Intuit QuickBooks Small Business Index: A New Employment Series for the US, Canada, and the UK

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Motivation

- Small and young businesses play an important role in economic activity
  - High growth: Have disproportional impact on job creation, innovation, and economic growth
  - Lifestyle: Employ 10% of US workforce
- Small and young businesses are very sensitive to economic conditions and highly sensitive to business cycle and monetary shocks
  - Early indicator of economic activity!
- Data on the performance of small business from administrative datasets lags considerably (BED)
  - Survey data is more timely but small firm samples are small and noisy ➔ focus on economy-wide statistics (CES)
  - Small business sentiment surveys useful but not quantitative (e.g. check new Census-BTOS)
  - Continued efforts by FRB and other institutions to create timely indicators of economic activity including for small business
    - largely looking at employment
    - E.g. FRB-ADP

Smallest of small business activity is not well covered!

Question

- Can we create a monthly indicator of smallest business activity that is near real time?

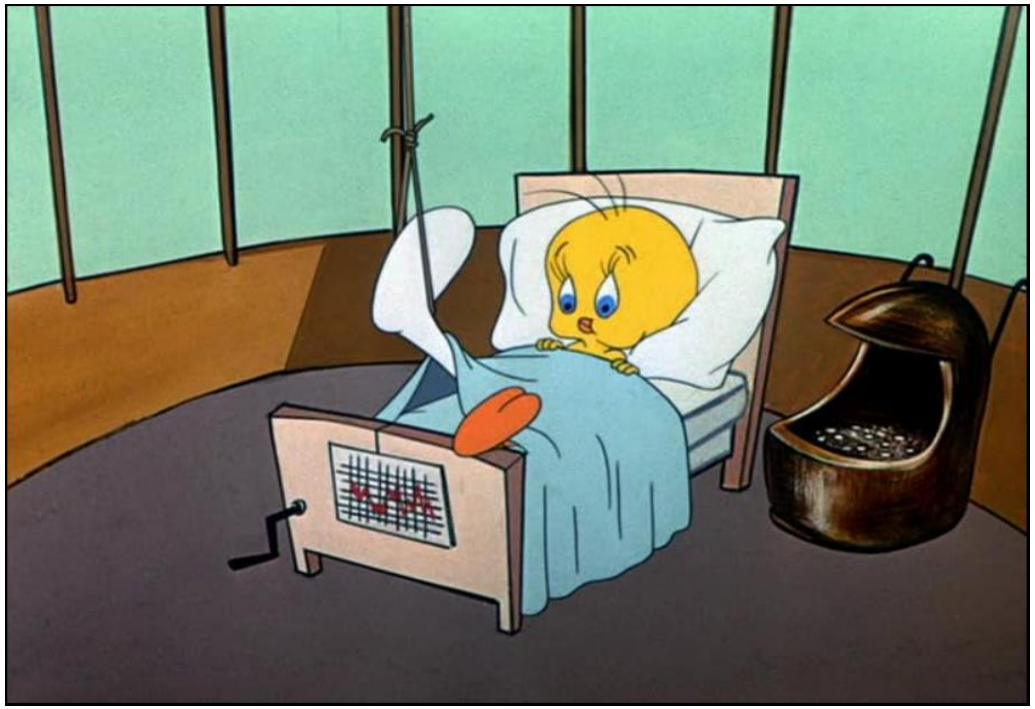
- Keys:
  - Very large sample of small business
  - Real time activity
  - Industry and geographic detail



Question

- Can we identify early impacts of policies? (another day)

- Keys:
  - Very large sample of small business
  - Real time activity
  - Industry and geographic detail



Data: Intuit Small Business QuickBooks

- Large global financial technology platform (Intuit)
- Sample of QuickBooks Online Payroll subscribers (QBO Payroll sample)
  - Strengths
    - Focus on small business: Over 330,000 US firms in the 1-9 size class
    - Administrative data => ready by COM
      - long-id, payroll date, employees, hours wkd, gross pay, taxes, bonuses, subscription join/cancel…
      - Track expansion/contraction/entry/exit
    - Coverage: Broad geography/industry
    - Available also for other countries
  - Challenges
    - Biased in unknown ways (unstructured)
    - Very large platform growth
    - Entry/Exit => Platform use concepts
      - Large seasonal component tied to use

Data: Intuit Small Business QuickBooks



Percentage of respondents by Revenue bin which selected "Accounting Software or App" as an answer to "Which of the following does the business use to manage and/or record its financial transactions?

