



DEPARTMENT OF APPLIED MATHEMATICS

應 用 數 學 系

**The Hong Kong Polytechnic University  
Department of Applied Mathematics**

**Seminar**

**Currency Target Zones as Mirrored Options**

by

**Dr Sandro Lera**

**MIT Institute for Data, Systems, and Society**

**Abstract**

A new way of modeling the dynamics of an exchange rate target zone is presented. In the presence of a single upper (resp. lower) target boundary, the exchange rate is precisely represented as the sum of a free float and a short (resp. long) position in a call (resp. put) option with strike price at the boundary. To model a target zone (with two boundaries), a natural approach consists in describing the exchange rate dynamics as the combination of the two, namely the sum of free float together with a long position in a put written on the lower boundary and a short position in a call option written on the upper boundary, respectively. We show that this first order approximation leads to significant mispricing (as much as 20%) and must be iterated, leading to an infinite sequence of compounded 'mirrored' option prices. We analyze basic properties of such mirrored nested options analytically, describe how to calculate them numerically, and show why it is crucial to take into account higher order corrections in realistic target zones. We argue that this analogy to option prices allows for conceptually simple generalizations that describe different target zone arrangements. We apply our methodology to the estimation of the fundamental value of the Hong Kong dollar that is hidden by the target zone peg to the US dollar. We also estimate the implied maturity and explain how this parameter serves as direct proxy for target zone credibility.

**Biography**

Sandro is a Postdoctoral Fellow working with Prof. Alex "Sandy" Pentland at the MIT Institute for Data, Systems, and Society. He received his BSc & MSc in Physics from ETH Zurich (Switzerland), and his PhD from the Centre of Future Resilient Systems (Singapore), under the supervision of Didier Sornette. His work is focused on the description of socio-economic systems with tools from statistical physics, and applications of machine learning in algorithmic trading.

**Date: 15 July 2019 (Monday)**

**Time: 11:00a.m. - 12:00noon**

**Venue: TU801, The Hong Kong Polytechnic University**

**\*\*\* ALL ARE WELCOME \*\*\***