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Nota di contenuto	Contents; Preface; Acronyms and Abbreviations; 1 Introduction; 1.1 Unobserved Components and Filters; 1.2 Independence, White Noise and Martingale Differences; 1.2.1 The Law of Iterated Expectations and Optimal Predictions; 1.2.2 Definitions and Properties; 1.3 Volatility; 1.3.1 Stochastic Volatility; 1.3.2 Generalized Autoregressive Conditional Heteroscedasticity; 1.3.3 Exponential GARCH; 1.3.4 Variance, Scale and Outliers; 1.3.5 Location/Scale Models; 1.4 Dynamic Conditional Score Models; 1.5 Distributions and Quantiles; 1.6 Plan of Book; 2 Statistical Distributions and Asymptotic Theory 2.1 Distributions 2.1.1 Student's t Distribution; 2.1.2 General Error Distribution; 2.1.3 Beta Distribution; 2.1.4 Gamma Distribution; 2.2 Maximum Likelihood; 2.2.1 Student's t Distribution; 2.2.2 General Error Distribution; 2.2.3 Gamma Distribution; 2.2.4 Consistency and Asymptotic Normality*; 2.3 Maximum Likelihood Estimation; 2.3.1 An Information Matrix Lemma; 2.3.2 Information Matrix for the First-Order Model; 2.3.3 Information Matrix with the $\theta = x' \theta$ Parameterization*;

2.3.4 Asymptotic Distribution; 2.3.5 Consistency and Asymptotic Normality\*; 2.3.6 Nonstationarity  
 2.3.7 Several Parameters  
 2.4 Higher Order Models; 2.5 Tests; 2.5.1 Serial Correlation; 2.5.2 Goodness of Fit of Distributions; 2.5.3 Residuals; 2.5.4 Model Fit; 2.6 Explanatory Variables; 3 Location; 3.1 Dynamic Student's t Location Model; 3.2 Basic Properties; 3.2.1 Generalization and Reduced Form; 3.2.2 Moments of the Observations; 3.2.3 Autocorrelation Function; 3.3 Maximum Likelihood Estimation; 3.3.1 Asymptotic Distribution of the Maximum Likelihood Estimator; 3.3.2 Monte Carlo Experiments; 3.3.3 Application to U.S. GDP; 3.4 Parameter Restrictions\*  
 3.5 Higher Order Models and the State Space Form\*  
 3.5.1 Linear Gaussian Models and the Kalman Filter; 3.5.2 The DCS Model; 3.5.3 QARMA Models; 3.6 Trend and Seasonality; 3.6.1 Local Level Model; 3.6.2 Application to Weekly Hours of Employees in U.S. Manufacturing; 3.6.3 Local Linear Trend; 3.6.4 Stochastic Seasonal; 3.6.5 Application to Rail Travel; 3.6.6 QARIMA and Seasonal QARIMA Models\*; 3.7 Smoothing; 3.7.1 Weights; 3.7.2 Smoothing Recursions for Linear State Space Models; 3.7.3 Smoothing Recursions for DCS Models; 3.7.4 Conditional Mode Estimation and the Score; 3.8 Forecasting  
 3.8.1 QARMA Models  
 3.8.2 State Space Form\*; 3.9 Components and Long Memory; 3.10 General Error Distribution; 3.11 Skew Distributions; 3.11.1 How to Skew a Distribution; 3.11.2 Dynamic Skew-t Location Model; 4 Scale; 4.1 Beta-tttt-EGARCH; 4.2 Properties of Stationary Beta-tttt-EGARCH Models; 4.2.1 Exponential GARCH; 4.2.2 Moments; 4.2.3 Autocorrelation Functions of Squares and Powers of Absolute Values; 4.2.4 Autocorrelations and Kurtosis; 4.3 Leverage Effects; 4.4 Gamma-GED-EGARCH; 4.5 Forecasting; 4.5.1 Beta-t-EGARCH; 4.5.2 Gamma-GED-EGARCH; 4.5.3 Integrated Exponential Models  
 4.5.4 Predictive Distribution

## Sommario/riassunto

The volatility of financial returns changes over time and, for the last thirty years, Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models have provided the principal means of analyzing, modeling and monitoring such changes. Taking into account that financial returns typically exhibit heavy tails - that is, extreme values can occur from time to time - Andrew Harvey's new book shows how a small but radical change in the way GARCH models are formulated leads to a resolution of many of the theoretical problems inherent in the statistical theory. The approach can also be applied to other aspects of volatility. The more general class of Dynamic Conditional Score models extends to robust modeling of outliers in the levels of time series and to the treatment of time-varying relationships. The statistical theory draws on basic principles of maximum likelihood estimation and, by doing so, leads to an elegant and unified treatment of nonlinear time-series modeling.