Source: QuickBooks Small Business Survey

FIGURE 9: SOFTWARE USAGE BY REVENUE

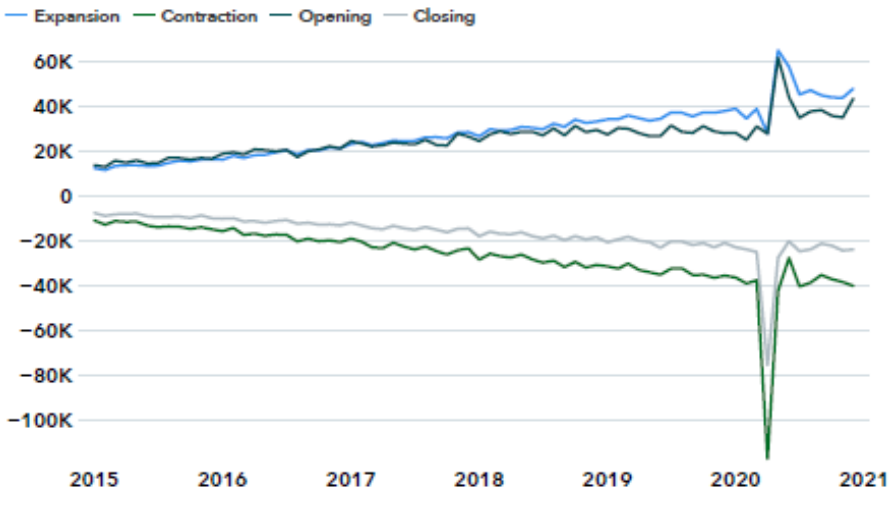


Percentage of respondents by Education which selected "Accounting Software or App" as an answer to "Which of the following does the business use to manage and/or record its financial transactions?

Source: QuickBooks Small Business Survey

FIGURE 12: ACCOUNTING SOFTWARE USE BY OWNER EDUCATION

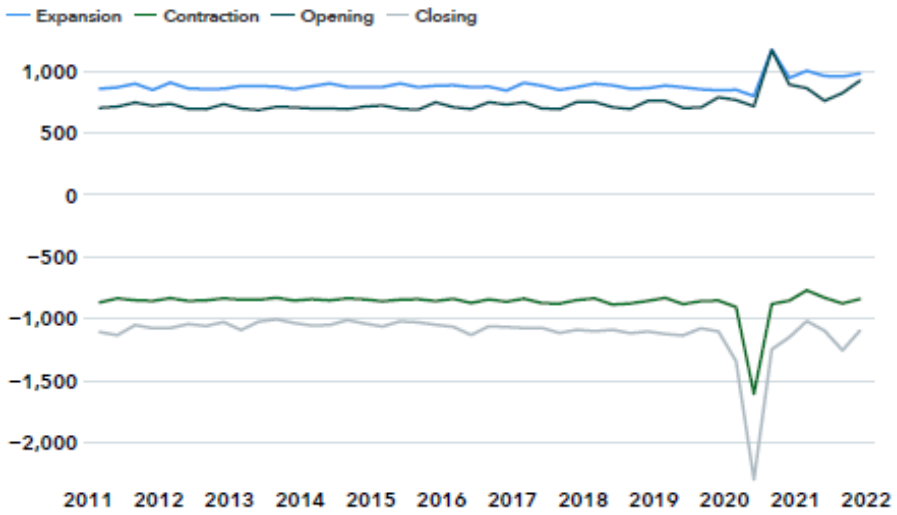
Data: Intuit Small Business QuickBooks



Firms Size 1-9, US. Note: Data points post December-2021 are used, but not shown in the figure to comply with confidentiality requirements.

Source: Seasonally Adjusted QuickBooks Online Payroll Sample.

FIGURE 20: SEASONALLY ADJUSTED GROWTH MARGINS, QUICKBOOKS SIZE CLASS 1 TO 9 (LEVELS.)

