Workshop in Quantitative Behavioural Finance
University of St. Gallen, December 14, 2012
Welcome

Behavioural finance has emerged as a new research field in finance applying psychology to financial decision making and financial markets. Starting from experimental findings from the psychology literature, behavioural finance has successfully addressed several observed anomalies concerning investors’ behaviour and asset prices.

However, behavioural finance still lacks a unified and rigorous formal framework which is able to combine psychological findings with the rich theoretical foundation of neoclassical finance. The development of a rigorous formal framework for behavioural finance is the main concern of quantitative behavioural finance.

We invited eight speakers who will discuss current developments in quantitative behavioural finance and will provide views on future challenges.

The workshop is free of charge, but places are limited.

You are welcome to register at http://www.mathstat.unisg.ch/wqbf.

We are looking forward to meeting you in St. Gallen.

Sincerely,

Enrico De Giorgi and Xunyu Zhou
## Program

### Schedule

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Presenter’s Abstracts

Hersh Shefrin: A Tale of Two Investors: Estimating Risk Aversion, Optimism, and Overconfidence
We combine two approaches to the pricing kernel, one empirical and one theoretical, which relax the restriction that the objective return distribution and risk neutral distribution share the same volatility and higher order moments. The empirical approach provides estimates for the evolution of the pricing kernel projection onto S&P 500 returns for the period 2002 through 2009. The theoretical approach provides a framework for extracting estimates of sentiment from the results of the empirical analysis, along with estimates of risk aversion and time preference. These estimates of sentiment turn out to be highly correlated with external measures such as the Baker-Wurgler sentiment index, the Yale/Shiller crash confidence index, and the Duke/CFO survey responses. We analyze the manner in which the three external measures reflect biases such as excessive optimism and overconfidence. Our analysis points out three significant issues related to overconfidence. The first issue is that the Baker-Wurgler sentiment index robustly reflects excessive optimism, but not the component of overconfidence that is uncorrelated with excessive optimism. The second issue is that overconfidence is strongly related to the presence of an upward sloping portion in the graph of the pricing kernel, a key feature of the “pricing kernel puzzle”. The third issue is that the time series properties of excessive optimism and overconfidence appear to generate a negative relationship between perceived risk and return.

Carole Bernard: Optimal Portfolios under Worst Case Scenarios
Standard portfolio theories such as Expected Utility Theory, Yaari’s Dual Theory, Cumulative Prospect Theory and Mean-Variance optimization all assume that investors only look at the distributional properties of strategies and do not care about the states of the world in which the cash-flows are received. Dybvig (1988a, 1988b) essentially showed that in these instances optimal portfolios are decreasing in the state price density, also pointing indirectly to the important role of diversified portfolios. In this paper we first observe that the worst outcomes for optimal strategies then exactly occur when the market declines (i.e. during a financial crisis), but this is at odds with the aspirations and requirements of many investors. Hence we depart from the traditional behavioural setting and study optimal strategies for investors who do not only care about the distribution of wealth but, additionally, also impose constraints on its interaction with the (stressed) financial market. Preferences become state-dependent and we are able to assess the impact of these on trading decisions. We construct optimal strategies explicitly and show how they outperform traditional diversification strategies under worst case scenarios and can help to reduce systemic risk.

Christian Reichlin: Behavioural Portfolio Selection: Asymptotics and Stability Along a Sequence of Models
We consider a sequence of financial markets that converges weakly in a suitable sense and maximize a behavioural preference functional in each market. For expected concave utilities, it is well known that the maximal expected utilities and the corresponding final positions converge to the corresponding quantities in the limit model. We prove similar results for non-concave utilities and distorted expectations as employed in behavioural finance, and we illustrate by a counterexample that these results require a stronger notion of convergence of the underlying models compared to the concave utility maximization. We use the results to analyze the stability of behavioural portfolio selection problems and to provide numerically tractable methods to solve such problems in complete continuous-time models.
Vicky Henderson: Trading Models under Prospect Theory

There is a well known intuition linking prospect theory with the disposition effect, the tendency of investors to sell assets that have risen in value rather than fallen. Recently, several authors have studied rigorous models in an attempt to formalize the intuition. However, some have found it difficult to predict a disposition effect whilst others produce a more extreme prediction where investors never voluntarily sell at a loss. We address these shortcomings in a model of asset liquidation under the preferences of Tversky and Kahneman (1992) and lognormal asset prices. We show investors exhibit a disposition effect as gains are realized at a greater rate than losses. Nonetheless, in contrast to the extant literature, we find that the investor will “give up” and sell at a loss, when the asset has a sufficiently low Sharpe ratio.

