**INTERNATIONAL MANAGEMENT INSTITUTE, BHUBANESWAR**

**Risk Modelling and Portfolio Optimization Using R (FN618)**
**PGDM 2019-21 Term VI**
**CREDIT: Half (1.5 credits)**
**SESSION DURATION: 60 Minutes**

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**Course Introduction:** This course aims to provide an in-depth knowledge of techniques of portfolio optimization using advanced algorithms. It will also provide an in-depth understanding of various risk modeling techniques. The knowledge acquired through this course will prepare the student for career in financial analytics role, portfolio managers and others.

**Pedagogy**
The course will be delivered through a mix of lectures and real-life assignments involving thorough analysis and presentations. Exercises will be based on R.

**Learning Outcomes**

- To measure risk and performance in the context of various risk models (LO 1)
- To understand diversification and be able to create a well-diversified portfolio. .(LO 2)
- To gain knowledge in optimization techniques. .(LO 3)
- To measure optimized portfolio performance .(LO 4)

**Evaluation Criteria:**

| Item | Weightage (%) | Learning Outcome(s) |
|---|---|---|
| Project (Group of 2 each) | 40% | LO 3, LO 4 |
| Quiz | 10% | LO1, LO3 |
| Assignments | 10% | LO3, LO5 |
| End Term Examination | 40% | LO1 to LO 6 |

**Readings:**
Investments, Eighth Edition, Bodie, Zvi , Alex Kane, *TMH* (Referred to as BKM)
R codes and reading materials will be distributed during the course

| Session No. | Topic | Learning Outcome | Readings |
|---|---|---|---|
| 1-2 | Measuring Risk<br>• Value at Risk (VaR)<br>• Conditional VaR (CVaR)<br>• Expected shortfall | LO1 | Handout and classroom discussion |
| 3-5 | Extreme Value Theory<br>• Block Maxima approach<br>• POT approach<br>• Using VaR and ES to estimate tail risk | LO1, LO2 | Handout and classroom discussion |
| 6-7 | Modelling volatility<br>• GARCH based models | LO1, LO2 | Handout and classroom discussion |
| 8-9 | Modelling dependence<br>• Copulas | LO2 | Handout and classroom discussion |
| 10-11 | Minimum variance portfolio<br>• Efficient frontier<br>• Minimum CVaR-Minimum Variance portfolios | LO2 | BKM, Ch. 7-9 |
| 12-13 | Portfolio Rebalancing and Backtesting<br>• 60:40 strategy<br>• Tactical Asset allocation<br>• Backtesting | LO3 | Handout and classroom discussion |
| 14-15 | Style Analysis<br>• One period style analysis<br>• Rolling period style analysis<br>• Index replication | LO3, LO4 | Handout and classroom discussion |
| 16-17 | PROJECT PRESENTATION | | |

**Guidelines for project:** Each student needs to mandatorily undertake a project and make a presentation at the end of the term. Since it is a group project, the contribution of each member needs to be clearly delineated although it is expected that each member should know the project thoroughly. The final report needs to be submitted before the presentation with the following components:

- Title page (format same as that of SIP report)
- Index
- Introduction about the topic (about 500 words)
- Data Source
- Methodology and model used
- Discussion of result
- Conclusion

**Plagiarism:**

We are committed to upholding the highest standards of academic integrity and honesty. Plagiarism is the use of or presentation of ideas, works that are not one's own and which are not common knowledge, without granting credit to the originator. You may refer the already available content just for your reference and to get the basic ideas. Only 20% of such content is acceptable, above that comes under the definition of Plagiarism which is unacceptable in IMI and will be treated seriously. All such cases will be referred to the appropriate body of the Institute for suitable disciplinary action.