

# Contents

<b>Preface</b>	<b>xi</b>
<b>1 Preliminaries</b>	<b>1</b>
1.1 Stochastic Processes	2
1.2 Convergence Concepts	3
1.3 Time Series Concepts	8
1.4 Laws of Large Numbers	14
1.5 Central Limit Theorems	16
1.6 Elements of Spectral Analysis	18
<b>2 DSGE Models, Solutions, and Approximations</b>	<b>26</b>
2.1 A Few Useful Models	27
2.2 Approximation Methods	45
<b>3 Extracting and Measuring Cyclical Information</b>	<b>70</b>
3.1 Statistical Decompositions	72
3.2 Hybrid Decompositions	83
3.3 Economic Decompositions	100
3.4 Time Aggregation and Cycles	104
3.5 Collecting Cyclical Information	105
<b>4 VAR Models</b>	<b>111</b>
4.1 The Wold Theorem	112
4.2 Specification	118
4.3 Moments and Parameter Estimation of a VAR( $q$ )	126
4.4 Reporting VAR Results	130
4.5 Identification	141
4.6 Problems	151
4.7 Validating DSGE Models with VARs	159
<b>5 GMM and Simulation Estimators</b>	<b>165</b>
5.1 Generalized Method of Moments and Other Standard Estimators	166
5.2 IV Estimation in a Linear Model	169
5.3 GMM Estimation: An Overview	176
5.4 GMM Estimation of DSGE Models	191
5.5 Simulation Estimators	197

<b>6</b>	<b>Likelihood Methods</b>	<b>212</b>
6.1	The Kalman Filter	214
6.2	The Prediction Error Decomposition of Likelihood	221
6.3	Numerical Tips	228
6.4	ML Estimation of DSGE Models	230
6.5	Two Examples	240
<b>7</b>	<b>Calibration</b>	<b>248</b>
7.1	A Definition	249
7.2	The Uncontroversial Parts	250
7.3	Choosing Parameters and Stochastic Processes	252
7.4	Model Evaluation	259
7.5	The Sensitivity of the Measurement	279
7.6	Savings, Investments, and Tax Cuts: An Example	282
<b>8</b>	<b>Dynamic Macro Panels</b>	<b>288</b>
8.1	From Economic Theory to Dynamic Panels	289
8.2	Panels with Homogeneous Dynamics	291
8.3	Dynamic Heterogeneity	304
8.4	To Pool or Not to Pool?	315
8.5	Is Money Superneutral?	321
<b>9</b>	<b>Introduction to Bayesian Methods</b>	<b>325</b>
9.1	Preliminaries	326
9.2	Decision Theory	335
9.3	Inference	336
9.4	Hierarchical and Empirical Bayes Models	345
9.5	Posterior Simulators	353
9.6	Robustness	370
9.7	Estimating Returns to Scale in Spain	370
<b>10</b>	<b>Bayesian VARs</b>	<b>373</b>
10.1	The Likelihood Function of an $m$ -Variable VAR( $q$ )	374
10.2	Priors for VARs	376
10.3	Structural BVARs	390
10.4	Time-Varying-Coefficient BVARs	397
10.5	Panel VAR Models	404
<b>11</b>	<b>Bayesian Time Series and DSGE Models</b>	<b>418</b>
11.1	Factor Models	419
11.2	Stochastic Volatility Models	427
11.3	Markov Switching Models	433
11.4	Bayesian DSGE Models	440
<b>Appendix A Statistical Distributions</b>		<b>463</b>
<b>References</b>		<b>469</b>
<b>Index</b>		<b>487</b>