



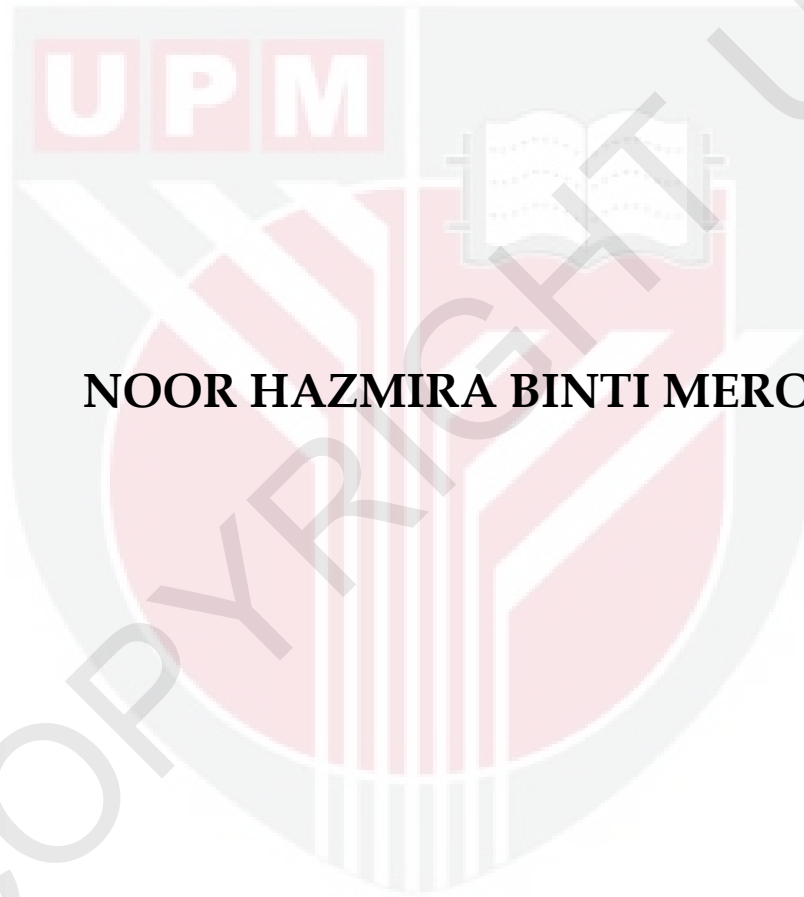
**UNIVERSITI PUTRA MALAYSIA**

**FORECASTING AVAILABILITY AND CONSUMPTION OF  
RUBBERWOOD IN PENINSULAR MALAYSIA**

**NOOR HAZMIRA BINTI MEROUS**

**FEP 2011 4**

**FORECASTING AVAILABILITY AND  
CONSUMPTION OF RUBBERWOOD IN  
PENINSULAR MALAYSIA**

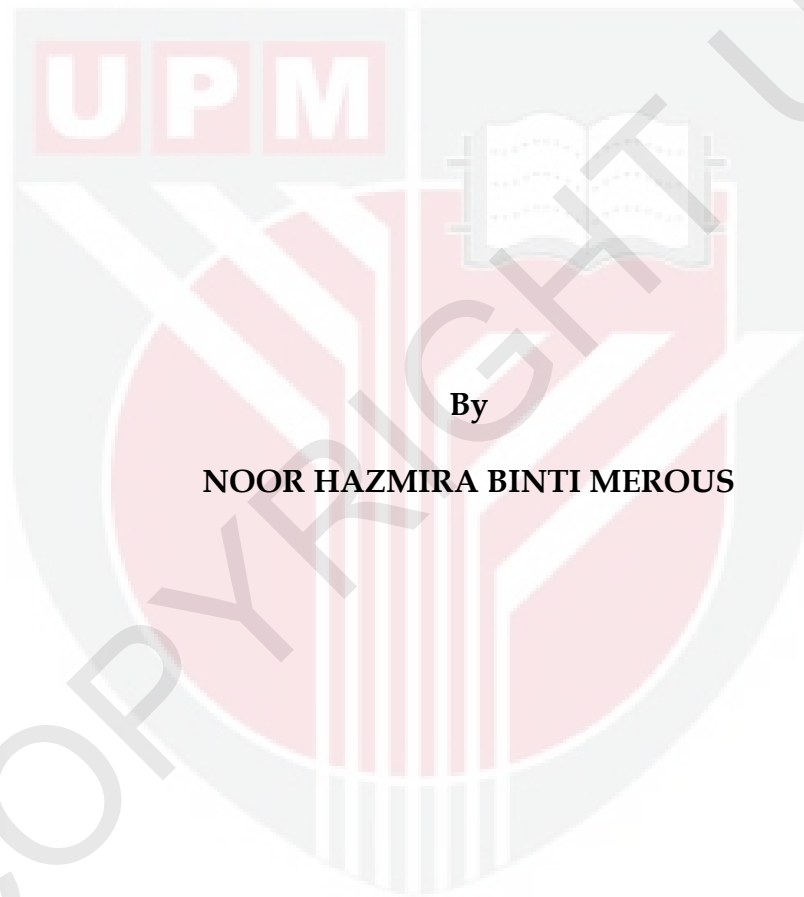


**NOOR HAZMIRA BINTI MEROUS**

**MASTER OF SCIENCE  
UNIVERSITI PUTRA MALAYSIA**

**2011**

**FORECASTING AVAILABILITY AND CONSUMPTION OF  
RUBBERWOOD IN PENINSULAR MALAYSIA**



By

**NOOR HAZMIRA BINTI MEROUS**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirements for the Degree of Master of Science**

**April 2011**

Abstract of thesis presented to the senate of Universiti Putra Malaysia  
in fulfillment of the requirement for the degree of  
Master Science

**FORECASTING AVAILABILITY AND CONSUMPTION OF RUBBERWOOD IN  
PENINSULAR MALAYSIA**

By

**NOOR HAZMIRA BINTI MEROUS**

April 2011

**Chair: Professor Mohd. Shahwahid Haji Othman, PhD**

**Faculty: Faculty of Economics and Management**

Rubberwood sawntimber has become one of the major contributors to the Malaysian furniture export and economic growth in the past two decades as its demand from wooden furniture manufacturing has increased tremendously. However, the availability of rubberwood sawntimber would not meet industry's demand. Therefore there is a need to examine and to identify the availability of rubberwood sawntimber in fulfilling the demand.

