MORTALITY MODELLING IN MALAYSIA USING O'HARE AND LI IN A STATE-SPACE APPROACH

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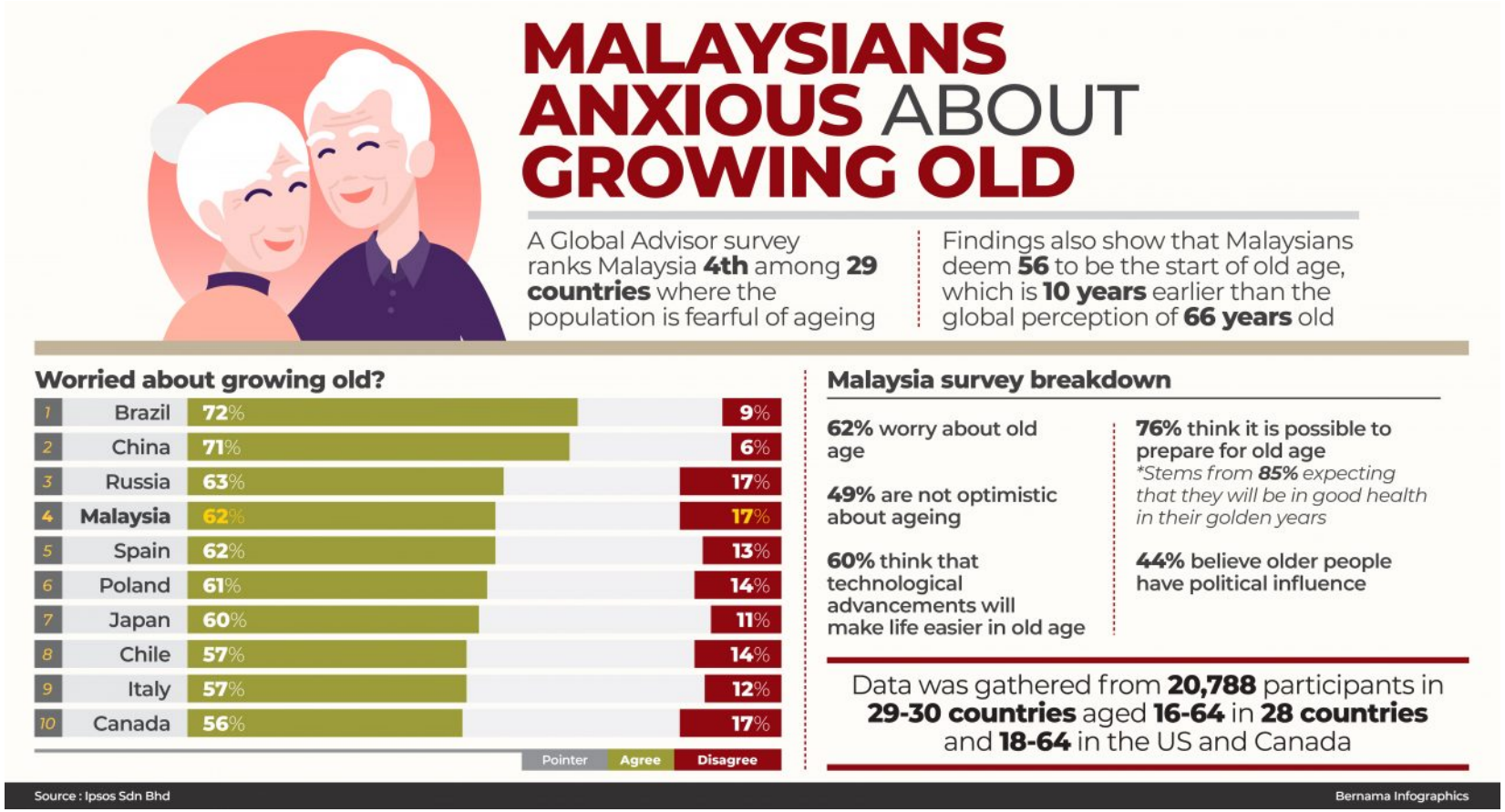
CONTENTS

Introduction

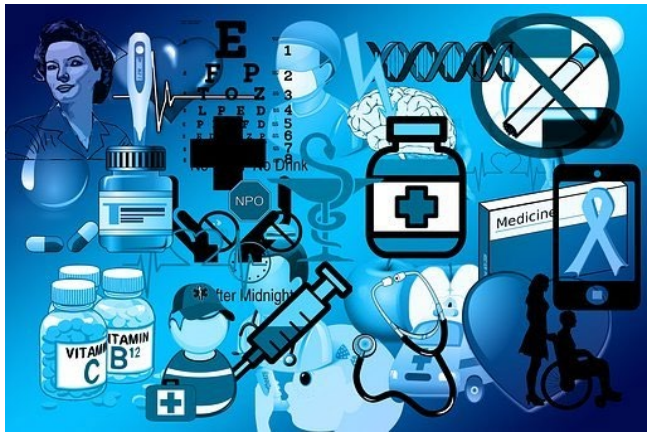
"Malaysia is expected to be an ageing nation by 2030"
(Tan Sri Lee Lam Thye-Alliance for a Safe Community Chairman, Dec 22, 2019)