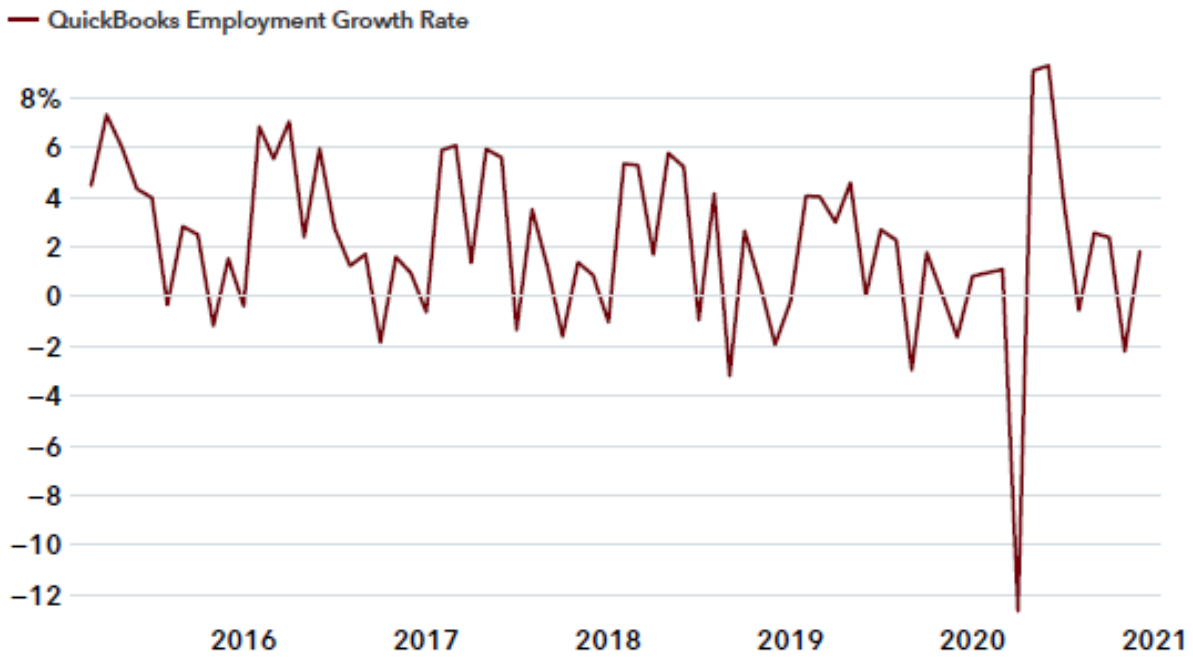


Employment gains (000's) for size class 1-9

Source: Business Employment Dynamics

FIGURE 21: SEASONALLY ADJUSTED GROWTH MARGINS, BED, SIZE CLASS 1 TO 9 (LEVELS.)

Data: Intuit Small Business QuickBooks



Note: Data points post-December 2021 are used, but not shown in the figure to comply with confidentiality requirements.

Source: QuickBooks Online Payroll Sample

FIGURE 14: OVERALL GROWTH RATE, g_t^{OVERALL}

Methods (U.S.)

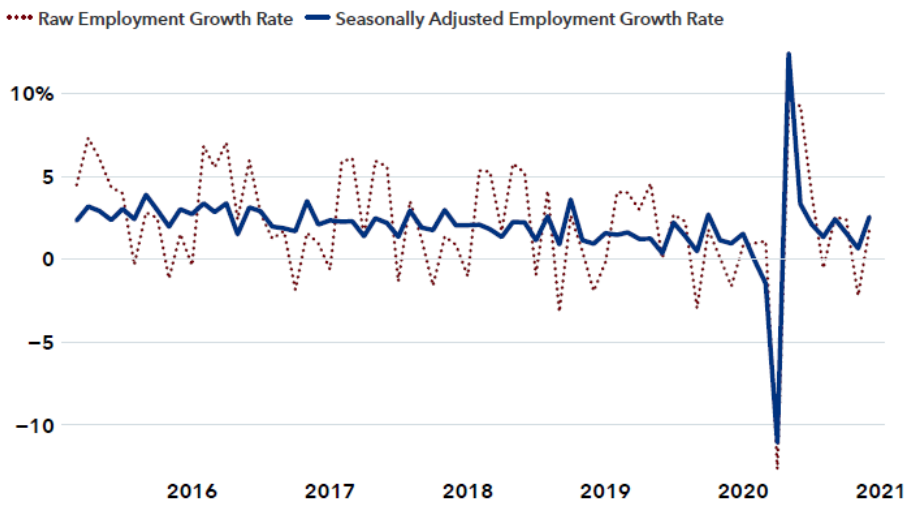
- Goal: Extract signal and benchmark net growth rate against official statistics
  - Assumption: relationship between official statistics and QB does not change rapidly => Users respond to shocks in similar ways (after adjustments for growth and seasonality)
- Challenge: No readily available monthly benchmark series!