For this purpose, up-to-date information on availability and consumption of rubberwood sawntimber in Malaysia is important. Factors affecting availability and consumption of rubberwood sawntimber are identified through the multiple regression model. The availability and consumption of rubberwood sawntimber are forecasted for five years ahead from 2008 to 2012 through three models that have been identified among the best forecasting technique which is multiple

regression, Box-Jenkins and composite model that combine both models. The composite model is applied to balance the limitation of each model in order to get the best estimate forecasts. With each of the strengths of these two methods, using them together as one method will generate the most reliable forecast value.

The results of the regression analyses have been statistically diagnosed and modified to generate the best models. Availability of rubberwood sawntimber is influenced by replanted area, price of rubberwood log, latex price and previous production of rubberwood sawntimber. Consumption of rubberwood sawntimber is influenced by national income and prices of other light hardwood species that are mainly consumed by sawmills, i.e. Dark Red Meranti and Red Meranti

In forecasting availability and consumption of rubberwood sawntimber statistical evaluation of all of the three models shows an acceptable result which means these models could give reliable forecasts. Both multiple regression and Box-Jenkins model in forecasting availability and consumption of rubberwood sawntimber in Malaysia are reliable due to the smaller error and a closer value between forecasts and actual values compared to previous forecasts. The composite model makes the forecast values more reliable and stable and this proves that this model balance the strength and weaknesses of both forecasting techniques and is able to generate the best estimated forecasts.

