Economic Brief

November 2023, No. 23-37

What Does Sectoral Inflation Tell Us About the Aggregate Trend in Inflation?

By Paul Ho and Mark W. Watson

To know the appropriate stance of monetary policy, policymakers need to determine the overall trend in inflation. This is challenging in the face of varied and evolving patterns in inflation across sectors. We describe a multisector statistical model that provides a systematic approach to appropriately weight incoming inflation data from each sector. By flexibly applying time-varying weights to different sectors, this model adjusts to changing patterns in these sectors over time — including during the pandemic — and suggests that trend inflation is lower than might be suggested by the aggregate data, with an estimate of 2.35 percent for the third quarter of 2023.

Two key questions have come up repeatedly over the past three years: How persistent will inflation be, and how concerned should one be about inflation in particular sectors of the economy? Questions about the behavior of inflation in different segments of economy are not new: For instance, there has historically been a focus on core inflation, which excludes food and energy prices because they are considered more volatile than prices in other sectors and, therefore, less indicative of the overall trend of inflation.

However, as the economy has evolved, the persistence and relative volatility of inflation in different sectors has changed, making it important to adapt how we gauge the overall trend in inflation. The past three years have made these changes especially salient, with various sectors experiencing price fluctuations not seen in recent decades.

To confront these challenges, policymakers need a systematic way to answer three questions:

- How much weight should be placed on the most recent data relative to past data?
- How much weight should be placed on data from different sectors?

- How have these weights changed over time?

Sectors and Trends

One approach to answering these questions uses the statistical model in my (Mark's) 2016 paper Core and Trend Inflation, co-authored with James H. Stock.

The model uses personal consumption expenditure (PCE) inflation data from 17 sectors and decomposes each sector's inflation into a *trend* component that captures persistent variation in inflation and a *transitory* component that captures nonpersistent variation.[1] The trend components are then averaged (weighted by the expenditure shares of each sector) to obtain an *aggregate trend*, which can serve as a measure of the overall state of inflation.

In this formulation, the aggregate trend is a weighted average of inflation in each of the sectors, where the weights differ across sectors for two reasons:

- Volatile sectors receive a lower weight because they exhibit relatively less variation in their trend.
- Sectors receive a larger weight if they account for a larger share of total consumption expenditures.

Thus, the importance of each sector's inflation data for the aggregate trend depends on both its expenditure share and its fluctuations.

To capture how the economy has changed over time, the model allows for time variation in expenditure weights for each component and volatility of each component, including allowing for large one-off transitory shocks. The time variation accounts for changes in the economy. For instance, it allows the importance of oil shocks in the 1970s to differ from the 2000s. More recently, inflation in many sectors deviated from their historical behavior during the COVID-19 pandemic.

Figure 1 compares the aggregate trend from this multisector model to analogous trends constructed using a similar univariate model estimated with either headline PCE or core PCE inflation data, where the univariate models effectively weight each sector only by expenditure weight, ignoring differences in the behavior of inflation across sectors.[2] Using core PCE instead of headline PCE places zero weight, by definition, on three sectors:

- Food and beverages for off-premises consumption
- Gasoline and other energy goods
- Gas and electric utilities

