

## Table of contents

Foreword.....	3
Acknowledgements.....	4
Summary table of contents .....	5
Table of contents .....	7
List of abbreviations and acronyms .....	15
1. Introduction and overview.....	18
Introduction .....	19
Structure of the handbook.....	21
2. Sources and methods used to compile initial estimates of QNA variables .....	24
Introduction .....	25
Some general conceptual and definitional issues.....	27
Time of recording.....	28
Consistency in recording and work-in-progress .....	29
Meaningfulness of quarterly data .....	30
GDP(P): the production approach.....	31
Market sector-dominated industries .....	31
Non-market sector-dominated industries .....	32
Output.....	33
Work-in-progress .....	33
Agricultural production of crops .....	35
Regular agricultural production.....	39
Storage .....	39
Employment-type indicators .....	40
Intermediate consumption .....	41
Taxes less subsidies on products .....	42
Deriving production account estimates for institutional sectors .....	42
Basic data commonly used to derive estimates of GDP(P) .....	43
GDP(E): the expenditure approach.....	48
Final consumption expenditure of households.....	48
Final consumption expenditure of non-profit institutions serving households (NPISHs) .....	52
Final consumption expenditure of government .....	52
Gross fixed capital formation .....	53
Consumption of fixed capital .....	57
Changes in inventories .....	58
The process of using enterprise survey data .....	58
Deriving estimates of changes in inventories by institutional sector .....	63
Acquisitions less disposals of valuables .....	63
Exports and imports of goods and services .....	64
GDP(I): the income approach .....	64
Compensation of employees .....	64
Operating surplus and mixed income.....	67
Taxes on production and imports .....	67
Subsidies .....	69

The allocation of primary income account – property income .....	70
Interest.....	71
Dividends.....	73
Withdrawals from income of quasi-corporations .....	74
Reinvested earnings on foreign direct investment .....	74
Investment income attributable to insurance policy holders .....	75
Investment income payable on pension entitlements .....	75
Investment income attributable to collective investment fund shareholders .....	76
Rent .....	76
The secondary distribution of income account .....	76
Current taxes on income, wealth, etc. ....	77
Net social contributions and social benefits other than social transfers in kind .....	79
Net non-life insurance premiums and non-life insurance claims.....	80
Current transfers within general government .....	81
Current international cooperation .....	81
Miscellaneous current transfers .....	81
Use of disposable income account .....	82
Individual and collective consumption expenditure.....	82
Adjustment for the change in pension entitlements .....	82
The capital account.....	82
Capital transfers .....	82
Other capital transfers .....	83
Acquisitions less disposals of non-produced non-financial assets .....	83
Ideal data requirements for QNA .....	83
Suggested “ideal” data set for compiling quarterly estimates .....	84
Quarterly budget expenditure surveys .....	84
Business surveys.....	84
Government spending and receipts .....	86
Other primary and secondary income flows .....	86
Balance of payments and international investment position and international trade statistics ....	86
Price indices .....	87
Tax authorities and government administrative sources .....	87
Summary of main points .....	88
Annex 2.A — Community legislation in the field of short-term statistics .....	89
The system of short-term business statistics .....	90
Reference Community legislation.....	90
Characteristics of the system of short-term business indicators.....	90
Wages and salaries .....	91
Production indices .....	91
Turnover indices .....	92
Output and other price indices .....	92
Employment and hours worked.....	92
Other short-term business statistics.....	93
Final consumption statistics .....	94
Employment .....	94
Reference Community legislation.....	94
Import and export data .....	94
Reference legislation .....	94
Statistics relating to the trading of goods with third countries .....	95
Statistics relating to the trading of goods between Member States .....	95

Balance of payments and international investment position.....	95
Reference legislation .....	95
The balance of payments and IIP statistics.....	96
Current Account.....	96
Goods .....	96
Services .....	97
Primary income.....	97
Secondary income.....	97
Capital account.....	97
Financial account.....	97
 3. Processes for acquiring basic data.....	98
Introduction .....	99
Sample surveys.....	100
Issues encountered with sample surveys .....	101
Administrative data.....	103
Maximizing the quality of basic data .....	104
Data obtained from another branch of the NSI .....	104
Sample surveys .....	104
Administrative data .....	106
Data obtained from outside the NSI .....	107
Sample surveys .....	107
Administrative data .....	107
Summary of main points .....	108
 4. The use of information in the compilation of QNA.....	109
Introduction .....	110
Description of the scheme .....	111
The properties of quarterly estimates .....	114
Flash estimates .....	115
Strategies for deriving flash estimates .....	116
More rapid supply of data by businesses .....	116
Use of data spanning less than three months .....	117
Using an alternative indicator .....	117
Seasonal adjustment of flash estimates.....	118
Extrapolation methods that do not use a quarterly indicator .....	118
Simple mathematical extrapolation .....	118
Time series methods .....	119
Summary of main points .....	120
 5. Statistical methods for temporal disaggregation and benchmarking.....	121
Introduction .....	122
Methods when no quarterly data are available .....	124
Smoothing methods.....	124
Boot, Feibes and Lisman method.....	124
Time series methods .....	126
Deriving preliminary quarterly estimates using an indicator .....	127
Simple extrapolation.....	127
Refinements to simple extrapolation .....	128

