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Annotated outline of the *Handbook on Business Cycle Composite Indicators*

Statistics Netherlands
United Nations Statistics Divisions
Eurostat
The Conference board

1. Introduction and definition

1.1. Chapter outline

- Scope and target audience of handbook
- Step by step guide to construct composite indicator (see Handbook OECD and Conference Board)
- Quality assurance framework of composite indicators (see Handbook OECD)
- Indicators and Composite Indexes
- Identification of the target variables
- Composite indicators to measure cyclical movements
- Composite indicators to detect the occurrence of turning points
- Composite indicators to measure economic growth
- Classification of the Indicators: Leading; Coincident and Lagging
- Communication and dissemination

1.2. Summary

This chapter is an introductory chapter that defines the scope of the handbook. Details will be confirmed once annotated outlines of other chapters have been agreed on.

1.3. Points of discussion

- The handbook is intended for compilers and users of business cycle composite indicators. Please recommend any target audiences that you think are necessary to be included?
- Please recommend any forms of quality assurance framework that can be served as the basis to assess the quality of the composite indicators.
- What dimensions of quality are important to the compilation and dissemination of composite indicators?
- Please recommend the best practice in the compilation, communication and dissemination of composite indicators.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.

2. Some historical and theoretical consideration on the construction of Business Cycle Composite Indicators

2.1. Chapter outline

- Pre Burns and Mitchell Indicators
- The Burns and Mitchell approach
- Composite Indicators based on Econometrics and Time Series approach

2.2. Key points:

Exogenous versus endogenous cyclical fluctuation's theories, monitoring the cyclical situation by a single variable or by a small/large set of variables, economic barometers, Burn and Mitchell approach, Conference Board approach, econometrics based composite indicators (diffusion indexes, VAR based indicators, etc).

2.3. Relevant documentations

- The Conference Board (2001), *Business Cycle Indicators Handbook*

2.4. Points of discussion

- This chapter gives an overview on some historical and theoretical consideration on the construction of the indicators. Please share your thoughts and recommend issues needed to be addressed in this chapter.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter

3. Data availability, frequency and adjustment techniques

3.1. Chapter outline

- Unavailability of long time series: back casting exercises
- Unavailability of appropriate price indexes
- Problems related to the presence of outliers and of seasonal and calendar effects: Seasonal Adjustment
- Imputation of missing data (see handbook OECD)
- Lack of information at desired frequency: Multi-frequency models (MIDAS, Bridge Equations models, etc.)

3.2. Discontinuities in time series: back casting exercises

Sample surveys conducted by national statistical institutes are generally conducted repeatedly in time with the purpose of constructing time series that describe the evolution of population parameters of interest. An important quality aspect of these surveys is comparability of the outcomes over time. To maintain consistent time series, the underlying survey process is generally kept unchanged as long as possible. It remains, however, inevitable to change or redesign a survey process from time to time. A major drawback of such redesigns is that it often has systematic effects on the outcomes of the survey, leading to discontinuities in the series. An important aspect of a survey redesign is to minimize this inconvenience for data users. This can be accomplished by quantifying the effect of the redesign on the outcomes of the main parameters.

Van den Brakel et al. (2008) discuss different statistical methods to deal with discontinuities due to survey redesigns. One possibility is to apply an intervention analysis using structural time series models. In this case the time series is modelled with an appropriate structural time series model and the discontinuities in the underlying survey design are modelled with intervention variables. The statistical methodology of this time series modelling approach with state-space models is described in detail by Van den Brakel and Roels (2010).

To maintain consistent time series, one might consider to correct the series observed in the past with the observed effects of the redesign. This is sometimes referred to as backcasting. This chapter develops the statistical time series modelling approach to construct long consistent series which are the basis to construct composite economic indicators.

3.3. Unavailability of appropriate price indexes

The use of price indexes in this context can be twofold. Firstly, an appropriately chosen price index may be desirable in itself as part of a composite indicator. Problems arise if in some countries this index is unavailable or not published in a timely fashion. Secondly, and more importantly, price indexes will be needed to deflate (other) indicators. The choice of deflator obviously depends on the indicators selected. The coverage of the price indexes compiled differs across

countries. In particular, good-quality PPI's are still lacking in many countries for parts of the services sector. There are several options to deal with this problem, although it will be difficult in general to quantify their appropriateness. For example, in some cases higher-level aggregate indexes, or indexes for similar industries, might be used instead. Also, price indexes from other countries can be used, such as approximating an import price index by an export price index from another country.

