

## WTO GOODS TRADE BAROMETER METHODOLOGY

### Introduction

This document outlines the methodology used to produce the WTO's Goods Trade Barometer, which is a composite leading indicator designed to signal of current and near-term trade developments in world merchandise trade. The Goods Trade Barometer replaces the World Trade Outlook Indicator (WTOI) and will be paired with a companion indicator for services trade (the Services Trade Barometer) starting in September 2019. The overall Goods Trade Barometer index combines information on several component indices representing trade-related variables including export orders, international air freight (IATA), container shipping, automobile sales and production, electronic components and agricultural raw materials. The Goods Trade Barometer anticipates changes in the trajectory of world merchandise trade volume relative to recent trends by three to four months on average, so for example the value of the index for January would provide an indication of trade conditions in April-May.

### Rationale for producing leading indicators for world trade

Data on world trade are often released with long lags or at relatively low frequencies, particularly figures on merchandise trade volume and commercial services trade. At the same time, policy makers, the business community and the general public have a strong interest in more immediate developments in trade. The WTO's main objective in developing its trade barometers was to obtain insights about the current trajectory of world trade (i.e. whether it is above or below trend, gaining or losing momentum, etc.) and to disseminate this information in an accessible format.

The WTO's trade barometers are not intended as short-term forecasts, although they do provide clues about trade growth in the immediate future. Rather, their main contribution is to identify turning points and gauge momentum in world trade growth. As such, they complement existing trade statistics and forecasts from the WTO and other organizations.

### What data are included in the Goods Trade Barometer

The Goods Trade Barometer index combines several component indices of trade-related data into a single composite index that anticipates turning points in world merchandise trade volume. Component indices are either leading with respect to world trade (that is, turning points in the data occur earlier than turning points in trade) or are available earlier, allowing time-shifted values to signal shifts in trade. The component indices include:

- An index of new export orders derived from Purchasing Managers' Indices based on business surveys in leading economies. Export orders are leading with respect to world trade and are released earlier than WTO quarterly trade volume data.
- An index of air freight sourced from the International Air Transport Association (IATA), which is released earlier than quarterly trade data and which leads trade by two to three months. Air freight has proven to be a very timely indicator of world trade and an early signal of turning points in economic activity (see data sources below for more information).
- A shipping index representing container port throughput of major international seaports in volume terms. Container shipping tracks world trade quite closely and is available earlier than WTO quarterly merchandise trade volume statistics.
- An automotive sector index based on sales and/or production of passenger vehicles in leading economies. Data on automobile sales and production tend to lead business cycles and trade, and are released very early.
- An index of bilateral electronic components trade based on customs data in physical units for leading exporting and importing countries. Electronic components trade tends to be moderately leading with respect to world trade.

- An index of trade in agricultural raw materials (mostly wood) based on customs data in quantity terms. Turning points in raw materials trade are very leading but the overall correlation with world trade is not as strong as some of other components.

## Methodology

The Goods Trade Barometer is released on a quarterly basis depending on data availability. The overall index and the component indices measure short-run deviations from recent (i.e. medium term) trends. Recent trends serve as baselines for each index, which are normalized to be equal to 100.

The first step in calculating the Goods Trade Barometer index is the selection of data to be included. Variables are chosen based on their temporal correlation with world merchandise trade in volume terms but also on their relevance to trade. Once a variable has been chosen, its performance is re-evaluated from time to time to ensure that it continues to perform as expected.

The second step is data collection. Currently, all data included in the Goods Trade Barometer index are of monthly frequency while the WTO's merchandise trade volume statistics are quarterly. All of the raw data used in calculating the Goods Trade Barometer index are expressed in real terms or physical units, e.g. freight-ton kilometres from IATA, production and sales of automobiles in terms of vehicles, container port throughput in twenty-foot equivalent units (TEUs), etc.

All data series are seasonally adjusted and smoothed with X-13 ARIMA unless the data already seasonally adjusted, in which case they are only smoothed. Recent trends for each data series are then estimated using the Hodrick-Prescott (HP) filter with conventional smoothing parameters.<sup>1</sup> Deviations from these trends are calculated for each component series as the difference between the smoothed, seasonally adjusted data and the trend established by the HP filter. Large or persistent shocks will shift the trend estimated by the HP filter to varying degrees depending on parameter values. As a result, the trend should be interpreted as a kind of moving average representing average growth over the last few years.