- Steps:
  - QB Data selection (QBO Payroll, active workers, non furloughed)
  - Seasonal adjustment
  - Modelling:
    - Creation of monthly benchmark series
    - Selection of adjustment factors (to adjust the levels)

Methods (U.S.)

- QB Data selection
  - QBO Payroll, active workers, non furloughed
- Seasonal adjustment
  - X-13-ARIMA SEATS program (BLS)
  - Separately on different creation/destruction margins (important)
  - Seasonal adjustment of levels then converted to rates (total sa emp series)
  - Additive properties: Net is sum of gross gains and losses in rates

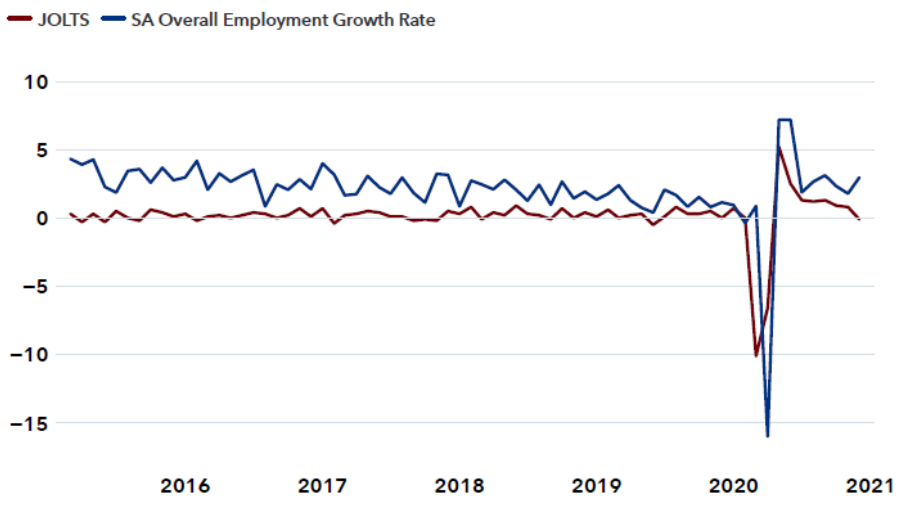
Seasonally Adjusted Series vs Actual vs JOLTS



Note: Data points post-December 2021 are used, but not shown in the figure to comply with confidentiality requirements.

Source: QuickBooks Online Payroll Sample.

FIGURE 22: SEASONALLY ADJUSTED NET JOB GAINS



Note: Data points post-December 2021 are used, but not shown in the figure to comply with confidentiality requirements.

Source: QuickBooks Online Payroll Sample and JOLTS Survey. Firms Size 1-9 Employees.

FIGURE 27: QUICKBOOKS SEASONALLY-ADJUSTED OVERALL VS. JOLTS

Methods (U.S.): Modelling data I

- Creation of a monthly benchmark series
  - BED (Quarterly) => Gold Standard
  - JOLTS (Monthly) => Survey (more timely but biased for small firms, not fully comparable concepts)

- IDEA: Use BED to discipline JOLTS series
  - Use Chow & Lin (1971) for frequency conversion

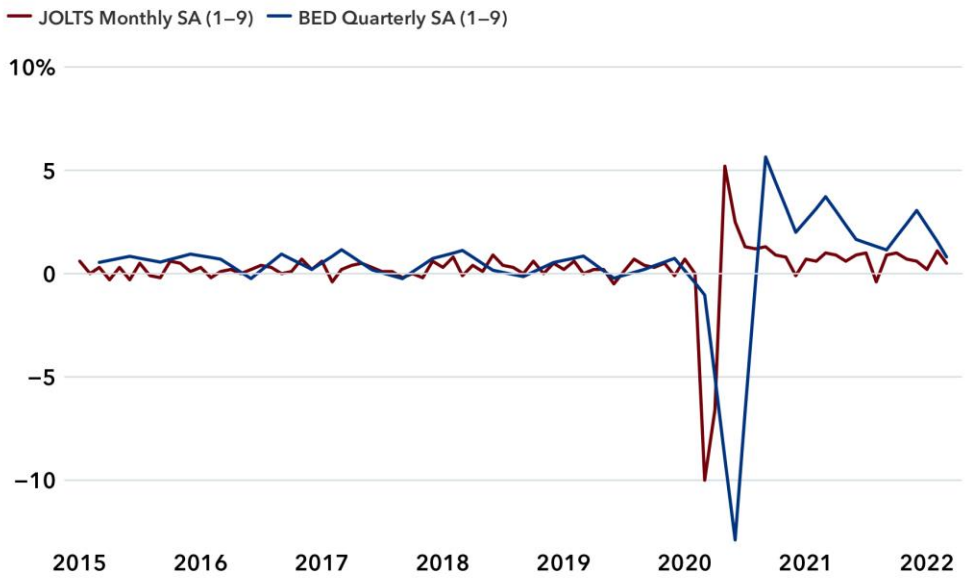
$$y_{j,t}^{BED,\,m} = \beta_j * y_{j,t}^{JOLTS,\,m} + u_{j,t}$$