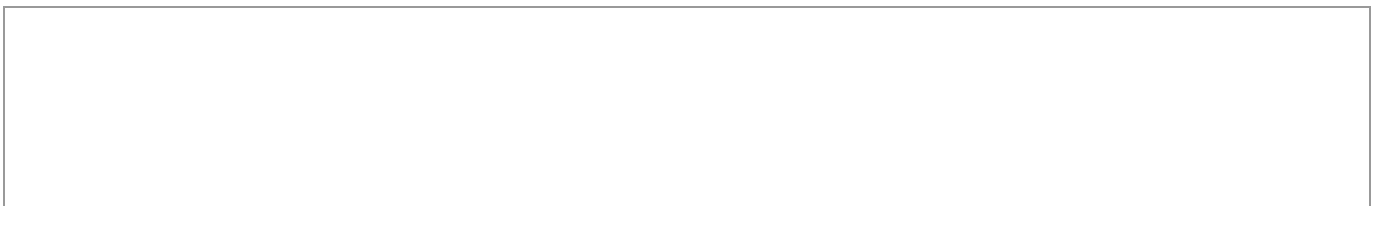
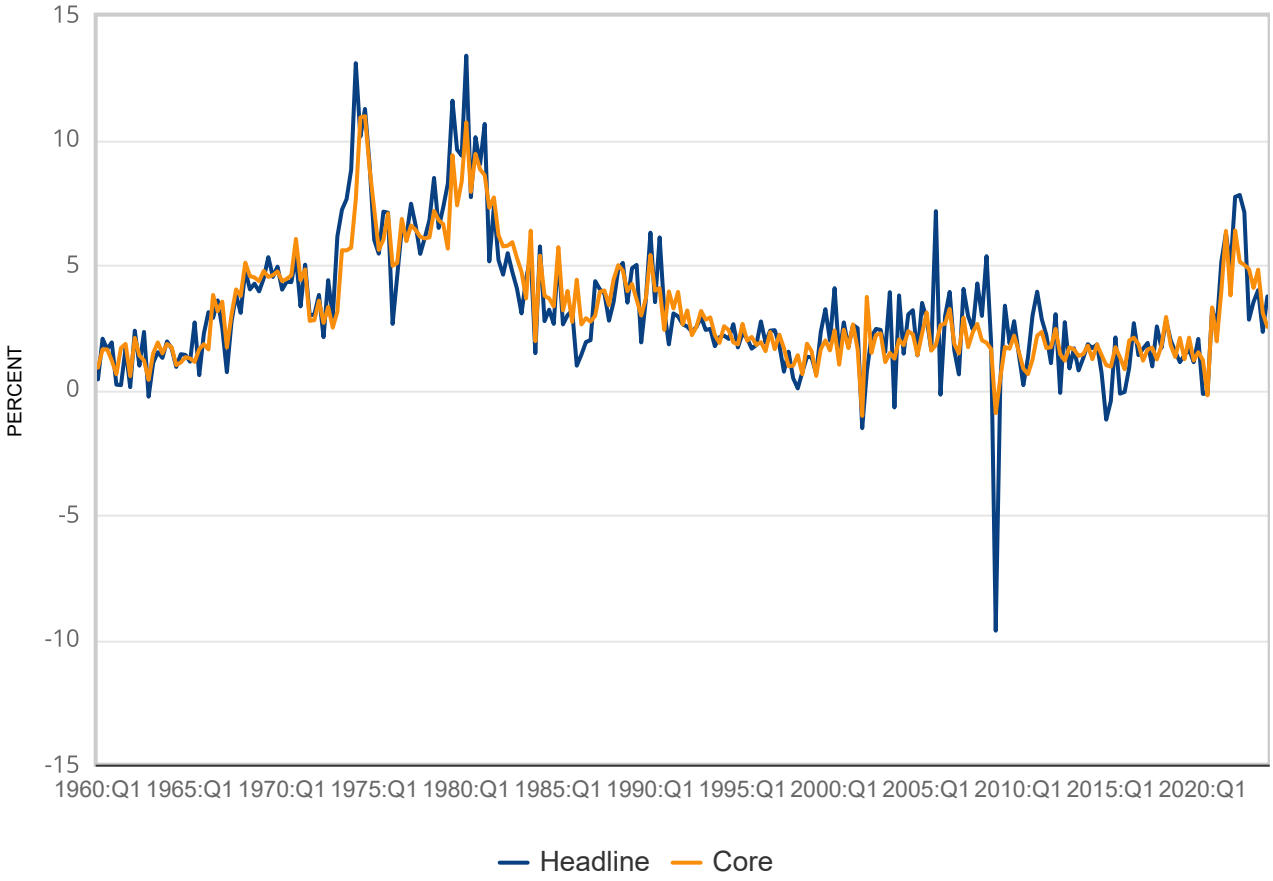