3.4. Problems related to the presence of outliers and of seasonal and calendar effects: Seasonal Adjustment

Seasonal adjustment plays an important role in analysing cyclical movements. Seasonally adjusted growth rates show how the economy develops and can provide help in determining turning points. At the same time the seasonal adjustment process is susceptible to strong fluctuations in the time series. The process is therefore subject tot several kinds of uncertainty, the magnitude of which can never be assessed precisely.

One of the main problems in estimating the seasonal pattern is deciding on which part of the fluctuations should be attributed to which time series component (trend, seasonal, cyclical, and irregular). Adjustment at the recent end of a time series is particularly difficult, especially in times of strong economic changes. It is difficult at an early stage to assess whether fluctuations are temporary or indicate a more structural change in the seasonal pattern. Ideally, we should wait for more observations to be available before proper seasonal adjustment can be done.

A common solution is to model sudden changes as outliers so that seasonal estimates are not affected too much. This assumes the seasonal pattern does not change in the short term. The main question is then what type of outlier we are dealing with. The most common types are additive outliers, level shifts, or transitory changes. Determining the exact type is difficult (or impossible) if we do not know the future of the time series. An alternative solution is not to model outliers and letting the trend-cycle and seasonal estimates absorb fluctuations.

Points of discussion:

- This debate has not been settled yet and we have to wonder whether we can make a choice. Maybe we should present more than one approach, each with its benefits and drawbacks?
- An alternative title for this section is “Problems related to seasonal adjustment”. Then outliers could be a separate section.
- We think that the comparison between X-12-ARIMA and TRAMO-SEATS is not a suitable subject for the current handbook. The section on seasonal adjustment methodology in Chapter 3 is more relevant to the handbook than a choice between the two packages. This is a general problem, not specific to the current handbook. Furthermore, there already has been a long debate between the advantages of either method [references to be added later]. For regular time series, both methods can deliver comparable results [reference to be added

3.5. Imputation of missing data

Points of discussion:

- Do missing data actually occur in the highly aggregated time series that we focus on in this handbook?
- Missing data in time series are usually not imputed with the methods that are standard for micro data and that are dealt with in the OECD handbook (hot deck, cold deck, regression, etc.). Usually, missing data points in time series are dealt with in the context of the time series model or heuristic that is applied, using an EM-algorithm for instance.
- In time series, the most recent observation may be missing. If we are dealing with a lagged time series with respect to the business cycle, other more timely time series may be used to predict the missing observation(s). However, this is not called imputation, but forecasting or nowcasting.

3.6. Lack of information at desired frequency: Multifrequency models (MIDAS, Bridge Equations models, etc.)

This section addresses the issue of unbalanced input dataset where the cyclical component indicators are sampled at different frequencies and where the information at desired frequency is missing. The problem of mixed frequency (e.g. monthly vs. quarterly) and jagged edges (i.e. at the end of the sample, different variables will have missing points corresponding to different dates in accordance with their timeliness) on the construction of business cycle composite indicator, and the principal of temporary disaggregation, will be explained. Several statistical models will be proposed here to deal with the issues. The underlying assumptions, advantage and disadvantage of each method will also be discussed.

- **Smoothing method** (Ch.6 Handbook of Quarterly National Account, Eurostat)
- **Two-step adjustment methods** (Denton 1971, Ch.6 Handbook of Quarterly National Account, Eurostat)
- **ARIMA approach** (Wei and Stram 1990 and Al-Osh 1989, Ch.6 Handbook of Quarterly National Account, Eurostat)
- **Optimal methods** (Bournay and Laroque 1979, Fernàndez, 1981, Litterman, 1983, Di Fonzo, 1987, Ch.6 Handbook of Quarterly National Account, Eurostat)
- **Dynamic models (**Ch.6 Handbook of Quarterly National Account, Eurostat)
- **Multivariate approach (**Ch.11 Handbook of Quarterly National Account, Eurostat)
- **State Space approach** (Ruth 2008)
- **Mixed Data Sampling (MIDAS) regression methods**. (Ghysels, Sinko and Valkanov 2006)

- **Bridge Equations models** (Angelini, et al. 2008)

Point of discussion:

- Please recommend methods that are appropriate to be included in this section.

