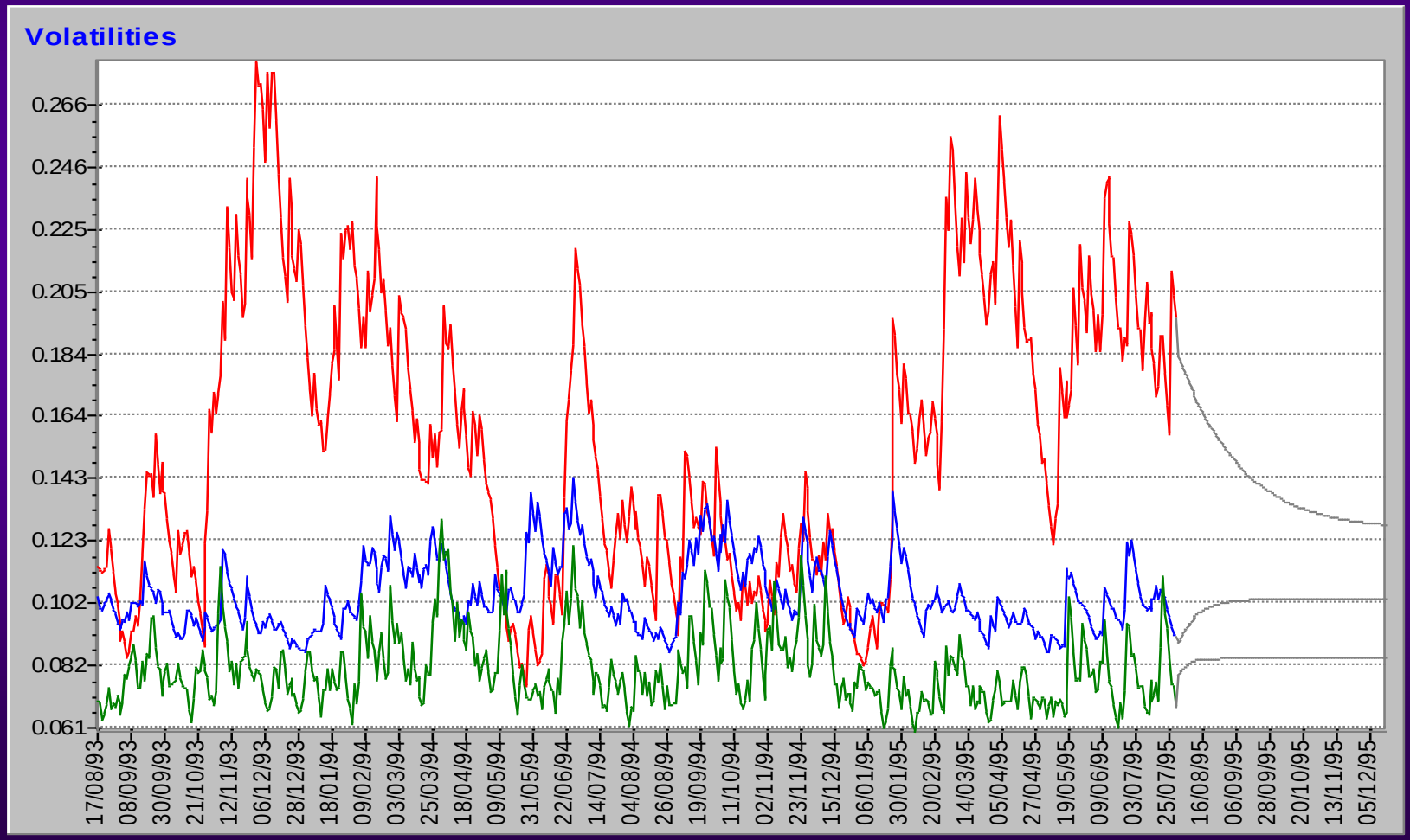
VaR without correlations

- Correlations measured from daily returns are unstable. Even their sign is often ambiguous.
- For large portfolios the number of pairwise correlations is unmanageable.
- Correlations are necessary to optimize portfolios, not for monitoring their variance.