Figure 1a: Aggregate Inflation

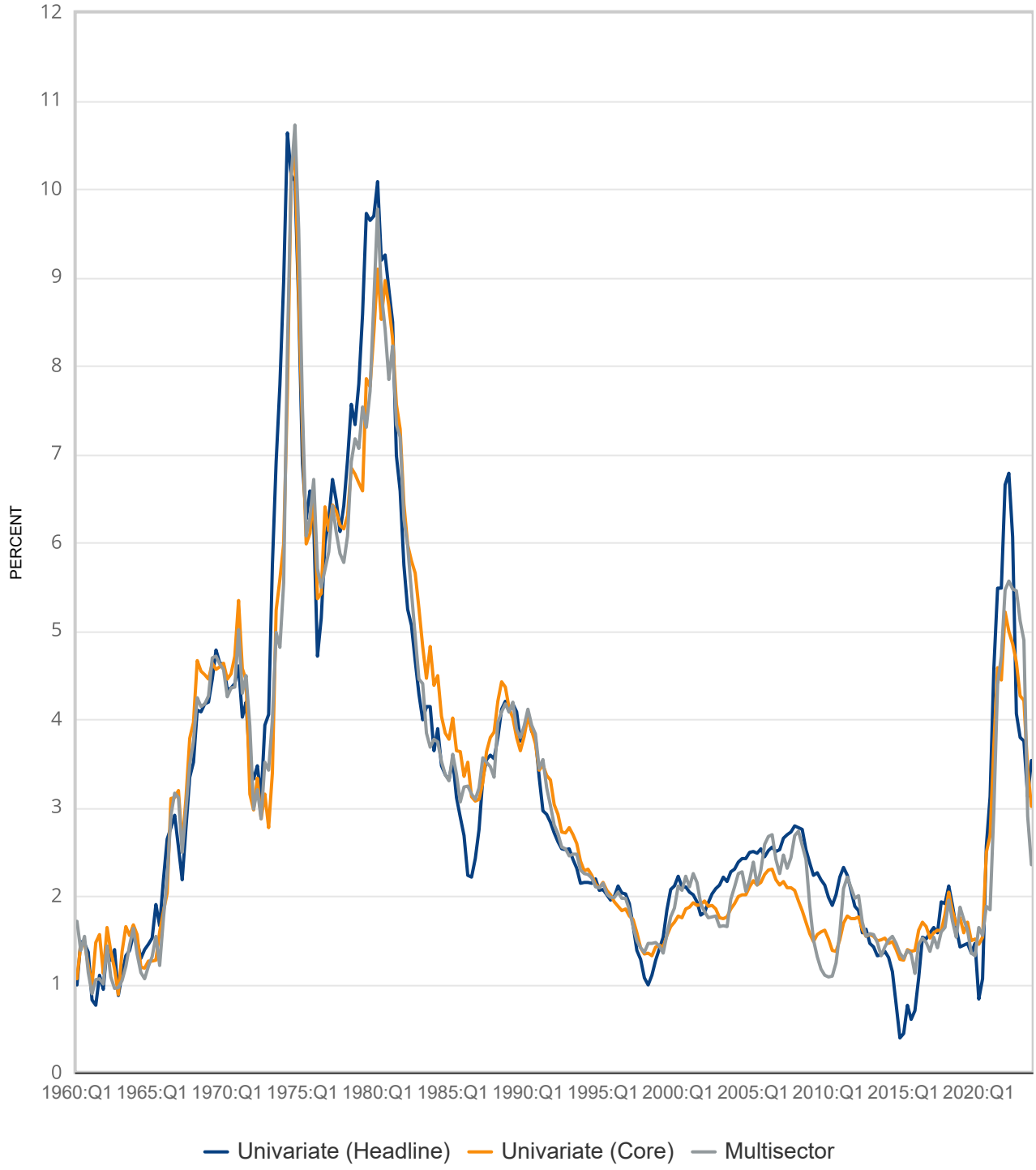
Headline and Core PCE Inflation



SOURCE: Bureau of Economic Analysis.

Figure 1b: Aggregate Inflation

Trend Inflation



SOURCES: Bureau of Economic Analysis and authors' calculations.

From the 1960s to the mid-1980s, there are some differences in the trends from each model, but these are swamped by the large increases in both measures of inflation. For subsequent years until the late 1990s, the three measures of trend inflation track each other closely, coinciding with the period during which headline and core inflation followed similar paths.

The three trends begin to deviate from each other during the 2000s, just as headline inflation starts displaying notably greater volatility than core inflation. The pattern continues through the recent inflationary episode: Even though all three trends rise sharply, they reach different peaks and decline at different rates. By the end of the sample (the third quarter of 2023), there remain meaningful differences, with the headline inflation trend at 3.53 percent, the core inflation trend at 3.01 percent and the multisector model's aggregate trend at just 2.35 percent.

There is little consistency in whether the trend from the multisector model tracks the headline or core inflation trend more closely. The multisector model, therefore, does not simply down-weight food and energy prices, as one would do by focusing on core instead of headline inflation. In other words, disaggregating inflation by sector beyond the "core" and "non-core" categories can provide useful information for the trend of inflation. In what follows, we examine various sectors to highlight changes over time in how one might weight recent data from each sector.

Inflation Before the Pandemic

Since the 1970s, there has been a tradition of focusing on core inflation and distinguishing it from headline inflation.[3] The argument for ignoring food and energy is that changes in inflation for these sectors tend to be short-lived, as they tend to have more high-frequency variation than other sectors. Therefore, including food and energy would muddy an attempt to establish the underlying trend for inflation. However, as the food and energy sectors have evolved over the past 60 years, one might question if the reasoning holds throughout the sample.

Figure 2 revisits the argument by showing sectoral inflation in food and beverages for off-premises consumption and in gasoline and other energy goods. High volatility is evident in energy prices, with fluctuations that are an order of magnitude larger than both headline inflation and the trend for the sector.

