FEDERAL RESERVE BANK *of* CLEVELAND

Economic Commentary

09.22.2025 | ISSN 2163-3738 | Number EC 2025-09

Understanding Inflation via Developments in Market and Nonmarket Inflation Rates

This *Economic Commentary* examines the recent behavior and the longer-term properties of market-based and non-market-based inflation series, including their cyclical properties, historical revisions, and predictive power in explaining future PCE inflation. The examination reveals a statistically significant association between market-based PCE inflation and estimates of labor market slack, and a strong positive association between movements in the stock market and in some of the financial services components of non-market-based PCE inflation. Disinflation in overall PCE inflation over the course of 2023 and 2024 was largely driven by disinflation in the market-based components, coinciding with a gradual loosening in labor market conditions.

Randal J. Verbrugge, Saeed Zaman

Topics Inflation, Econometrics, modeling, and forecasting

DOI 10.26509/frbc-ec-202509

Introduction

Aggregate inflation measures, such as personal consumption expenditures (PCE) price inflation, are constructed as a weighted average of the price changes for a wide variety of goods and services components. The prices for the majority of the components are based on "observed" market prices;[1] however, for a select minority, prices are not observed and must be imputed using some combination of judgment and alternative data. This distinction in pricing categorization has led to a popular breakdown of overall inflation into market-based and non-market-based inflation measures. Specifically, the Bureau of Economic Analysis (BEA), the statistical agency that produces the PCE price data, defines non-market-based prices as "prices of goods and of individual or collective services that are produced by nonprofit institutions and by the government that are supplied for free or at prices that are not economically significant."[2] An example of a "collective services" item is the maintenance of law and order that is provided for the benefit of the public as a whole.

As of March 2025, the market-based category accounts for approximately 86 percent of the overall basket of items used to construct headline PCE inflation, and this share has remained relatively stable over the past decade. The remaining 14 percent comprises items for the non-market-based category, of which nearly 50 percent are various forms of financial services.

Figure 1 plots the 12-month inflation rates for market-based and non-market-based PCE categories alongside aggregate inflation from January 2012 through June 2025. We select 2012 as the starting year because that is when the Federal Reserve's Federal Open Market Committee adopted an explicit inflation target of 2 percent. As the figure demonstrates, throughout most of the period shown, the inflation rate for non-market-based PCE has been notably higher than that for market-based PCE, often by more than 2 percentage points. This differential peaked at 5.4 percentage points in mid-2021, during the recent inflation surge.

Figure 1: Inflation series

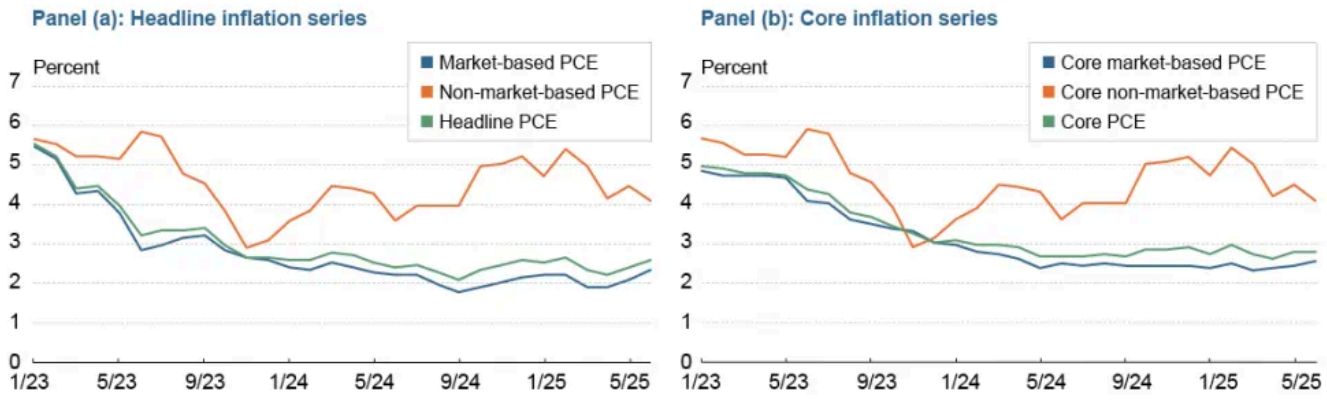
Source: Bureau of Economic Analysis

Note: The plots shown are 12-month inflation rates for the period January 2012 to June 2025.

