

METHODOLOGY OF WORLD TRADE OUTLOOK INDICATOR (WTOI)

Introduction

This document outlines the methodology used to prepare the World Trade Outlook Indicator (WTOI), which is intended to serve as a signal of current and near-term trade conditions. The WTOI is a composite index of trade-related indices, including indices on export orders, international air freight (IATA), container shipping, automobile sales and production, electronic components and agricultural raw materials. The WTOI 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 WTOI value for January would provide an indication of trade conditions in April-May.

Rationale for a Trade Outlook Indicator

Data on world merchandise trade in volume terms are often released with long lags or at relatively low frequencies while 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 the WTOI 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 WTOI is not intended as a short-term forecast, although it does provide clues about trade growth in the immediate future. Rather, its main contribution is to identify turning points and to gauge momentum in global trade growth. As such, it complements trade statistics and forecasts from the WTO and other organizations.

What data are included in the WTOI

The WTOI 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 export orders derived from business surveys covering leading manufacturing 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).
- An index of container throughput of major international ports in North America, Europe and Asia. 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 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 WTOI is a monthly index but is released on a quarterly basis for reasons of data availability, since some of the underlying data are quarterly but converted to monthly frequency by interpolation. The WTOI and its 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 WTOI is the selection of data to be included. In addition to correlations with trade and timeliness of data, there also must be an economic rationale for including a particular indicator in the WTOI. All of the data currently included in the WTOI satisfy these criteria. Once a variable has been chosen, its performance will be re-evaluated from time to time to ensure that it continues to perform as expected. In future, the WTO may enrich the World Trade Outlook Indicator with additional data as new information becomes available.

The second step is data collection. Most data in the WTOI are of monthly frequency. In a few exceptional cases quarterly data are used, but these are converted monthly frequency by interpolation before being included in the index. All of the raw data used in calculating the WTOI 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 are seasonally adjusted and smoothed with the X-13 ARIMA program unless 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.¹ 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 (automotive products) are lag shifted by one month to coincide with end points of other data series. Finally, the overall WTOI 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.

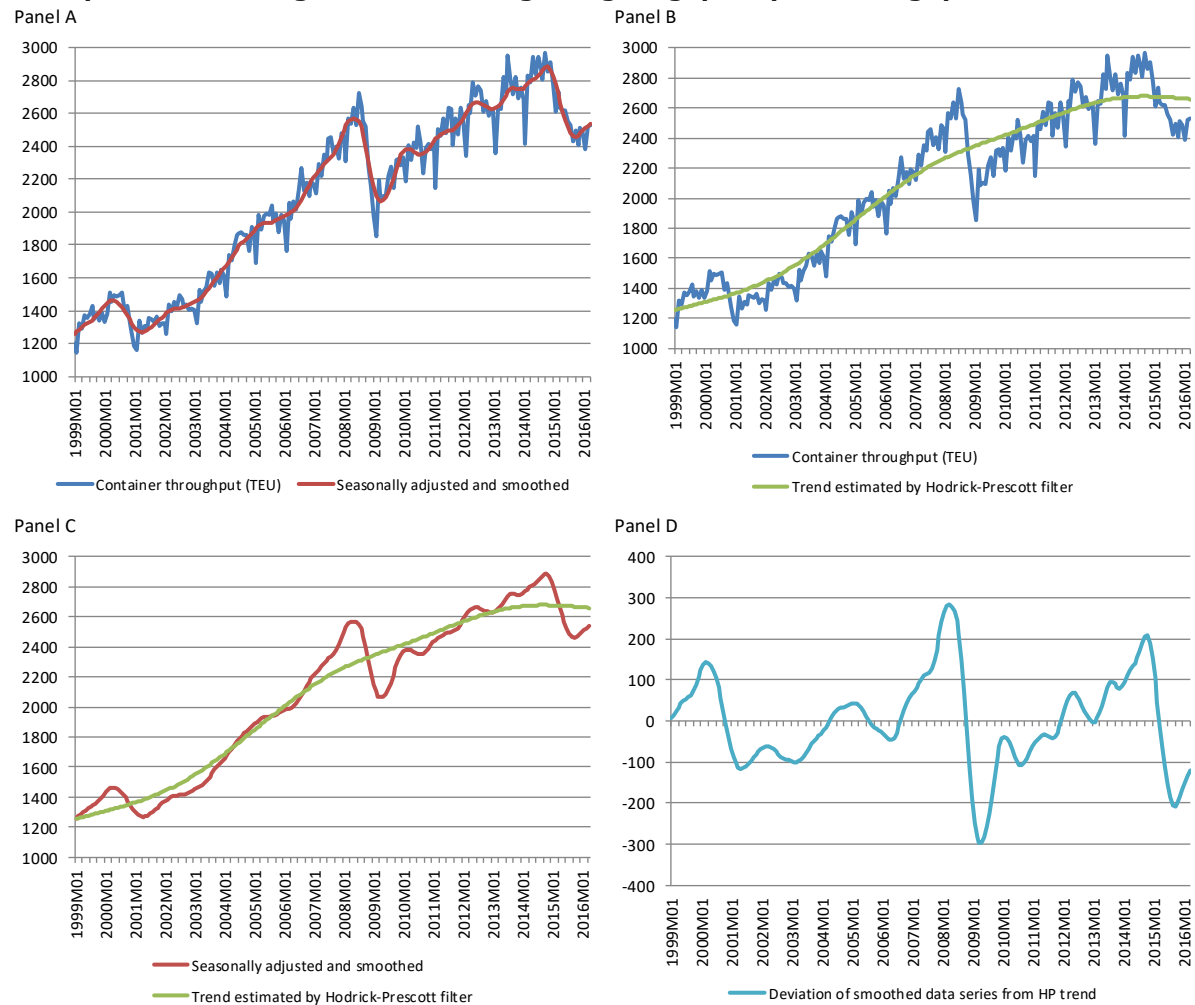
Possible data issues include end-point bias inherent in smoothing algorithms such as X-13 ARIMA and the HP filter. As a result, the latest data points may occasionally be subject to strong revisions in subsequent months.