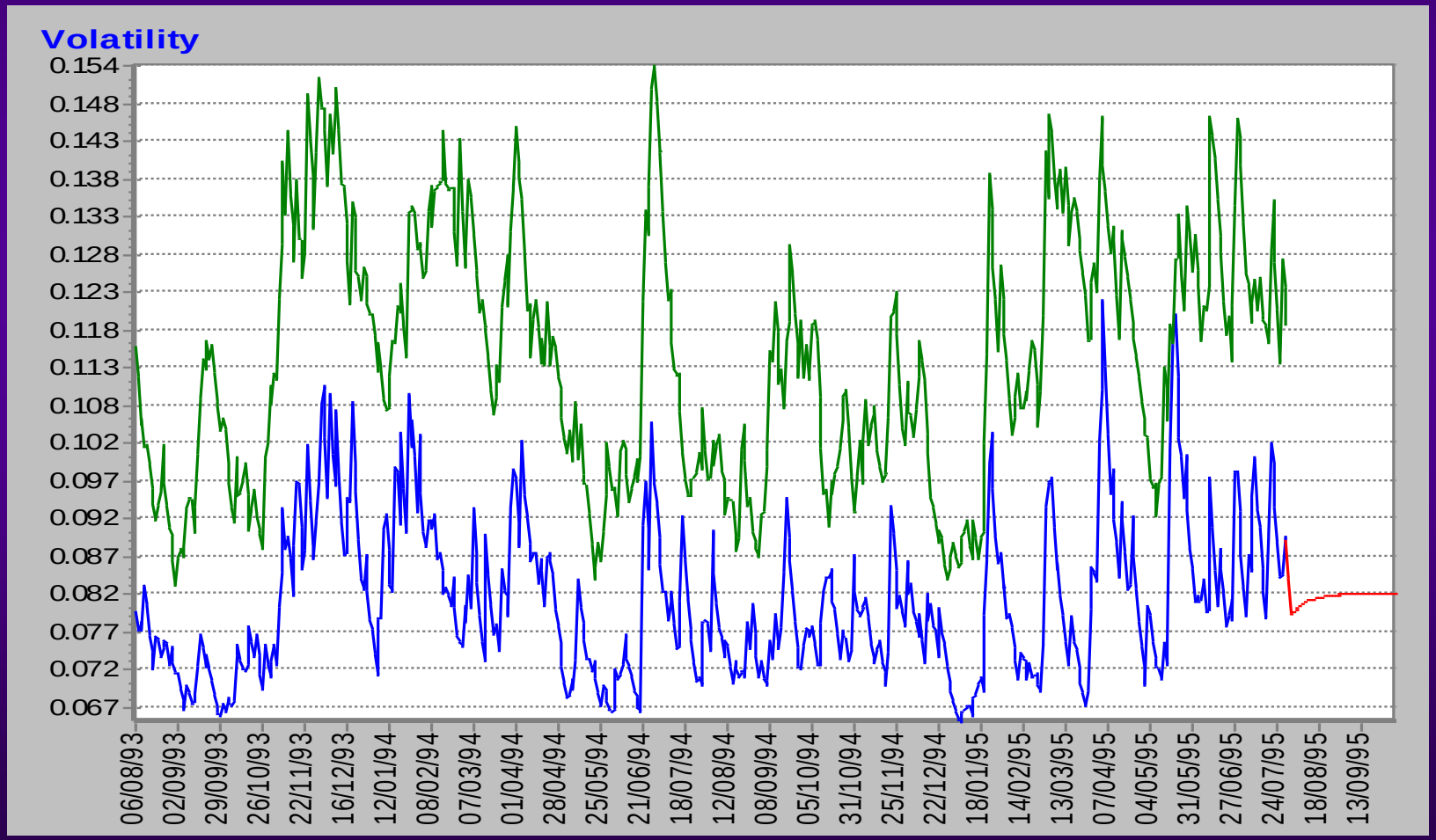
A better way to compute VaR

- We calculate past portfolio returns holding current weights constant.
- We fit a volatility model and we forecast future portfolio volatility and VaR.
- Risk is attributed to individual securities or baskets by differencing.
- Stress testing and correlation stability model risk beyond variance.