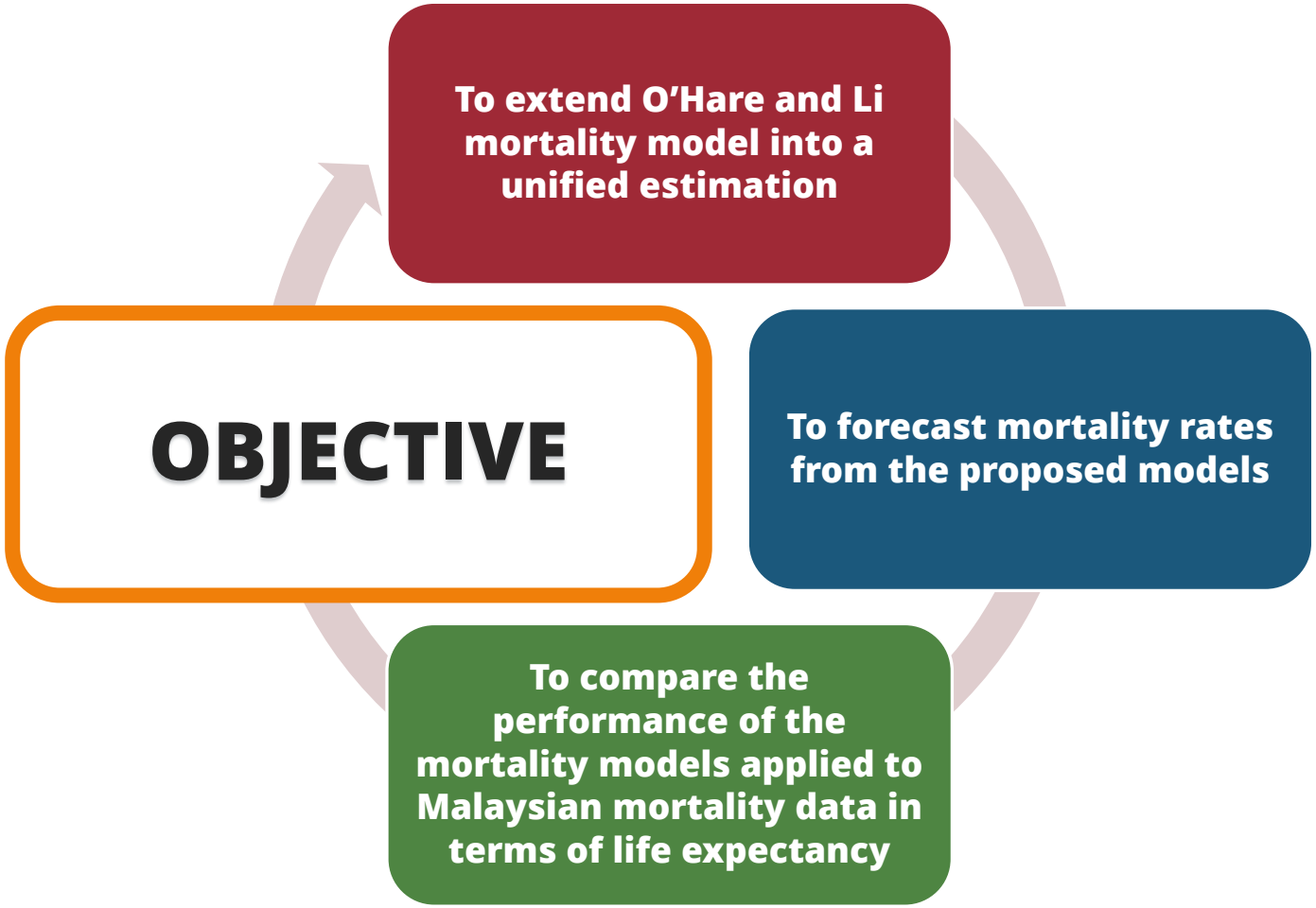
BorneoPost

Introduction

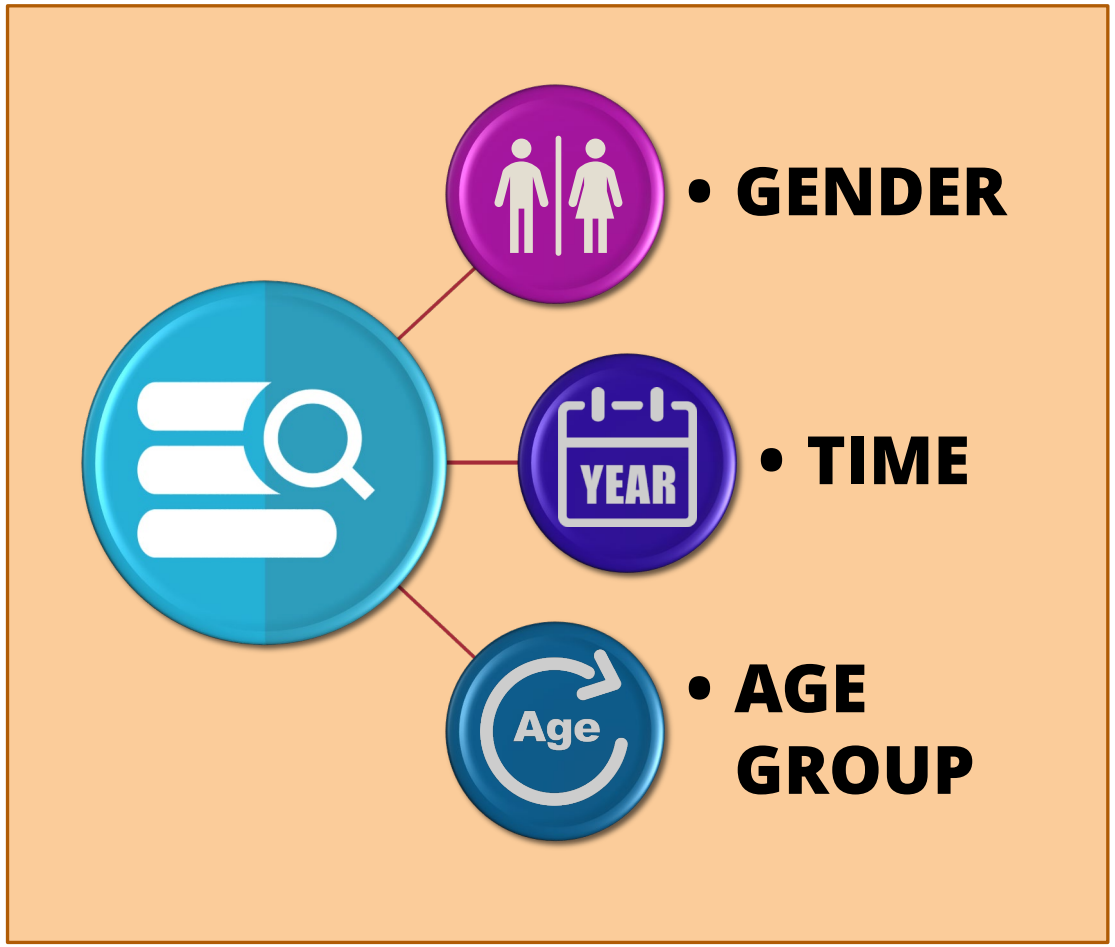
"CAN WE AFFORD LIFE INTO OUR 80s?"

