

**Passport Options** are also known as “perfect trader” option and many financial journalists have called them “Free Lunch” options. A Passport Option is an option on the trading account. A trading account is the amount of money that an investor accumulates as a result of buying or selling a stock or a basket of stocks. At maturity, investment horizon, the investor walks away with all the money accumulated in this account or nothing, if, overall, there has been a loss. In other words, if the balance of the account is negative due to trading of stocks (assets), the investor simply walks away, whereas, if the balance is positive he walks away with the money. Seems like free lunch? If it were, banks would not offer it to their clients. In 1997 Alex Lipton-Lifschitz, a quant working in Deutsche Bank together with his colleagues from Banker’s Trust, Tom Hyer and Dmitry Pugachevsky introduced the Passport Options in a paper titled “*Passport to Success*” in Risk magazine. Since then many banks in the Europe and Asia have tried to copy and modify this product and have offered it to high net worth individuals. Valuation of Passport Options can be done through a techniques described in the branch of study known as Control Theory.

**Stochastic Control Theory** Control theory, a branch of mathematics, is a theoretical description of how we can act optimally today to gain rewards in the future. This theory tells us how to optimizing a sequence of actions to attain some future goal or objective. It is used in the field of biology, biophysics, theoretical physics, engineering, financial economics and of course, quantitative finance. If the dynamics of the “control problem” is given by a stochastic differential equation, as is the case with many financial derivatives, then the field of study becomes Stochastic Control Theory. The most famous of such equations is the Stochastic Hamilton Jacobi Bellman (HJB) equation. Many engineers learn about Stochastic Control Theory via the topic of Dynamic Programming. Jamil Baz and George Chacko, in their excellent book, *Financial Derivatives: Pricing, Applications and Mathematics* talk about this problem. Paul Wilmott in his book on *Quantitative Finance* talks about using Stochastic Control Theory to value Passport Option. Further, in 1999, in a follow through Paper titled “*Similarities and Self-Similarities*” Lipton-Lischitz described techniques borrowed from physics to find out similarities between the pricing formulas for passport options, lookback options and Asian options.

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# Valuation of Passport Options using Stochastic Control Theory

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## Quantitative Finance Seminar

31<sup>st</sup> March, 2012

J W Marriott\*, Hong Kong

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$$V(S, \pi, T) = \max(\pi, 0)$$

$$V(S, \pi, t) = S \times H(\psi, t) \quad \psi = \frac{\pi}{S}$$

$$\frac{\partial H}{\partial t} + \frac{1}{2} \sigma^2 (|\psi| + 1)^2 \frac{\partial^2 H}{\partial \psi^2} = 0$$

## Valuation of Passport Options using Stochastic Control Theory

### Quantitative Finance Seminar, Hong Kong

31<sup>st</sup> March, 2012

CFE School, the Learning and Education division of Risk Latte Company, is organizing a **Quantitative Finance Seminar** in Hong Kong the area of **Valuation of Passport Options using Stochastic Control Theory**. The seminar is aimed at equity and FX options traders, quants and structurers, sell side derivatives sales professionals, risk managers and hedge fund managers. It is even suitable for all those who are keen to understand the important mathematical technique of Stochastic Control and how it is currently being implemented in various areas of quantitative finance.

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Seminar Title: **Valuation of Passport Options using Stochastic Control Theory**

Date: 31<sup>st</sup> March, 2012 (Saturday)

Time: 4:30 pm to 6:30 pm (2 hours)

Venue: J W Marriott / Island Shangri La\*

Methodology: **Excel™ spreadsheet** Implementation

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### Theory and Math

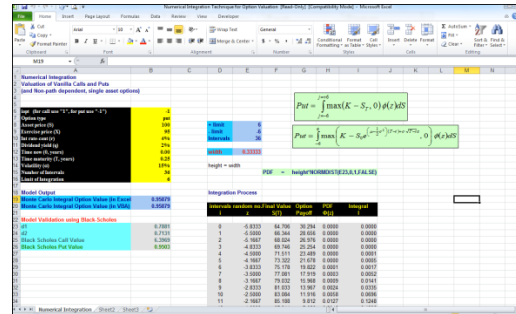
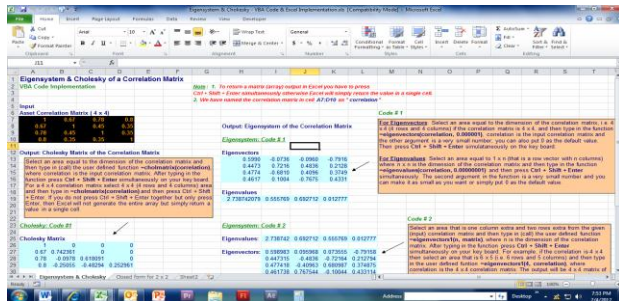
- The optimization landscape- where Dynamic optimization fits in
- Solution techniques for dynamic optimization problems- calculus of variations, dynamic programme, etc.
- Dynamic programme and optimal control, deterministic case, example from manufacturing (using Excel™ solver implementation)
- Stochastic Control Theory: optimal control in the stochastic case
- The Hamilton Jacobi Bellman (HJB) equation, some solution methods
- The passport option: the governing HJB equation, single asset, geometric Brownian motion with constant volatility;
- Passport option; HJB equation for multiple asset case

### Excel™ Spreadsheet Implementation

- Implementing Passport option pricing tool for single asset trading account (GBM with constant volatility case)
- Dominant Solution Techniques: Monte Carlo simulation plus Excel™ solver, finite difference and finite element methodologies;
- Solution Analysis: what are the alternatives? How about zero strike call in BS vanilla case? How is it similar / different from portfolio insurance?

Conclusion

- some extensions of the basic model
- Outline discussion of 3 research papers on the topic - Shreve, Wilmott et al.



Fees:

- HK\$400 (HKD Four Hundred) for CFE graduates
- HK\$900 (HKD Nine Hundred) for all others

Registration:

If you are interested in attending this seminar on either of the above dates then please write to us at [cfeschool@risklatte.com](mailto:cfeschool@risklatte.com) with your contact details together with the details of the fee payment.

The fee can be paid by cheque or direct transfer to our bank account. The bank account details are:

HSBC

Exchange Square Branch, Hong Kong

Account Number: **083 384404 838**

Account Name: **Risk Latte Company Limited**

*\*Dates and Venue subject to change.*