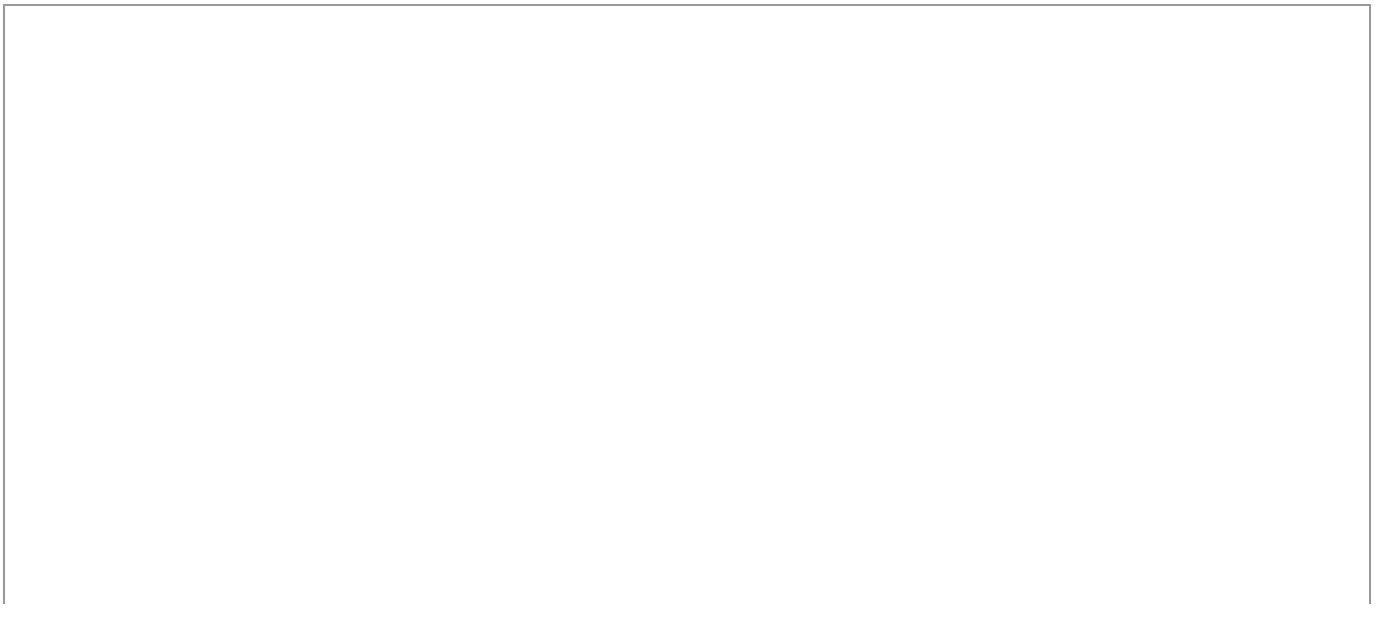
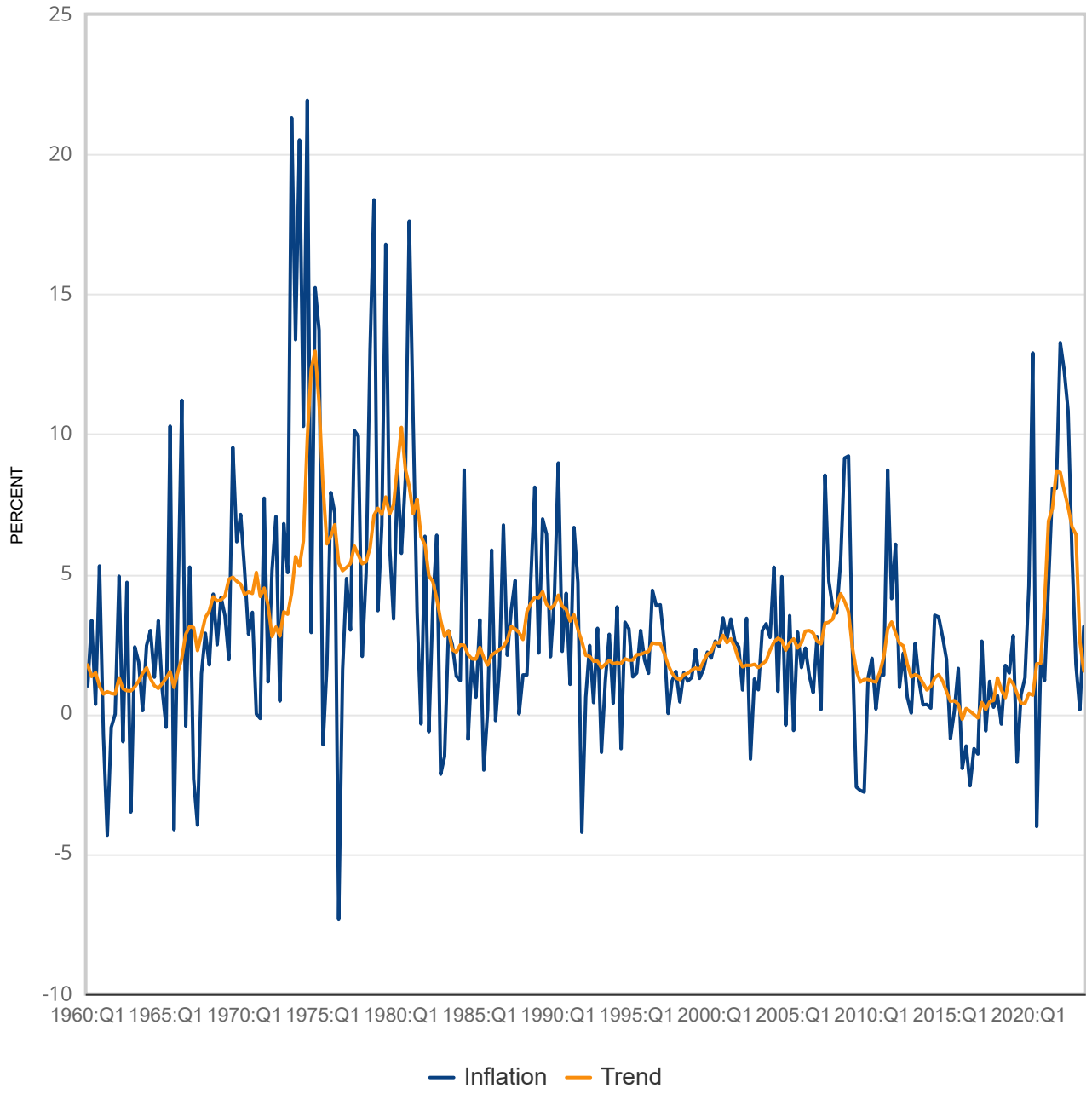