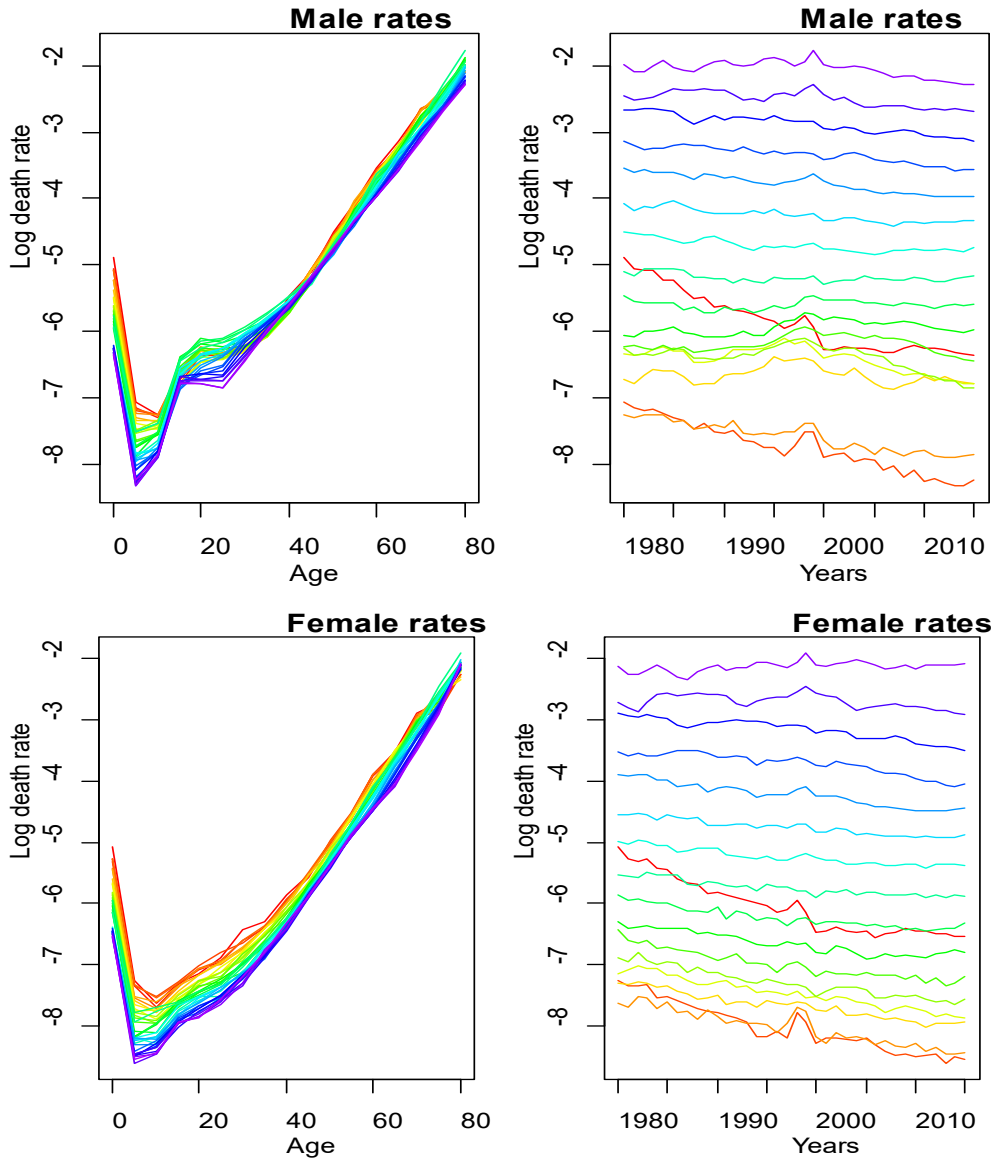


Objectives


To extend O'Hare and Li mortality model into a unified estimation
OBJECTIVE
To forecast mortality rates from the proposed models
To compare the performance of the mortality models applied to Malaysian mortality data in terms of life expectancy

Data


• GENDER
YEAR
• TIME
Age
• AGE GROUP


Male rates
Log death rate
-2
-3
-4
-5
-6
-7
-8
0
20
40
60
80
Age
Male rates
Log death rate
1980
1990
2000
2010
Years
Female rates
Log death rate
Age
Female rates
Log death rate
Years