Since the market-based PCE category constitutes the bulk of the overall PCE basket, inflation developments in this category significantly influence the contours of overall inflation; non-market-based PCE inflation then tends to lift overall PCE inflation to a greater or lesser degree. Over some periods, the two categories actually move in different directions, the past two years being a case in point.

Figure 2 plots the same inflation series, zooming in on the period from 2023 to June 2025, following the peak of post-COVID-recession inflation. Panel (a) plots the inflation measures for headline PCE inflation, and panel (b) plots core PCE, or PCE excluding food and energy. From early 2023 through early 2025, the inflation rate among the components of the market-based category has declined steadily from 5.5 percent to 1.9 percent (and from 4.8 percent to 2.3 percent in the case of market-based core PCE) on a 12-month basis. By contrast, the inflation among non-market-based categories has experienced decidedly uneven progress toward the 2 percent aggregate inflation goal. After moderating from 5.7 percent to 2.9 percent through November of 2023, it reversed course and trended higher, peaking at 5.4 percent by February 2025, a situation which has helped keep overall PCE inflation and core PCE inflation above 2 percent. Since early 2025, non-market-based PCE inflation (equivalent to non-market-based core PCE) has moderated to 4.1 percent as of June 2025, while market-based PCE inflation has inched higher to 2.3 percent and market-based core PCE inflation has increased to 2.6 percent.

Figure 2: Inflation series in focus, 2023 and onward



Source: Bureau of Economic Analysis

Notes: The plots shown are 12-month inflation rates for the period January 2023 to June 2025. Panel (a) plots data for PCE inflation and panel (b) for core PCE inflation.

To understand these inflation developments and future prospects, this Economic Commentary examines the properties of market-based and non-market-based inflation series, including their cyclical properties, historical revisions, and predictive power in explaining future PCE inflation. Our analysis reveals that the market-based (core) inflation series is sensitive to labor market conditions; in keeping with this, the gradual loosening of labor markets over the past two years has been associated with a steady decline in market-based inflation. By contrast, non-market-based inflation does not exhibit such sensitivity; however, it is instead strongly correlated with movements in the stock market. This is because some of the components of the non-market-based category, mainly imputed financial services, are strongly correlated with stock market performance. Given strong stock market performance in 2023 and 2024, it is not surprising that non-market-based inflation remained elevated. Furthermore, the non-market-based inflation category is subject to a greater degree of data revisions than the market-based category; thus, it is possible that the high readings of the past two years may be revised lower (or higher) in the future.

What is included in non-market-based PCE inflation? How important are stock market movements?

The non-market-based PCE category primarily includes prices of items characterized as services, including financial services furnished without payment, medical care and hospitalization services, social assistance services, and others. Table 1 lists the components of the non-market-based PCE basket along with their relative weights in the overall PCE basket and the non-market-based PCE basket. The three largest components by weight are final consumption expenditures of nonprofit institutions serving households (21.5 percent of the non-market-based PCE basket), financial services furnished without payment (20.8 percent), and portfolio management and investment advice services (11.4 percent). The component “financial services furnished without payment” includes items like checking account maintenance at commercial banks and other depository institutions. Several other components—“mutual fund sales charges”; “trust, fiduciary, and custody activities”; “health insurance

income loss, health insurance workers' compensation"; and "net motor vehicle and other transportation insurance"—are also imputed financial services. Indeed, approximately 50 percent of the non-market-based components by expenditure shares are financial-related services that are imputed.

