

Estimating Future Values of Source Data

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- BEA estimates are backward looking; previous month, quarter, etc.
- Source data: Survey and Non-survey (administrative, private proprietary)
- About 80% of the source data comes from external sources
 - Main sources: Census, Bureau of Labor Statistics, Statistics of Income
- Source data received over time
- As a result, BEA produces vintages of estimates
 - Example: 3 current quarter estimates of GDP: 30 (Advance), 60 (Second) and 90 (Third) days after end of reference quarter

- GDP (expenditure approach)=

Personal Consumption Expenditures + Gross Private Domestic Investment +
Government Consumption and Investment + Exports – Imports

- Each component above has many subcomponents
- Example: Personal Consumption Expenditures has 200+ subcomponents
- Vintage estimates for each subcomponent; aggregated to produce vintage estimate of GDP

- Component i estimated in time t by either:
 - Method 1: Relevant data from source data provider
 - Method 2: Extrapolation/otherwise “forecasted”
- See Holdren, A.E., “[Gross Domestic Product and Gross Domestic Income: Revisions and Source Data](#),” *Survey of Current Business* 94 (June 2014)
Classification of data provided
- Share of Method in GDP estimates
 - Advance: \approx 25% Method 1; \approx 75% Method 2
 - Third: \approx 38% Method 1; \approx 62% Method 2

- Includes: Extrapolation, moving averages, regressions, growth factors and judgement
- Each program determines the best method for their estimates
- Consider PCE Services
 - Due to limited source data, many PCE Services estimates use trends for extrapolation for the first three estimates
 - Two common trend methods in PCE Services use the US population and the price index specific to that category
 - One method uses this simple population trend to extrapolate, but some categories also apply a growth rate.

- Trend method 1: $CD_t = CD_{t-1} \left(\frac{USP}{USP_{t-1}} \right) \left(\frac{PI}{PI_{t-1}} \right)$
- Trend method 2: $CD_t = CD_{t-1} \left(\frac{USP}{USP_{t-1}} \right) \left(\frac{PI}{PI_{t-1}} \right) (g)$
- Where:
 - CD - Current-Dollar Services estimate
 - USP - Projections of total US population from the Census Bureau
 - PI - Price index for the estimate category based on BLS data.
 - g - Growth rate determined by analysts and supervisors using the growth in the annual estimate for recent years. Growth rates are updated during Annual Updates.

- Regional program estimates largely based on income variables.
- IRS/SOI data on income taxes are extrapolated forward a year by using the change in the BLS Quarterly Census of Employment and Wages (QCEW) wage data for the extrapolated year.
- BLS QCEW State quarterly wages are extrapolated forward a quarter by using the change in Current Employment Survey state level employment.

- Estimation is comprised of survey and non-survey data.
- We do not know “true” value.
- Reliability: evaluation of the repeated estimation of the same event
- Assessed by examining magnitude and pattern of revisions.

