The aim of this communication is to present a theoretical model for the pricing of guaranteed annuity conversion options associated with certain deferred annuity pension-type contracts in the UK.

A guaranteed annuity option provides the holder of the contract the right to either receive at retirement a cash payment or receive an annuity which would be payable throughout his/her remaining lifetime and which is calculated at a guaranteed rate, depending on which has the greater value. This guarantee was a common feature of pension policies sold in the UK during the 1970s and 1980s.

Until recently, the cash benefit was more valuable than the guaranteed annuity option since a higher pension could be obtained by applying the cash on the best annuity rates available in the market. After the reduction in the level of market interest rates over recent years, and particularly since 1998, the position has become reversed and the guaranteed annuity option is now usually worth more than the cash benefit. Improvements in mortality rates since these options were issued have also made them more valuable to policyholders, and many insurance companies have experienced solvency problems as a result of these two combined effects, requiring the setting up of extra reserves and leading one large life insurer to be closed to new business.

The proposed model exploits the traditional option valuation procedure in order to provide indications in terms of pricing, reserving and hedging of the guaranteed annuity option contract. The option pricing approach to valuation of these guarantees is based on

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the similarity between the payoff structure of the contract under consideration and a call option written on a coupon-bearing bond. In particular, the model makes use of a one-factor Heath-Jarrow-Morton framework for the term structure of interest rates and, under the additional assumption of an unsystematic mortality risk, independent of the financial risk, a closed analytical formula for the value of the guaranteed annuity option can be obtained. The pricing formula derived implicitly contains the dynamic investment strategy that replicates the contract. The sensitivity of the price of the option to changes in the key parameters is also investigated.

The model is then extended to incorporate in the Guaranteed Annuity Option value also stochastic mortality trends, which are modeled via a mean-reverting Brownian Gompertz process.