

**Principal Components Analysis (PCA)** is a very important mathematical technique used in almost all areas of Quantitative Finance. Institutional portfolio managers use this to allocate funds amongst assets and asset classes, interest rate structurers and quants use this technique to model the yield curve and analyze its shape and many rate quants use this technique to implement the famous HJM Model. Many rates and fixed income traders use this methodology to hedge their portfolios, quantitative equity traders use this to develop algorithms to buy and sell stocks and FX algorithmic traders use this to generate price signals.

Even outside of Quantitative Finance, PCA is everywhere in our lives, from biology, physics, engineering, economics to software development and internet search engines. The most famous and powerful internet search engine, Google, uses PCA algorithm. It can be safely said that without PCA there would be no Google Search.

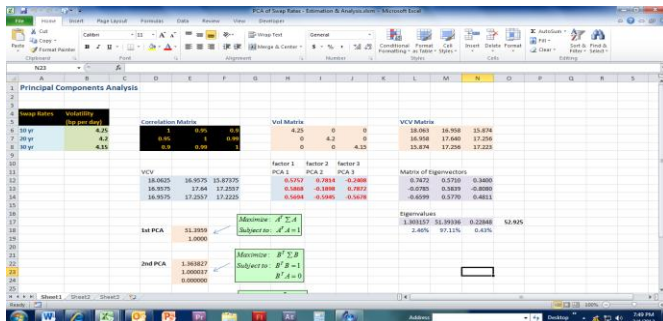
$$MW = \lambda W$$

$$MW - \lambda W = 0$$

$$\Rightarrow (M - \lambda I)W = 0 \Rightarrow |M - \lambda I| = 0$$

$$W \Lambda W^T = M$$

$$M = \begin{pmatrix} \rho_{11} & \dots & \rho_{1N} \\ \vdots & \ddots & \vdots \\ \rho_{n1} & \dots & \rho_{nn} \end{pmatrix} \quad \Lambda = \begin{pmatrix} \lambda_1 & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & \lambda_n \end{pmatrix}$$



# Principal Components Analysis (PCA) & Interest Rate and FX Modeling

## Quantitative Finance Seminar

15<sup>th</sup> April 2012  
Trident Hotel, Bandra-Kurla\*

$$M = \begin{pmatrix} 1 & -0.990 & 0.860 & 0.005 \\ -0.990 & 1 & -0.670 & 0.047 \\ 0.860 & -0.670 & 1 & 0.128 \\ -0.005 & 0.047 & 0.128 & 1 \end{pmatrix}$$

$$W = \begin{pmatrix} 0.613 & 0.777 & -0.132 & -0.050 \\ -0.574 & 0.560 & 0.585 & 0.117 \\ 0.542 & -0.286 & 0.777 & 0.139 \\ 0.023 & 0.014 & -0.187 & 0.981 \end{pmatrix}$$

## Principal Components Analysis (PCA) & Interest Rate and FX Modeling Quantitative Finance Seminar, Mumbai 15<sup>th</sup> April, 2012

CFE School, the Learning and Education division of Risk Latte Company, is organizing a **Quantitative Finance Seminar** in **Mumbai** the area of **Interest Rate & FX Modeling using PCA**. The seminar is aimed at quantitative equity traders, institutional portfolio managers and analysts, algorithmic traders and other equity and market risk professionals. It is even suitable for all those who are keen to understand the PCA technique and how it is applied and implemented within an important area of finance.

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Seminar Title: **Principal Components Analysis (PCA) & Interest Rate and FX Modeling**

Date: 15<sup>th</sup> April, 2012

Time: 4:30 pm to 8:30 pm

Venue: Trident Hotel, Bandra-Kurla Complex

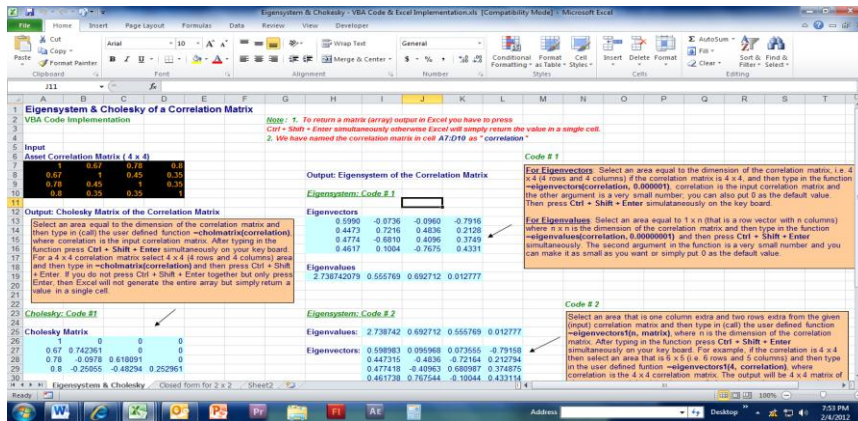
Duration: 4 hours (with a break)

Methodology: **Excel™ spreadsheet** Implementation

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### Outline of Topics

- What is PCA within the context of Interest Rates and FX why is the methodology so important
- Intuitive Understanding of Principal Components (PCs) given the volatilities and correlations of the interest rates and FX;
- Optimization Technique for estimating PCs (Matrix Math and Excel™ Solver optimization);
- Eigen decomposition for estimating PCs (Matrix Math for estimating Eigenvalues & Eigenvectors );
- Intuitive understanding of Eigenvalues and Eigenvectors and how they relate to the PCs of a correlation / VCV matrix;
- Estimation of PCs for USD (or other G7 Currency) Swap Rates
- Analysis of the PCs
- Using PCA for hedging a portfolio using butterfly weights;
- PCs for FX Volatility data;
- Monitoring ATM FX Volatilities and generating FX Volatility trade signals using PCA;



**Fees:**

- US\$50 (USD Fifty) for all CFE graduates
- US\$50 (USD Fifty) for all CFE Level 2 registrants
- US\$75 (USD Seventy Five) for all CFE Level 1 registrants
- US\$200 (USD Two 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.

**Note:** Seats are extremely limited due to restriction of space, so reserve your place early.

The fee can be paid by direct transfer / wire 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**

SWIFT CODE: **HSBCHKHHKHK**

*\*Dates and Venue subject to change.*