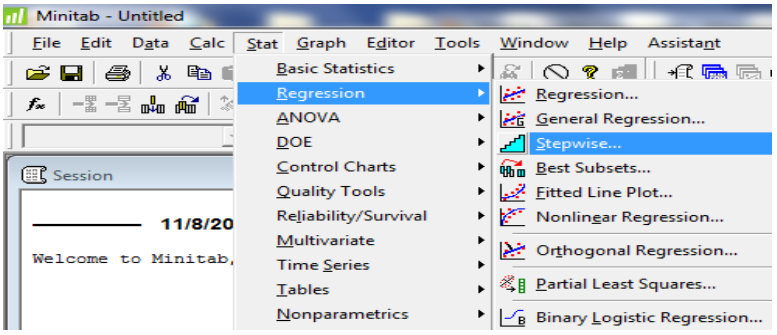
Short Course on

LINEAR REGRESSION ANALYSIS

(including WLS & FGLS)

16 & 17 MARCH 2021

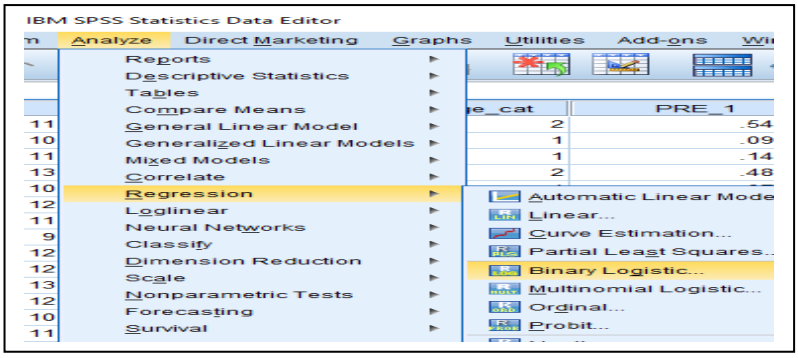


PURPOSE of Course on Regression Analysis. Limiting the theoretical content, this course presents the application of linear regression analysis. Approaches to model building, model diagnostics and inferences are emphasized. The course also introduces **logistic regression for binary dependent variable** and looks at issues of multicollinearity and functional form of regression model. Computation and some interpretation of result are facilitated through hands-on examples and the use of statistical software.

```
The regression equation is
price = - 24.1 + 11.0 bdrms + 0.00208 lotsize
          + 0.124 sqrft + 13.7 colonial

Predictor        Coef     SE Coef       T       P
Constant       -24.13       29.60   -0.81   0.417
bdrms          11.004       9.515    1.16   0.251
lotsize     0.0020758   0.0006427    3.23   0.002
sqrft         0.12424     0.01334    9.31   0.000
colonial        13.72       14.64    0.94   0.351

S = 59.8770    R-Sq = 67.6%    R-Sq(adj) = 66.0%
```



Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	117.387[a]	.277	.370

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

Observed		Predicted psr 0	Predicted psr 1	Percentage Correct
Step 1	psr 0	43	16	72.9
	psr 1	13	39	75.0
	Overall Percentage			73.9

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	hb	.279	.155	3.259	1	.071	1.322
	mcv	.085	.040	4.553	1	.033	1.089
	age_cat	1.312	.398	10.853	1	.001	3.714
	Constant	-12.726	3.539	12.933	1	.000	.000

a. Variable(s) entered on step 1: hb, mcv, age_cat.

"… The **logistic regression** technique is used since having **a categorical outcomes violates the assumption of linearity in standard linear regression**. The **log odds** for the categorical value is a linear combination of one or more explanatory variables describing the **categorical outcomes**. …"

School of Mathematical Sciences

(Wholly-owned by USM)

Short Course on

LOGISTIC REGRESSION ANALYSIS

6 & 7 APRIL 2021

LINEAR REGRESSION ANALYSIS

DAY 1 : TUESDAY, 16 MARCH 2021

8:30 AM	**REGISTRATION**
8:45 AM	**SESSION 1 – REVIEW OF HYPOTHESIS TESTING** ▪ p-value, t-test 1 & 2 samples, 1-way ANOVA
10:45 AM	**TEA BREAK**
11:00 AM	**SESSION 2 – INTRODUCTION TO LINEAR REGRESSION** ▪ Correlation Analysis, Simple Regression Model, Classical Assumptions
12:45 NOON	**Q & A (SESSIONS 1 & 2)**
1:00 PM	**LUNCH**
2:00 PM	**SESSION 3 – MULTIPLE LINEAR REGRESSION** ▪ Testing for Overall Significance and Individual Parameters, Coefficient of Determination $\bar{R}^2$
3:45 PM	**TEA BREAK**
4:00 PM	**SESSION 4 – MODEL ADEQUACY CHECKING & DIAGNOSTICS** ▪ Residual Analysis; Detection for Outliers, Influence and Leverage
5:45 PM	**Q & A (SESSIONS 3 & 4)**

