Understanding U.S. Inflation During the COVID Era

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The views expressed herein are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.
Headline Inflation = Core Inflation + Headline Shocks

Core: Underlying inflation that depends on expectations, labor market tightness.
  • Measure: Cleveland Fed weighted median CPI. Strips out relative price shocks in any industry (not only food and energy). Also consider other measures.

Headline shocks: High-frequency, relative price shocks. COVID examples.
  • Measure: Deviation of headline from core.

This paper:
  1. Explain both core and headline shocks during COVID era so far.
  2. Assess what might happen in the future.
High Inflation: Both Core and Headline Shocks

CPI Inflation (Percent)

Monthly Annualized Inflation

- Headline
- Core inflation
- Headline-inflation shocks

12-month Inflation

- Headline
- Core inflation
- Headline-inflation shocks
Explaining Core Inflation

Expectations:
• Long-term expectations. Hazell and others (2022).
• Measure: SPF 10-year ahead forecast. Also consider Michigan 5-year ahead.

Labor market tightness:
• Measure: Vacancy/unemployed ratio (V/U). Furman and Powell (2022) and others.
• Focus on effect over time (12-month average).
• Contrast results with traditional measure (unemployment).

Pass-through of past headline shocks:
• Channels: wages or other costs. Blanchard (2022), di Giovanni and others (2022).
• Focus on pass-through over time (12-month average).
Core Inflation: Strong Role of V/U

Inflation Gap (Median – Long-term Expectations) vs. V/U (12-month or 4-quarter Average)
The Importance of Core Measurement: XFE Inflation vs Median Inflation Gap (Core Measure – Long-term Expectations) vs. V/U (4-quarter Average)
Allowing for Non-linearities

Motivation:
- Gagnon and Collins (2019): U-inflation tradeoff steeper at low U.
- Blanchard (2022): salience of large shocks.
- Ball and Mankiw (1994): asymmetric effects in presence of menu costs, trend inflation.
- Owyang and Vermann (2014): “rockets and feathers.”

Application:
- Specify core inflation gap as cubic function of V/U and of past headline-inflation shocks.
- Also consider locally weighted scatter-plot smoothing (lowess).
Evidence of Non-linearity and Asymmetry

Framework Explains Rise in Core Inflation During the Pandemic

Sample: 1985-2022

Sample: 1985-2019
Three Factors Drive Headline Shocks: Energy, Backlogs, Autos

1. Energy price inflation minus median.
2. Firms’ backlogs of work (IHS Markit).
3. Auto-related inflation minus median.

Strong fit.

Other factors investigated: less relevant (COVID lockdowns affecting multiple sectors).
Accounting for the Rise in Inflation

Decomposition: Rise in 12-month CPI Headline Inflation from December 2020 to July 2022

- Headline inflation shock
- Passthrough
The Future: Two Big Questions

Focus on two factors that will shape how much U needs to rise to contain inflation:

**Question 1**

**Beveridge Curve.** Shifted out during the pandemic. Will the curve shift back?

Optimistic case: Move to pre-COVID (blue).

Pessimistic case: Stay on COVID (red).

Relates to debate between Figura and Waller (2022) and Blanchard, Domash and Summers (2022) about whether V can fall without a large rise in U.

Note: Lines indicate log-linear relationship for each period.
**Question 2**

**Inflation expectations.** Will they remain anchored? SPF and Michigan have drifted up slightly.

Optimistic case: revert to 2019 level.

Pessimistic cases:
1. Expectations drift as during COVID.
Where is Inflation Heading?

Derive core inflation paths conditional on paths for unemployment. Focus on three paths:

1. FOMC June 2022 Summary of Economic Projections. U peaks at 4.1%.
2. IMF 2022 Article IV Consultation Staff Report. U peaks at 5.3%.
3. High U scenario (Summers 2022). U rises to 7.5% for two years.

For each path, consider alternative Beveridge Curve and inflation expectations assumptions.

In all cases, set future headline-inflation shocks to zero. Low serial correlation. Caveat.