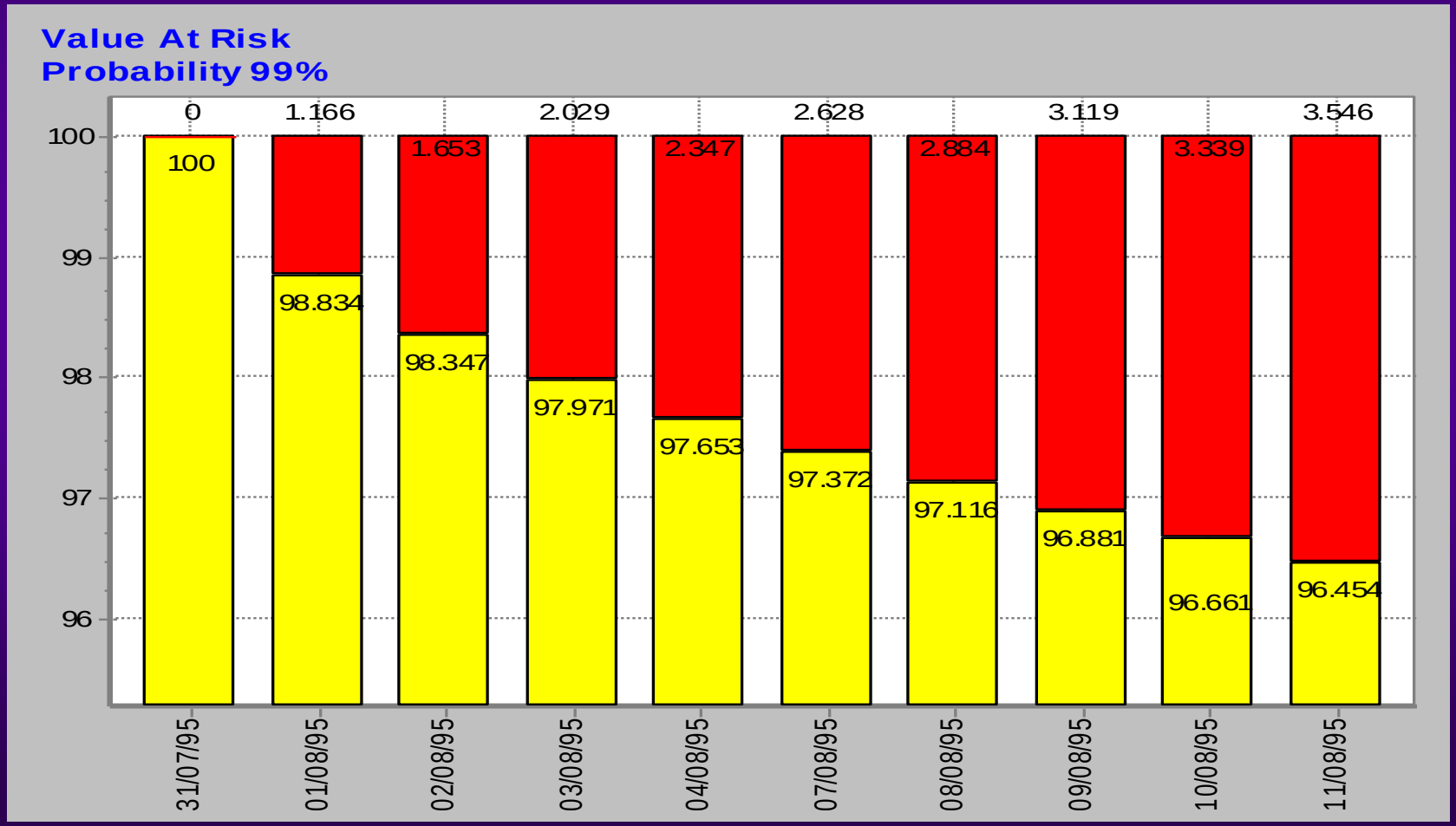
Volatilities of Japan, UK & US indices



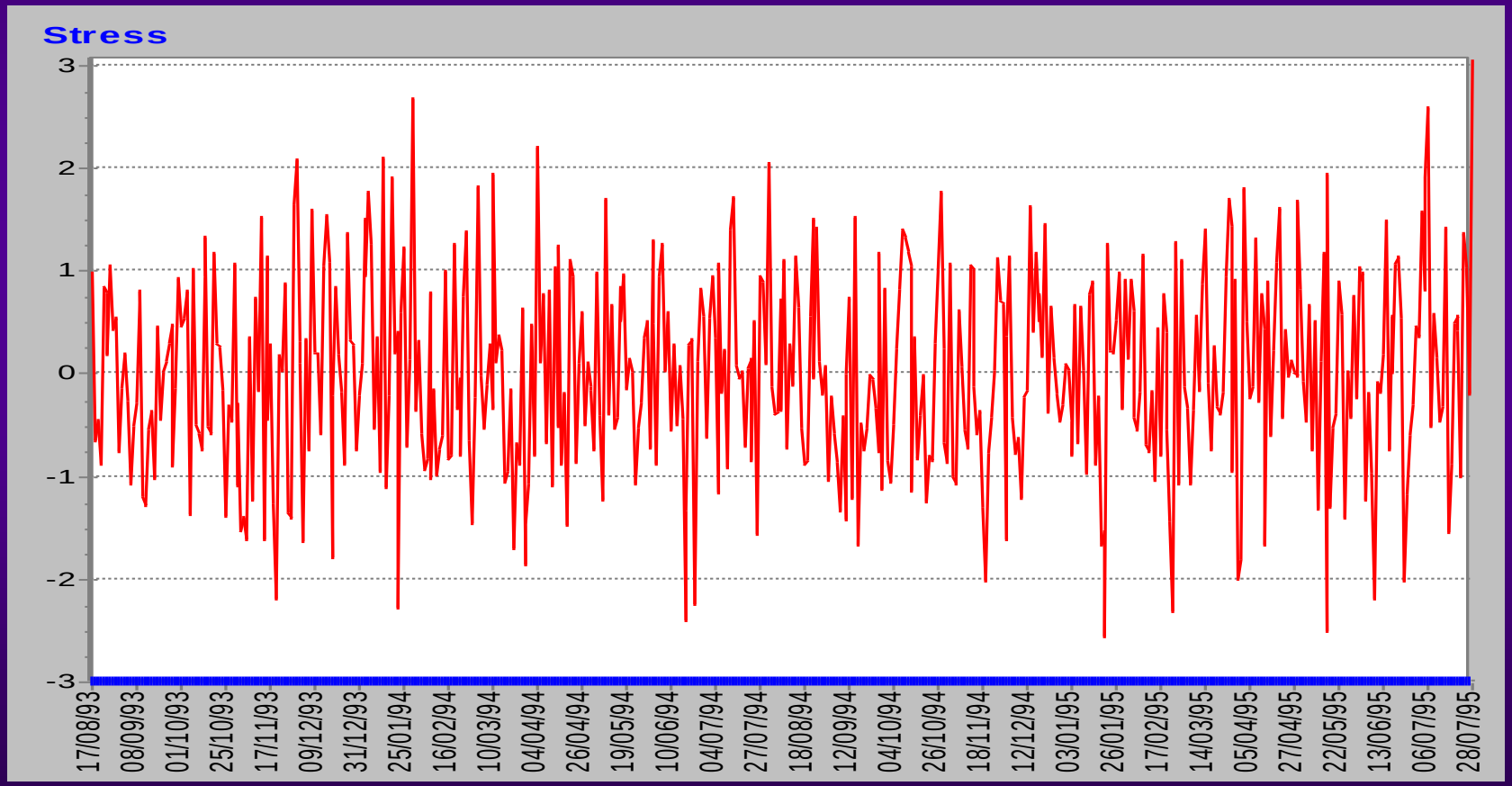
Diversified & undiversified volatility



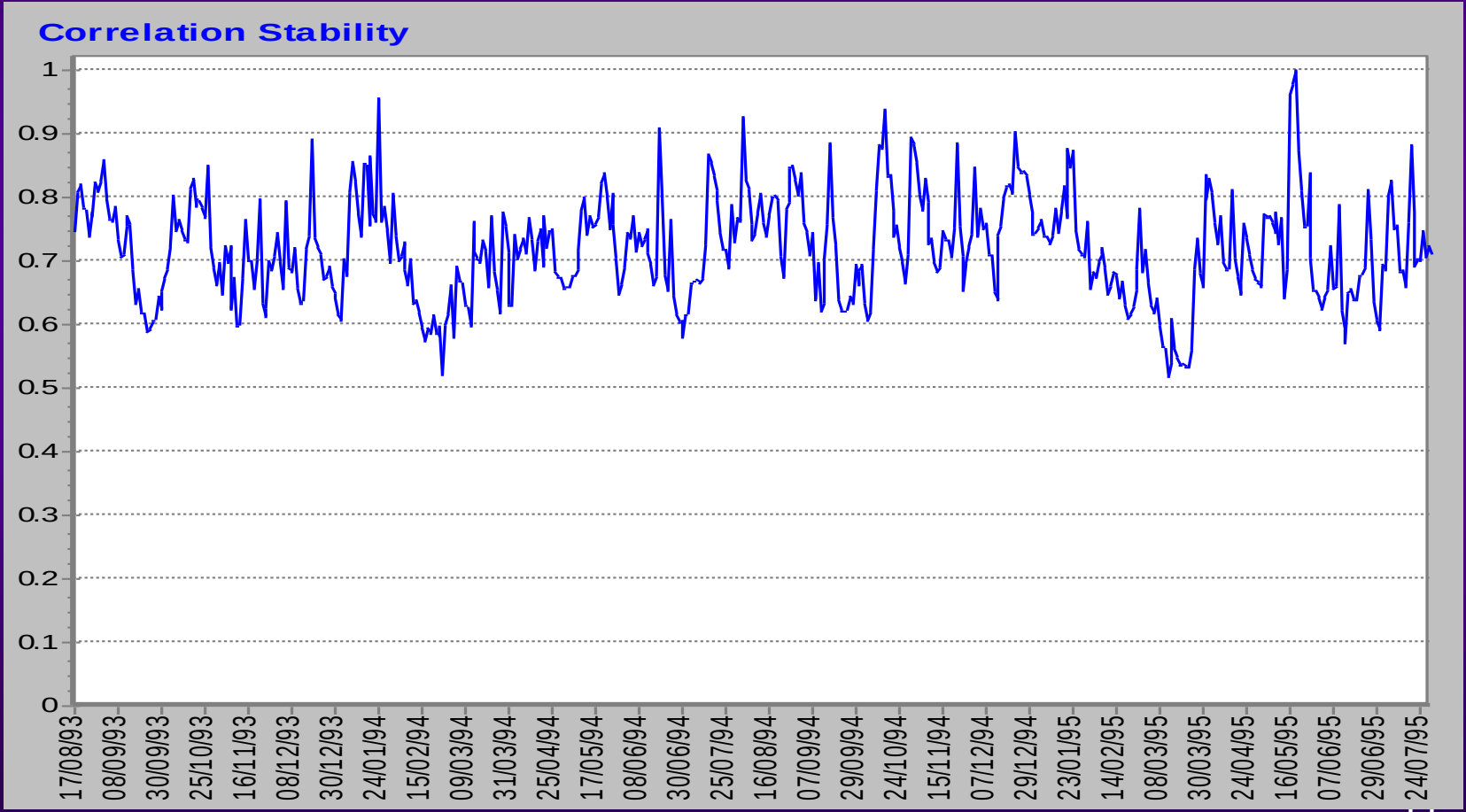
Portfolio VaR

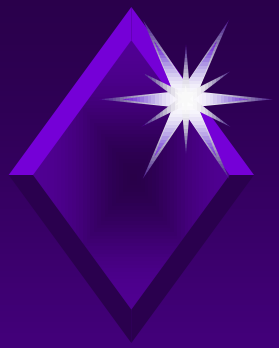


Stress Testing



Correlation Stability





♦ *Simulating Risk*

- Current volatility forecasts and randomly selected standardized residuals are combined to simulate future returns.
- The arbitrary distributional assumptions of the Montecarlo method are not required.
- Our simulation produces Worst Case Scenarios, VaR, long term portfolio risk.
- Implied volatility is also simulated for calls.

