**Work in teams of 2 people.**

Use the excel spreadsheet “Workshop7.xlsx” available in comunidad.

**Questions to be answered in the excel spreadsheet.**

In the VIMEX sheet, you will find the returns of the IPC Mexican Index, the VIMEX Mexican volatility index and the 10Y Mexican Bond yield. Compute the daily volatility using the Riskmetrics model, where the starting variance is 0.0004 and lambda is 0.94. Use this volatility to standardize the returns of all series.

1. Compute correlations of the following pairs using the following formula for the standardized returns using data from August 1, 2006 to December 31, 2014. Report the correlations of:
   1. VIMEX-IPC
   2. VIMEX-Bond
   3. Bond-IPC

**NOTE: Use these correlation values as the starting values for your models below.**

1. Calibrate a DCC model using data from August 1, 2006 to December 31, 2014 for the simple exponential smoother. Rather than maximizing the n-dimensional log likelihood functions, maximize the sum of the bivariate likelihoods on top of page 165. Report
   1. Lambda
   2. Composite Bivariate loglikelihood: ln (CLc)
2. Repeat exercise 2 for the mean reverting GARCH correlations and report
   1. Alpha
   2. Beta
   3. Composite Bivariate loglikelihood: ln (CLc)
3. Repeat exercise 2 for the mean reverting GARCH with asymmetric correlations with and report
   1. Alpha
   2. Beta
   3. Gamma
   4. Composite Bivariate loglikelihood: ln (CLc)
4. Assume that you hold 30% of IPC, 20% of VIMEX and 50% of the 10Y Mexican Bond. To answer this question assume that the returns over the next K days are normally distributed.
   1. Report the 5-day 1% VaR for March 23, 2015 for the model on Q2
   2. Report the 5-day 1% VaR for March 23, 2015 for the model on Q3
   3. Report the 5-day 1% VaR for March 23, 2015 for the model on Q4
   4. Report the 5-day P/L in percentage for March 23, 2015
   5. How many breaches for the 5-day percentage P/L are there between August 2, 2006 and June 30, 2015 according to the model on Q2?
   6. How many breaches for the 5-day percentage P/L are there between August 2, 2006 and June 30, 2015 according to the model on Q3?
   7. How many breaches for the 5-day percentage P/L are there between August 2, 2006 and June 30, 2015 according to the model on Q4?
5. You are the trading analyst of an important firm and have been asked to compute the VaR for a basket of stocks called BASKET MEXICO. You want to show all that you learned at ITAM, so you implement two methodologies to compute the VaR.

Your portfolio is made of 10 stocks where each stock has a 10% weight in the portfolio:

|  |  |
| --- | --- |
|  | **Weight** |
| GRUPO FINANCIERO INBURSA SRIES 'O' | 10% |
| GPO FINANCE BANORTE | 10% |
| GENTERA | 10% |
| ARCA CONTINENTAL | 10% |
| COCA-COLA FEMSA 'L' | 10% |
| FOMENTO ECONOMICO MEXICANO | 10% |
| POCHTECA | 10% |
| GRUPO SALTILLO | 10% |
| CEMEX CPO | 10% |
| CONTROLADORA COMERCIAL MEXICANA | 10% |
| **Basket MEXICO** | **100%** |

Methodology 1: Standard Model. Compute the historical volatilities and the correlation matrix using all the data provided in the spreadsheet. Report

1. What is the historical 1-day volatility of CONTROLADORA COMERCIAL MEXICANA?
2. What is the historical 1-day volatility of COCA-COLA FEMSA 'L'?
3. What is the correlation of CONTROLADORA COMERCIAL MEXICANA and COCA-COLA FEMSA 'L'?
4. What is the historical 1-day volatility of the basket of 10 stocks?
5. Using the historical volatilities and correlation, report the 1-day 1% VaR for the BASKET MEXICO for June 16, 2015.

Methodology 2: Exposure Mapping. In this case we assume that the returns of the basket are explained with 2 factors: IPC and VIMEX. Using all data, compute the daily returns of the basket and run a CAPM type model with the two factors:

In that case  (see page 156 from the book).

Report

1. The 1-day return of the BASKET MEXICO on June 1st, 2015?
2. The 1-day 1%-VaR of BASKET MEXICO for June 16, 2015 using correlation model of Q2
3. The 1-day 1%-VaR of BASKET MEXICO for June 16, 2015 using correlation model of Q3
4. The 1-day 1%-VaR OF BASKET MEXICO for June 16, 2015 using correlation model of Q4
5. How many breaches are there between January 3, 2011 and June 15, 2015 based to the model on Q2 for the BASKET MEXICO?
6. How many breaches are there between January 3, 2011 and June 15, 2015 based to the model on Q3 for the BASKET MEXICO?
7. How many breaches are there between January 3, 2011 and June 15, 2015 based to the model on Q4 for the BASKET MEXICO?