ELEC9450: Engineering Finance
UNSW EE&T - Session II 2003 - Prof V Solo

1. AIMS, CONTENT

Aims
The course aims to provide a solid but understandable treatment of derivative pricing and the mathematics behind it, but from an 'Engineering' point of view. Spreadsheet software will be used for illustration and exercises. There will(?) be some guest lectures from experts.

Prerequisites
Undergraduate courses in probability and preferably third year level mathematics

Content

(I) - Finance background
Futures, Options, Swaps. Futures pricing, Term Structure of Interest rates, Arbitrage.

(II) - Random Process background
Limits, Markov processes, Kolmogorov forward and backward equations, Brownian motion, Ito calculus.

(III) - Derivate Pricing

(a) - Core Material
Option pricing (including American options) - binomial tree and its limiting forms. and risk neutral pricing.

(b) - Applications
Stock indices, currency exchange, futures on various instruments.

(c) - Other topics.
Empirical issues, volatility smile , numerical issues.

2. ASSESSMENT

Assignments: three or four (total 60%)
Late assignments will be penalised.

Exam: A final exam (40%)

3. BOOKS

These *selected* resources relate to derivatives hedging and pricing rather than general securities or financial econometrics.

Aside from some popular background (and some knowledge of Economics) three levels are distinguished:

UGF - Undergraduate finance level (car driving)

PGF - Postgraduate finance level (car maintenance)

PGM - Postgraduate mathematics level (car design)

Beware then of motorcar or aeroplane illusion!

Background :
(English 1997) gives intelligent layman's view of securities markets.
(F Partnoy 1997), F.I.A.S.C.O. Account of life as a derivatives trader complete with nutshell expose' of derivatives and explanations of the big failures.

UGF : •=on reserve
•(Chance 1998) (P332.645/65).
•(Elton & Gruber 1995) covers related topics (S332.6/79).
•(Sherris 1996) (S332.632/23).

PGF :
(Hull 2000) - standard text
(Jarrow & Turnbull 1996) - has more on interest rate models than (Hull 2000).
(Ritchken 1996) - very readable.

PGM :
(Baxter & Rennie 1996) - stochastic; but nonrigorous like treatment; written by probabilist.
(Neftci 1996) - stochastic: continuous time - lacks intuition.
(Pliska 1997) - stochastic: rigorous but readable development.
(Wilmott, Howison & Dewynne 1995) - pdes: takes applied maths route; quite readable.
•(Wilmott 1998) - Comprehensive - readable (S332.645/86).

Random Processes
There are many books. But useful (undergrduate level) are:
(Bhat 1984)- introductory
(Cox & Miller 1965) - more advanced

4. JOURNALS

There are many - see (Chance 1998) Appendix I.
Risk is perhaps the premier discipline magazine.

5. DATA/INFORMATION SOURCES

Financial Review has options listings and occasional articles
The Economist has occasional articles
See also (Chance 1998) Appendix I.

6. SOFTWARE

The textbooks are starting to include software e.g. (Chance 1998),(Jarrow & Turnbull 1996),(Hull 2000), but bigger packages are also available (e.g. Wilmott's company).

In this course we use MATLAB and sometimes spreadsheets. Although MATLAB has a finance toolbox almost all the mfiles in that toolbox are very basic and not useful for this course.

7. WEBSITES

There are many - see:

(1) Chance's website at VPI
(http://www.cob.vt.edu/finance/faculty/dmc)
(2) NEMMCO - manger of Australian Electricity Market
(http://www.nemmco.com.au)
(3) Sydney Futures exchange - http://www.sfe.com.au/

8. GLOSSARY

Glossary starting on page 755 of (Chance 1998) has 21 pages! But one can make a lot of progress with a smaller vocabulary!

9. LECTURE TIMES -SPECIAL ARRANGEMENTS

Most lectures will be Wednesdays 6pm-9pm.

However due to research commitments there will be no lectures in some weeks and also it may be necessary to deliver all the lectures in less than 14 weeks.

Thus some lectures will be held at alternative times e.g. Friday nights and weekends. Details to be announced.

10. REFERENCES

Baxter, M. & Rennie, A. (1996), *Financial Calculus*, Cambridge University Press, Cambridge.

Bhat, U. N. (1984), *Elements of Applied Stochastic Processes*, J Wiley, New York.

Chance, D. M. (1998), *An Introduction to Derivatives (4th ed.)*, Dryden Press, New York.

Cox, D. & Miller, H. (1965), *The theory of Stochastic Processes*, Chapman and Hall, London.

Elton, E. J. & Gruber, M. J. (1995), *Modern Portfolio Theory*, J Wiley, New York.

English, J. (1997), *Australian Stockmarket Investor*, Allen and Unwin, Sydney.

Hull, J. C. (2000), *Options Futures and other Derivative Securities (4th ed.)*, Prentice Hall, New York.

Jarrow, R. S. & Turnbull, S. (1996), *Derivative Securities*, South Western College Publishing, Cincinnati.

Neftci, S. N. (1996), *An Introduction to the Mathematics of Financial Derivatives*, Academic Press, New York.

Pliska, S. R. (1997), *Introduction to Mathematical Finance: discrete time*, Blackwell, London.

Ritchken, P. (1996), *Derivative Markets: Theory , Strategy and Applications*, Harper Collins, New York.

Sherris, M. (1996), *Money and Capital Markets: Pricing, Yields and Analysis (2nd ed.)*, Allen and Unwin, Sydney.

Wilmott, P. (1998), *Derivatives: The theory and Practice of Financial Engineering*, J Wiley, New York.

Wilmott, P., Howison, S. & Dewynne, J. (1995), *The Mathematics of Financial Derivatives: A student Introduction*, Cambridge University Press, Cambridge, UK.