Benchmarking methods .....	130
Pro rata adjustment .....	130
Denton difference method .....	130
Denton proportional method .....	131
Characteristics of the two Denton methods .....	131
Benchmarking the current year (when no annual data are available) .....	132
Methods that impute values for a QNA variable by modelling the relationship between (annualized) preliminary quarterly estimates of a QNA variable, or a quarterly indicator, and the corresponding annual benchmarks.....	133
Chow and Lin method .....	134
Developments of Chow and Lin's optimal method (dynamic models and Kalman filter) .....	135
Optimal methods using two steps .....	135
Optimal methods versus simple extrapolation .....	136
Organizational arrangements for the use of statistical methods in QNA .....	138
Seasonal adjustment and benchmarking.....	139
Summary of main points .....	139
Annex 5.A — A formal presentation of mathematical and statistical models .....	140
Introduction .....	140
Basic principles .....	140
Smoothing methods .....	142
Time series methods.....	143
Wei and Stram's procedure .....	143
AI-Osh's procedure.....	144
Further information about time series methods.....	144
Annual benchmarking .....	144
Denton methods .....	145
Denton difference method .....	145
Denton proportional method .....	146
Optimal methods .....	146
Dynamic models.....	148
Annex 5.B — Two-step optimal methods — French approach .....	150
Introduction .....	150
Fitting a model between the annualized quarterly indicator and the annual benchmark.....	150
Models used .....	150
Selecting the best model .....	151
From the annual model to the preliminary quarterly estimates .....	151
Benchmarking.....	152
Example: deriving quarterly constant price estimates of gross value added in the French manufacturing industry.....	152
Fitting and choosing a model .....	152
From the annual model to the preliminary quarterly estimates .....	153
Benchmarking.....	154
Annex 5.C — Temporal disaggregation of national accounts time series: an illustrated example using different methods and models .....	155
Introduction .....	155

Description of the models used.....	156
The data used in Analysis .....	159
Fitting models to the data.....	161
Comparing the quarterly extrapolations with the actual data.....	165
Comparing the quarterly distributions with the actual data.....	169
Some conclusions.....	170
Further comments.....	171
 6. Chain-linked volume estimates.....	172
Introduction .....	173
Formulae for the aggregation of elemental components to form quarterly chain-linked volume indices ..	175
Terminology .....	175
Different index formulae .....	175
Requirements of an integrated system of price and volume indices.....	178
Chain indices .....	179
The case for using chain indices .....	179
Deriving annual chain-linked volume indices in the national accounts .....	181
Deriving quarterly chain-linked volume indices in the national accounts .....	181
Choosing between chain Laspeyres and chain Fisher indices .....	183
Deriving annually-linked quarterly Laspeyres-type volume indices .....	183
Annual overlap method.....	184
One-quarter overlap method .....	185
Over-the-year method .....	186
Practical issues concerning chain Laspeyres volume indices .....	189
Alternative ways of linking and unlinking quarterly Laspeyres-type volume indices.....	190
Annual overlap method.....	190
One-quarter overlap method .....	192
Example: UK final consumption expenditure.....	193
Deriving chain-linked volume indices of time series that are not strictly positive.....	197
Strictly positive flow series.....	198
Strictly positive stock series (inventories).....	198
Availability of base year data.....	198
Seasonal and calendar adjustment.....	199
Contributions to growth .....	199
The additive case .....	199
Non-additive case .....	200
Additive Volume Data (AVD) Method .....	200
Weighted Growth Rates (WGR) Method .....	203
Partial Contributions to Growth (PCG) Method .....	204
Relationships between the different methods .....	204
Choice of method .....	204
Issues concerning volume estimation at the elemental level.....	205
Conceptual and definitional issues.....	205
Data issues .....	205
Value added.....	206
Changes in inventories .....	206
Agriculture.....	206
Prices .....	206
Quality change.....	208
Summary of main points .....	208

