BERGISCHE UNIVERSITÄT
WUPPERTAL
GAUSS-STRASSE 20
42119 WUPPERTAL
TELEFAX (0202) 439-2901
TELEFON (0202) 439-0
WWW www.uni-wuppertal.de

Fachbereich C
MATHEMATIK UND NATURWISSENSCHAFTEN
Mathematik
Lehrstuhl für Ang. Mathematik/Numerik

Univ.-Prof. Dr. Matthias Ehrhardt

ehrhardt@math.uni-wuppertal.de
http://www-num.math.uni-wuppertal.de

Bergische Universität Wuppertal
Gaußstraße 20, 42119 Wuppertal

DATUM	8. Juli 2014
GESPRÄCHSPARTNER	Matthias Ehrhardt
AKTENZEICHEN	—
TELEFON	(0202) 439-3361
TELEFAX	(0202) 439-3668
GEBÄUDE	G
EBENE	14
RAUM	02

Faculty of Mathematics, Physics and Informatics
Comenius University
Referát doktorandského štúdia
Mlynská dolina F2, 842 48 Bratislava
Slovakia

8. Juli 2014

Report on Habilitation of Dr. Beata Stehlikova

To whom it may concern

thanks for inviting me to provide a report on the habilitation thesis of Dr. Beata Stehlikova entitled

APPROXIMATE ANALYTICAL SOLUTIONS IN SHORT RATE MODELS.

This very well-written habilitation thesis is concerned with stochastic differential equations describing so-called short rate models and later the pricing of financial derivatives by solving parabolic partial differential equations (PDEs). The thesis is based on 6 scientific papers.

After an introductory part providing the necessary basic definitions in chapter 1, Dr. Beata Stehlikova presents her own research results (in chapter 2 and 3) on approximate analytical solutions for the bond prices for the established Chan-Karolyi-Longstaff-Sanders (CKLS) model. Next, she started from the approximation formula of Choi and Wirjanto and added further terms for increasing the accuracy. Additionally, she derived a corresponding approximation based on the Vasicek model which has a simple form, i.e. more suitable for calibration purposes.

In an analytic work she proved the uniqueness of the solution in certain cases of the bond pricing equation in the CKLS model. And in a more modelling related manuscript Dr. Beata Stehlikova studies a PDE with 2 space dimensions that describes the domestic and union short rates, e.g. of Slovakia and the EU before entering the monetary union. Later this is generalized in the CKLS modelling framework.

For practical calibration purposes, a simple procedure for the CKLS model is proposed using simply an optimization of a one-dimensional problem. This idea is demonstrated for the Vasicek model and for the 2D model using real market data before the adoption of the Euro currency by Slovakia.

Furthermore, by considering the time as a small parameter and approximations in stochastic volatility models she discusses general procedures for a one-factor model. Dr. Beata Stehlikova determines the first three terms of the expansion using the averaging with respect to the invariant distribution.

Also, Dr. Beata Stehlikova was extremely active in supervising master theses; she successfully supervised 6 theses in the research fields of *Convergence models, modelling interest rates before entering a monetary union, Estimating short rate from term structures, Fast time scale of volatility.*

To conclude i strongly recommend the habilitation thesis of Dr. Beata Stehlikova to be accepted.

Sincerely yours,

Matthias Ehrhardt

Prof. Dr. Matthias Ehrhardt
Fachbereich C
Angewandte Mathematik/
Numerische Mathematik
Bergische Universität
42097 Wuppertal