Literature Review

Independent Estimation

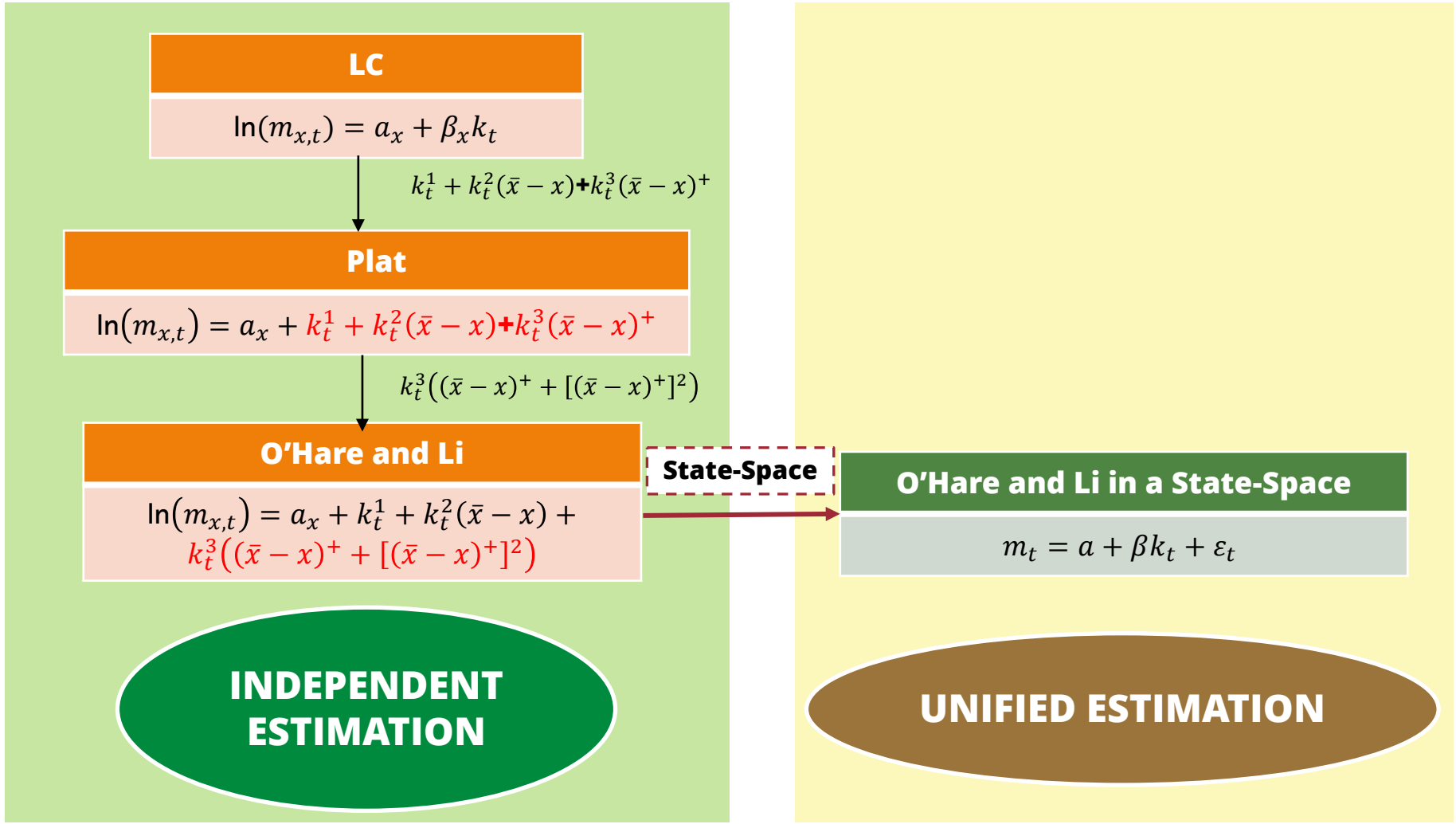
Authors	Mortality Model	Weaknesses
Lee and Carter (1992)	Lee and Carter Model by using SVD method	SVD method assumes for homoskedastic error over all ages. Single factor implies for perfectly correlated across ages. The assumption of one PCA is not adequate.
Renshaw and Haberman (2006)	Age-Period Cohort Effects Model	APC model has trivial correlation like LC
Currie (2006)	Simplification of Renshaw and Haberman (2006) model	Currie (2006) has a less fit quality as compared to APC model.
Cairns et al. (2009)	CBD model	The model's design if for higher ages only.
Plat (2009)	4-factor period effects	Did not perform very well when the age range is widened below 20.
O'Hare and Li (2012)	Quadratic age-effect parameter	The model has a better performances in capturing mortality with nonlinear pattern as compared to Plat (2009) model.

Research Gap

MODEL	MALAYSIA	INTERNATIONAL
Lee-Carter Model	Ngataman, et al. (2016); Asmuni (2015) ; Kamaruddin (2015); Husin et al. (2015),	Lee and Carter (1992)
Lee-Carter State Space	Husin et al. (2016)	Fung et al. (2015); Fung et al. (2017); Pedroza (2006); Liu and Li (2016)
O'Hare in a State Space	GAP	GAP

PERFORMING BETTER

Methodology



Results and Discussions

Table 1: Comparison between observed and in-sample data for male and female from 1980-2010

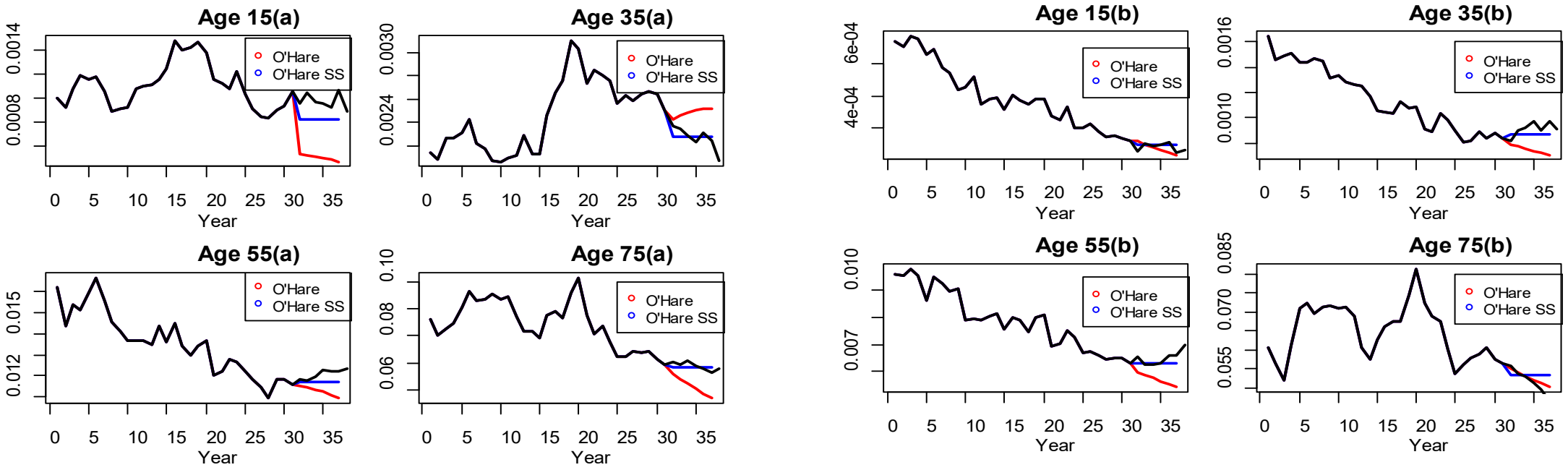
Models	O'Hare		O'Hare State-Space	
	Male	Female	Male	Female
AE(%)	-0.0879	-0.0437	-0.0182	-0.0041
MAPE(%)	0.0732	0.0608	0.0637	0.0508
RMSE(%)	0.8179	0.4367	0.4358	0.3186