DAY 2 : WEDNESDAY, 17 MARCH 2021

8:30 AM	**SESSION 5 – MODEL BUILDING & VARIABLE SELECTION** ▪ Best Subset Regression Models ; Selection Techniques : Forward, Backwards
10:30 AM	**TEA BREAK**
10:45 AM	**SESSION 6 – OTHER ISSUES IN REGRESSION** ▪ Multicollinearity: detection and remedial Measures; Functional form
12:45 NOON	**Q & A (SESSIONS 5 & 6)**
1:00 PM	**LUNCH**
2:00 PM	**SESSION 7 – VIOLATION OF ASSUMPTION: HETEROSCEDASTICITY** ▪ Detecting and Remedial Measure : BP-LM and White Tests, Weighted and Generalized Least Squares
3.45 PM	**TEA BREAK**
4.00 PM	**SESSION 8 – MORE HANDS-ON EXERCISES** • More Practices on Variable Selection, Functional Form and Handling with Heteroscedasticity
5:15 PM	**Q & A (followed by CERTIFICATE PRESENTATION at 5.30pm)**

5-Step Approach to Regression Analysis

- ❖ Formulation of regression model
- ❖ Estimation of the regression equation
- ❖ Goodness-of-fit of estimated regression model
- ❖ Testing estimated coefficients of the model
- ❖ Testing of model's assumptions

Lead Facilitator

Dr Zainudin Arsad has successfully conducted **more than 150 short courses since 2009**. He is a senior lecturer at USM, obtaining his BSc. and PhD from the Dept. of Actuarial Mathematics & Statistics, Heriot-Watt University, UK. His areas of research are Time Series Analysis and Econometric Modeling with main interest in the Applications of Kalman Filter Technique in Financial Issues. Dr Zainudin is a member of Sustainable Tourism Research Cluster (STRC) in USM that receives RM4.2million research grant, responsible in investigating determinants of tourist satisfaction level.

LOGISTIC REGRESSION: WHEN & WHY

Logistic regression is a statistical model that in its basic form uses a logistic function to predict the outcome of a categorical dependent variable based on set of predictors (explanatory variables). The technique is used since having **a categorical outcomes violates the assumption of linearity in standard linear regression**. Logistic regression deals with this problem by using a logarithmic transformation on the dependent variable (popularly known as **log odds or the logit**) which allows analyst to model non-linear relationship in a linear way. Logistic regression is used in various fields, in particular in medical fields, social sciences, marketing, economics and engineering. Examples include **predicting the risk of developing a given disease** based on characteristics of patients and **predicting the outcome of loan approval** based on social and economic profiles.

LOGISTIC REGRESSION ANALYSIS

DAY 1 : TUESDAY, 6 APRIL 2021

8:30 AM	**REGISTRATION**
8:45 AM	**SESSION 1 – INTRODUCTION TO LINEAR REGRESSION** ▪ Correlation Analysis, Simple Regression Model, Classical Assumptions
10:45 AM	**TEA BREAK**
11:00 AM	**SESSION 2 – MULTIPLE LINEAR REGRESSION** ▪ Testing for Overall Significance and Individual Parameters, Coeff. Of Determination $\bar{R}^2$
12:45 NOON	**Q & A (SESSIONS 1 & 2)**
1:00 PM	**LUNCH**
2:00 PM	**SESSION 3 – MODEL BUILDING & VARIABLE SELECTION** ▪ Best Subset Regression Models ; Selection Techniques : Forward, Backwards t
3:45 PM	**TEA BREAK**
4:00 PM	**SESSION 4 – MODEL ADEQUACY CHECKING & DIAGNOSTICS** ▪ Residual Analysis; Detection for Outliers, Influence and Leverage
5:45 PM	**Q & A (SESSIONS 3 & 4)**

DAY 2 : WEDNESDAY, 7 APRIL 2021

8:30 AM	**SESSION 5 – BINARY LOGISTIC REGRESSION** ▪ Dichotomous Outcome, Omnibus Test Hosmer-Lemershow Goodness-of-fit Test, Odds-ratio
10:45 AM	**TEA BREAK**
11:00 AM	**SESSION 4 – MULTINOMIAL LOGISTIC REGRESSION** ▪ Categorical/Polytomous Outcome, Multiple Logit Equations, Interpreting Odds Ratio
12:45 PM	**Q & A (SESSIONS 5 & 6)**
1:00 PM	**LUNCH**
2:00 PM	**SESSION 7 – ORDINAL LOGISTIC REGRESSION** ▪ Ordered Multiple Outcomes, Cumulative Probability Parallel Line Assumption
3.45 PM	**TEA BREAK**
4.00 PM	**SESSION 8 – MORE ON MULTINOMIAL & ORDINAL LOGISTIC REGRESSION** • More Hands-on Exercises on Multinomial and Ordinal Logistic Regression
5:15 PM	**Q & A (followed by CERTIFICATE PRESENTATION at 5.30pm)**

