**Figures**: The optimal volatility surface obtained for S&P 500 index European call options in October 1995. $S_0 = \$ 590$, $r = 0.06$, $q = 0.0262$. Note: the available maturities are plotted on the $T$ axis in unit of years.
Figure: The optimal volatility surface obtained for S&P 500 index European call options in October 1995 (Coleman et al. (1999)). $S_0 = 590, r=0.06, q=0.0262$. Note: the available maturities are plotted on the $T$ axis in unit of years.
**Figure:** Left: The prices of S&P 500 index European call options in October 1995 (Andersen and Brotherton-Ratcliffe (1998)). Right: The relative errors of computed option prices with respect to observed price.
Figure: The optimal local volatility surface reconstructed before applying any regularization for S&P 500 index European call options in October 1995
Test3: Foreign exchange European options

Figure: The optimal volatility surface obtained for European call options of US dollar/Deutsche mark rate. The spot price was $S_0 = 1.48875$; US dollar interest rate was $r_{US} = 5.91\%$; Deutsch mark rate was $r_{Deutschmark} = 4.27\%$.

Figure: Left: The prices of European call options of US dollar/Deutsche mark rate (Avellaneda et al. (1997)). Right: The relative error of computed option price with respect to observed price.
Test4 : Foreign exchange European options

**Figure:** The optimal volatility surface obtained for European call options of euro/US dollar rate on Mar 18, 2008. The spot price was 1.5755; US dollar interest rate was $r_{USD} = 2.485\%$; euro interest rate was $r_{EUR} = 4.550\%$.

**Figure:** Left: The prices of European call options of euro/US dollar rate (Turinici (2009)). Right: The relative error of computed option price with respect to recovered price.
Truncation level

- The only parameter that’s subject to change
- The higher the truncation level, the more oscillatory of the volatility surface
- Robust for truncation levels in the interval $(0, 0.90\%)$. Optimal volatility surface and relative errors do not change significantly when the truncation level is in this interval

Scaling

All the spot prices are scaled to 100

- All different kinds of European options are changed into just one problem
- For options in the Foreign exchange market, relative errors can be reduced

CPU time

407, 166, 12, 59 seconds respectively using a Dell Vostro 1720 with Intel Core Duo CPU @2.2G HZ and 2GB RAM. For the first numerical test, to reach high accuracy, no
Thank you!