Results and Discussions

Table 2: Comparison between observed and forecast data for male and female from 2011-2017

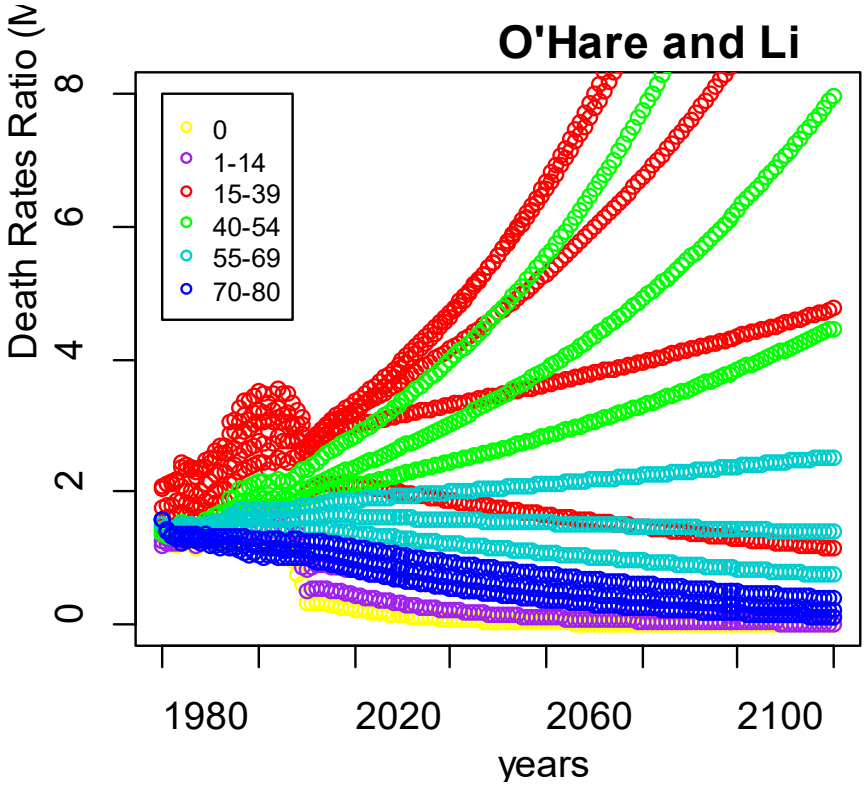
Models	O'Hare and Li		O'Hare and Li State-Space	
	Male	Female	Male	Female
AE(%)	0.1506	0.1130	-0.0415	0.0726
MAPE(%)	0.1916	0.1179	0.1073	0.0980
RMSE(%)	0.3713	0.6049	0.1408	0.6373