7. Seasonal and calendar adjustment .....	209
Introduction .....	210
Causes of seasonal variation.....	210
Calendar variation.....	212
Moving holidays.....	212
Working-days.....	212
Trading-days.....	213
Leap year/length of the month.....	213
Seasonal adjustment models.....	213
Choice of seasonal adjustment method.....	215
Calculating and applying adjustments for calendar variation .....	217
Principal steps in undertaking seasonal adjustment.....	218
Prior transformations and adjustments (commonly referred to as 'linearization') .....	218
Choice of seasonal adjustment model .....	219
ARIMA models .....	220
Organizational arrangements for seasonal adjustment in QNA .....	221
Trend-cycle estimates .....	221
Relationship between quarterly seasonally adjusted data and annual data.....	223
Reasons for not having temporal consistency .....	223
Reasons for having temporal consistency .....	223
Benchmarking seasonally adjusted data to the annualized quarterly unadjusted data .....	224
Seasonal adjustment and revisions .....	225
Direct versus indirect seasonal adjustment .....	226
Deriving seasonally adjusted chain-linked volume measures .....	227
Case 1: all series are directly seasonally adjusted .....	228
Case 2: all aggregates are indirectly adjusted .....	228
Case 3: some aggregates are directly adjusted and others are indirectly adjusted .....	228
Non-strictly positive series.....	228
Editing .....	229
Transparency of procedures .....	229
Reference paper.....	229
Publication of information about seasonal adjustment.....	230
Summary of main points .....	230
8. The balancing of QNA .....	232
Introduction .....	233
Key principles of balancing .....	235
Other important features of balancing.....	237
Issues and procedures for quarterly balancing.....	239
Meaningfulness of the set of quarterly figures to be balanced.....	239
The quarterly balancing process.....	240
Automated and manual balancing .....	241
Key features of the balancing process .....	241
Steps in the balancing process .....	243
Creating the data sets .....	244

The balancing steps in practice.....	245
Alternatives to balanced supply and use tables.....	246
Compiling unbalanced detailed supply and use tables .....	247
Compiling highly aggregate supply and use tables.....	247
Partial supply and use tables .....	247
Balancing GDP .....	247
The net lending/borrowing procedure.....	247
The integration of supply and use tables with institutional sector accounts .....	248
Use of mathematical and statistical methods to balance quarterly SUTs and achieve temporal consistency with balanced annual data .....	249
Multivariate optimal methods.....	250
Multivariate benchmarking method .....	250
Applying the multivariate methods .....	250
Some organizational issues for the balancing process.....	251
Organizational arrangements .....	252
The quarterly timetable.....	252
Education of users and presentational issues .....	253
Other issues .....	254
Summary of main points .....	255
Annex 8.A — A framework for quarterly balancing .....	257
Introduction .....	257
An example of a balancing exercise .....	259
The balancing procedure.....	260
Annex 8.B — Balancing by using mathematical and statistical models .....	261
A formal presentation .....	261
Multivariate adjustment .....	262
Multivariate optimal estimation.....	263
Extrapolation.....	265
Annex 8.C — Benchmarking and balancing methods in the Dutch national accounts .....	266
Introduction .....	266
Setting the scene .....	267
The Quarterly Machine .....	267
The model.....	267
The tools.....	268
The benchmarking process in practice.....	269
The Balancing Machine .....	271
Selected formulae .....	271
9. The validation of QNA .....	274
Introduction .....	275
Why validation is so important in QNA.....	275
Statistical validation.....	276
Validating the source data.....	276
Validating the initial national accounts estimates.....	278

Plausibility of the quarterly growth rates.....	278
Adequacy of the seasonal and calendar adjustment .....	278
Consistency of the current price and volume estimates.....	279
Unexpected revisions .....	279
Coherence with national accounts indicators .....	279
Validating estimates from later compilation steps .....	281
Accounting validation .....	281
Economic validation .....	282
“Economic” cross-checks .....	283
Economic analysis.....	284
Flash estimates .....	285
Summary of main points .....	285
Annex 9.A — Statistical Validation: Comparing National Accounts Variables with Closely Related Indicators .....	287
CPI versus HFCE IPD.....	287
Other comparisons of price indices with national accounts IPDs .....	288
Compensation of employees versus employment data from the LFS and a wage cost index .....	288
10. Revision policy and analysis.....	290
Introduction .....	291
Revision analysis .....	291
Different approaches to revision analysis .....	292
Revisions database .....	293
Revision policy .....	293
Routine revisions .....	294
Major revisions .....	295
Ad hoc revisions .....	295
Informing users of revisions .....	296
Summary of main points .....	297
Bibliography .....	299
Index .....	302