

# Contents

<b>1</b>	<b>Introduction</b>	1
1.1	Discrete Stochastic Processes and Time Series	1
1.2	Trend Definition and Estimation	4
1.3	AR(1) Stochastic Process	7
	References	12
<b>2</b>	<b>Monte Carlo Experiments</b>	15
2.1	Monte Carlo Statistical Ensembles	15
2.2	Numerical Generation of Trends	18
2.3	Numerical Generation of Noisy Time Series	21
2.4	Statistical Hypothesis Testing	26
	References	30
<b>3</b>	<b>Polynomial Fitting</b>	31
3.1	Polynomial Fitting	31
3.2	Polynomial Fitting of Artificial Time Series	34
3.3	An Astrophysical Example	38
	References	42
<b>4</b>	<b>Noise Smoothing</b>	43
4.1	Repeated Central Moving Average	43
4.2	Smoothing of Artificial Time Series	49
4.3	A Financial Example	53
	References	58
<b>5</b>	<b>Automatic Estimation of Monotonic Trends</b>	61
5.1	Average Conditional Displacement (ACD) Algorithm	61
5.2	Automatic ACD Algorithm	65
5.3	Evaluation of the ACD Algorithm	70
5.4	A Climatological Example	74

5.5	Monotonic Components of Nonmonotonic Trends . . . . .	76
	References . . . . .	80
<b>6</b>	<b>Estimation of Monotonic Trend Segments from a Noisy Time Series . . . . .</b>	<b>81</b>
6.1	Time Scale of Local Extrema . . . . .	81
6.2	Local Extrema of Noisy Time Series . . . . .	85
6.3	Local Extrema of RCMA Trends . . . . .	89
6.4	Significant Local Extrema of a Real Time Series . . . . .	92
	References . . . . .	97
<b>7</b>	<b>Automatic Estimation of Arbitrary Trends . . . . .</b>	<b>99</b>
7.1	Automatic RCMA (AutRCMA) . . . . .	99
7.2	Statistical Significance of the Local Extrema of the AutRCMA Trend . . . . .	105
	References . . . . .	110
	<b>Appendix A: Statistical Properties of the Linear Regression . . . . .</b>	<b>111</b>
	<b>Appendix B: Spurious Serial Correlation Induced by MA . . . . .</b>	<b>113</b>
	<b>Appendix C: Continuous Analogue of the ACD Algorithm . . . . .</b>	<b>117</b>
	<b>Appendix D: Standard Deviation of a Noise Superposed over a Monotonic Trend . . . . .</b>	<b>121</b>
	<b>Appendix E: Construction of a Partition of Scale <math>\Delta n</math> . . . . .</b>	<b>127</b>
	<b>Appendix F: Estimation of the Ratio Between the Trend and Noise Magnitudes . . . . .</b>	<b>129</b>



<http://www.springer.com/978-94-007-4824-8>

Automatic trend estimation

Vamos, C.; Crăciun, M.

2013, X, 131 p. 77 illus., Softcover

ISBN: 978-94-007-4824-8