Figure 2a: Sectoral Inflation

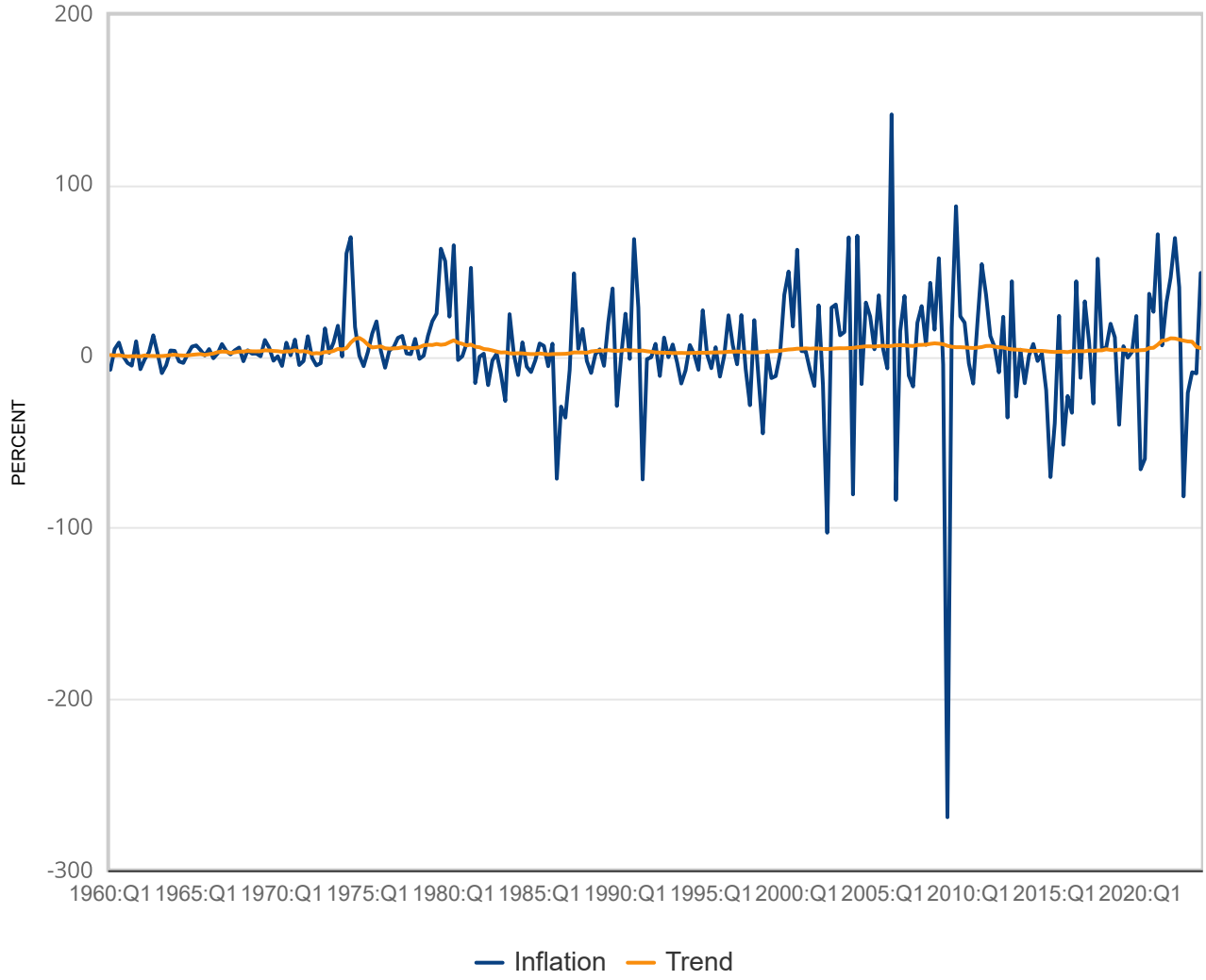
Food and Beverages Purchased for Off-Premises Consumption



SOURCES: Bureau of Economic Analysis and authors' calculations.

Figure 2b: Sectoral Inflation

Gasoline and Other Energy Goods



SOURCES: Bureau of Economic Analysis and authors' calculations.

On the other hand, the picture for food depends on the period. In the 1970s, the food sector exhibited substantial high-frequency variation, suggesting that disregarding it might indeed help give a clearer picture of the underlying trend. However, from the late 1990s onward, the food sector was not materially more volatile than other sectors of the economy, suggesting that one might be giving up useful information about the trend of inflation by disregarding that sector. Indeed, the weight that the multisector model's aggregate trend places on the food sector is even greater than its expenditure share for some of this period.

Therefore, there was evidence even before the COVID-19 pandemic that one should change the relative weights on different sectors in different periods when computing the aggregate trend. The pandemic brought further attention to the changing behavior of inflation across sectors.