We continue to discuss partial liquidation and consider two possible interpretations - either the investor treats each partial sale as a separate investing episode, or she thinks in terms of a single episode which concludes when all sales are completed in that asset. We show that in fact, under either interpretation, the investor prefers to take an “all or nothing” sales strategy.

Haim Levy: Investment Choices with Envy and Altruism

Experiment reveals that envy and altruism strongly affect the utility from investment choices: 70% of the subjects reveal envy, 10% reveal altruism and 20% are indifferent. Envious subjects even prefer an inferior First degree Stochastic Dominance (FSD) investment choice provided that their peer group loses more. We develop bivariate utility-free Stochastic Dominance (SD) rules with envy and altruism. Surprisingly, some non-pathological altruism preferences (let alone envious preferences) induce a reduction in the univariate expected utility of all parties. However, with the additive preferences, we identify important cases where the bivariate and the univariate SD efficient sets coincide.

Hanqing Jin: Consumption-based Behavioral Portfolio Selection in Continuous Time

We study the optimal consumption-investment problem in a continuous-time financial market with behavioural criteria featured by S-shaped utility function and probability distortions. Different formulations of the problem are studied. When optimal solution exists, we get explicit solutions based on some algebraic equations.

Matteo Del Vigna: Weak Insider Trading and Behavioral Finance

In this paper, we study the optimal portfolio selection problem for weakly informed traders in the sense of Baudoin. Apart from expected utility maximizers, we consider investors with other preference paradigms. In particular, we consider agents following cumulative prospect theory as developed by Tversky and Kahneman as well as Yaari’s dual theory of choice. We solve the corresponding optimization problems, in both non-informed and informed case, i.e. when the agent has an additional weak information. Finally, comparison results among investors with different preferences and information sets are given, together with explicit examples. In particular, the insider’s gain, i.e. the difference between the optimal values of an informed and a non informed investor, is explicitly computed.

Xunyu Zhou: Arrow-Debreu Equilibria for Rank-Dependent Utilities

We provide conditions on a one-period-two-date pure exchange economy with rank-dependent utility agents under which Arrow-Debreu equilibria exist. When such an equilibrium exists, we
derive the state-price density explicitly, which is a weighted marginal rate of substitution between the initial and the end-of-period consumption of a representative agent, while the weight is expressed through the differential of the probability weighting function. Based on the result we reach several findings, including that asset prices depend upon agents’ subjective beliefs regarding overall consumption growth, that an uncorrelated security’s entire probability distribution and its interdependence with the other part of the economy should be priced, and that there is a direction of thinking about the equity premium and risk-free rate puzzles. Moreover, we propose a “rank-neutral probability” as an appropriate modification of the original probability measure under which assets can be priced in the same way as in an economy with expected utility agents.
Speakers

Hersh Shefrin

Hersh Shefrin is the Mario L. Belotti Professor of Finance at Santa Clara University. He has been contributing to the literature in behavioural economics and behavioural finance for more than thirty years. A 2003 article in the American Economic Review listed him as one of the top fifteen economic theorists to have influenced empirical work. In 2009, his behavioural finance book Beyond Greed and Fear was recognized by J.P. Morgan Chase as one of the top ten books published since 2000. Among Professor Shefrin’s other books are A Behavioral Approach to Asset Pricing, Behavioral Corporate Finance, Ending the Management Illusion, and Behaviouralizing Finance. He received his Ph.D. from the London School of Economics in 1974. He holds an honorary doctorate from the University of Oulu, Finland.