$$u_{j,t} = \rho_j * \; u_{j,t-1} + e_t, \;\; 0 \leq \rho_j < 1, \;\; e_t \sim \; IID(0,\sigma)$$

$$y_{j,t}^{BED,\,q} = \sum_{s=0}^{r-1} y_{j,t-s}^{BED,\,m}, \;\; t = r,\; 3r,\; 6r,\; \ldots$$

BED-JOLTS Composite (BJC) series

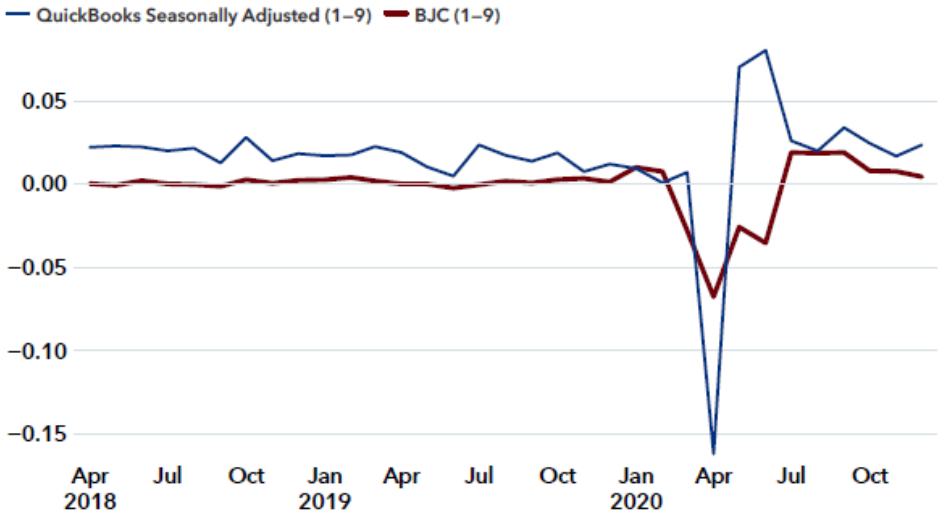
- JOLTS vs BED



BED growth rates between the two quarterly values are linearly interpolated.

FIGURE 33: QUARTERLY BED VS MONTHLY JOLTS, NET JOB CREATION RATE, SA, PERCENT

- interpolated monthly frequency



Note: Data points post-December 2021 are used, but not shown in the figure to comply with confidentiality requirements.

Source: Business Employment Dynamics, JOLTS and QuickBooks Online Payroll Sample.

FIGURE 35: QUICKBOOKS OVERALL AND BED-JOLTS COMPOSITE (BJC)

Methods (U.S.): Modelling data II

- Creating adjustment factors: Flexible Least Squares (Kalaba and Tesfatsion (1989))
  - Model the relationship between BJC and Intuit series
  - Allow previous observations to come into the model
    - We can give different weight to different observations (more current)
  - Allows the parameters of the model to change over time
    - Specially important given platform growth and during shocks

$$\underset{\beta_{j,t}\in \mathbf{B_t}}{\operatorname{argmin}} R(\mathbf{B_t}) = \sum_{t=1}^{T}\left(y_t^{BED,\,m} - \beta_{0t} - \sum_{j=0}^{q} y_{t-j}^{INTUIT,\,m}\beta_{j+1,t}\right)^2 + \lambda \sum_{t=1}^{T}\sum_{j=0}^{q} d_j * \left(\beta_{j+1,t} - \beta_{j+1,t-1}\right)^2$$