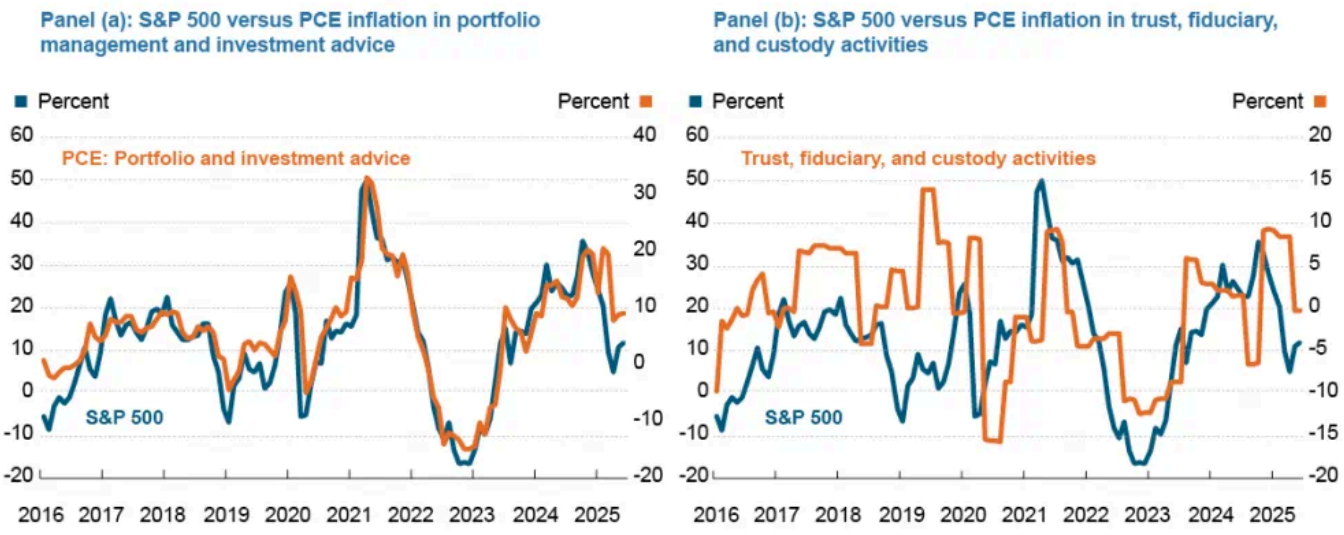
Table 1: Non-market-based PCE components, March 2025

Non-market-based PCE disaggregate component	Percent share of overall PCE basket (%)	Percent share of non-market-based PCE (%)
Used auto margin	0.17	1.2
Used truck margin	0.27	1.9
Food produced and consumed on farms	0.004	0.0
Standard clothing issued to military personnel	0.002	0.0
Rental value of farm dwellings	0.139	1.0
Gambling	1.07	7.6
Food furnished to employees (including military)	0.18	1.3
Financial services furnished without payment	2.93	**20.8**
Mutual fund sales charges	0.04	0.3
Portfolio management and investment advice services	1.61	**11.4**
Trust, fiduciary, and custody activities	0.1	0.7
Life insurance	0.63	4.5
Medical care and hospitalization	1.14	8.1
Health insurance: Income loss	0.03	0.2
Health insurance: Workers' compensation	0.172	1.2
Net motor vehicle and other transportation insurance	0.55	3.9
Labor organization dues	0.09	0.6
Social assistance	1.17	8.3
Social advocacy and civic and social organizations	0.12	0.9
Religious organizations' services to households	0.04	0.3
Foundations and grant making and giving services to households	0.05	0.4
Domestic services	0.195	1.4
Net foreign travel	0.35	2.5
Final consumption expenditures of nonprofit institutions serving households	3.03	**21.5**
	14	100

Sources: Bureau of Economic Analysis (BEA), authors' calculations based on data vintage downloaded from the BEA's website at the beginning of May 2025
Note: Percents for the three largest components by weight are in bold.

For a number of these services, stock market movements are quite influential in the imputation. Figure 3, panel (a) plots the 12-month growth rate in the S&P 500 index and the inflation rate in the portfolio management and investment advice services component, and Figure 3, panel (b) plots the inflation rate in the trust, fiduciary, and custody activities services component alongside the growth rate in the S&P 500 index. As the figure demonstrates, the positive association between the inflation rates in these components and the S&P 500 is pronounced.