Fig 1 : World Capitalisation weigthed Portfolio Returns

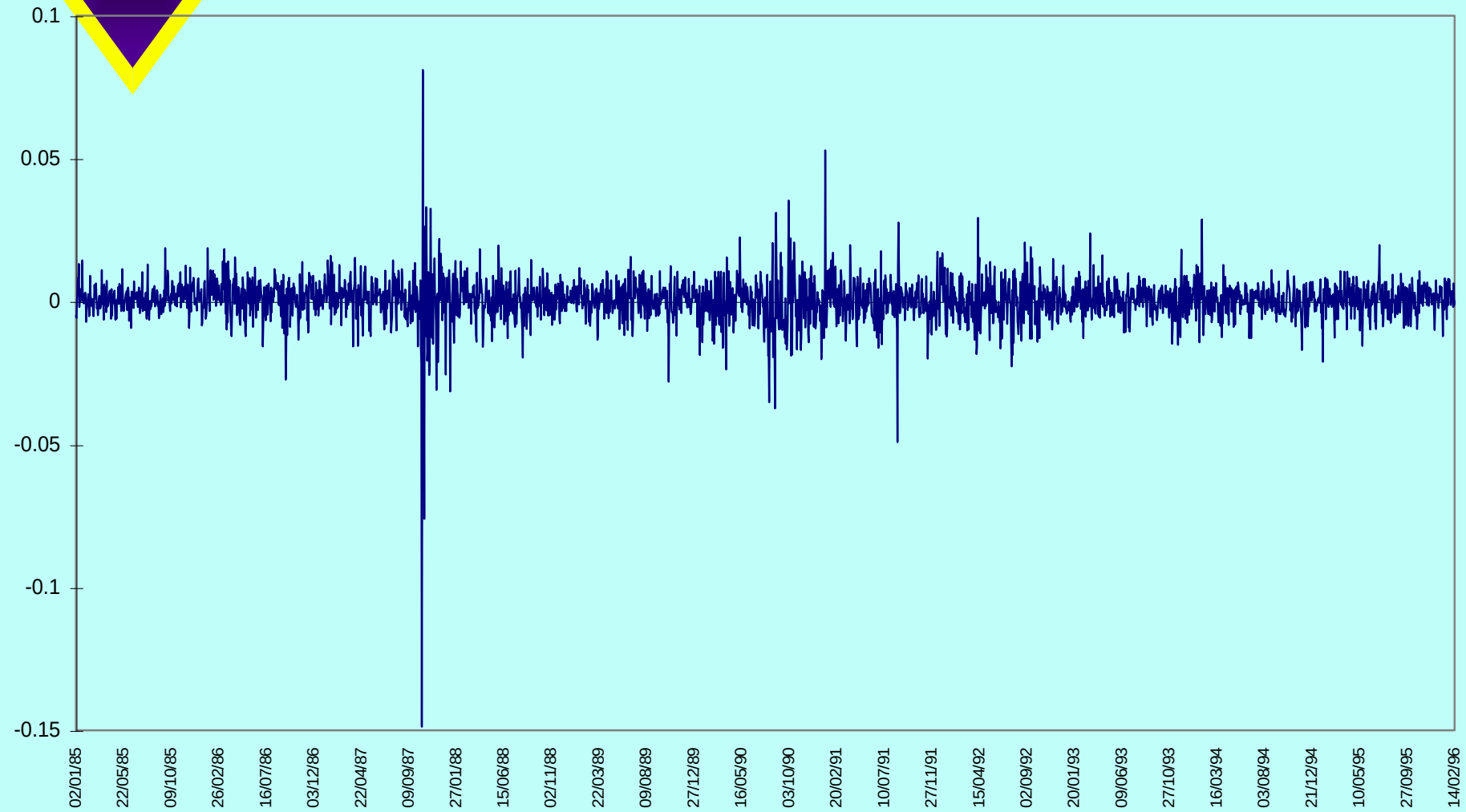


Fig 2 : Porfolio Stress Analysis (Standardised Residuals)