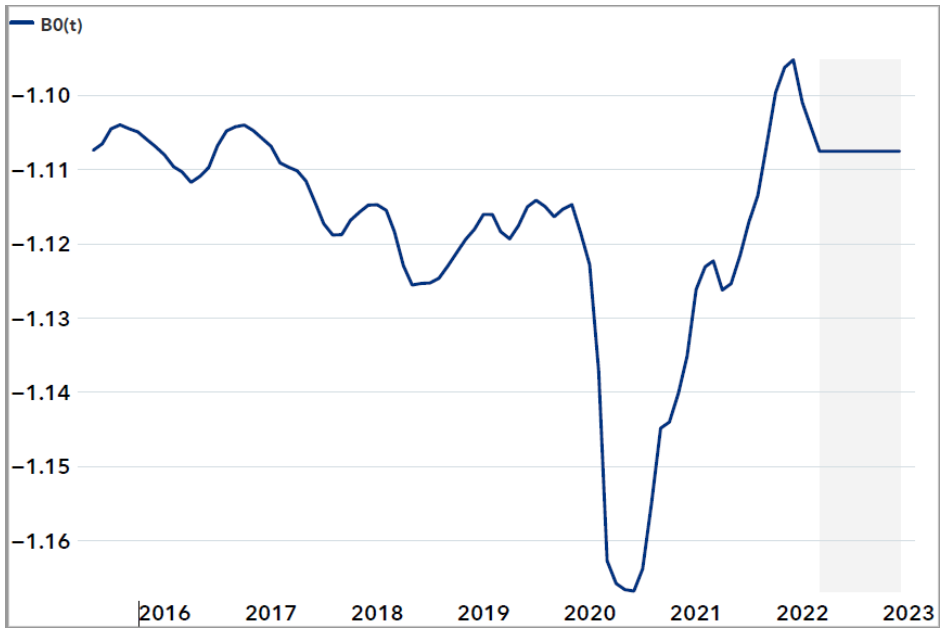
where,

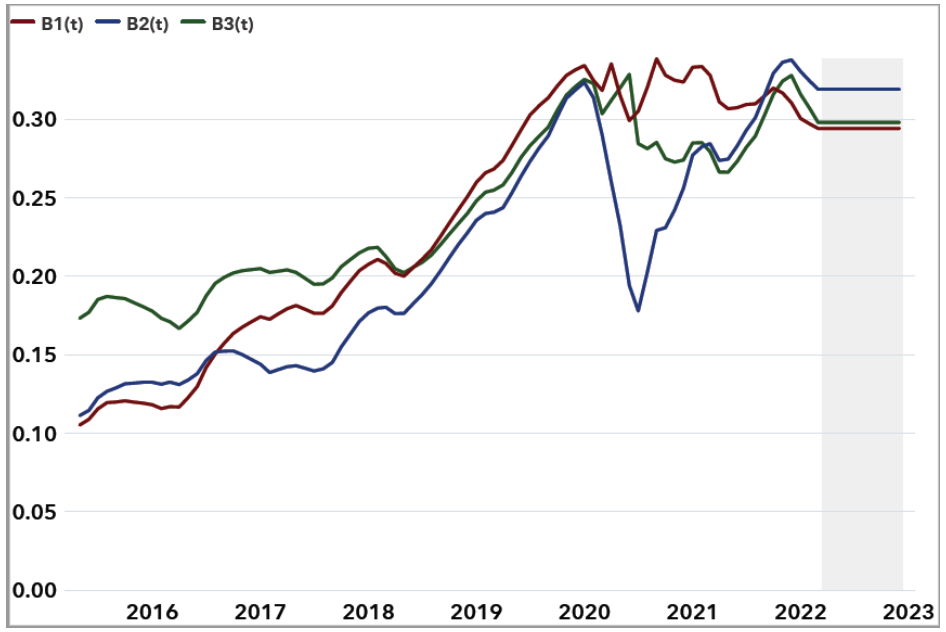
$$d_j = \sum_{t=1}^{T}\left(y_{t-j}^{INTUIT,m}\right)^2.$$

- Steps:
  - Identify optimal lag structure and weights (use LASSO regression)
  - Parameter tuning for out-of-sample performance

Methods (U.S.): Modelling data II

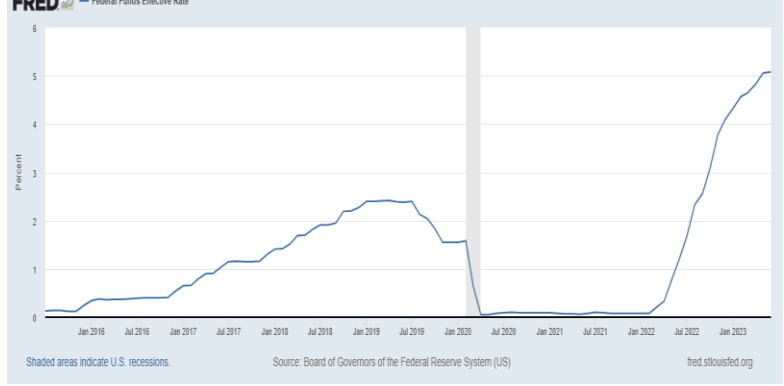
- Graphical intuition





- Steps:
  - Identify optimal lag structure and weights (use LASSO regression)
  - Parameter tuning for out-of-sample performance