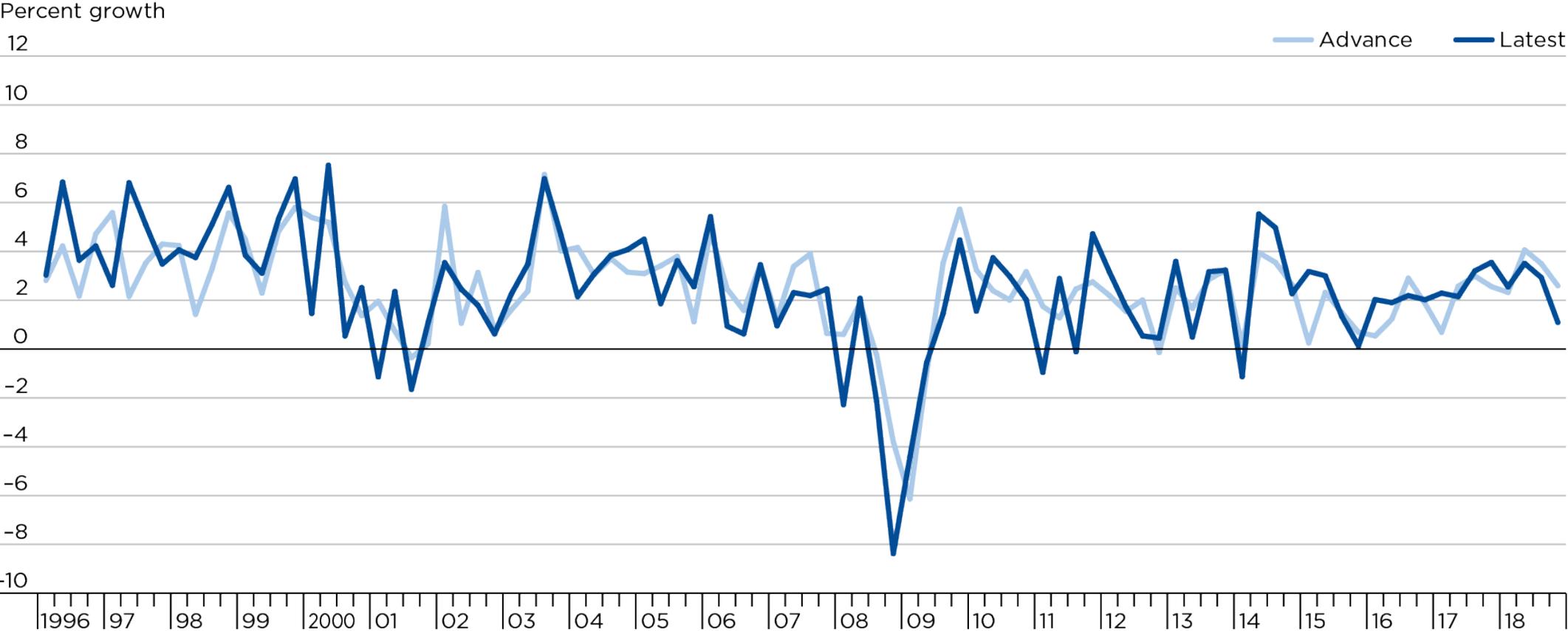
Evaluating Revisions

- Evaluate the magnitudes of difference between two vintages

$$R_t = Y_t - Y_{t-1}$$

- Qualitative reliability: whether estimates present the same general picture of economic activity in terms of the following:
 - Long-term growth rates
 - Trends in saving, investment, government spending, corporate profits, and other key components of GDP and GDI
 - Broad features of the business cycle
 - The patterns of quarterly growth, including whether growth in any period is high or low relative to the trend, is accelerating or decelerating, or is positive or negative.
- [“See The Revisions to Gross Domestic Product, Gross Domestic Income, and Their Major Components”](#) (Fixler, de Francisco & Kanal, 2021)

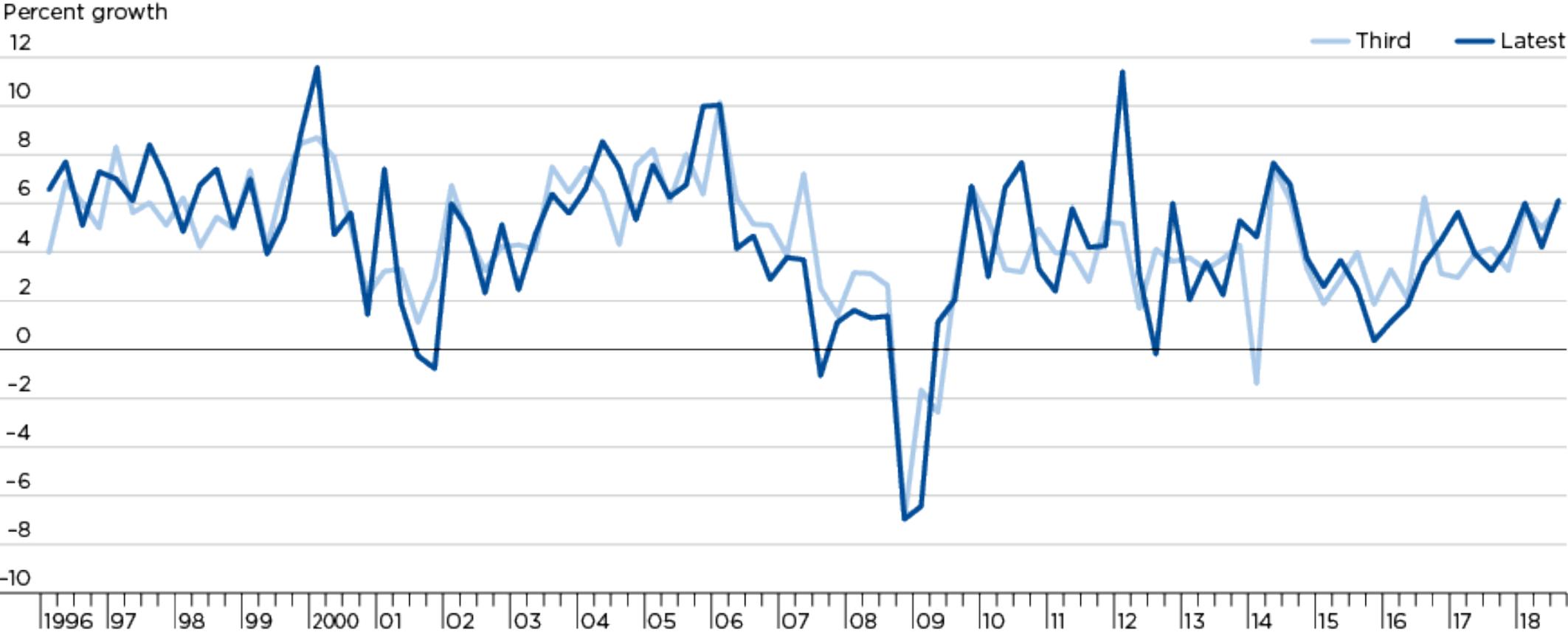
Chart 1. Advance and Latest Estimates of Real Gross Domestic Product Growth, 1996–2018



U.S. Bureau of Economic Analysis

Revision: Difference between Latest and Third Estimates

Chart 2. Third and Latest Estimates of Gross Domestic Income Growth, 1996-2018



U.S. Bureau of Economic Analysis

Reducing Revision Magnitudes

- Earlier vintage estimate can be viewed as depending on the “forecasted” value conditioned on the information available at the time
- Note that the previous estimate may not be identical to the forecasted value as there are adjustments
- Implication is that revision magnitudes can be decomposed into three main sources:
 - forecast error*
 - new source data
 - revisions to previously received source data
- Efforts to reduce forecast error
 - Using Machine Learning to improve forecasts- applied to some Quarterly Services Survey data Chen et al.
<https://www.nber.org/system/files/chapters/c14268/c14268.pdf>
 - Researching the use of nowcasting techniques; Chen and Hood
<https://www.bea.gov/system/files/papers/BEA-WP2021-3.pdf>

* Falls within the direct control of the BEA and its production staff.

Thank you for your time,
questions?