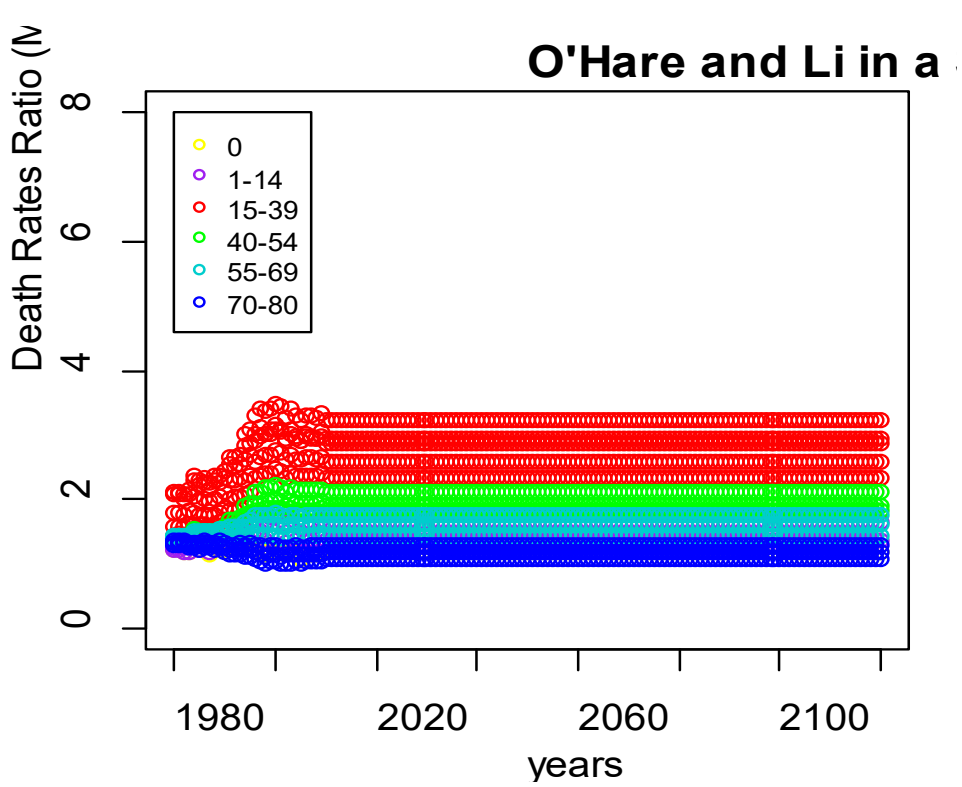
Results and Discussions



Forecast plots 2011-2017 comparison between observed and forecast data for (a) male and (b) female.