The results also indicate that the rubberwood sawntimber is experiencing deficit. Therefore the concern on shortages and that production is no longer able to cater to demand is true based on the result of the multiple regression and composite model. As for the Box-Jenkins model result, production of rubberwood sawntimber was still able to cater to the demand for the rubberwood sawntimber until the year 2010 but will be deficit starting the year 2011.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan untuk  
ijazah Master Sains

**FORECASTING AVAILABILITY AND CONSUMPTION OF RUBBERWOOD IN  
PENINSULAR MALAYSIA**

Oleh

**NOOR HAZMIRA BINTI MEROUS**

April 2011

**Pengerusi: Profesor Mohd. Shahwahid Haji Othman, PhD**

**Fakulti: Fakulti Ekonomi dan Pengurusan**

Kayu getah begergaji merupakan salah satu penyumbang utama kepada eksport perabot di Malaysia dan pertumbuhan ekonomi negara pada dua dekad yang lalu kerana peningkatan besar permintaan perabot kayu. Walaubagaimanapun kayu getah begergaji telah berkurangan dan oleh sebab itu, mengetahui dan mengenalpasti keadaan kayu getah begergaji ialah sangat penting untuk memenuhi permintaan.

Untuk tujuan ini, maklumat terkini berkenaan keadaan dan penggunaan kayu getah begergaji di Malaysia ialah penting. Faktor-faktor yang mempengaruhi keadaan dan penggunaan kayu getah begergaji telah dikenalpasti melalui model regresi berbilang manakala unjuran keadaan dan penggunaan kayu getah begergaji telah dibuat untuk tempoh lima tahun akan datang dari 2008 hingga 2012 menggunakan tiga model yang telah dikenalpasti antara teknik unjuran

terbaik iaitu regresi berbilang, Box-Jenkins dan model komposit yang menyatukan kedua-dua model ini. Model komposit diaplikasi untuk menyeimbangkan kelemahan kedua-dua model untuk mendapatkan nilai unjuran terbaik. Dengan kekuatan kedua-dua kaedah ini, menggunakan kedua-duanya di dalam satu kaedah akan menghasilkan nilai unjuran yang paling tepat.

Keputusan analisis regresi telah diuji dan diolah untuk menghasilkan model-model yang terbaik. Keadaan kayu getah bebergaji dipengaruhi oleh kawasan penanaman semula pokok getah, harga kayu balak getah, harga susu getah dan keadaan kayu getah bebergaji terdahulu. Penggunaan kayu getah bebergaji pula dipengaruhi oleh pendapatan dan harga lain-lain kayu dalam spesis yang sama dengan kayu getah yang paling banyak digunakan oleh kilang-kilang kayu iaitu Meranti Merah Tua dan Meranti Merah

Penilaian statistik dalam unjuran keadaan dan penggunaan kayu getah bebergaji menunjukkan keputusan yang signifikan daripada ketiga-tiga model dan ini bermaksud model-model ini berupaya menghasilkan unjuran yang tepat. Model regresi berbilang dan Box-Jenkins dalam membuat unjuran keadaan dan penggunaan kayu getah bebergaji adalah relevan melihat kepada jumlah perbezaan yang lebih kecil dan nilai unjuran yang lebih dekat dengan nilai sebenar berbanding unjuran terdahulu. Model komposit membuatkan nilai unjuran lebih tepat dan stabil dan ini membuktikan bahawa model ini



menyeimbangkan kekuatan dan kelemahan kedua-dua teknik unjuran dan berupaya untuk menghasilkan unjuran yang terbaik

Keputusan turut menunjukkan, masalah kekurangan wujud dalam keadaan kayu getah begergaji. Oleh sebab itu kebimbangan mengenai kekurangan kayu getah begergaji dan penghasilannya tidak lagi mampu untuk memenuhi permintaan adalah betul berdasarkan keputusan-keputusan daripada model regresi berbilang dan komposit. Manakala untuk model Box-Jenkins, penghasilan kayu getah begergaji masih mampu menampung permintaan sehingga 2010 tetapi mula berkurangan bermula tahun 2011.