3.7. Relevant documentations

- Eurostat (1999), *Handbook of Quarterly National Accounts*
- Ghysels, E., Sinko, A. and Valkanow (2006), "MIDAS Regressions: Further Results and New Directions"
- Angelini, E., Camba-Mendez, D., Giannone, D., Runstler G., and Reichlin L. (2008), "Short-Term Forecasts of Euro Area GDP Growth", European Central Bank Working Paper Series No. 949
- Ruth, F. (2008), "Constructing a monthly indicator of fixed capital formation via high frequency interpolation; The state space approach"
- Eurostat (2008), *ESS Guidelines on Seasonal Adjustment*
- Van den Brakel, J.A., P. Smith and S. Compton (2008). Quality procedures for survey transitions – experiments, time series and discontinuities. *Survey Research Methods*, 2, 123-141.
- Van den Brakel, J.A. and Roels, J. (2010). Intervention analysis with state-space models to estimate discontinuities due to a survey redesign. *Annals of Applied Statistics*, 4, 1105-1138.

3.8. Other points of discussion:

- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.

4. Variables selection techniques

4.1. Chapter outline

- Large versus Small dataset based Indicators
- Classification of variables according to their leading/lagging properties
- Subjective identification of variables
- The use of Factor Analysis and Principal Component Analysis approach
- Other non parametric techniques (Partial Least Squared, etc)
- General to Specific approach to reduce the Variable Space

4.2. Summary

When dealing with turning points composite indicators usually we start from a quite small dataset on which the following steps should be accomplished to achieve the optima selection of variables:

a) Analyze the leading-lagging structure of the variable;
b) Identify for each variable or group of variables what kind of cycle they are describing in a closer way (E.g. growth cycle in the case of qualitative surveys);
c) Identify the most appropriate set of transformation to be applied to data in order to have clear and less noised cyclical signals.

Usually these kinds of indicators are built up staring from a quite small dataset of containing potential candidate variables to be used. In this specific case the selection is then done mostly by using a prior knowledge of data and checking them, empirically, using indicators such as the QPS and the concordance index. This does not exclude the use or more formal selection criteria (e.g. classification techniques). Nevertheless the use of factor analysis and/or principal components is not largely used when constructing turning points indicators.

4.3. Points of discussion:

- Please recommend approaches to analyze the leading-lagging structure of variables.
- Please recommend any subjective or formal selection criteria to select component variable for the construction of composite indicators.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.
- Is it possible to agree on and recommend a harmonized set of component indicators, which is generic in nature, to form the basis for the construction of composite indicators?

5. Indicators to measure cyclical movements

5.1. Chapter outline

- The choice of target variables
- The choice of the reference cycle (classical, growth or acceleration cycle)
- Filtering techniques to achieve noise minimization and a proper estimation of trend –cycle component
- Detrending methods: Parametric versus non parametric (univariate versus multivariate)
- Aggregation of individual signals: choice of the weights versus combining forecasts
- Multivariate detrending methods and filtering
- Some examples

5.2. Key points:

Reference variables (real statistical variables versus latent variables), advantages and drawbacks of referring to alternative cyclical definition, limits of detrending techniques (instabilities of current estimates), the usefulness of simultaneous monitoring of classical and growth cycle, combining cyclical estimates (subjective versus statistical aggregation).

5.3. Introduction

The aim of this chapter is to address specific statistical and data issues in cyclical movement measurement. The introductory section will go on to define the scope for this chapter, which include the choice of reference cycle, the choice of cyclical movement indicators, filtering techniques, univariate detrending methods, methods that aggregate individual signals (choice of weights vs. combining forecast) and multivariate detrending methods

5.4. The choice of target variables

This section discusses the use of real statistics variables and latent variable as reference variables for cyclical measurement. It will focus on the choice of economic indicators that are used as components of composite business cycle indexes. Business cycle reflects co-movements in a broad range of macroeconomic aggregates such as output, employment, sales, etc., and therefore it would be inadequate to define business cycle solely in a single indicator. The section will provide detail explanations on the selection criteria of choosing component variable. The criteria are based on but not limited to the following characteristics.

- Conformity — the series must conform well to the business cycle.
- Consistent timing — the series must exhibit a consistent timing pattern
- Economic significance— cyclical timing must be economically meaningful and logical.
- Statistical adequacy— data must be collected and processed in a statistically reliable way.

- Smoothness— month-to-month movements must not be too erratic.
- Currency — the series must be promptly availability without major revisions.

