



**International Virtual Course of Financial Mathematics ITB-USM 2021
09th – 20th August 2021 (Malaysian Time)**

Program Outline

Day	Time	Module	Remarks
1	09.00 am	Opening Ceremony	
	09.30 am	Introduction to Islamic Financial Mathematics	
	10.30 am	Break	
	10.45 am	Bank Balance Sheet	
	11.45 am	Break	
	12.00 pm	Problem Solving 1	
	13.00 pm	Lunch Break	
	14.00 pm	Problem Solving 2	
2	09.30 am	Contracts in Islamic Bank	
	10.30 am	Break	
	10.45 am	Profit Sharing Calculation	
	11.45 am	Break	
	12.00 pm	Problem Solving 3	
	13.00 pm	Lunch Break	
	14.00 pm	Quiz 1	
3	09.30 am	Ijarah (Leasing)	
	10.30 am	Break	
	10.45 am	Shares on the Sharia Index	
	11.45 am	Break	
	12.00 pm	Problem Solving 4	
	13.00 pm	Lunch Break	
	14.00 pm	Problem Solving 5	
4	09.30 am	Sukuk (Islamic Bond)	
	10.30 am	Break	
	10.45 am	Islamic Insurance	
	11.45 am	Break	
	12.00 pm	Problem Solving 6	
	13.00 pm	Lunch Break	
	14.00 pm	Quiz 2	
5	09.30 am	Small Capital Investment Profit Sharing Modeling	
	10.30 am	Break	
	10.45 am	Small Capital Investment Profit Sharing Modeling (Contd.)	
	11.45 am	Break	
	12.00 pm	Problem Solving 7	
	13.00 pm	Lunch Break	
	14.00 pm	Final Exam	



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Day	Time	Module	Remarks
6	09.00 am	Introduction to Financial Mathematics in Stock Investment – Annuity Approach	Software: EViews/ Minitab/ Excel
	10.30 am	Break	
	11.00 am	Computation of Terminal Fund and IRR For Long Term Stock Investment	
	12.30 pm	Lunch	
	14.00 pm	Assessment 1	
	16.00 pm	Conclusion and Discussion	
7	09.00 am	Principles of Hypothesis Testing	
	10.30 am	Break	
	11.00 am	Principles of Hypothesis Testing (Contd.)	
	12.30 pm	Lunch	
	14.00 pm	Hypothesis Testing for 2 Samples	
8	09.00 am	Assessment 2	
	10.30 am	Break	
	11.00 am	Assessment 2 (Contd.)	
	12.30 pm	Lunch	
	14.00 pm	Regression Analysis I	
9	09.00 am	Variable Selection & Model Building	
	10.30 am	Break	
	11.00 am	Variable Selection & Model Building (Contd.)	
	12.30 pm	Lunch	
	14.00 pm	Time Series Regression	
10	09.00 am	Assessment 3	
	10.30 am	Break	
	11.00 am	Statistical Approach, Application and Advantage on Real Based Problem	
	12.30 pm	Closing Ceremony	



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Course Synopsis Islamic Financial Mathematics



Speaker :

Dr. Novriana Sumarti
Faculty of Mathematics and Natural Sciences
Institut Teknologi Bandung
Bandung, Indonesia



Speaker :

Mr. Ade Candra Bayu
Faculty of Mathematics and Natural Sciences
Institut Teknologi Bandung
Bandung, Indonesia

Abstract: This course contains an introduction to Islamic economics (the difference of Riba and interest on loans, contracts of Qardh (loans), Buy and Sell, Mudharabah and Musyarakah investments), Islamic bank balance sheets (differences in Funding and Financing), sukuk investments (bonds), sharia stocks, sharia insurance (tabarru funds and participant accounts) and a profit-loss sharing model for small capital investments. The material will be equipped with some detailed calculations, so that mathematical modelling with optimization of one or several variables can be built using these existing equations.

Session 1 (Day 1 - Morning): Introduction to Islamic Financial Mathematics

- Typical Characteristics of Sharia Economics, Riba, Gharar and Maysir
- Profit sharing vs Riba
- Akad in financial transactions

Session 2 (Day 1 - Morning): Bank Balance Sheet

- Banking Financial Balance Sheet
- Sharia Bank Functions and Activities

Session 3 (Day 1 - Afternoon): Problem Solving 1

Session 4 (Day 1 - Afternoon): Problem Solving 2

Session 5 (Day 2 - Morning):

- Qard, Wadiah, Buying and Selling
- Mudharabah and Musyarakah Savings, Profit and Revenue Sharing
- Akad (Contracts) in Buying and Selling

Session 6 (Day 2 - Morning): Profit Sharing Calculation

- Funding and Financing
- Investment Weighted System

Session 7 (Day 2 - Afternoon): Problem Solving 3

Session 8 (Day 2 - Afternoon): Quiz I

Session 9 (Day 3 - Morning): Ijarah (Leasing)

- Depreciation of goods
- Tangible and Intangible Ijarah

Session 10 (Day 3 - Morning): Shares on the Sharia Index

- Stock Pricing Model using Binomial Tree
- Financial Ratios on Islamic Market Indexes

Session 11 (Day 3 - Afternoon): Problem Solving 4

Session 12 (Day 3 - Afternoon): Problem Solving 5

Session 13 (Day 4 - Morning): Sukuk (Islamic Bond)

- Results based on Sukuk ownership period
- Formulation of rewards and income from Sukuk