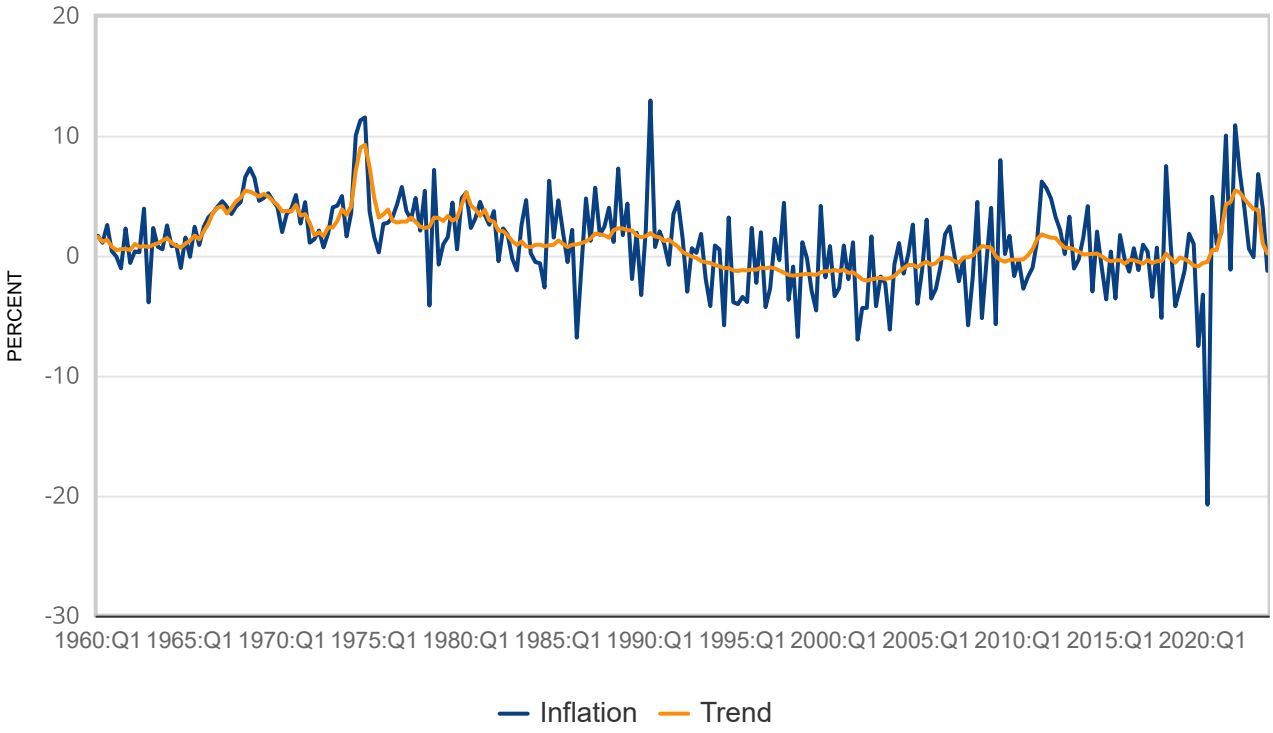
Inflation During the Pandemic

Events such as lockdowns and supply chain issues during the COVID-19 pandemic were unprecedented and led to unusual movements in sectoral inflation. Policymakers were tasked with figuring out how to respond to these data.

During the initial months of the pandemic, the clothing and footwear sector was one of those that was hit particularly hard. Indeed, Figure 3a shows a sharp deflation of around 20 percent in the second quarter of 2020. Nevertheless, the trend did not discernably respond to this dip in prices. Instead, the model interprets the episode as being a large one-off shock to clothing and footwear prices, a plausible description of the temporary pandemic-related lockdowns. Consequently, the aggregate trend responded much less to inflation in the clothing and footwear sector during this quarter than it historically had.

Figure 3a: Sectoral Inflation

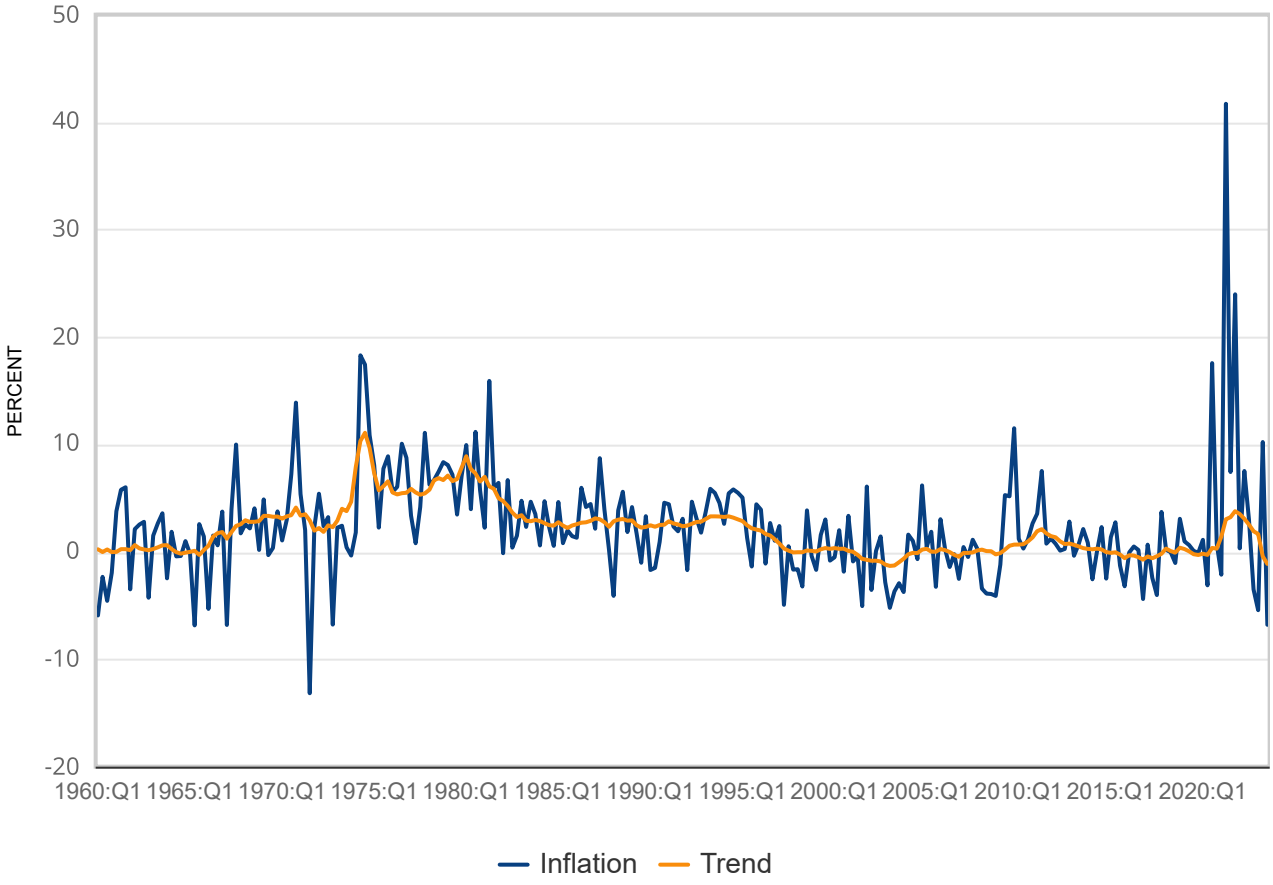
Clothing and Footwear



SOURCES: Bureau of Economic Analysis and authors' calculations.