Subject to the agreement, the section will go on to recommend a harmonized set of component indicators to be used for the construction of business cycle composite indicators. This information will not only be useful for those compiling business cycle composite indicators, but also form the basis for statistical agencies for the collection of economic short term statistics that are relevant for the construction of the business cycle composite indicators.

Points of discussion:

- Please recommend criteria that are appropriate for the selection of components to construct composite indicators.
- Is it possible to agree on and recommend a harmonized set of component indicators, which is generic in nature, to form the basis for the construction of composite indicators

5.5. The choice of the reference cycle

As it is important for producers to have a clear identification of the kind of business cycle they are referring to, this section will first state and describe conventional approaches that define business cycle, namely 1, classical cycle; 2, growth (deviation-from-trend) cycle; and 3, acceleration (growth rate) cycle. The classical business cycles are identified as recurrent, alternating phases of expansion and contraction in a large number of economic activities such as output, consumption, prices, investment, employment, etc. The cycles are characterized by co-movements in the fluctuations of the economic activities, with periodicities larger than one year. The concept of growth (deviation-from-trend) cycles can be defined in terms of the deviations of the economy from its potential (i.e. the long-term trend). The concept of acceleration cycles refers to the sequences of prolonged phases of acceleration and deceleration, which is measured by cyclical changes in the growth rate of economic activity. The underlying theory and assumptions, together with the advantages and disadvantages of each approach will be discussed. This section will also elaborate the usefulness of simultaneous monitoring of classical and growth cycle.

Points of discussion:

- Should we define business cycle in other chapters, or in this chapter?
- Do we want (or is it possible) to recommend a harmonized method to define business cycle in the handbook?

5.6. Detrending methods: Parametric versus non parametric detrending methods

A convention approach to business cycle measurement is the concept of growth (deviation-from-trend) cycle, where business cycle fluctuations are identified in terms of the deviations from the trend of the process. Hence, the construction of cyclical indicators involves the detrending process in order to identify the underlying cyclical pattern in the data.

This section describes the methodology of different types of parametric and non-parametric detrending procedure. First, filtering techniques are needed in order to achieve noise minimization and a proper estimation of trend-cycle component. Then detrending process is the applied to the estimated trend-cycle component to obtain the cyclical component of the series.

Notice that the detrending methods addressed in this section are univariate in nature and are purely a statistical based decomposition. Multivariate extension will be addressed in the later section. The large majority of the univariate detrending methods have been developed starting from the beginning of 1980s. Such methods can be classified into two main categories listed as follows:

5.6.1. Non-parametric methods

- First differencing filter
- Henderson filter
- Phase Average Trend Method (NBER)

5.6.2. Parametric methods

- Beveridge-Nelson decomposition (1981)
- Unobserved component model (Havery 1985)
- Stock and Watson decomposition (1986)
- Hodrick-Prescott filter (1997)
- Baxter-King filter (1999).
- Christiano-Fitzgerald filter (1999)

This section will also address the limitation of detrending techniques, which include but not limited to issues such as instabilities of current estimates, over-smoothing the series, etc.

Point of discussion:

- Please recommend any appropriate filtering techniques to achieve noise minimization and a proper estimation of trend –cycle component.
- Please recommend any detrending methods that are appropriate to be included in this section.

5.7. Aggregation of individual signals: choice of the weights versus combining forecasts

In order to emphasize the cyclical patterns in the data and de-emphasize the volatility of individual indicators, the best of them are combined into composite indexes. One motivation for combining several indicators into one composite index is the observation that there is no single "best" indicator. Another important motivation is to have a measure of diffusion among several indicators since business cycles are phenomena that are observed nearly simultaneously across all aspects of the economy. These business cycle composite indexes serve as summary measures of the current and historical behavior of the cyclical indicators.

The idea of a composite index is an extension of diffusion indexes which measure the proportion of components that are rising. In contrast to diffusion indexes, the

composite indexes also measure the magnitude of the change in the components. While diffusion indexes measure how widespread a cyclical movement is, composite indexes help measure the depth of that movement. Combined with the duration of the cyclical movement, these two types of indexes help determine whether observed changes in the data correspond to a persistent cyclical movement.

This section describes the methodology of different types of weighting and aggregation methods that use to combine individual component series into composite indicators. The underlying assumptions, advantage and disadvantage of each method will be discussed. The proposed method are listed as follows

- Equal weights
- Standardization factors (Conference Board)
- Weights based on principal component analysis and factor analysis
- Regression analysis
- Unobserved component models
- Weights based on public/expert opinion

Points of discussion:

- Please recommend methods that are appropriate to be included in this section.
- Do we need to include a section on data normalization?