For more information on content of courses and brochure, kindly contact:
Dr. Zainudin Arsad (013-515-9571 or zainudin.arsad@usm.my) or Ms. Noor Farhana Fazil (nfarhana.stat17@gmail.com)

Course Fee

Fee inclusive of SST
Linear Regression: **RM400** per participant (Group 3-6: RM360 per participant)
Logistic Regression: **RM450** per participant (Group 3-6: RM405 per participant)
The fees cover course materials, luncheons & morning refreshments, and a Certificate of Attendance.

Postgraduate student: **RM300** (Linear Reg) & **RM350** (Logistic Reg), requires proof of status.
Group 3-6 students: **RM270** (Linear Reg) & **RM315** (Logistic Reg), per student

Accommodation

Recommended nearby hotel is U Hotel (RM175 - RM225, reservation at 04-658-1000, only 300m walk from USM). Alternatively, stay at Vistana Hotel (RM225 - RM350, reservation at 04-646-8000, 3km from USM, 10mins by taxi). Muslims can try to get a room at the USM Pusat Islam (only RM70 per night, limited rooms, enquiry at 04-653-3753). For other listings of accommodation please visit www.penang-hotels.com (please make your own reservation)

REGISTRATION FORM (Closing Date: 14 Mac & 4 April 2021)

LINEAR REGRESSION ANALYSIS (16 & 17 MARCH 2021)

LOGISTIC REGRESSION ANALYSIS (6 & 7 APRIL 2021)

Please scan and email this registration form (together with a copy of LO/PO, if applicable) to :

Noor Farhana Fazil:
School of Mathematical Sciences, Universiti Sains Malaysia, 11800 USM PENANG.
Email : nfarhana.stat17@gmail.com

NAME OF SHORT COURSE (Please tick (✓) short course(s) to be attended)

Linear Regression Analysis (16 & 17 March 2021)		Yes		No
Logistic Regression Analysis (6 & 7 April 2021)		Yes		No

Please register the following name/names: (Please use separate sheet, if required)

Item	Name	Designation
*1.		

Industry Sector:		
Company:		
Address:		
		Postcode:
*Primary Person:		*Mobile Phone:
*Telephone No.:	*Fax No.	*Email:

"I hereby agree that the personal data that I have provided to USAINS, whether now or in future, may be used, recorded, stored, disclosed, or otherwise processed by or on behalf of USAINS in accordance with the Personal Data Protection Act 2010 and USAINS' data protection policy (available at USAINS' website - www.usainsgroup.com), for the purpose of facilitation and organisation of this event, research and audit, and maintenance of a participant database for the promotion of this event, and such ancillary services as may be relevant."

MODE OF PAYMENT (Fill in or Tick when necessary)

I enclose		Number	Bank	No. of Participants:	
	Crossed Cheque			Postgraduate Student:	
	Cash on Day			Group Discount:	
	Bank Transfer				
	LO/PO			Total Sum:	RM
		Payment must be made payable to **'Usains Holding Sdn. Bhd.'**.			

1. Telegraphic Transfer. Please note the following:

   Payee Name: Usains Holding Sdn. Bhd.
   Details: Short Course on Linear Regression Analysis OR Logistic Regression Analysis
   Name of Bank: AmBank (M) Berhad, Level 21, Menara Dion, Jalan Sultan Ismail, 50250 Kuala Lumpur.
   Account Number: 888 – 100 – 985 – 0380 Swift Code: ARBKMYKL
   (Please SCAN & EMAIL your Bank-in Slip (write name and contact no) with Registration form to nfarhana.stat17@gmail.com)

2. Proof of **Local Order (LO) or Purchase Order (PO)** must be scanned/emailed to Dr. Zainudin/Ms. Farhana for confirmation and secure of place, and it must be presented during morning registration.
   The Organizer reserves the right to refrain a registered participant from taking part in the event if no proof of payment can be presented. This only applies to registered participants who have NOT paid the registration fee PRIOR to the event date.

Cancellation / Substitution

Cancellation must be made in writing through fax, e-mail or post **at least 10 working days** before the course. No refunds are available after this period. In the case of cancellation, **an administration charge of RM150** will be applied. However, substitute participants are welcomed at no extra charge provided written notice is given to the organizer at **least 5 working days** before the event.

Date:	Company's Official Stamp
Signature:	