Carole Bernard

Carole Bernard is currently associate professor in the department of Statistics and Actuarial Science at the University of Waterloo. In 2005, she obtained her PhD in Finance from the University of Lyon in France on the subject of “Valuation of Guarantees in Insurance and in Finance using the Option Theory”. It received the award for the best PhD in Finance (2005) in France. Since then, Dr. Bernard has published in many journals in actuarial science, mathematics, economics and finance. She was recently awarded the 2011 EGRIE Young Economist Best Paper Award for the paper “Financial bounds for Insurance Claims” with Steven Vanduffel and the 2012 Johann de Witt prize for the paper “Explicit Representation of Cost-Efficient Strategies” with P. Boyle and S. Vanduffel.
Christian Reichlin

Christian Reichlin is currently PhD candidate in the Department of Mathematics at ETH Zurich under the supervision of Professor Martin Schweizer and Professor Thorsten Hens. He holds a master in Mathematics from ETH Zurich. His present research is focusing on behavioural portfolio selection and its ensuing consequences for the financial markets.

Vicky Henderson

Vicky Henderson is a Senior Research Fellow at the Oxford-Man Institute and is affiliated with the Mathematical Institute and Oriel College, University of Oxford. Previously in the Finance Group at Warwick Business School, Vicky held positions at Princeton University, ETH Zurich, Westpac Investment Banking, and spent six months at the Isaac Newton Institute, University of Cambridge. Vicky’s research area is mathematical finance with an emphasis on derivative pricing in incomplete markets. She has interests in behavioural finance, real options and corporate finance, derivatives, executive compensation, incomplete markets and utility indifference pricing, and models of portfolio choice. Vicky has been involved in major conference organisation for the Isaac Newton program in 2005 and the 2010 Quantitative Finance program at the Fields Institute, Toronto. Vicky is an Associate Editor of the Journal of Economic Dynamics and Control, Mathematics and Financial Economics, and Review of Derivatives Research.
Haim Levy

Professor Haim Levy-Hebrew University, Jerusalem, Israel
- Ranked Number 64 in the Nobel list in Economics; Nobel list: publications 1969-2000
- Ranked as the most prolific researcher in the World in Finance during the years 1945-1986. Appeared in Financial Management, Autumn 1988
- Co-authored papers with two Nobel Prize winners in Economics (H. Markowitz and P. Samuelson).

Hanqing Jin

Hanqing Jin is a University Lecturer in University of Oxford. He received his Mphil. in Mathematics from Nankai University in 2001, and the PhD in Financial Engineering from the Chinese University of Hong Kong in 2004. After then, he worked in the same Department for another two years, and then moved to the National University of Singapore in 2006. His research interests include Mathematical Finance, Operation Research, and Applied Stochastic Analysis. His research focuses on portfolio selection, behavioural finance and time consistency in financial decision making.
Matteo Del Vigna holds a PostDoc position in the Department of Mathematics for Economics at University of Florence, Italy. He obtained his Ph.D. in 2012 under the supervision of Prof. Luciano Campi at University Paris-Dauphine, in partnership with Prof. Maria Elvira Mancino at University of Pisa. His research interests concern information asymmetry models, financial market equilibria with behavioural agents and market modelling through dynamical systems.

Xunyu Zhou is the Nomura Professor of Mathematical Finance, the Director of the Nomura Centre for Mathematical Finance, and a Professorial Fellow of St Hugh’s College, the University of Oxford. His primary research areas are quantitative finance and risk management, and he has recently engaged in the study of behavioural finance.

He is an invited speaker at the 2010 International Congress of Mathematicians, a winner of the SIAM Outstanding Paper Prize, and a recipient of the Croucher Senior Research Fellowship. He also holds a chair professorship at the Chinese University of Hong Kong. He got his BSc and PhD degrees in 1984 and 1989 respectively, both from Fudan University, and worked in Kobe University and University of Toronto.
Organizers

Enrico De Giorgi

Enrico De Giorgi is Professor of Mathematics at the University of St. Gallen and Head of the Profile Area “Quantitative Economics Methods”. His research interests are decision analysis, quantitative behavioural finance and risk management. He holds an MS in Mathematics from the ETH Zurich and a Ph.D. in Economics from the University of Zurich. His research has been published in Management Science, Journal of Quantitative and Financial Analysis, Games and Economic Behavior, Journal of Economic and Dynamics Control, among others. He is Associate Editor of Management Science and Founding Partner of Behavioural Finance Solutions GmbH.