Amplitudes and means of the deviation series are standardized by dividing each series by its mean absolute deviation since January 2007, multiplying by a common scaling factor and adding 100. (The scaling factor and mean are chosen arbitrarily to facilitate interpretation.) Data series that are available earliest (e.g. new export orders from PMIs) are lag shifted so that their end points coincide with the end points of other data series. Finally, the overall index is calculated as a weighted average of the component indices. Weights have been chosen based on the degree of correlation between the component indices and world trade, and on the extent to which they lead world trade.

Possible data issues include end-point bias inherent in smoothing algorithms such as X-13 ARIMA and the HP filter. As a result, the latest data points may occasionally be subject to strong revisions in subsequent months.

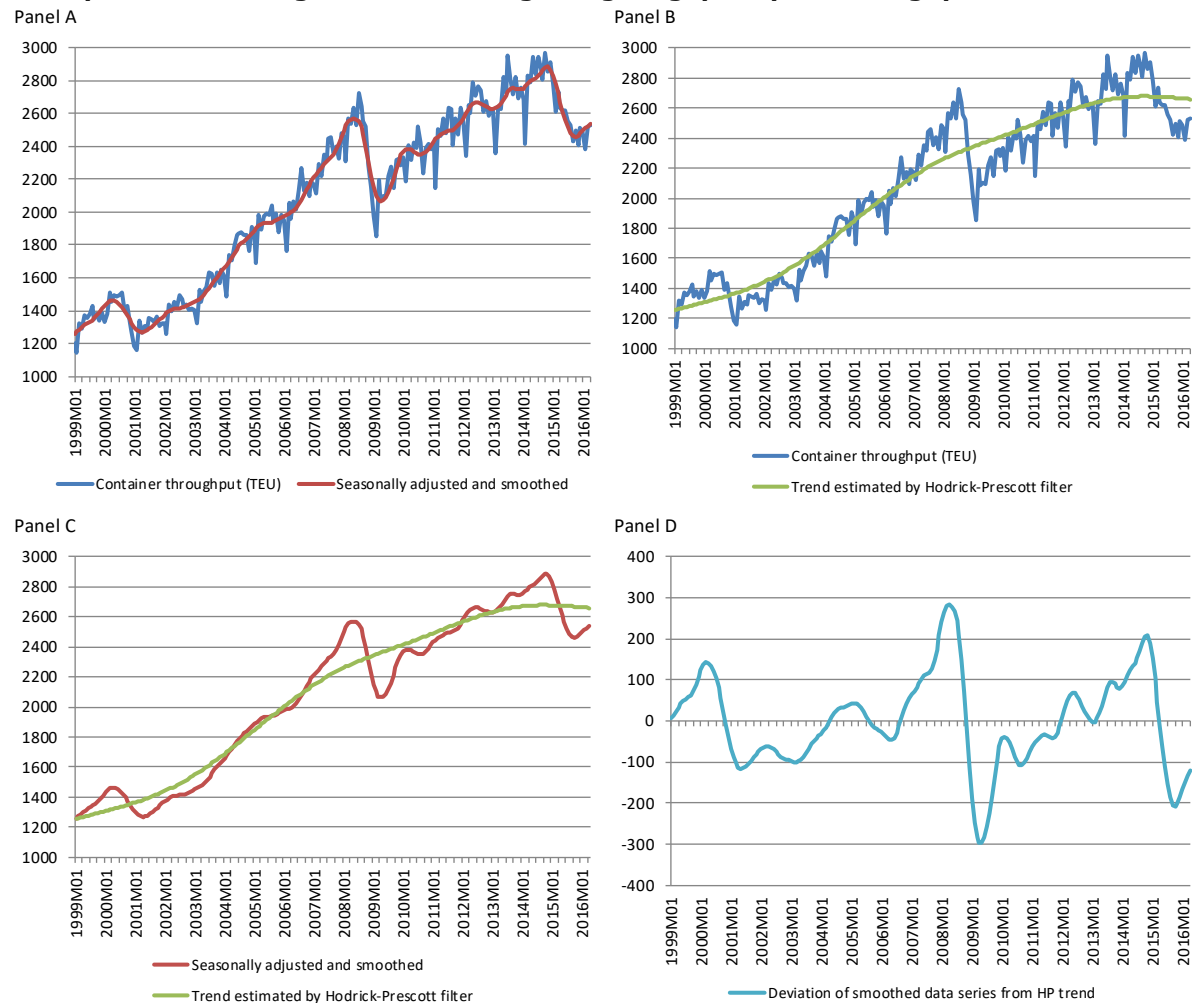
The process of smoothing and de-trending the data is illustrated by Chart 1 using container port throughput of Singapore as an example. Panel A shows the original, unadjusted data (blue line) plotted against seasonally-adjusted and smoothed data (red line). Panel B also shows the original data series (blue line) compared to the trend estimated by the HP filter (green line). Note that the HP-estimated trend becomes less steep over time in response to recent shocks. Panel C shows the smoothed short-run series and the HP trend together, while Panel D shows deviations of the smoothed series from the trend. Fluctuations in the deviation series are subsequently standardized by dividing by the mean absolute deviation in the series and multiplying by a constant. Finally, the mean is reset to 100 by adding 100 to each value.