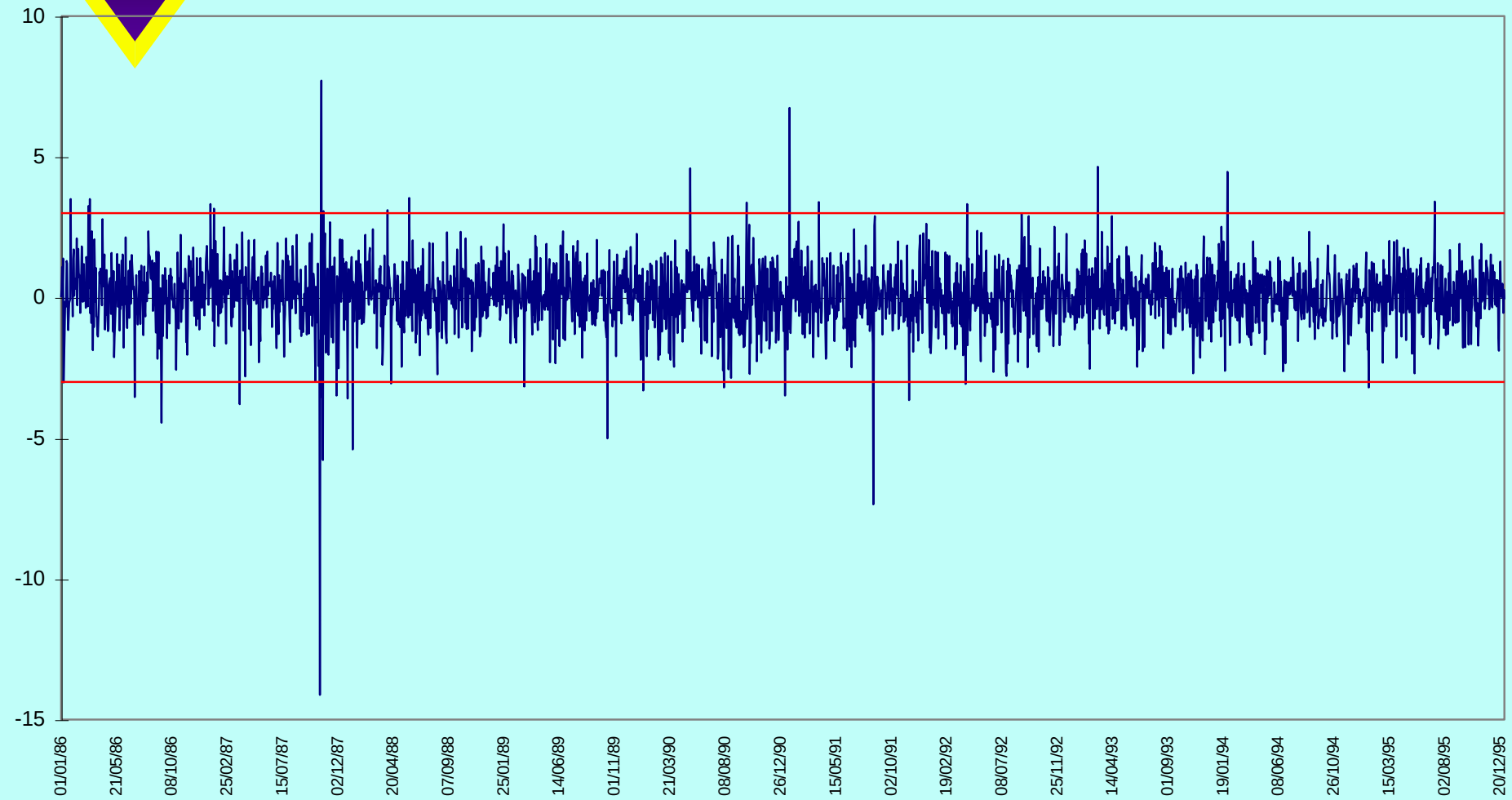


Fig 3 : Annualized volatility of the portfolio

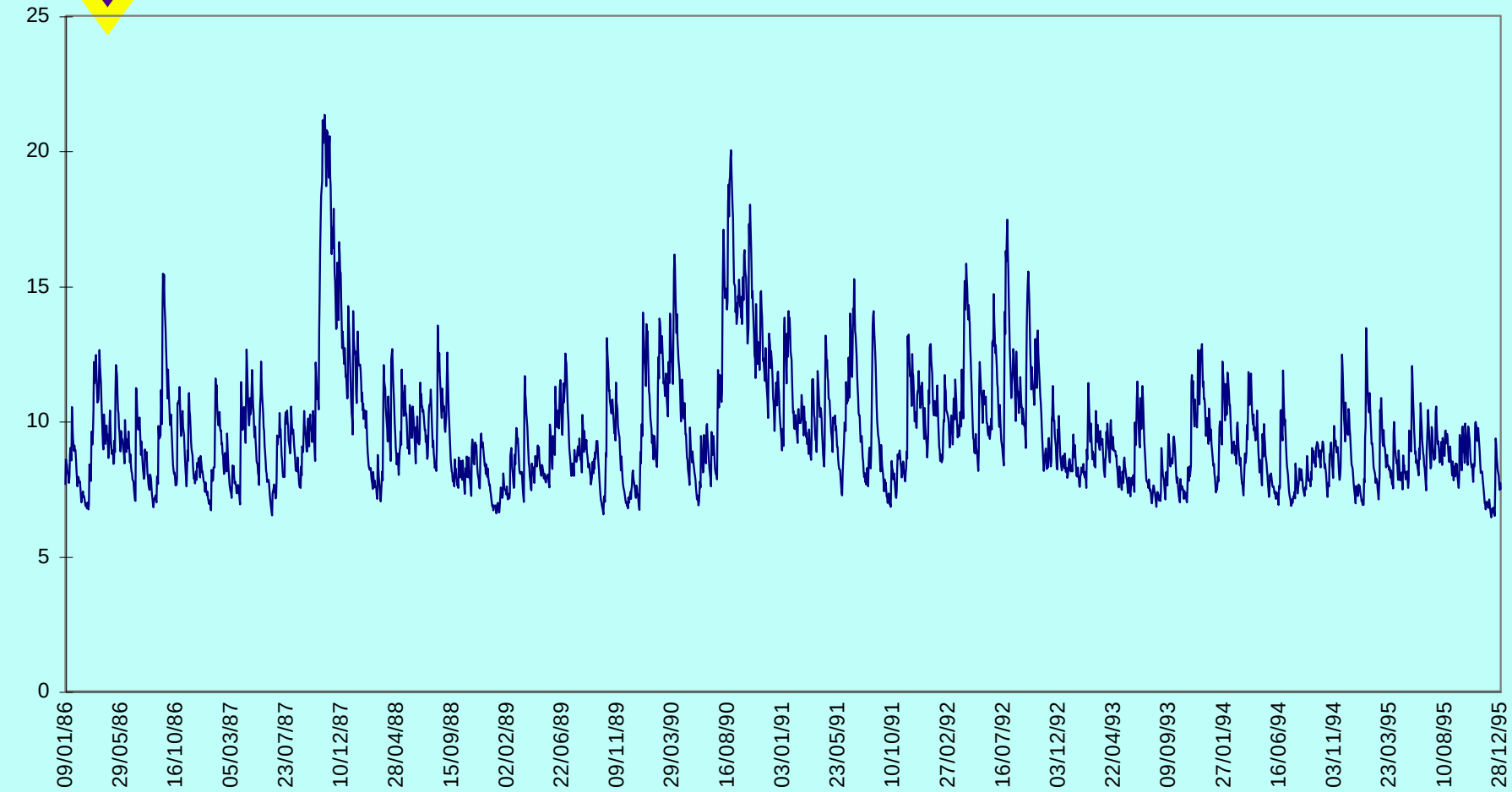
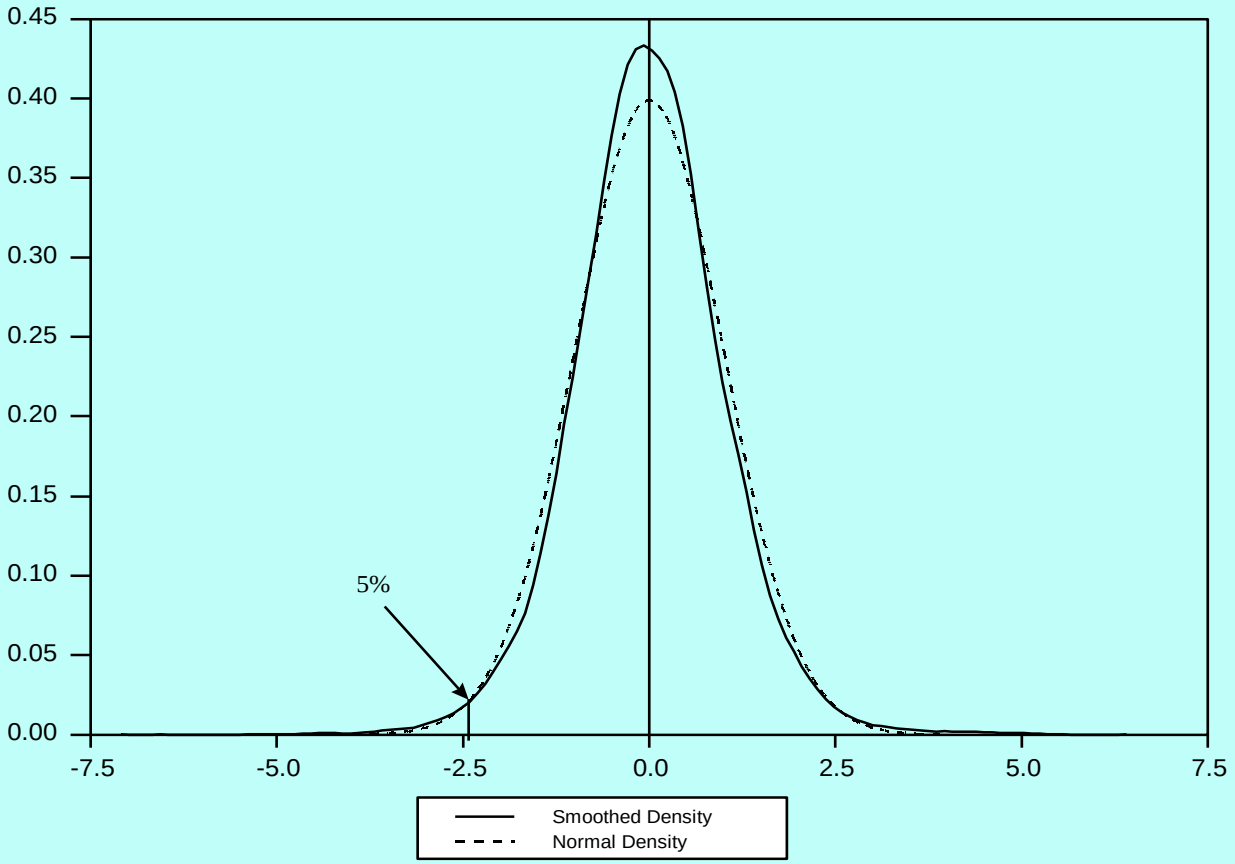
