Dipartimento di Scienze Economiche e Statistiche

Convegno MAF 2006

Metodi Matematici e Statistici per le Assicurazioni e la Finanza

11, 12, 13 Ottobre 2006
Università degli Studi di Salerno

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Programma del Convegno

Wednesday, October 11th

9.30 - 11.00 Registration and welcome

11.00 – 11.30 Opening

11.30 – 12.45 ORGANIZED SESSION 1
(Multi)fractional models for financial dynamics
Chair and Guest Organizer: Bianchi S.

Bianchi S., Pianese A.
Scaling Laws in Stock Markets.An analysis of prices and volumes

Cerqueti R., Rotundo G.
Dynamics of financial time series in an inhomogeneous aggregation framework

Corazza M., Nardelli C.
A fractional differo-integral approach for fractal compound financial laws

Resta M.
On the informative content of dynamic Hurst exponents: a comparison among different techniques

12.45 – 14.00 Lunch

14.00 – 14.45 Keynote lecture
Chairman: Sibillo M.

Barone Adesi G.
Università della Svizzera Italiana
GARCH options in incomplete markets

14.45 – 16.00 CONTRIBUTED SESSION 1
Financial duration and immunization strategy
Chair: Bacinello A.

De La O Gonzalez M., Diaz A., Navarro E.
Testing contingent immunization: evidence from the Spanish treasury market

De Luca G., Rivieccio G., Zuccolotto P.
Exploring the copula approach for the analysis of financial durations

Díaz A., Tolentino M.
Risk measures for bonds with embedded options from different consistent term structure of interest rates models

Jareño F., Navarro E.
Stock Duration and Inflation Shocks

16.00-17.00 ORGANIZED SESSION 2
Tecniche parametriche e non parametriche nell'analisi di dati finanziari
Chair and Organizer: Pizzi C.

Bonollo M., Provedel A., Bissaro A.
The Market Parameters Management from Front Office to Back Office Software Systems: Methodology, Application features, Solutions

Cavaliere G.
Volatility breaks and persistence in financial time series

Mancuso D.
Support vector machines per la regressione: una applicazione al mercato mobiliare italiano

17.00 – 17.15 Coffee break

17.15 - 18.30 CONTRIBUTED SESSION 2
Time series models in finance
Chair: Battaglia F.

Amendola A., Niglio M., Vitale C.
Least square predictors for threshold models: properties and forecast evaluation

Bordignon S., Raggi D.
Inference for Stochastic Volatility models: a sequential approach

Starica C., Ferulano R.
Previsione di volatilità: un nuovo approccio non-parametrico

Zirilli F.
Maximum likelihood estimation of the Heston stochastic volatility model using asset and option prices

20.00 Jazz Orchestra of the University of Salerno in concert

Thursday, October 12th

9.00 – 9.45 Keynote lecture
Chairman: La Rocca M.

Wolf M.
University of Zurich
Multiple Testing Based on Generalized Error Rates with an Application to Hedge Fund Evaluation

9.45 – 10.00 Coffee break

10.00 – 11.15 ORGANIZED SESSION 3
Actuarial models for valuation and management of insurance risk
Chair and Guest Organizer: De Angelis P.

Fortunati A.
Metodi numerici per la solvibilità dei Fondi Pensione

Baione F.
Obbligazioni strutturate collegate allo smontamento delle riserve sinistri

Levantesi S., Menzietti M.
A biometric risks analysis in Long Term Care Insurance

Campana C., Ferretti P.
On Bounds for Concave Distortion Risk Measures for Sums of Risks

11.15– 12.45 CONTRIBUTED SESSION 3
Quantitative tools in economics
Chair: Canestrelli E.

	Acciaio B. *Optimal Risk Sharing with Non-Monotone Monetary Functions*
	Cerqueti R., Costantini M. *Speculative bubbles under cross sectional dependence*
	Faggini M. *Analysis of Economic Fluctuations: a contributions from Chaos Theory*
	La Torre D. *Approximating by iterated function systems and iterated multifunction systems*
	Salzano M. *Large events analysis and tools for economic policy*
12.45 – 14.00	Lunch
14.00 – 15.15	CONTRIBUTED SESSION 4 ***Mathematical and statistical methods for financial choices*** Chair: Pianca P.
	Barro D., Canestrelli E., Ciurlia P. *Optimal scenario tree reduction for financial optimization problems*
	Fini M., La Torre D. *Robustness by generalized Influence Functions: a new approach*
	Nardon M., Pianca P. *Monte Carlo simulation of generalized Gaussian densities*
	Vistocco D. *On the Use of Quantile Regression for Financial Portfolios' Style Analysis*
15.15 – 16.15	CONTRIBUTED SESSION 5 ***Multivariate analysis in finance and insurance*** Chair: Amendola A.
	Baragona R., Battaglia F. *New proposals in multivariate outliers identification*
	Giordano G., Russolillo M., Haberman S. *Comparing mortality trends via Lee Carter method in the framework of multidimensional data analysis*
	Grilli L., Russo M.A. *Decision Making in Financial Markets by Means of a Multivariate Ordering Procedure*
16.15 – 16.30	Coffee break
16.30 – 17.45	CONTRIBUTED SESSION 6 ***Premiums and reserves*** Chair: Di Lorenzo E.
	Cardin M., Pacelli G. *On characterization of convex premium principles*
	Cerchiara R.R. *Fast fourier transform, extreme value theory e simulazione nell'analisi della dipendenza tra normal e large claims di una compagnia di assicurazioni danni*
	Coppola M., D'Amato V., Sibillo M. *The fair value of the insured loan portfolio scheduled at variable interest rates*
	D'Ortona N.E. *Il metodo di Fisher e Lange per la stima della riserva sinistri*
20.30	Social Dinner

