# UNIVERSITI TEKNOLOGI MARA

# PROJECTING INPUT-OUTPUT TABLE FOR MALAYSIA

NORHAYATI BINTI SHUJA'

Thesis submitted in fulfilment of the requirements for the degree of **Doctor of Philosophy** 

**Faculty of Computer and Mathematical Sciences** 

August 2016

### ABSTRACT

Input-output tables provide detailed accounts of the flow of production and consumption of goods and services from producers to consumers. It serves as a dataset for input-output analysis which provide the tools to perform economic modelling. The construction of the input-output tables based on detailed census or surveys is a complex procedure that requires substantial financial expenditures, large human capital and time. This is the main reason why Malaysia Input-Output Table (MIOT) is produced and published on average every five years. However, for policy makers, the time lag that reflects data from much earlier years is not appropriate to be used for planning and formulating economic policies. Hence, the availability of timely and updated input-output tables is critical for effective assessment of the contribution of industries to the economy. Therefore, projecting input-output table for Malaysia is important as it can provide the latest information for policy makers in national development and budget allocation. The aim of this study is to compare two projection methods for projecting input-output tables for Malaysia. The data for the study are Gross Domestic Product and MIOT for 2000, 2005 and 2010. This study involved three phases. In the first phase of the study, two projection methods, the RAS and EURO method were used to project the MIOT 2005 and MIOT 2010 using the actual MIOT 2000 and MIOT 2005 respectively. The RAS is a bivariate method while the EURO is a stochastic method. The projection of input-output tables involved an intensive iterative procedure using MS-Excel Visual Basic programming. In the second phase of the study, the projection performance of RAS and EURO methods were assessed based on statistical measures and input-output analysis. The three error measures are Mean Absolute Deviation (MAD), Root Mean Squared Error (RMSE) and Dissimilarity Index (DI). The input-output analyses are based on the forward and backward linkages using Rasmussen and Hypothetical Extraction Method (HEM). The projected MIOT 2005 and MIOT 2010 were compared with the actual MIOT 2005 and MIOT 2010. The actual MIOT is considered as "benchmark". The deviation of the forward and backward indices between the actual and the projected MIOT is calculated. The results show that EURO performs better than the RAS method in projection of MIOT. In the last phase, the EURO method was used to project MIOT 2015 and linkages and key sectors were then identified. The Transport & Communication and the Finance & Insurance sectors were identified as a key sector of the Malaysian economy in 2015.

## ACKNOWLEDGEMENTS

#### In the name of Allah, the Most Beneficent and the Most Merciful

Firstly, I am very grateful to Allah for giving me the strength and perseverance in helping me finally complete this thesis.

No words would suffice to express my utmost gratitude and heartfelt appreciation to my supervisor, Professor Dr. Mohd. Alias bin Lazim and co-supervisor Professor Dr. Yap Bee Wah, both from Universiti Teknologi MARA (UiTM) for their dedicated supervision, sincere encouragement, constructive and positive criticism and frank comments but most crucial of all, the helpful feedback and significant contributions to all my setbacks encountered during my gruelling and demanding journey in completing this thesis. They have sacrificed a great amount of their valuable time and showered me with patience and tolerance while responding to my multitude queries at whatever time of the day it maybe, as well as have also engaged in numerous discussions throughout the lengthy period of my research and preparation for this thesis. I wish to convey my sincere gratefulness and an immense 'terima kasih' to both of them for being such wonderful, amazing and brilliant supervisors. Not forgetting a similar mention to my second co-supervisor, Associate Professor Nobuhiro Okamoto for his constructive views, frank comments and quick feedback to my inquiries whenever required, all which is greatly appreciated. Another big thank you also goes to the respective lecturers and staff in Faculty of Computer and Mathematical Sciences, UiTM for their generous support in diligently handling the procedures for the submission of this thesis.

My earnest gratitude and appreciation also goes to my immediate boss and to all my office staff and work colleagues for their co-operation, assistance as well as their kind consideration in helping ease the burden of my official workload throughout the long years of my research. Nevertheless, most important of all, is the kind understanding and generous time-frame leeway extended to me by the top management of the Department of Statistics, Malaysia without which I would not be able to pursue and successfully complete the arduous journey. May Allah bless you all.

Last but not least, my special thanks go to my beloved family for their kind patience, abundant tolerance and generous support extended to me during the demanding period of my research. Especially to my dearest husband, I would like to express my heartfelt gratefulness for his unconditional love and compassion towards sharing my dream to seek knowledge and pursue this doctorate degree. Without his valuable assistance and bighearted support, it would not be possible for me to fully concentrate and balance my time for work, family and research. His constant encouragement, support, and concern and care for my health and wellbeing is dearly cherished and appreciated.

# **TABLE OF CONTENTS**

Page

CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	111
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xi
LIST OF FIGURES	xiv
LIST OF ABBREVIATIONS	xvi
LIST OF GLOSSARIES	xviii

## **CHAPTER ONE : INTRODUCTION**

1.1	Research Background	1
1.2	Problem Statement	2
1.3	Research Objectives	4
1.4	Significance of the Research	6
1.5	Scope and Limitations of the Research	6
1.6	Organization of the Thesis	7

## **CHAPTER TWO : DEVELOPMENT OF INPUT-OUTPUT TABLES**

2.1	An Overview of Input-Output Tables	8
2.2	History of Input-Output Tables	10
2.3	The Importance of Input-Output Tables	11
2.4	The Development of Malaysia's Input-Output Tables	14
2.5	Compilation of Malaysia Input-Output Tables	15
	2.5.1 Data Extraction	17
	2.5.2 Reconciliation Classifications of the Input-Output Table	18
	2.5.3 Compilation of Supply Table	18
	2.5.4 Compilation of Use Table	21
	2.5.5 Compilation of the Valuation Matrices	24

# CHAPTER ONE INTRODUCTION

### 1.1 RESEARCH BACKGROUND

Input-output table is one of the important tools used in economics analysis and is widely applied by researchers and analysts at regional, national and international levels. It provides valuable information about the structure of a country's economy which can be used for policy development and decision making purposes. Its usefulness as a decision making tool has prompted the United Nations to promote it as a practical planning tool for developing countries. Thus, in order to create more systematic approach of economic analysis, the United Nation in 1999 introduced a standardized system of economic accounts for constructing input-output tables. However, the work involved to prepare an input-output table is enormous. As such, to produce a benchmark input-output table based on the normal procedure of using census data of establishments is rather expensive and time-consuming. For this reason, the availability of the most current input-output table has become a major concern in the analysis of the country's economy. Generally, the latest input-output tables available would reflect data compiled from a very much earlier reference year. For example, the Malaysia Input-Output Tables (MIOT) for 2010 was only released in 2014 by Department of Statistics Malaysia. Therefore, this setback would mean that most applications of input-output analysis generally may not be accurate because the available database is usually out-dated due to the extended length of time taken to prepare and compile these tables. To overcome this critical issue, projecting the inputoutput data is identified as the most viable proposition for better decision making process.

In view of its significant importance in providing up to date inputs for applications in a wide range of economic analysis and decision making activities, therefore, this study will focus on finding the most suitable procedure to project the input-output tables for Malaysia for better decision making purposes. It is hoped that the projected input-output tables can help policy makers to review and provide assistance, for example; in the case of selected vital industries which may need

1