5.8. Multivariate de-trending methods

In the field of economy, the underlying trend in the data is commonly defined as a steady-state equilibrium position, which in certain cases is constraint by some structural relationships. While univariate detrending methods are a purely statistical decomposition, multivariate detrending methods presented in this section are an extension of the univariate ones giving the possibility of including some conditional constraints which can be derived from economic relationships. The section describes the methodology of different types of multivariate detrending procedure. The proposed methods are listed as follows

- Multivariate Hordrick and Prescott Filter (Laxton and Telow 1992)
- Multivarate Beveridge and Nelson decomposition (Evans and Reichlin 1994)
- Multivariate unobserved component decomposition (Harvey 1985)

Point of discussion:

- Please recommend methods that are appropriate to be included in this section.

5.9. Relevant documentations

- OECD (2008), *Handbook on Constructing Composite Indicators: Methodology and User guide* (2008)
- OECD (2008), *OECD System of Composite Leading Indicators*
- The Conference Board (2001), *Business Cycle Indicators Handbook*
- Dominique L., Mazzi, G.L. and Sartori F. (2003), "*Statistical Methods for Potential Output Estimation and Cycle Extraction"*
- Ruth, F. (2010), "*A Cross-Sectional approach to Business Cycle Analysis"*
- Zarnowitz and Ozyildirim (2001), *"Time Series Decomposition and Measurement of Business Cycles, Trend and Growth Cycles"*.

- Nilsson, R and Gyomai, G *"A comparison of the Phase-Average Trend method, the Hodrick-Prescott and Christiano-Fitzgerald filters"*

5.10. Other points of discussion

- Please suggest any other key points needed to be addressed in this chapter
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.
- Should composite indicators be based on a common set of basic statistics (components)?
- Should the compilation based on a standard methodology or countries should choose among a set of recommended approaches by selecting the one giving the best performance with respect to specificities of each country?
- What is our opinion on the dilemma between subjective approach and statistical approach in the process of variable selection and weight definition to construct composite indicators

6. Indicators to detect turning points

6.1. Chapter outline

- The choice of the reference variable
- The choice of reference cycle (classical, growth or acceleration cycle)
- Probit/Logit based models
- Non linear time series models: Markov Switching, Self Exciting Threshold Autoregressive
- Aggregation of individual signals: choice of the weights versus combining forecasts
- Multivariate non linear time series modelling
- Analysis of turning points
- The use of visualization tools: Some examples

6.2. Key points

Turning points under different cyclical definition, unified approach ABCD or αABβCD, limits of turning points indicators for classical business cycle, usefulness of detecting simultaneously turning points of different cycles, usefulness of multivariate methods to ensure the full consistency with the theoretical turning points sequence ABCD or αABβCD.

6.3. Introduction

A special case of composite indicators delivering to users signals is on the probability to be in a recessionary phase and on the occurrence of turning points. They complement cyclical indicators in the sense that the later do not necessary supply clear information on turning points. They can also be easily red and understudy even in a graphical way.

6.4. On the reference cycle

A first choice to be made by producers is a clear identification of the kind of cycle they are referring to: classical cycle, growth cycle or deviation cycle, acceleration cycle. The second important choice is to identify a reference cycle on which the composite indicator has to be validated over a sufficiently long period covering whenever possible several cycles. The ideal candidate for this role is an official chronology but, since official chronologies do not necessarily exist at national level and for all kind of cycle, approximate solutions have to be identified. The most obvious one is, subject to the availability of long time series; to produce a non official chronology by dating the target cycle starting from official statistics by using a sample and non-parametric dating rules. The composite indicator should be built up in such way to replicate as close as possible such chronology.

6.5. Statistical tools for the construction of turning points composite indicators

The main message that this kind of indicators is supposed to deliver is about the change of the cyclical phase (turning points) between expansion and recession and vice versa. A secondary message is the persistence, with respect to the recent past, into a particular cyclical phase. Due to the fact that cyclical phases are often asymmetric, (especially those related to the classical cycle), the use of standard linear modeling techniques is not necessary the most appropriate one. Furthermore turning points indicators are supposed to deliver more a qualitative message (e.g. a probability of being in a recessionary phase) than a quantitative one so that appropriate models have to be identified. Taking into account the consideration mentioned above; two main classes of models are widely used to construct turning points indicants. They are:

i. Regression base models: Probit and Logit
ii. Non-linear time-series models: Markov switching models (MS), self extracting threshold models (SETAR).