Friday, October 13th

9.00 – 10.00	ORGANIZED SESSION 4 ***Options and choices for the beneficiaries of pension and insurance products*** Chair and Guest Organizer: Olivieri A.
	Bacinello A.R. *A full Monte Carlo approach to the valuation of the surrender option embedded in life insurance contracts*
	Belloni M. *Retirement choices in Italy: what an option value model can tell us*
	Pitacco E. *Funding post-retirement income*
10.00 – 10.15	Coffee break
10.15 – 11.15	CONTRIBUTED SESSION 7 ***Financial and pension funds*** Chair: Pitacco E.
	Lisi F., Corazza M., Bernardi D. *Metodi quantitativi per la gestione automatica di fondi comuni*
	Martinelli F., Astolfi G., Marafin S. *Fixed Income Performance Attribution Models*
	Otranto E., Trudda A. *Classifying the Italian pension funds via GARCH distance*
11.15 – 12.45	CONTRIBUTED SESSION 8 ***Financial markets*** Chair: Navarro E.
	Centanni S., Minozzo M. *Modeling ultra-high-frequency data: the S&P 500 future index*
	Corazza M., Malliaris A.G., Scalco E. *Non-linear modellization of bivariate asset prices comovements and applications*
	Díaz A., Jareño F. *Inflation news and stock returns: a sectorial analysis of the Spanish case*
	Ferrer R., Gonzalez C., Jorda P. *Financial Integration of the Spanish Mortgage Market and Capital Markets*
	Giordano F., Parrella M.L. *Le reti neurali per la scelta della finestra nella stima nonparametrica di derivate*
12.45 – 14.00	Lunch
14.00 – 15.15	CONTRIBUTED SESSION 9 ***Capital management in insurance business*** Chair: Corazza M.
	Bisignani R., Masala G., Micocci M. *Economic capital management for insurance companies using conditional value at risk and a copula approach*
	Cerrone R., Di Tommasi E. *Adeguatezza patrimoniale e controllo dei rischi nelle compagnie di assicurazione:il progetto Solvency II*

Cocozza R., Di Lorenzo E., Orlando A., Sibillo M.
A liability adequacy test for mathematical provision

Orlando A., Politano M.
Further Remarks on Risk Profiles for Life Insurance Participating Policies.

15.15 Closing

Scarica Programma MAF2006

A liability adequacy test for mathematical provision

Rosa Cocozza,[*] Emilia Di Lorenzo,[†]
Albina Orlando,[‡] Marilena Sibillo[§]

In a fair valuation context, let us introduce two probability spaces $(\Omega, \mathcal{F}', P')$, $(\Omega, \mathcal{F}'', P'')$, where $\mathcal{F}'$ and $\mathcal{F}''$ are the σ-algebras containing, respectively, the *financial events* and the *life duration events*. Given the independence of the mortality fluctuations on the interest rates randomness, we denote by $(\Omega, \mathcal{F}, P)$ the probability space canonically generated by the preceding two. $\mathcal{F}$ contains the information flow about both mortality and financial history, represented by the filtration $\{\mathcal{F}_k\} \subseteq \mathcal{F}(\mathcal{F}_k = \mathcal{F}'_k \cup \mathcal{F}''_k$ with $\{\mathcal{F}'_k\} \subseteq \mathcal{F}'$ and $\{\mathcal{F}''_k\} \subseteq \mathcal{F}'')$.

Assuming a frictionless market, with continuous trading, no restrictions on borrowing or short-sales, the zero-bond and the stocks being both infinitely divisible, the fair value of the reserve at time t of a portfolio of life insurance contracts - with obvious meaning of the symbol $\mathcal{F}_t$- is given by

$$V_t = E\left[\sum_{r>t} CF_r v(t,r)/F_t\right], \qquad (1)$$

where $v(t,r)$ is the present value at time t of one monetary unit due at time r, CF_r is the net cash flow at time r, and E represents the expectation under the risk-neutral probability measure, whose existence derives by well known results, based on the completeness of the market.