Derive paths for 12-month CPI median inflation using equations (PC, BC, inflation expectations process) estimated in the paper.
Inflation with FOMC Unemployment Projections

Note: Calculations for core (weighted median CPI) inflation using median unemployment path in June 2022 FOMC Summary of Economic Projections. Dashes show 2.5% target for weighted median CPI inflation from Atlanta Fed Underlying Inflation Dashboard.
Inflation with Higher (IMF Staff) Unemployment Path

Note: Calculations for core (weighted median CPI) inflation using unemployment path underlying 2022 IMF Article IV Staff Report. Dashes show 2.5% target for weighted median CPI inflation from Atlanta Fed Underlying Inflation Dashboard.
Inflation Paths with Even Higher (7.5%) Unemployment Path

Note: Calculations for core (weighted median CPI) inflation assuming 7.5% unemployment during 2023-2024. Dashes show 2.5% target for weighted median CPI inflation from Atlanta Fed Underlying Inflation Dashboard.
Extra Slides
### Relation Between H and V/U

**Headline-inflation Shocks Not Associated with V/U**

#### Estimated Equation for Headline Shocks, 2020-22

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<th></th>
<th>(1)</th>
<th>(2)</th>
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<tbody>
<tr>
<td>Energy price inflation</td>
<td>0.054***</td>
<td>0.053***</td>
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<tr>
<td>(0.007)</td>
<td>(0.008)</td>
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<tr>
<td>Backlogs of work</td>
<td>0.198***</td>
<td>0.193**</td>
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<tr>
<td>(0.065)</td>
<td>(0.069)</td>
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<tr>
<td>Weighted average of car inflation rates</td>
<td>0.063***</td>
<td>0.065***</td>
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<tr>
<td>(0.008)</td>
<td>(0.008)</td>
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<tr>
<td>V/U</td>
<td>-2.035</td>
<td>-0.967</td>
<td>-17.392</td>
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<tr>
<td>(2.687)</td>
<td>(0.868)</td>
<td>(24.245)</td>
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<tr>
<td>V/U-squared</td>
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<td>15.500</td>
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<td>(24.037)</td>
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<tr>
<td>V/U-cubed</td>
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<tr>
<td>(7.467)</td>
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<td>Constant</td>
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<td>(2.322)</td>
<td>(3.312)</td>
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<td>Observations</td>
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<tr>
<td>R-squared</td>
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<tr>
<td>Rbar-squared</td>
<td>-0.00802</td>
<td>0.912</td>
<td>0.906</td>
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![Graph showing the relation between H and V/U](image-url)
Why Has High Inflation Been Such a Surprise?

Predictions for Median CPI Inflation Gap During the Pandemic: Comparison Across Models

1. Nonlinear model with V/U and pass-through effect.

2. Linear model with U - U* and no pass-through effect (Ball and others, 2021).

Parameters estimated with pre-pandemic (1985-2019) sample. U* from CBO.
Relation Between Core Inflation and U.

Derivation: Substitute V/U from Beveridge Curve into Phillips Curve with V/U

Median CPI Inflation Gap vs. U for Different BC
Robustness: Evidence of Non-linearity and Asymmetry

Results robust to starting the “Great Moderation” at alternative dates (1981, 1983, 1985).

Note: Bands report 95% conf. intervals. H = headline-inflation shocks. Inflation gap = median inflation – long-term expectations.
Implied Sacrifice Ratios

Sacrifice Ratio: Cumulative difference in the U rate (in point-years) between the SEP and IMF (or between the IMF and the 7.5%) paths between August 2022 and December 2024 divided by the difference in 12-month inflation in December 2024.

Across assumption sets, the sacrifice ratio is relatively low when U rises from the SEP path to the IMF staff path.

Raising unemployment further to 7.5% comes with relatively limited additional disinflation benefit at a substantial U cost.

<table>
<thead>
<tr>
<th>Assump. BC</th>
<th>Expectations</th>
<th>Assump. BC</th>
<th>Expectations</th>
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<tr>
<td>1</td>
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<td>Optimistic Revert</td>
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<td>Pessimistic Drift (γ = 0.98)</td>
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<td>Optimistic Drift (γ = 0.98)</td>
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<tr>
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<td>Pessimistic Drift (γ = 0.94)</td>
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<td>Optimistic Drift (γ = 0.94)</td>
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American Rescue Plan Played a Role
Counterfactual Scenario Without American Rescue Plan

Note: Calculations for core (weighted median) PCE inflation using unemployment path in June 2022 FOMC Summary of Economic Projections. Dashes show 2.4% target for weighted median PCE following approach of Atlanta Fed Underlying Inflation Dashboard.