Results

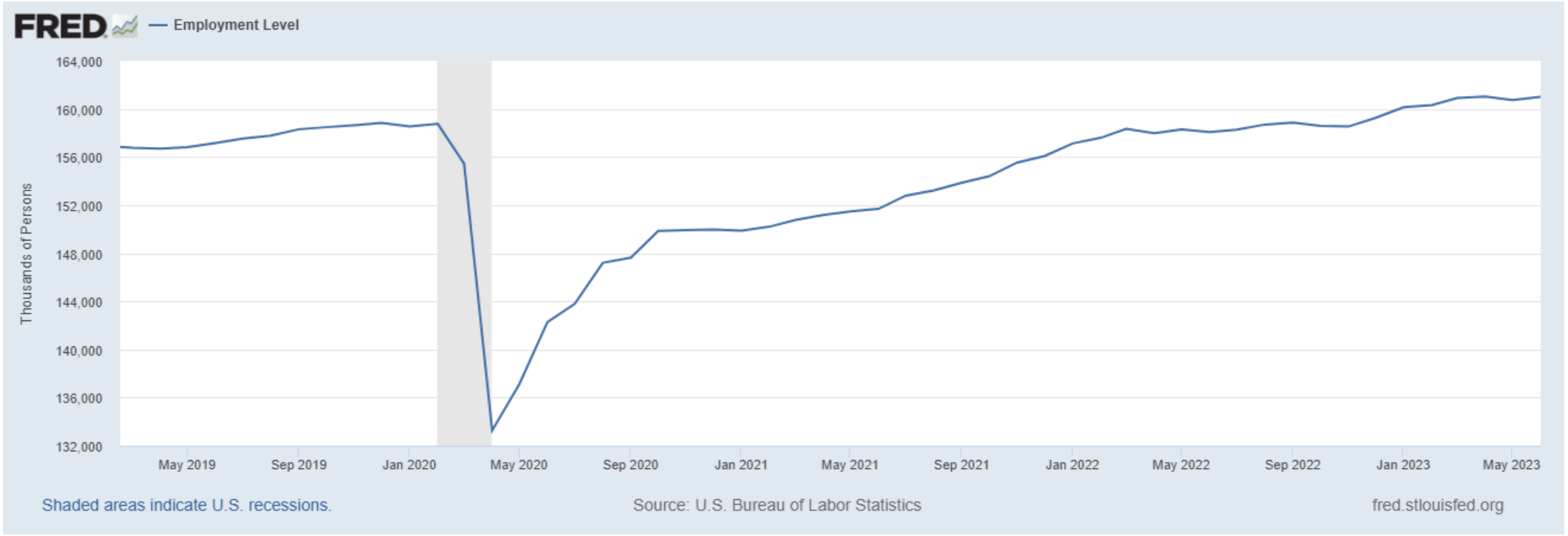


Intuit QuickBooks Small Business Index

USA | Total Employment | Businesses with 1-9 Employees



Results



Source: Bureau of Labor Statistics, Current Employment Statistics (CES)

Next Steps

- Monitor performance and make adjustments as needed
- Analyze information content of new series beyond what is available already
- Develop additional series:
  - Job Flows: Reallocation, Creation, and Destruction
- Other relevant metrics:
  - Sales, Inventories, outstanding invoice, contract work, ….
- QB: No information on business motivation or owner demographics
  - Future (?)
  - Enhanced with surveys
- Research:
  - Explore impact of monetary shocks
  - Drivers/impact of Technology adoption and use (marketing or field experiments)
  - …
- Engage with NSO for potential improvements

Conclusion

- Successfully launched a new small business data series tracking the smallest of small business for US, Canada, UK: fills a data gap
- Benchmarked against official statistics
- Using a powerful methodology to get around sample bias and composition
- Raises interesting questions about policy and impact on small business
- Excited about next steps…

Thanks!