Figure 3b: Sectoral Inflation

Motor Vehicles and Parts



SOURCES: Bureau of Economic Analysis and authors' calculations.

Later in the pandemic, supply chain issues arose, with one prominent example being semiconductor shortages that led to a spike in car prices. Indeed, we see a sharp spike in inflation for motor vehicles and parts in Figure 3b. The increased inflation was accompanied by a rise in high-frequency volatility, drastically reducing the weight that the model put on the sector. As inflation in the economy began to rise more broadly, the trend rose but did so more slowly and substantially less than motor vehicles and parts sectoral inflation itself.

These are just two examples of how the atypical behavior of sectoral inflation during the pandemic posed a challenge for policymakers as they sought to pin down the trend of inflation. While we now have the benefit of hindsight in weighting the sectoral inflation data after seeing how prices have evolved since 2020, policymakers had to contend with these shocks in real time.

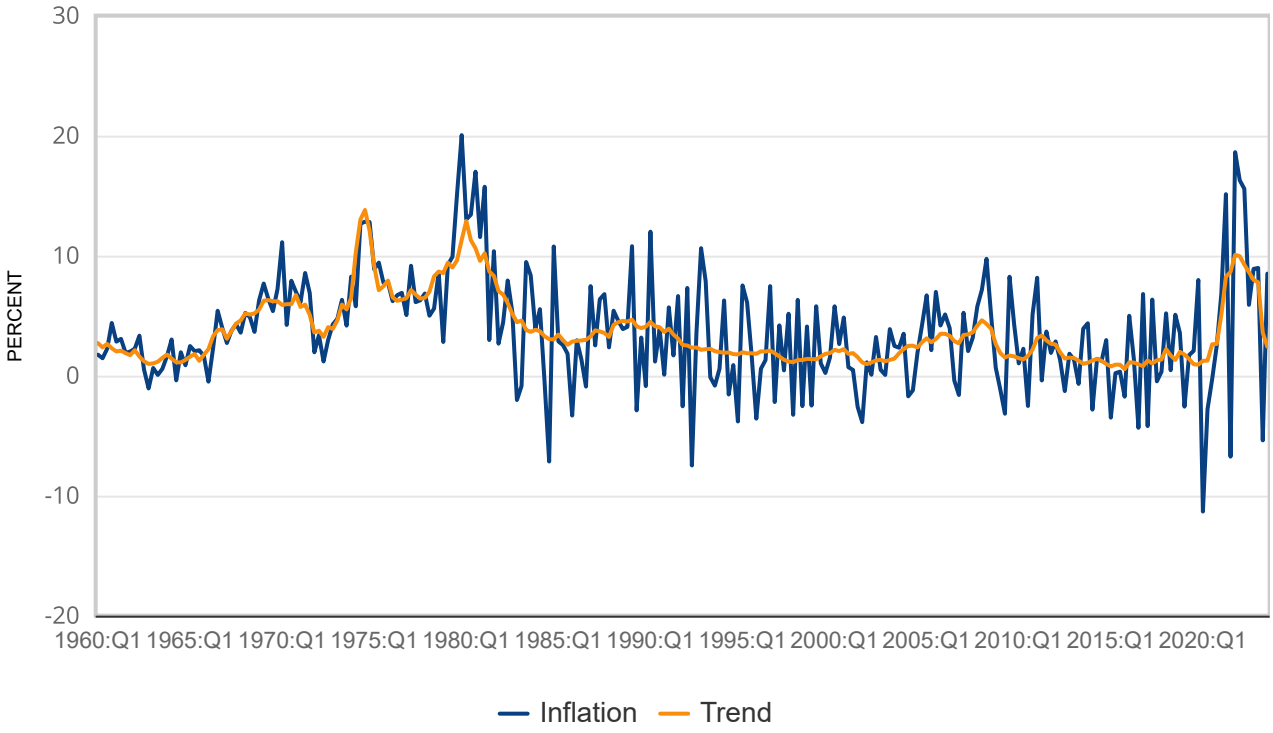
Inflation Today

Even though inflation has fallen from its peak, policymakers continue to wrestle with figuring out the aggregate trend of inflation today. While certain industries (such as clothing and footwear) have normalized somewhat, the behavior of inflation in other sectors remains noteworthy.

For example, Figure 4a shows the transportation services sector's continued volatility, which began at the onset of the pandemic in 2020. Even though the expenditure share of this sector has returned to pre-pandemic levels with the return to office and air travel, the multisector model down-weights incoming data from the industry, interpreting these as likely one-off movements.