The next 4 subsections are devoted to a brief introduction and presentation of the models motioned above. Before moving into the description of the models it is important to say that, usually, those models are used in a univariate version which is fitted to each single component variable of the indicator. Multivariate extensions are also possible even if some estimation problems can affect the usefulness of this second approach especially in the case of SETAR models

i. Probit models
ii. Logit models
iii. MS models
iv. SETAR models

6.6. Constructing turning points indicators

In a univariate framework, once the type of statistical model has been chosen, the most appropriated specification will be identified. In this first step 3 important decisions having remarkable effects of the quality of the signals delivered have to be taken by the producers of composite indicators:

i. The choice of the threshold
ii. The identification of the most appropriate number of regimes to be defined within each model
iii. The use or not of a censoring rule (e.g.; concerning a minimum length of a cyclical phase). It is important that a full consistency is dept so that for each component series the same choices are made.

In the next session we will briefly discuss the implications related to the choices mentioned above. At this stage several tests of specification will be used and integrated by some specific ones related to the ability of each specification to identify properly turning points (QPS, concordance index…). In a second phase the signal delivered by each model will be combined to obtain a composite turning points indicator.

The aggregation can be done by following 3 different strategies:

i. Equal weighting

ii. Use of combining forecasting techniques;
iii. Subjective definition of weights based on the relative reliability of signals returned by each component series.

Alternatively a multivariate approach can be adopted. In this case all component series will be modeled simultaneously. The delivered signal will then be already combined and the waiting structure is implicitly defined within the modeling procedure. Obviously in the case of a multivariate specification the level of threshold, the number of states as well as the application of censoring rules will be defined taking into account not the individual series behaviour, but the behaviour of the multivariate specification.

a) Additional considerations on the construction of turning points composite indicators
b) A comparison of alternative specifications
c) Some examples
    - Euro-area coincident turning points indicators for the classical business cycle and for the growth cycle
    - Coe-rexecode leading recession indicator for the French economy.
d) Conclusions

6.7. Points of discussion

- Please recommend appropriate approach to be included in this section.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.
- Should composite indicators be based on a common set of basic statistics (components)?
- Should the compilation based on a standard methodology or countries should choose among a set of recommended approaches by selecting the one giving the best performance with respect to specificities of each country?
- What is our opinion on the dilemma between subjective approach and statistical approach in the process of variable selection and weight definition to construct composite indicators

7. Indicators to measure economic growth

7.1. Chapter outline

- Identification of the target variables
- Regression based models
- Factor VAR based models (automatic leading Indicators ALI and automatic cointegrated leading Indicators ACRI)
- Some examples

7.2. Key points

Relationships between composite indicators to measure economic growth, nowcasting and flash estimates, volatility of macroeconomic variables and its effects on the reliability of composite indicators, the relative importance of soft and hard data to anticipate economic growth.

7.3. Points of discussion

- Please recommend appropriate approach to be included in this section.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.
- Should the compilation based on a standard methodology or countries should choose among a set of recommended approaches by selecting the one giving the best performance with respect to specificities of each country?
- Should composite indicators be based on a common set of basic statistics (components)?

8. Validation of Business Cycle Composite Indicators

8.1. Chapter outline

- Real time out-of-sample forecasting simulation
- Use of lagging indicators to validate leading and coincident ones
- Sensitivity analysis (See OECD handbook)

8.2. Key points

The importance of vintage databases for the construction and evaluation of composite indicators, the importance of a turning points chronology to validate composite indicators to detect turning points, advantages and drawbacks of construction and use of lagging composite indicators for validation purposes.

8.3. Relevant documentations

- Ozyildirim, A. (2010), *Real Time Research on the Index of Leading Economic Indicators at the Conference Board*
- OECD (2008), *Handbook on Constructing Composite Indicators: Methodology and User guide* (2008)

8.4. Points of discussion

- Please recommend appropriate approach to be included in this section.
- Please suggest any other key points needed to be addressed in this chapter.
- Please recommend documents/papers that can be used as basis for the eventual text in this chapter.
- Should the validation based on a standard methodology or countries should choose among a set of recommended approaches by selecting the one giving the best performance with respect to specificities of each country?