

Essays on Modeling Nonlinear Time Series

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van •Amsterdam

op gezag van de Rector Magnificus

Prof, mr P.F. van der Heijden

ten overstaan van een door het college voor promoties ingestelde
commissie. in het openbaar te verdedigeei in de Aula der Universiteit

op dinsdag 10 September 2002, te 12.00 uur

door

Paul Tjeerd de Bruin"

geboren te Den Helder

Contents

1	Introduction	1
1.1	Modeling macroeconomic time series	2
1.2	Nonlinear conditional mean models	4
1.3	Research topics	6
1.3.1	Forecasting with nonlinear models	7
1.3.2	Data transformation and nonlinearity	8
1.3.3	Seasonally and nonlinearity	9
2	Approximating forecasts for SETAR processes	11
2.1	Introduction	11
2.2	Normal forecasting error method	12
2.3	Extensions to more complicated models	16
2.4	Proof of the proposition	19
2.5	Concluding remarks	21
3	Nonlinearity and data transformations	23
3.1	Power transformations and evidence of nonlinearity	23
3.1.1	Introduction	23
3.1.2	Data	24
3.1.3	Empirical methodology	28
3.1.4	Results	30
3.1.5	Simulations	35
3.1.6	Concluding remarks	41
3.2	Forecasting power transformed time series data	53
3.2.1	Introduction	53
3.2.2	Preliminaries and research question	54
3.2.3	Nonlinear models and forecasting	55

3.2.4	Adjusting the forecasting bias	56
3.2.5	Results	58
3.2.6	Conclusions.	62
3.3	Power transformations and regime switches.	63
3.3.1	Data and models.	63
3.3.2	The K coefficient of agreement	64
3.3.3	Results	68
3.3.4	Conclusions	70
4	Seasonal adjustment and the business cycle	77
4.1	Introduction	77
4.2	Econometric modeling	80
4.2.1	SEASTAR models for seasonally unadjusted data.	80
4.2.2	STAR models for seasonally adjusted data	82
4.2.3	Comparing results from SEASTAR and STAR models	82
4.3	International evidence.	83
4.3.1	The data	83
4.3.2	(SEA)STAR models	83
4.3.3	Is there agreement across chronologies?	86
4.4	Conclusion	92
5	Seasonal Smooth Transition Autoregression	95
5.1	Introduction	95
5.2	Representation and specification.	97
5.2.1	Representation	97
5.2.2	Specification strategy.	99
5.2.3	Quarterly industrial production	100
5.3	Parameter estimation and diagnostics	105
5.3.1	Parameter estimation	105
5.3.2	Diagnostics	107
5.4	Forecasting	114
5.4.1	Generating forecasts	114
5.4.2	Empirical results.	115
5.5	Effects of seasonal adjustment	118
5.6	Concluding remarks.	119

6	Summary and conclusions	,	121
	Bibliography		125
	Nederlandse samenvatting (Summary in Dutch)		131