Figure 4a: Sectoral Inflation

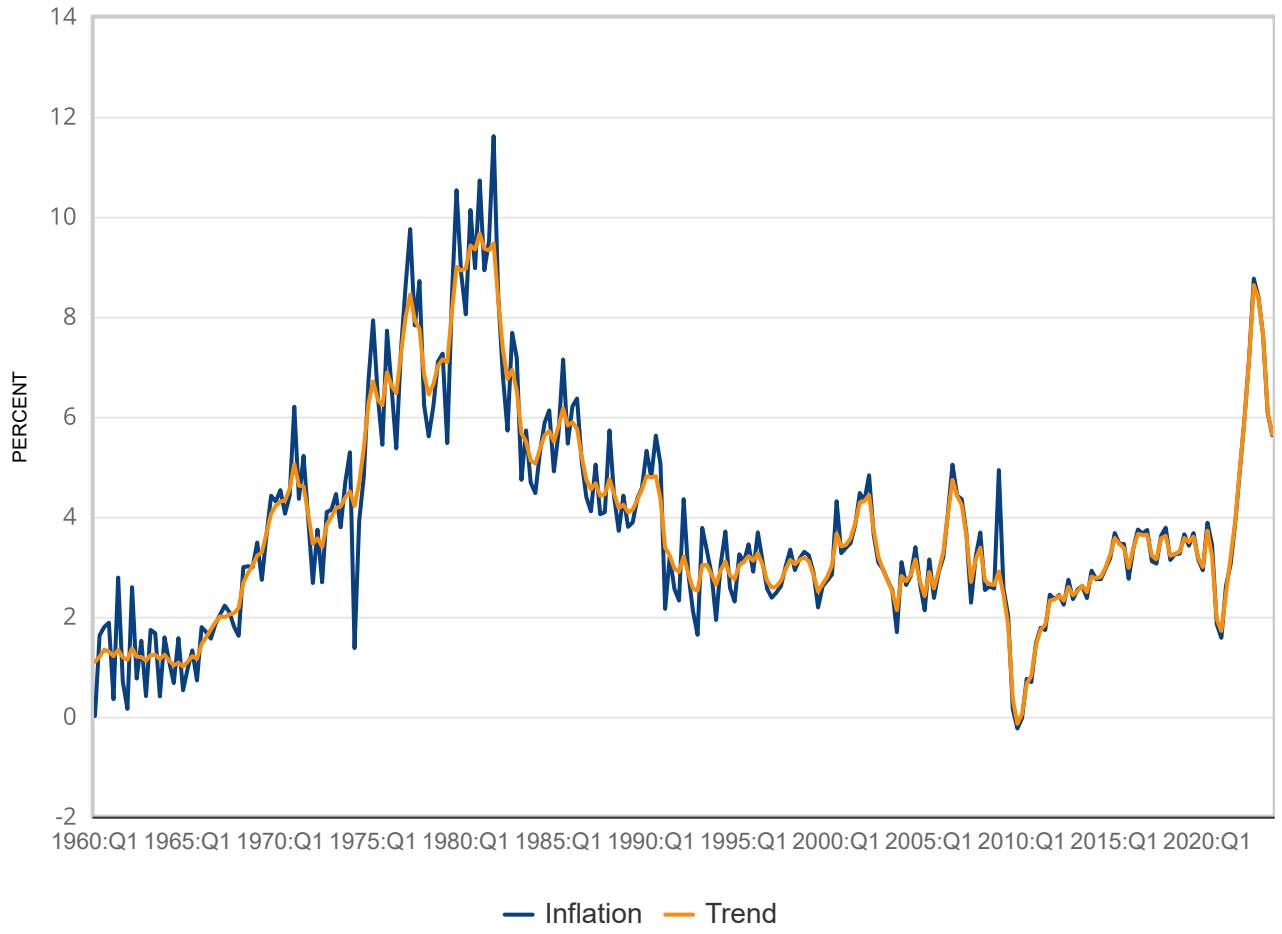
Transportation Services



SOURCES: Bureau of Economic Analysis and authors' calculations.

Figure 4b: Sectoral Inflation

Housing Excluding Gas and Electric Utilities



SOURCES: Bureau of Economic Analysis and authors' calculations.

Another sector that has received significant attention is housing. It has been well documented that the trend in housing inflation tends to lag the rest of the economy. Indeed, the peak of the trend in housing inflation comes later than the peak of the aggregate trend. However, housing inflation is an extremely smooth series: While there are substantial fluctuations, these tend to be persistent. As a result, the model places a relatively large weight on recent housing data when computing the aggregate trend. The recent decline in housing inflation is thus good news in the Federal Reserve's attempts to bring inflation back to its 2 percent target.

Concluding Remarks

Inflation varies across time and sectors. Policymakers want to avoid responding to one-off spikes in inflation for specific sectors and instead focus on the more slow-moving aggregate trend in inflation. This task is complicated by the evolving behavior of sectoral inflation, which implies that the weights one places on each sector should vary over time. With the

most recent weights inferred from data through the third quarter of 2023, the multisector model paints an optimistic picture, with the aggregate trend of inflation falling even more rapidly than headline or core inflation might suggest.

Paul Ho is an economist in the Research Department of the Federal Reserve Bank of Richmond. Mark W. Watson is the Howard Harrison and Gabrielle Snyder Beck Professor of Economics and Public Affairs at Princeton University and a long-term consultant at the Federal Reserve Bank of Richmond.

---

[1] *To account for co-movement of inflation across sectors, these components are further decomposed into components common to all sectors and components idiosyncratic to the sector. This common/idiosyncratic decomposition is not important for the issues discussed in this article but can be useful for other purposes.*

[2] *In all figures, inflation is measured as the quarterly average of monthly inflation expressed in percentage points at an annual rate.*

[3] *Important early contributions to this tradition are the 1975 paper "Alternative Responses of Policy to External Supply Shocks" by Robert Gordon and the 1981 book Core Inflation by Otto Eckstein.*

To cite this Economic Brief, please use the following format: Ho, Paul; and Watson, Mark W. (November 2023) "What Does Sectoral Inflation Tell Us About the Aggregate Trend in Inflation?" *Federal Reserve Bank of Richmond Economic Brief, No. 23-37.*

Topics

Inflation