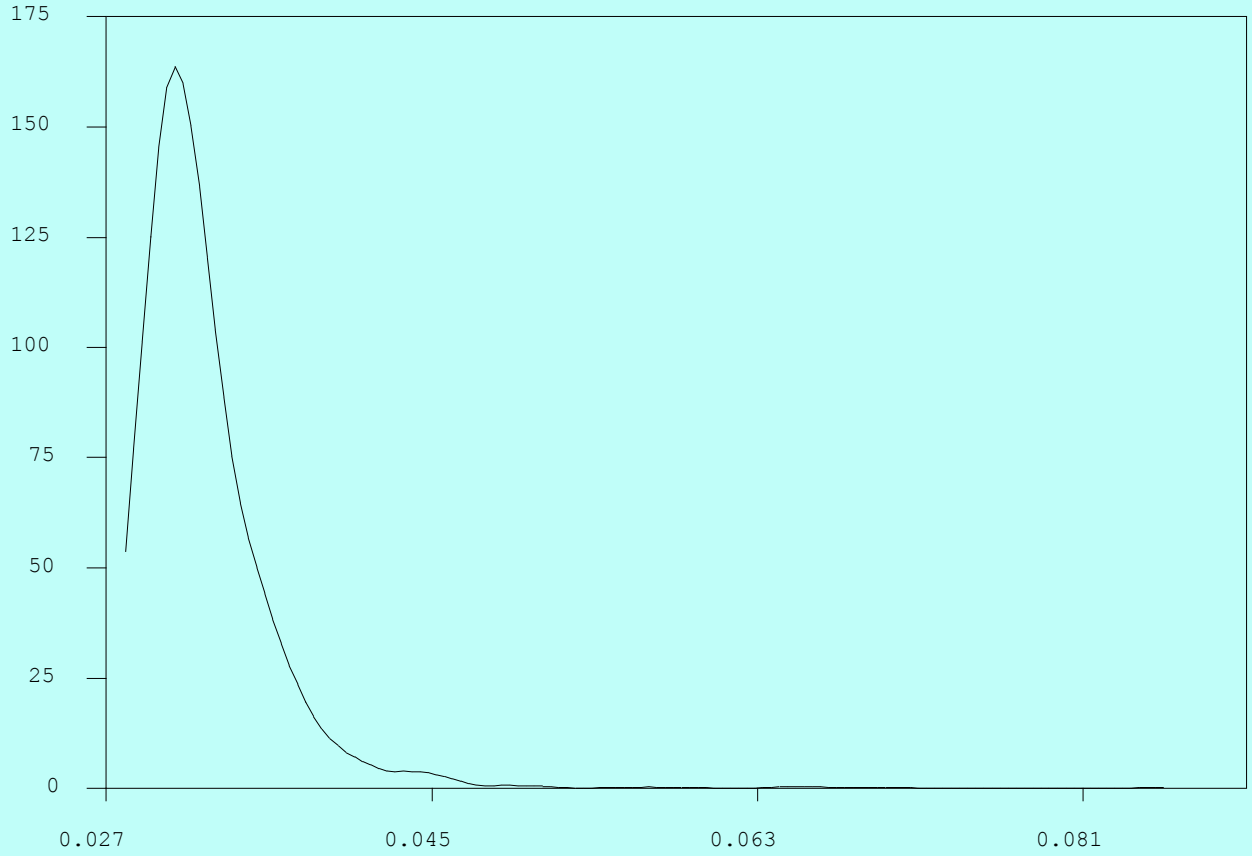
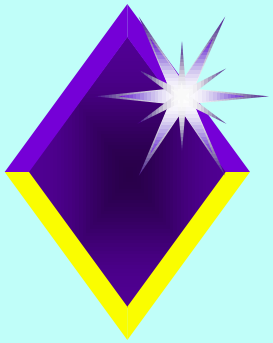


Fig 4 : Normalized Estimated Distribution of Returns in 10 days versus the normal density (10,000 Simulations)



Estimated empirical Distribution of portfolio Variance over next 10 days





Bootstrap simulation