Additional slides

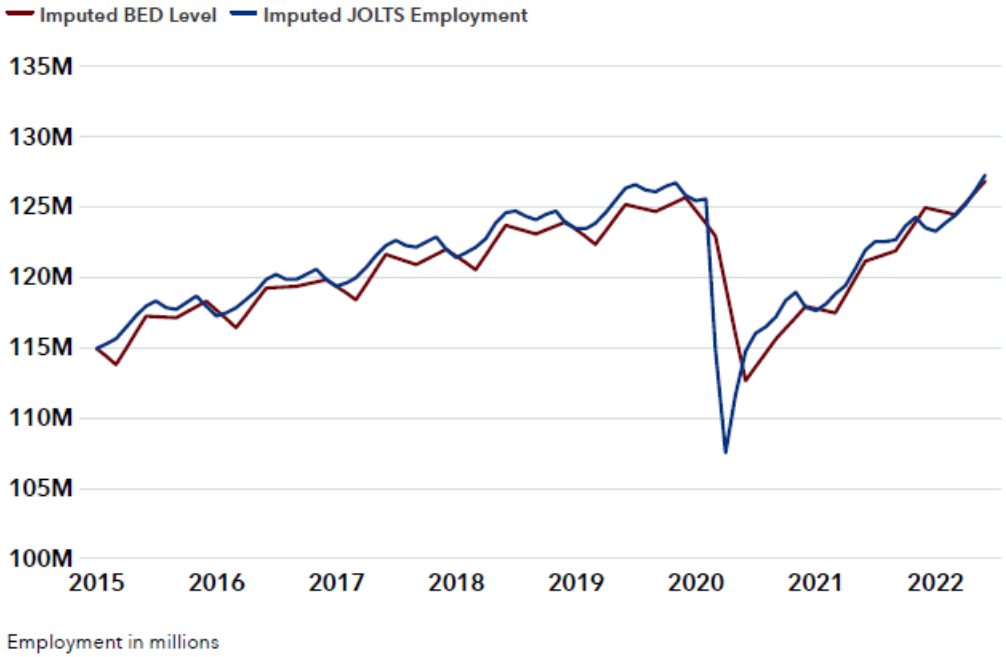


FIGURE 29: TOTAL EMPLOYMENT: JOLTS/BED*, NATION

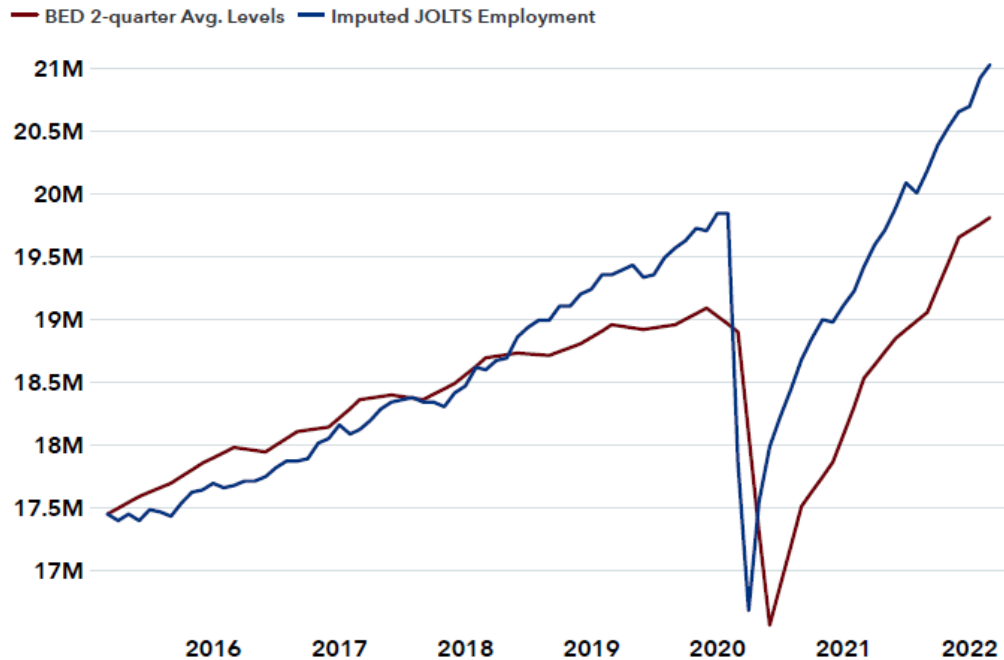


FIGURE 30: TOTAL EMPLOYMENT: JOLTS/BED, 1-9 WORKERS

NOTES: BED AND JOLTS ARE BENCHMARKED AGAINST QCEW 2018 Q1.