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Autore	Fouque Jean-Pierre
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4.2 Formal Regular and Singular Perturbation Analysis  
4.3 Parameter Reduction; 4.4 First-Order Approximation: Summary and Discussion; 4.5 Accuracy of First-Order Approximation; 5 Implied Volatility Formulas and Calibration; 5.1 Approximate Call Prices and Implied Volatilities; 5.2 Calibration Procedure; 5.3 Illustration with S&P 500 Data; 5.4 Maturity Cycles; 5.5 Higher-Order Corrections; 6 Application to Exotic Derivatives; 6.1 European Binary Options; 6.2 Barrier Options; 6.3 Asian Options; 7 Application to American Derivatives; 7.1 American Options Valuation under Stochastic Volatility  
7.2 Stochastic Volatility Correction for American Put  
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9.6 Markovian Jump Volatility Models; 9.7 Multidimensional Models; 10 Around the Heston Model; 10.1 The Heston Model; 10.2 Approximations to the Heston Model; 10.3 A Fast Mean-Reverting Correction to the Heston Model; 10.4 Large Deviations and Short Maturity Asymptotics; 11 Other Applications; 11.1 Application to Variance Reduction in Monte Carlo Computations; 11.2 Portfolio Optimization under Stochastic Volatility; 11.3 Application to CAPM Forward-Looking Beta Estimation; 12 Interest Rate Models; 12.1 The Vasicek Model; 12.2 The Bond Price and its Expansion  
12.3 The Quadratic Model

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## Sommario/riassunto

Building upon the ideas introduced in their previous book, *Derivatives in Financial Markets with Stochastic Volatility*, the authors study the pricing and hedging of financial derivatives under stochastic volatility in equity, interest-rate, and credit markets. They present and analyze multiscale stochastic volatility models and asymptotic approximations. These can be used in equity markets, for instance, to link the prices of path-dependent exotic instruments to market implied volatilities. The methods are also used for interest rate and credit derivatives. Other applications considered include variance-reduction techniques, portfolio optimization, forward-looking estimation of CAPM 'beta', and the Heston model and generalizations of it. 'Off-the-shelf' formulas and calibration tools are provided to ease the transition for practitioners who adopt this new method. The attention to detail and explicit presentation make this also an excellent text for a graduate course in financial and applied mathematics.

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