



Figure 3.5 Rolling correlations of European stock markets.

function `rollc()` is defined first. Within this function the correlation matrix is calculated and, due to its symmetry, the upper triangular part thereof is extracted. The computation of the rolling correlations is then performed with the function `rollapply()` contained in **zoo**. The plots of these correlations are fairly similar for all pairs portrayed, as are their ranges. For the DAX/CAC the correlation ranges between 0.505 and 0.838, for the DAX/FTSE the values are between 0.42 and 0.749, and lastly for the CAC/FTSE the correlation is in the interval 0.451 to 0.76.

## 3.2 Implications for risk models

The stylized facts for univariate and multivariate financial returns have been given in the previous section. With respect to risk models and the risk measures derived from them the following normative requirements can be deduced so far:

- Risk models which assume iid processes for the losses are not adequate during all market episodes.
- Risk models that are based on the normal distribution will fall short in predicting the frequency of extreme events (losses).
- Risk models should be able to encompass and address the different volatility regimes. This means that the derived risk measures should be adaptive to changing environments of low and high volatility.
- In the portfolio context, the model employed should be flexible enough to allow for changing dependencies between the assets; in particular, the co-movement of losses should be taken care of.