## ACKNOWLEDGEMENTS

My utmost thankful and greatest gratitude feeling goes to Allah S.W.T for giving me guidance and strength to fulfill the university requirements to graduate and to finish my thesis writing. All of my appreciation also goes to Forest Institute of Malaysia (FRIM) for sponsoring my study.

I sincerely thank all of my supervisors, Professor Mohd. Shahwahid Haji Othman and Dr. Law Siong Hook for all the guidance, assistance and encouragement. My thanks also goes to my supervisors at FRIM Dr. Hj. Ahmad Fauzi bin Puasa and Dr. Ismariah bt. Ahmad. for all the guidance, assistance and tolerance.

My thankfulness are extended once again to Dr. Lim Hin Fui and Dr. Jean-Marc Rhoda who encouraged me to further my study. My biggest appreciation goes to Madam Rohana binti Abd. Rahman, Miss Norsuryani binti Abdul Ghani and Miss Noor Aini Zakaria for their guidance, assistance and care. My biggest thanks also to all research officers at Economic and Strategic Analysis Program at FRIM, and lecturers at Faculty of Economic and Management, UPM.

Last but not least, to all my family, namely my beloved parents (Haji Merous bin Mansor and Hajjah Azizah binti Abd. Hamid), my two sisters (Noor Hamiza and Noor Hazima), my husband (Mohd. Zailani bin Md. Noor) and my two children (Fatihah Damia' and Muhammad Aryan), thank you for all the love, encouragement, support and patience you have given me.

I certify that an Examination Committee has met on 14 April 2011 to conduct the final examination of Noor Hazmira Merous on her thesis entitled “Forecasting Availability and Consumption of Rubberwood in Peninsular Malaysia” in accordance with the Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

**Khairil Wahidin Awang, PhD**

Senior Lecturer  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Chairman)

**Zaiton Samdin, PhD**

Senior Lecturer  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Internal Examiner)

**Mohd Mansor Ismail, PhD**

Associate Professor  
Faculty of Agriculture  
Universiti Putra Malaysia  
(Internal Examiner)

**Mohammad Firdaus, PhD**

Jalan Kampar  
Kampus Epebe Darmaga Bogor  
Fam Epebe Bogor Indonesia  
(External Examiner)

---

**SHAMSUDDIN SULAIMAN, PhD**

Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Mohd. Shahwahid Haji Othman, PhD**

Professor  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Chairman)

**Law Siong Hook, PhD**

Associate Professor  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Member)

**Ahmad Fauzi Puasa, PhD**

Deputy Director  
Malaysian Institute of Economic Research  
(Member)

**Ismariah Ahmad, PhD**

Senior Research Officer  
Economics and Strategic Analysis Programme  
Forest Research Institute, Malaysia  
(Member)

---

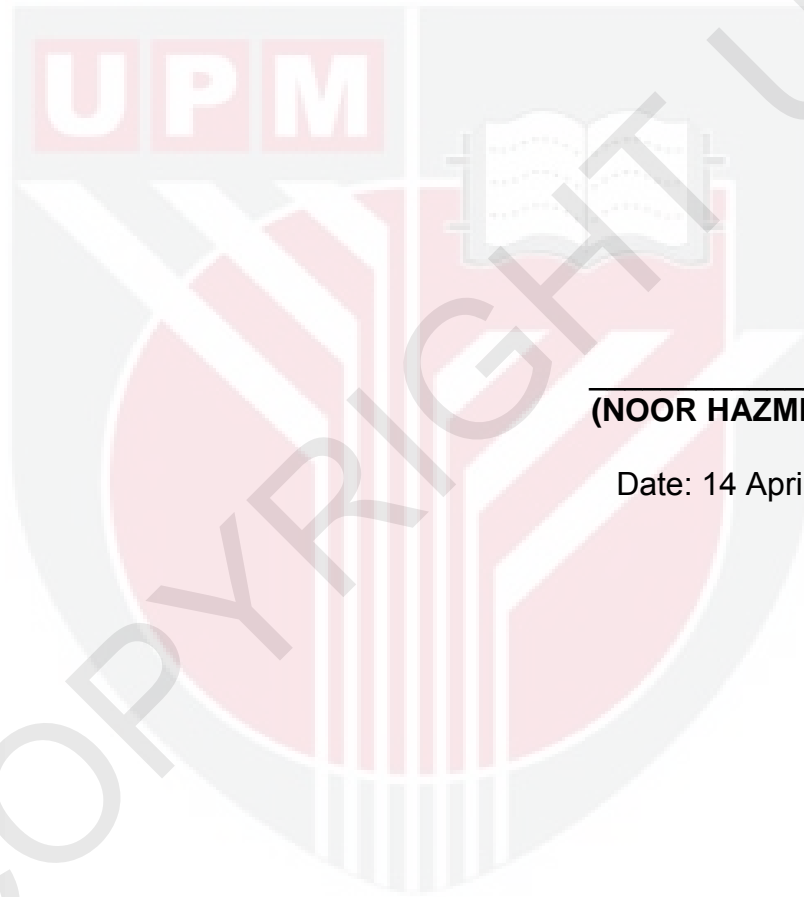
**HASANAH MOHD. GHAZALI, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:

## DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



**(NOOR HAZMIRA MEROUS)**

Date: 14 April 2011

## TABLE OF CONTENTS

	Page
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iv
<b>ACKNOWLEDGEMENTS</b>	vii
<b>APPROVAL</b>	viii
<b>DECLARATION</b>	x
<b>LIST OF TABLES</b>	xiii
<b>LIST OF FIGURES</b>	xiv
<b>LIST OF ABBREVIATIONS</b>	xv
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Background of the Study	1
1.2 Rubberwood and Wooden Furniture Industry	2
1.3 The Issues in Rubberwood-based Industries	4
1.3.1 Availability of Rubberwood	5
1.3.2 Consumption of Rubberwood	9
1.4 Problem Statement of Study	10
1.5 Justification of Study	11
1.6 Objectives of the Study	13
1.6.1 General Objective	13
1.6.2 Specific Objectives	13
<b>2 LITERATURE REVIEW</b>	<b>14</b>
2.1 Various Forecasting Techniques on Commodities	14
2.1.1 Studies on Accuracy of Various Forecasting Techniques	15
2.1.2 Studies Applying Multiple Regression Model	18
2.1.3 Studies Applying ARIMA Model	22
2.1.4 Studies Applying Composite Model	23
2.1.5 Studies Applying Vintage Approach	25
2.1.6 Selected Forecasting Technique	26
2.2 Forecasting Availability and Consumption of Rubberwood Sawntimber	27
2.3 Review of Selected Forecasting Techniques	34
2.3.1 Multiple Regression Model	34
2.3.2 ARIMA Model	35
2.3.3 Composite Model	35
<b>3 METHODOLOGY</b>	<b>37</b>
3.1 Type of Forecast	37
3.2 Justification of Methodology Selected	38
3.3 The Theoretical Framework	39
3.4 Analysis of Data	45

3.4.1 Multiple Regression Model	46
3.4.2 Box-Jenkins Model	49
3.4.3 Composite Model	52
3.4.4 Forecasting Performance Measures	53
3.5 Data	55
3.6 Sequence of the Analysis	57
<b>4 RESULTS AND DISCUSSION</b>	<b>58</b>
4.1 Model Analyses	58
4.1.1 Regression Results	58
4.1.2 ARIMA Model	64
4.1.3 Composite Model	70
4.2 Comparison of Forecasts Results	71
4.2.1 Forecasts Results for Availability	71
4.2.2 Forecasts Results for Consumption	73
<b>5 CONCLUSION AND RECOMMENDATIONS</b>	<b>76</b>
5.1 Summary and Conclusion	76
5.2 Limitations of the Study	79
5.3 Recommendations	80
<b>REFERENCES</b>	<b>82</b>
<b>APPENDIX A: Original data</b>	<b>88</b>
<b>BIODATA OF STUDENT</b>	<b>90</b>