Federal Reserve Board experience using transaction data

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Any views expressed here are those of the presenter and not those of the Board of Governors of the Federal Reserve System or the Federal Reserve System.
How/why we use transaction data

- Fill in *knowledge gaps* with timeliness, higher frequency, broad coverage, greater granularity (geographic, industry, product, etc...)
- Create alternative estimates that *complement* official statistics or that *verify movements* in official statistics
- *Answer questions* that require more granular data
- Help with a *narrative* about economic developments
Value of transaction data

• Value of high-frequency data varies over time
  – At a FESAC meeting in mid-2020, I noted that the value of such data is increasing in the size of a shock or the arrival rate of shocks.
  – More recently, Domenico Giannone from Amazon, said at a “Big Data and Machine Learning Conference” (co-sponsored last month by the Board) that “high-frequency data are not so helpful in ‘normal times’ because of high-frequency noise”

• Suggests taking a longer perspective when assessing the costs and benefits of using such data

• Suggests value of combining data sources using statistical models to summarize movements and/or extract more signal
  – Example: The Fed’s Common Inflation Expectations index (which is a research series)
Example 1: Payroll Processor Data

A. Estimates of private payroll employment growth

<table>
<thead>
<tr>
<th>Aggregate payroll employment growth</th>
<th>Payroll employment growth in leisure and hospitality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millions of jobs, monthly rate</td>
<td>Millions of jobs, monthly rate</td>
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</tbody>
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**NOTE:** ADP data are weekly and extend through February 6, 2021. BLS data are monthly.

**SOURCE:** Federal Reserve Board staff calculations using ADP, Inc., Payroll Processing Data; Bureau of Labor Statistics (BLS), Current Employment Statistics (CES).

Example 2: Spending Indicators

B. Indicators of consumption growth

Retail goods spending

Services spending

NOTE: NPD data are weekly and extend through February 6, 2021, and Census data are monthly. All series show nominal spending on nonfood retail goods. Dashed lines represent the first and second waves of stimulus tranche.

SOURCE: NPD Group; Census Bureau.

NOTE: Year-over-year percent change in 7-day moving average. Health-care visits data extend through February 7, 2021; food services data extend through February 15, 2021; and hotel occupancy data extend through February 6, 2021.

SOURCE: SafeGraph, Inc.; Fiserv, Inc.; STR, Inc.; Transportation Security Administration.

Example 3: Job Posting Indicators

Note: JOLTS is seasonally adjusted. Indeed is a 7-day average.
Example 4: Employment Indicators

Small Business Employment

Percent change from two years prior

Source: Homebase. Data show their customer base of 60,000 small businesses, concentrated in leisure, hospitality, and retail industries.
Example 5: Search/Social Media

Initial UI Claims

Index, 7-day moving average

Number (thousands)

Mar.  Apr.  May

Initial Claims

Google Trends: File for Unemployment

Note: Series for claims is not seasonally adjusted.
Source: Department of Labor and Google Trends.

Example 6: Mobility Data

Google Mobility Index
Percent change from baseline

May 29

- Work
- Grocery
- Retail and Recreation

Note: Baseline defined as median of Jan. 3 to Feb. 6 period.
Source: Google Mobility Reports.

Daily Visits to Select Locations
Year-over-year percent change

May 31

- Doctor/Dentist
- Auto Mechanic
- Gas Stations

Source: SafeGraph, using cell phone geo-location data.

Additional Examples of Data Types...

7. Real estate vacancies

8. Prices for shipping

9. Prices for commodities

10. Production/capacity for various goods
An Aside on Non-Transaction Indicators

C. High-frequency indicators by official statistical agencies

**New business applications**

<table>
<thead>
<tr>
<th>Weekly</th>
<th>Thousands</th>
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<tbody>
<tr>
<td>Feb.</td>
<td></td>
</tr>
<tr>
<td>Apr.</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td></td>
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<tr>
<td>Aug.</td>
<td></td>
</tr>
<tr>
<td>Oct.</td>
<td></td>
</tr>
<tr>
<td>Dec.</td>
<td>600</td>
</tr>
<tr>
<td>Cumulative 2020</td>
<td>500</td>
</tr>
<tr>
<td>Cumulative 2017-19 average</td>
<td>400</td>
</tr>
<tr>
<td>Cumulative 2021</td>
<td>300</td>
</tr>
<tr>
<td>+ 100</td>
<td></td>
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<tr>
<td>- 0</td>
<td>200</td>
</tr>
</tbody>
</table>

**Household expectations**

<table>
<thead>
<tr>
<th>Weekly</th>
<th>Percent of households</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>70</td>
</tr>
<tr>
<td>June</td>
<td>60</td>
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<tr>
<td>July</td>
<td>50</td>
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<tr>
<td>Aug.</td>
<td>40</td>
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<tr>
<td>Sept.</td>
<td>30</td>
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<td>Oct.</td>
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<td>Nov.</td>
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<td>Dec.</td>
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<tr>
<td>Jan.</td>
<td></td>
</tr>
<tr>
<td>Feb.</td>
<td></td>
</tr>
</tbody>
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*NOTE: The cumulative 2021 data extend through February 6, 2021. The data are derived from Employer Identification Number applications with planned wages.*

**SOURCE:** Business Formation Statistics, Census Bureau via Haver Analytics.

*NOTE: Data extend through February 1, 2021. Dashed lines represent pauses in Household Pulse Survey data collection.*

**SOURCE:** Household Pulse Survey, Census Bureau via Haver Analytics.

An Aside on Non-Transaction Indicators, continued

• FRBNY Survey of Consumer Expectations

• Atlanta Fed/Chicago Booth/Stanford Survey of Business Uncertainty (SBU)

• Many Federal Reserve Bank surveys for manufacturing, services, energy, agriculture (often of a diffusion index form)
Lessons Learned

- Acquisitions process takes a team
  - For us, we have a team of data librarians manage the acquisition process, including working with SMEs, our attorneys, procurement, and the vendor
  - Economists and other SMEs participate in data trials

- Every data provider is a little different
  - Need to partner with provider to understand their business, the way in which the data are generated and captured, and their unique sensitivities
  - Need to work closely with the provider to address measurement challenges
  - Can’t be complacent, as new challenges will arise
  - Bespoke engagements don’t scale

- Getting access to microdata is challenging
  - Second-best outcome is having transparency into the transformations and cleaning that is done to the underlying data
  - Third-best outcome is aggregated data with limited transparency (may be good enough for indicator usage but not for creating official statistics)
Lessons Learned, continued...

• Look for “choke points” in the flow of data
  – Organizations at those points have large volumes of data, and *possibly* more representative data
  – However, the amount of detail may be more limited than what you can get from other sources

• Be prepared to manage a multitude of challenges, including:
  – Adjusting for potential biases in the data
  – Adjusting for non-economic variability
  – Communicating findings (including the tension between wanting the same signal as corresponding official statistics and wanting a unique signal)
  – Long-term availability is harder to ensure than in-house data collections
  – Risk of hold-up in contract negotiations
  – Risk of reduced innovation (from not looking at additional data sources due to required cost and effort)