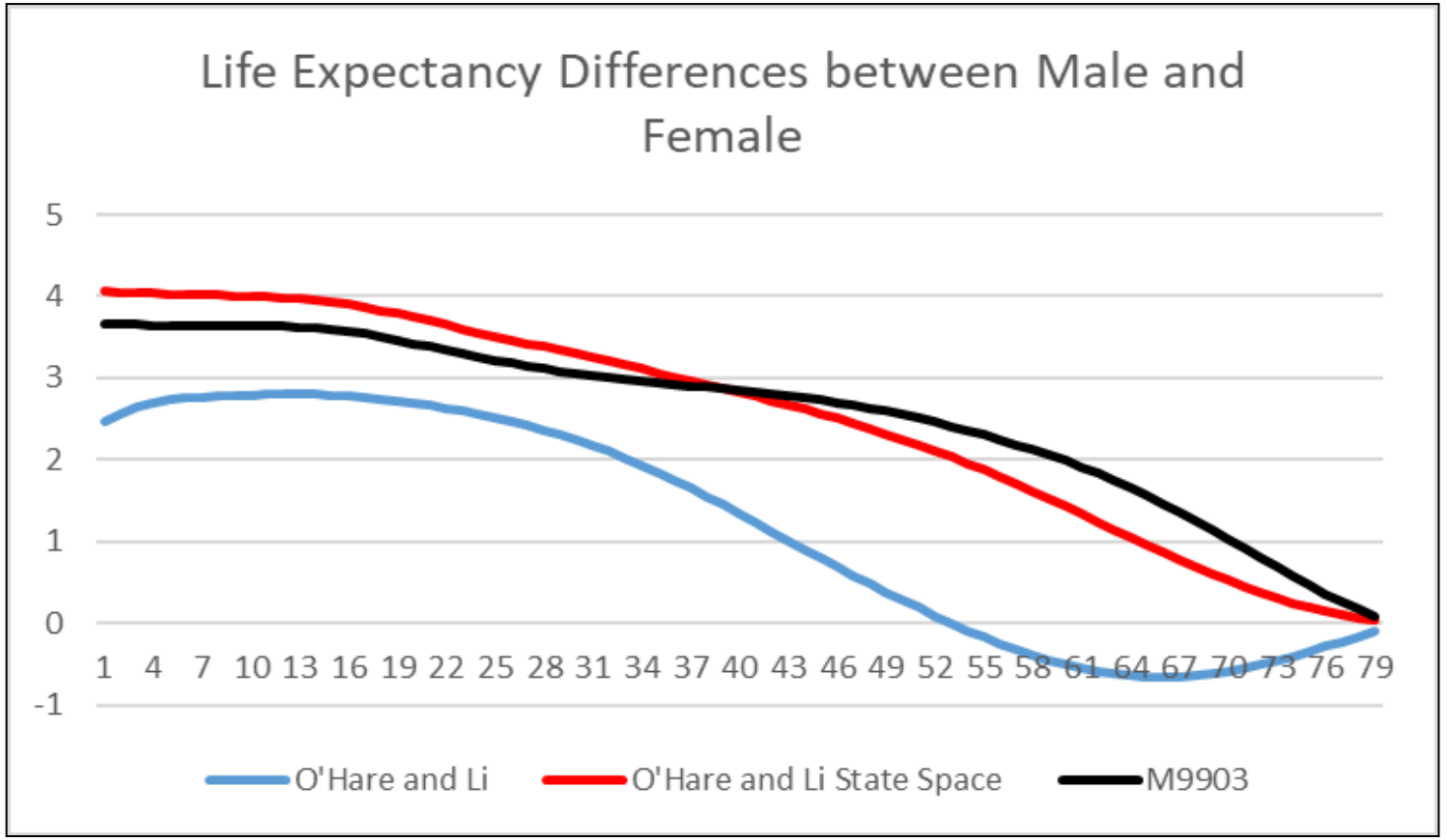
Results and Discussions





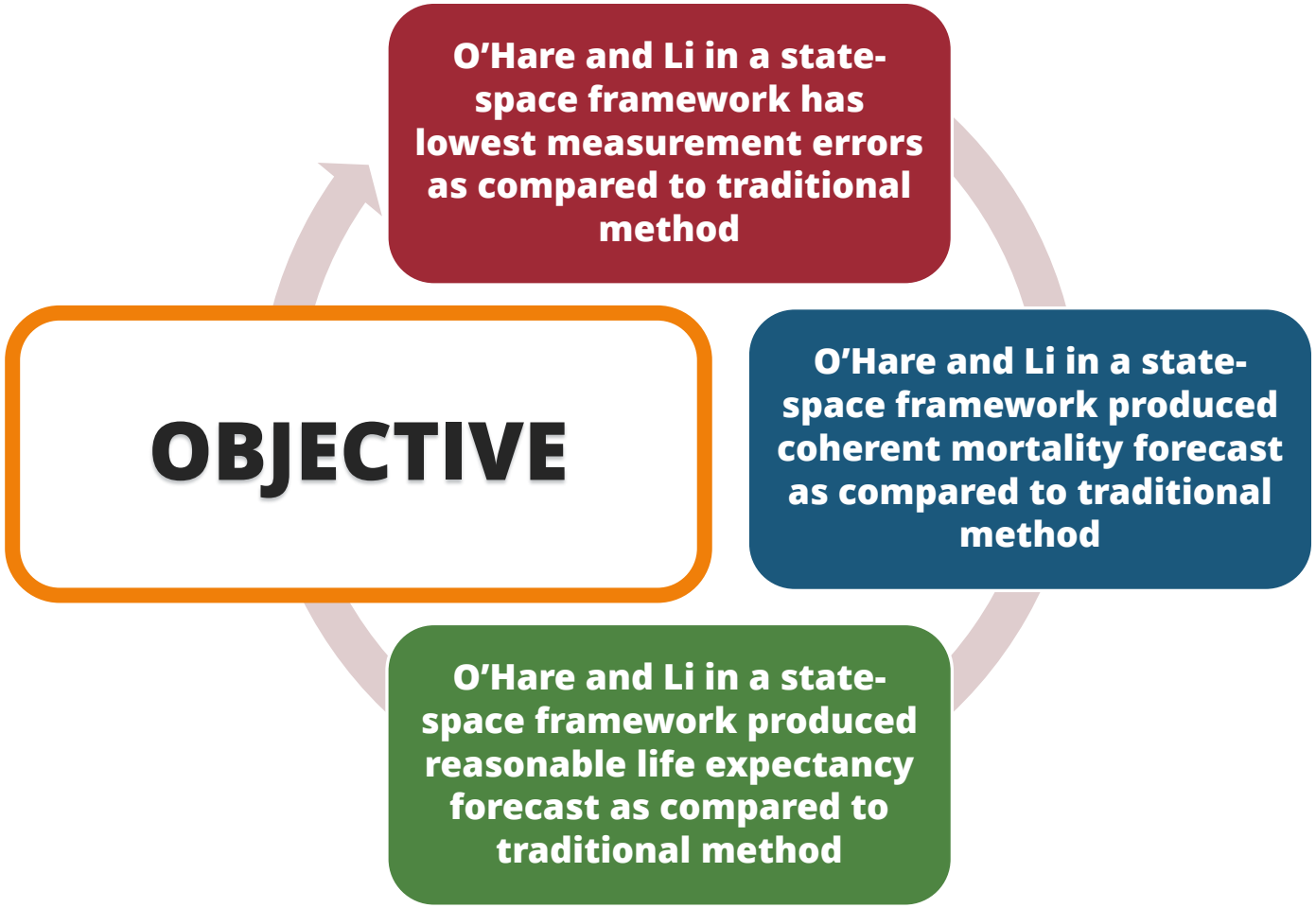
Forecast male-to-female ratio plots 2011-2120

Results and Discussions



The life expectancy differences between male and female

Conclusion


O'Hare and Li in a state-space framework has lowest measurement errors as compared to traditional method
O'Hare and Li in a state-space framework produced coherent mortality forecast as compared to traditional method
O'Hare and Li in a state-space framework produced reasonable life expectancy forecast as compared to traditional method
OBJECTIVE

THANK YOU

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