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<sup>1</sup> The Hodrick-Prescott (HP) filter is a standard technique in economics for separating underlying trends in data series from short run fluctuations. If  $y$  is a data series, then the trend can be estimate by minimizing over  $\tau$  the expression  $\sum_{t=1..T} (y_t - \tau_t)^2 + \lambda \sum_{t=2..T} (\tau_{t+1} - 2\tau_t + \tau_{t-1})^2$ . In calculating the WTO Barometer indices, the lambda parameter is set to 129,600 according to the Ravn-Uhlig rule for monthly data.

Chart 1

**Example of smoothing and de-trending using Singapore port throughput in TEU**



Source: Singapore port authority.

**Presentation**

The level of the Goods Trade Barometer index in the latest month is represented by a graphical gauge, with a value of 100 indicating growth in line with the medium-term trends. The latest values of the component indices are shown in a horizontal bar chart. In both cases, values less than or equal to 97.5 are represented by the colour red, indicating growth substantially below trend. Values greater than or equal to 102.5 are represented by the colour green, indicating growth well above trend. Intermediate values are coloured amber, indicating growth roughly in line with trend.

A separate chart plots the barometer index over time against a comparable index for merchandise trade. Merchandise trade volume growth tends to accelerate when the barometer index (represented by the blue line) is above the index for world merchandise trade volume (represented by a black line), and decelerate when the barometer index is below the trade index.

Finally, another chart shows the level and growth of world merchandise trade in volume terms. These data serve as a point of comparison for the Goods Trade Barometer.

## **Release schedule**

The Goods Trade Barometer is to be disseminated four times per year, while the Services Trade Barometer will be released two times per year. In both cases, the precise timing of releases will depend on data availability.

## **Data sources**

Underlying data for the Goods Trade Barometer and its component indices are obtained from a variety of sources. Data on container shipping are sourced from the Institute for Shipping Economics and Logistics. Data on export orders are sourced from IHS-Markit purchasing managers' indices. Data on automobile sales and production are sourced from central banks, national statistical agencies and industry associations. Customs data on electronic components and agricultural raw materials are sourced from TDM Trade Data Monitor and national statistics.

(Note: The calculation of the electronic components index has changed as of May 2019. It is now based on selected bilateral trade flows rather than aggregate trade flows of early reporting countries. This improves dynamic correlation with world trade but does not have a significant effect on the level of the Goods Trade Barometer index.)

Commercial data on international air freight in freight tonne kilometres are provided courtesy of the International Air Transport Association (IATA). Air freight has proven to be a very timely indicator of overall world trade and an early signal of turning points in economic activity. Further information and analysis are available here:

Background:

[http://www.iata.org/publications/economic-briefings/Air freight and world trade.pdf](http://www.iata.org/publications/economic-briefings/Air_freight_and_world_trade.pdf)

IATA Quarterly Analysis:

<http://www.iata.org/cargochartbook>

IATA Monthly Analysis:

<http://www.iata.org/freight-monthly-analysis>