



Systemic Risk Centre

Masterclass Series

Tutor: Dr William T. Ziemba

Title: Static and Dynamic Portfolio Theory and Applications

Date: 29th May 2015

Venue: Tower 2

Masterclass Timetable

08:45 - 09:15 Registration

09:15 - 11:00 Fundamentals of static portfolio theory

Session 1a. Stochastic Dominance, risk aversion and basic portfolio theory

Is X more risky than Y?

Equivalence of second order stochastic dominance and mean variance.

Proof of the main result of mean-variance theory.

Mean preserving spreads and the equivalence of fatter tails, and expected utility theory.

Session 1b. Risk Aversion

What is risk aversion? How do we measure it?

Arrow-Pratt risk aversion indices.

Why is the mean the most important thing to get right in any portfolio allocation situation?

How does risk aversion affect portfolio choices?

Rubinstein's optimal risk aversion measure that is not estimable but we can approximate it with the average Arrow-Pratt risk aversion measure? Kallberg-Ziemba (1983) show how accurate this is and that you do not need utility functions just risk aversion values.

Brief summary of own-company pension plans. The ENRON disaster as an example of application of risk aversion and getting the mean right. [Handout of slides and paper to read]

Background reading: Hanoch and Levy (1969), Pratt (1964), Ziemba (2012, 2015), Chopra and Ziemba (1993), Douglass, Wu and Ziemba (2004). A very good treatment with reprints of many of these papers and others plus additional topics is in MacLean and Ziemba (2013). The presentation follows Ziemba (2015:155-167).

Exercise: Estimate your own utility function by both the certainty equivalence and gain and loss equivalence methods.

11:00 - 11:15 Break

11:15 - 13:15 Session 2. The Kelly capital growth investment criterion

The basic results that show its long run superiority over the wagering models.

Samuelson's criticisms and responses to them.

The good and bad properties.

Some applications.

Background reading: Intro in Ziemba and Ziemba (2013), MacLean et al (2011, 2010ab), Ziemba (2016)

13:15 - 14:15 Lunch

14:15 - 15:00 Session 3. InnoALM model

InnoALM multiperiod stochastic programming model for Siemens Austria Pension Fund-only consistently used model for pensions and regulators in Austria.

Why convex risk measures are preferred and safer than Value at Risk and C-Var and easier to understand.

Use of scenario dependent correlation matrices. Why an average correlation matrix as generally used even with stress simulations will not work as it cannot capture stocks down - bonds up in a stock market crash.

Formulation of InnoALM.

Results of the InnoALM.

Background reading: Geyer and Ziemba (2008), Ziemba (2007, 2013, 2015)

15:00 - 15:15 Break

15:15 - 16:30 Session 4a. Continuous time finance: intertemporal asset liability management

Basic model: extensions of Merton.

Four fund separation with liabilities.

Applications and limitations.

Extensions to assets with jumps.

Session 4b: Selecting Managers

Incentives and risk taking behavior in hedge funds: the evaluation of regular hedge funds.

What is the effect of the managers' stake in the fund on risk taking behavior.

What is the value of the call option on other people's money worth and how is risk taking affected as a function of how much the fund manager's own money is in the fund.

How to evaluate great investors: the downside symmetric Sharpe ratio.

- Buffett versus the Ford Foundation and other funds.
- Renaissance Medallion.
- The greatest funds: why they live and how they die.
- Recognizing a fraud fund.

Background reading: Benk (2012), Gergaud and Ziemba (2012), Kouwenberg and Ziemba (2007), Rudolf and Ziemba (2004), Ziemba (2005)

Handout of some problems from MacLean, Ziemba and Vickson (2016)

16:30 Close

Readings and reference material

- Benk, M. (2012) Intertemporal surplus management with jump risks Gassman, H. I. and W. T. Ziemba, *Stochastic Programming Applications in Finance, Energy and Production*, World Scientific, pp 69-95
- Chopra, V. and WT Ziemba (1993) The effect of errors in mean and co-variance estimates on optimal portfolio choice," *Journal of Portfolio Management*, (Winter): 6-11.
- Douglass, J., O. Wu and W T Ziemba (2004) Stock ownership decisions in defined contribution pension plans, *Journal of Portfolio Management* (Summer): 92-100.
- Geyer, A. and W.T. Ziemba (2008) The Innovest Austrian Pension Fund Planning Model InnoALM, *Operations Research* 56 (4); 797-810.
- Gergaud, O. and W.T. Ziemba (2012) Great investors: their methods, results and evaluation, *Journal of Portfolio Management* 38 (4):128-147.
- Hanoch, G. and H.Levy (1969) The efficiency analysis of choices under risk, *Review of Economic Studies* 36, 335–346.
- Kallberg, J.G., Ziemba, WT. (1983) Comparison of Alternative Utility Functions in Portfolio Selection Problems, *Management Science* XXIX: 1257-1276
- Kouwenberg, R. and W T Ziemba (2007) Incentives and risk taking in hedge funds, *Journal of Banking and Finance* 31: 3291-3310
- MacLean, L.C., Thorp, E.O., Zhao, Y., Ziemba, W.T. (2011) How does the Fortune's Formula-Kelly capital growth model perform? *Journal of Portfolio Management* 37(4):96-111
- MacLean, L.C., E. O. Thorp, Ziemba, W.T., (Eds) (2010a) *The Kelly Capital Growth Criterion: Theory and Practice*, World Scientific, (hardback) 2011 (paperback)
- MacLean, L.C., Thorp, E.O., Ziemba, W.T., (2010b) Long term capital growth: The good and bad properties of the Kelly and fractional Kelly capital growth criterion, *Quantitative Finance*, 681-687.
- MacLean, L and W T Ziemba, Eds. (2013) *Handbook of the Fundamentals of Financial Decision Making* (2 volumes), World Scientific
- MacLean, L, W T Ziemba and R Vickson (2016) *Problems in the Fundamentals of Financial Decision Making*, World Scientific
- Pratt, J. (1964) Risk aversion in the small and in the large, *Econometrica*, 32, 122-136
- Rudolf, M. and WT Ziemba (2004) Intertemporal Asset-Liability Management ,*Journal of Economic Dynamics and Control*, 28(4): 975-990
- Ziemba, RES and Ziemba, WT (2013). *Investing in the modern age*. World Scientific
- Ziemba (2003). *The Stochastic Programming Approach to Asset Liability and Wealth Management*, AIMR: Charlottesville, VA
- Ziemba, WT (2005) The symmetric downside risk Sharpe ratio and the evaluation of great investors and speculators, *Journal of Portfolio Management*, (Fall): 108-122
- Ziemba, W.T. (2007) The Russell Yasuda, InnoALM and related models for pensions, insurance companies and high net worth individuals in *Handbook of Asset and Liability Modeling*, Volume 2: *Applications and Case Studies*, S.A. Zenios, W.T. Ziemba (eds) in *Handbooks in Finance*, North Holland, 861-962.
- Ziemba, WT (2013) The case for convex utility measures, *Quantitative Finance Letters* 1:47-54
- Ziemba, WT (2015) Portfolio optimization: theory and practice, in K. Zopoundis (ed) *Quantitative Financial Risk Management: Theory and Practice*, The Frank Fabozzi Series, Wiley (in press), 57 pages
- Ziemba, W T (2016) A response to Professor Paul A Samuelson's objections to Kelly capital growth investing, *Journal of Portfolio Management* (in press)