The process of smoothing and de-trending the data is illustrated by Chart 1 using container port throughput of Singapore. 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.

¹ 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 estimated by minimizing over τ 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 WTOI, the λ 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 WTOI in the latest month is represented by a graphical gauge, with a value of 100 indicating growth in line with the trend as measure. Values of the WTOI and component indices less than or equal to 97.5 are coloured red, indicating growth substantially below trend. Values greater than or equal to 102.5 are coloured green, indication growth well above trend. Intermediate values are coloured amber, indicating growth roughly in line with trend.

For component indices, arrows pointing up, down and horizontal indicate accelerating, slowing or stable trade growth. These are summarized in the following table.

| | Up | Horizontal | Down |
|-------|--|---|---|
| Red | Index value < 97.5, month-on-month change > 0.1 | Index value between 97.5 and 102.5, month-on-month change between -0.1 and 0.1 | Index value < 97.5, month-on-month change < -0.1 |
| Amber | Index value between 97.5 and 102.5, month-on-month change > 0.1 | Index value between 97.5 and 102.5, month-on-month change between -0.1 and 0.1 | Index value between 97.5 and 102.5, month-on-month change < -0.1 |
| Green | Index value > 102.5, month-on-month change > 0.1 | Index value > 102.5, month-on-month change between -0.1 and 0.1 | Index value > 102.5, month-on-month change < -0.1 |

A separate chart in the document plots the WTOI indicator against a comparable index of merchandise trade. Merchandise trade growth tends to accelerate when the trade indicator (represented by the blue line) is above the index for merchandise trade volume (represented by a red line), and decelerate when the indicator is below the trade index.

Finally, a table shows point changes in the WTOI and component indices in recent months. Positive changes indicate an upward trend while negative changes suggest a downward trend. Increasingly positive (or less negative) values indicate rising momentum while increasingly negative (or less positive) values point to a loss of momentum. Values transitioning from positive to negative (or vice versa) indicate turning points. These values should be interpreted with caution as they do not represent changes in the values of the underlying data. Rather, they represent changes in the indices, which are seasonally adjusted, smoothed, de-trended and amplitude adjusted by the WTO.

Release schedule

The WTOI is disseminated four times per year, with the precise schedule dependant on data availability and the timing of other WTO statistical releases.

Data sources

Underlying data for the WTOI 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.

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 is available here:

Background:

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>