Xunyu Zhou

Xunyu Zhou is the Nomura Professor of Mathematical Finance, the Director of the Nomura Centre for Mathematical Finance, and a Professorial Fellow of St Hugh’s College, the University of Oxford. His primary research areas are quantitative finance and risk management, and he has recently engaged in the study of behavioural finance. He is an invited speaker at the 2010 International Congress of Mathematicians, a winner of the SIAM Outstanding Paper Prize, and a recipient of the Croucher Senior Research Fellowship. He also holds a chair professorship at the Chinese University of Hong Kong. He got his BSc and PhD degrees in 1984 and 1989 respectively, both from Fudan University, and worked in Kobe University and University of Toronto.
The Faculty of Mathematics and Statistics consist of three Chairs responsible for the teaching of mathematical and statistical methods at the University of St. Gallen. The research focus is on the development and application of quantitative methods for economics and finance.

The profile area Quantitative Economics Methods is dedicated to fundamental research in the field of mathematics, econometrics and statistics, and the application of their respective methods in teaching. The profile area Quantitative Economics Methods is one of three core areas of expertise at the School of Economics and Political Science.

FINRISK has developed rapidly into a world-class academic forum for cutting-edge research in finance, advanced doctoral education and knowledge transfer between finance researchers and Switzerland’s finance professionals. The FINRISK network is managed from the University of Zurich and enjoys the participation of additional academic institutions in Geneva, Lausanne, Lugano, St. Gallen and Zurich. FINRISK’s goal is to develop a Swiss centre of excellence in finance.

The Swiss National Science Foundation (SNSF) is the most important Swiss agency promoting scientific research. As mandated by the Swiss Federal government, it supports all disciplines from philosophy and biology to the nanosciences and medicine.

BhFS Behavioural Finance Solutions bridges the needs of the financial sector with the academic knowledge in Finance. BhFS was founded in 2007 as a spin-off company of the Institute of Banking and Finance at the University of Zurich.
St. Gallen

Directions

How to get to the University and the executive campus.

By Car

Take the motorway (A1) exit St. Gallen/Kreuzbleiche and head towards the centre. Once you have gone through the tunnel, move into the left lane and follow the sign to Universität / WBZ Holzweid.

By Bus

At St. Gallen’s main train station, take bus no. 5 towards Rotmonten. The buses run every 10 minutes. For the University campus, get off at the “Universität” bus stop and cross the main road. For the executive campus, get off at “Rotmonten” (final stop) and walk back around 250 m. You can also go to the Bahnhof Nord bus stop (at the back of the train station) and take bus no. 9 to “Gatterstrasse / Universität West” for the University or again to “Rotmonten”, for the executive campus.

Useful links

VBSG (St. Gallen buses): [http://www.vbsg.ch](http://www.vbsg.ch)
On Foot

From the main train station it is a 10 - 15 minute walk up the hill to reach the University. The best way are the stairs, starting at Müller-Friedberg-Strasse. The bottom of the stairs can easily be reached from the train station or the center of the city.

Tips in St. Gallen

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<td>Abbey District</td>
<td>The entire St. Gallen Abbey District has been a UNESCO World Heritage site since 1983. The best-known city landmarks are the Baroque cathedral with its twin spires and the Abbey Library with its gorgeous rococo hall. <a href="#">More Information</a>.</td>
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<td>Abbey Library</td>
<td>The library collection is the oldest in Switzerland, and is one of earliest and most important monastic libraries in the world. In 1983 the library together with the Abbey of St. Gallen were made a World Heritage Site, as ‘a perfect example of a great Carolingian monastery’. <a href="#">More Information</a>.</td>
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<td>University of St. Gallen</td>
<td>The University of St. Gallen was founded as a “business academy” in 1898 and offered its first lectures in 1899, making it one of the oldest universities of its kind in the world. <a href="#">More Information</a>.</td>
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<td>Muehleggbahn</td>
<td>The Muehleggbahn is the oldest inner-city public transport. It was established in 1893 to connect the Muehlertor and St. Georgen. <a href="#">More Information</a>.</td>
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<td>Drei Weihern</td>
<td>Just above the city lies the beautiful natural outdoor pool. Not only is it possible to relax at the pool side in the summer or take a nice Christmassy walk in the winter, you also have a spectacular view on St. Gallen. <a href="#">More Information</a>.</td>
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Contact

University of St. Gallen
Faculty of Mathematics and Statistics
Bodanstrasse 6
9000 St. Gallen
Switzerland

fadrina.denoth@unisg.ch
+41 (0) 71 224 24 29

http://www.mathstat.unisg.ch/wqbf