With respect to the demographic risk context, given that the demographic valuation is not supported by the hypotheses of completeness of the market, the current valuation can be represented by means of the expectation consistently with the best prediction of the demographic scenario. In a general perspective, a fair valuation procedure involves the latest information on the two main factors bringing risk to the business, properly interest rates and mortality (see [CDLOS]).

Formula (**??**) can be easily specialised in the case of a portfolio of different life annuities with benefits payable at the beginning of each period. In this case we split the portfolio in m homogeneous sub-portfolios characterized by common aspects, that is age at issue, policy duration, payments, deferment period, etc.

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Let us introduce the following notations:

$$n = \text{maximum term for all contracts},$$

$$S_{i,r} = \text{number of survivors at time } r \text{ of the insureds of the } i\text{-th group},$$

$$L_i = \text{constant annual benefit for each contract of the } i\text{-th group},$$

$$P_{i,r} = \text{premium paid at time } r \text{ for each contract of the } i\text{-th group},$$

$$T_i = \text{deferment period } (T_i = 0, 1, \ldots),$$

$$\tau_i = \text{premium payment period } (0 \leq \tau_i < T_i).$$

Hence formula (**??**) becomes

$$V_t = E\left[\sum_{r=t+1}^{m}\sum_{i=1}^{m}\left[S_{i,r}\left(L_i \mathbf{1}_{(n_i \geq r)\wedge(r \geq T_i)} - P_{i,r}\mathbf{1}_{(n_i \geq r)\wedge(r<\tau_i)}\right)\right] v(t,r)/F_t\right], \tag{2}$$

where the indicator function $\mathbf{1}_{(n_i \geq r)\wedge(r \geq T_i)}$ takes the value 1 if $n_i \geq r$ and $r \geq T_i$, 0 otherwise, whilst the indicator function $\mathbf{1}_{(n_i \geq r)\wedge(r<\tau_i)}$ takes the value 1 if $n_i \geq r$ and $r < \tau_i$, 0 otherwise.

Formula (**??**) is framed in a *forward* perspective, within a current valuation provided at the initial position in 0. Analogously this formula can be re-interpreted in a *spot* perspective, according to a year by year valuation, that is providing the current value of the reserve at the end of the year, valued at the beginning of the year itself (cf. [CDLOS]).

In a solvency assessment perspective, models involving the so-called *quantile reserve* play a fundamental role because of their specific links to the *Value-at-Risk*.

Indicating by $R(t)$ the financial position at time t, that is, in this case, the stochastic mathematical provision of a portfolio of contracts, the quantile reserve at confidence level α $(0 < \alpha < 1)$, is the value $R^*_\alpha(t)$ implicitly defined by the following equation:

$$P\{R(t) > R^*_\alpha(t)\} = 1 - \alpha. \tag{3}$$

Moreover, considering the time interval $[t, t+h]$ and the financial positions at its extremes, say $r(t)$ and $R(t+h)$ respectively, the potential periodic loss is defined as (Teugels et al. 2002):

$$L = r(t) - R(t+h), \tag{4}$$

therefore at confidence level α, the Value-at-Risk $VaR(\alpha)$ is given by:

$$P\{L > VaR(\alpha)\} = 1 - \alpha \Leftrightarrow VaR(\alpha) = F^{-1}(\alpha), \tag{5}$$

F being the cumulative distribution function of $R(t)$.

In this section we propose a simulation procedure to quantify the VaR of two homogeneous portfolios of deferred life annuities. For sake of simplicity, the valuation of the financial instruments composing the ZCB portfolio will be made assuming a term structure of interest rates based on a square root CIR process:

$$dr_i = -\alpha(r_i - \mu)dt + \sigma\sqrt{r_i}dW_t,$$

with α and σ positive constants, μ the long term mean and W_t a Wiener process.

Referring to the mortality scenario, in a fair valuation estimating framework, we consider a marking-to-model system for the demographic quantities. We assume that the best prediction for the time evolution of the surviving phenomenon is represented by a fixed set of survival probabilities, estimated taking into account the improving trend of mortality rates (best estimate).

For each portfolio, we simulate 100000 values of the potential periodic loss L defined in §2. The simulated $\{L(j)\})$, $j = 1, 2, \ldots, 100000$ can be treated as a sample from a normal distribution (cf. [CDLOS]), which we use to estimate the VaR. The results obtained for a portfolio of 1000 deferred 15-years temporary unitary life annuities (deferment period $T = 5$), for policyholders aged 30 at issue. Periodic premiums are paid at the beginning of each year of the deferment period.

We compute the VaR , during the deferment period. We frame the calculation within a spot perspective, according to a year by year valuation.

Under the above hypothesis about survival and rates, we present the results obtained for a portfolio of 1000 deferred 10-years temporary unitary life annuities.

Tables supplying the maximum future net carrying amount of the final reserve within a set confidence interval will be provided.

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