Session 14 (Day 4 - Morning): Islamic Insurance

- Calculating the Sum Insured for Life Insurance

Session 16 (Day 4 - Afternoon): Problem Solving 6

Session 17 (Day 4 - Afternoon): Quiz 2

Session 18 (Day 5 - Morning): Small Capital Investment Profit Sharing Modeling

- Distribution of Data
- Daily Profit Data Generation

Session 19 (Day 5 - Morning): Small Capital Investment Profit Sharing Modeling

- Optimization on Nisbah

Session 20 (Day 5 - Afternoon): Problem Solving 7

Session 21 (Day 5 - Afternoon): Final Exam



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Course Synopsis

Long Term Stock Investment Framework and Its Performance Measurement



Speaker :

Dr. Shamsul Rijal Muhammad Sabri
School of Mathematical Sciences
Universiti Sains Malaysia
Pulau Pinang, Malaysia

Abstract: This course consists of two lecture sessions, one assessment and finally, conclusion. The first slot introduces the financial mathematics that is related to the long term stock investment framework – annuity, present value (PV), future value (FV), discounted cash flow (DCF), net present value (NPV) and internal rate of return (IRR). The second slot discusses further on how to attain stock investment terminal fund based on this framework. Interestingly, the terminal fund is not only computed based on the share price, but also related the company's announcements that benefit the retail shareholders such as the distribution of cash dividend as well as the issuance of company shares (share split/consolidate and bonus issue). Furthermore, the participant may also experience themselves in computing the IRR at the end of the course session. An assessment is organized to evaluate the understanding of the participant towards this model and its measure of investment performance. Finally, the advantages and drawbacks of this model will be addressed.

Session 1 (Day 6 - Morning): Introduction to Financial Mathematics in Stock Investment – Annuity Approach

- Time Frame in Financial Mathematics
- Investment Duration, Present Value (PV), Future Value (FV) and Interest Rate (or Rate of Return)
- Annuity Series of Payment and Cash Flow Of Investment
- Discounted Cash Flow (DCF), Net Present Value (NPV) And Internal Rate of Return (IRR)
- Computation of IRR Using Ms Excel
- End

Session 2 (Day 6 - Morning): Computation of Terminal Fund and IRR For Long Term Stock Investment

- Long Term Stock Investment Framework

- Conversion of Determined Capital Contribution to Share Units Based on Share Price and Board Lot (Buying Share)
- Computation of Cash Dividend Based on Share Units and Dividend Rate
- Share Accumulation Based on Share Issuances (Stock Split and Bonus Issue)
- Computation of Terminal Fund Based on Accumulated Share and Share Price (Selling Share)
- DCF, NPV and IRR (The Performance Measurement)
- Computation of IRR Using Ms Excel
- End

Session 3 (Day 6 - Afternoon): Assessment 1

Session 4 (Day 6 - Afternoon): Conclusion

- Limitation of Discussed Framework
- Advantages
- Drawbacks
- Insightful of The Long Term Stock Investment and Its IRR
- End

Course Synopsis Hypothesis Testing & Regression Analysis



Speaker:

Dr. Zainudin Arsad
 School of Mathematical Sciences
 Universiti Sains Malaysia
 Pulau Pinang, Malaysia

Abstract: This course gives lectures and hands-on experience for data analysis. The course is made of two components, Statistical Hypothesis Testing and Linear Regression Analysis. Many statistical data analyses involve testing claim on population parameters. Statistical hypothesis testing makes sure analyst follow certain procedures in making conclusion based on evidence provided by the sample. While regression analysis is the most basic technique to investigate relationship among variables, there have been misuse and abuses. The course lectures on the assumptions of the regression model and also on requirements for diagnostic checking. In addition, techniques for selecting importance variables from a pool variables and criteria for choosing the best model from a few tentative models will also be discussed. The course will also look into techniques to identify outlier. Each session consists of lecture on methodologies and theories as well as guided hand-on exercises.

Session 1 (Day 7 - Morning): Principles of Hypothesis Testing

- Null and Alternative Hypothesis, 1- & 2-tailed Hypothesis
- Critical Value, Significance Level, p-value
- Hypothesis Testing on 1-sample Mean, Z-test & t-test

Session 2 (Day 7 - Afternoon): Hypothesis Testing for 2 Samples

- Independent and dependent samples
- Test of equal variance

Session 3 (Day 8 - Morning): Assessment 1

Session 4 (Day 8 - Afternoon) Regression Analysis I

- Scatter Plot, Correlation Analysis, Multiple Linear Regression
- Residual Analysis, Outlier Detection

Session 5 (Day 9 - Morning): Variable Selection & Model Building

- Evaluating Tentative Models: R^2 , \bar{R}^2 , MSE and Mallows's C_p
- Variable Selection: Best Subsets, Forward Selection, Backward Elimination

Session 6 (Day 9 - Afternoon): Time Series Regression

- Trending and Autocorrelation in Time Series Data
- Detection: Durbin-Watson Statistic, Breusch-Godfrey (LM) test.
- Remedy: Generalized & Feasible Least Square, First Difference

Session 7 (Day 10 - Morning): Assessment II

Seminar

Statistical Approach, Application and Advantage on Real Based Problem



Speaker :

Dr. Majid Khan Bin Majahar Ali
School of Mathematical Sciences
Universiti Sains Malaysia
Pulau Pinang, Malaysia

Abstract: This talk will be quite different from the rest of the talks in the Workshop. I shall not focus on any specific topic and provide a detailed exposition on that. I shall begin with a brief discussion on financial problems using Game Theory approach: Auctions and Risk averse as the first part of the lecture. This may convince us that Machine Learning (ML) is one of suitable solver. Then, more discussion will be emphasized on advance statistical based approach in other important field (agriculture, transportation, solid waste management and environmental analysis) where internet of things (IoT) and ML usually combined and keep the real data in cloud database using an efficient algorithm. Finally, the data that collected (Big data) will be used, analyse and forecast using hybrid regression (sparse and robust).