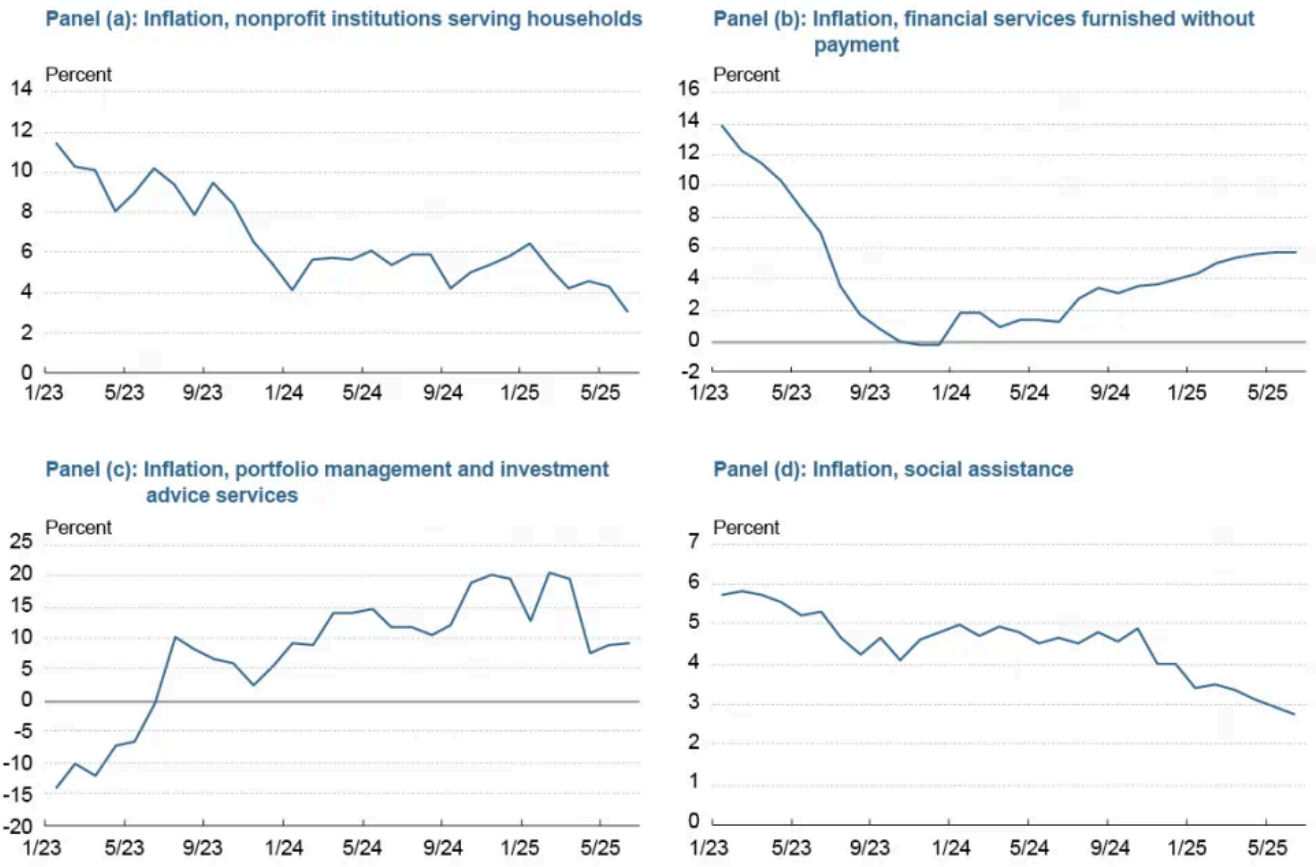
Figure 3: Correlation between S&P 500 and components of non-market-based PCE



Sources: Bureau of Economic Analysis and Haver Analytics
Note: The plots shown are 12-month growth rates in percent for the period January 2016 to June 2025.

Figure 4 plots the inflation rates in the four largest components of the non-market-based category, components which collectively account for more than 60 percent of the expenditure share of the overall non-market-based PCE. These components are the final consumption expenditures of nonprofit institutions serving households (Figure 4, panel (a)), financial services furnished without payment (Figure 4, panel (b)), portfolio management and investment advice services (Figure 4, panel (c)), and social assistance services (Figure 4, panel (d)). As can be seen in the figure, between mid-2023 through the end of 2024, the four components did not move in lockstep. While the two financial services components generally trended higher, the other two stayed stable but remained elevated over this period. As a result, non-market-based PCE inflation trended higher through much of the period shown.

Figure 4: Inflation rates in some components of non-market-based PCE



Source: Bureau of Economic Analysis

Note: The plots shown are 12-month inflation rates for the period January 2023 to June 2025.

Differential revision properties of market-based versus non-market-based PCE inflation

Like most other economic data, PCE inflation data are revised over time as more source data are released and updated. Knotek and Zaman (2017), among others, document the extent to which the most recent ("final") vintage PCE price data differ from real-time data because of regular comprehensive revisions that reflect more complete source data. Because non-market-based prices are imputed based on judgment and alternative data that may be incomplete, one would expect larger revisions to non-market-based PCE inflation data compared to market-based PCE inflation data. We indeed find that to be the case.

The revision performance of non-market-based PCE inflation cannot be directly explored, since real-time data vintages are not readily available for this measure. However real-time data vintages are available for aggregate PCE and market-based PCE inflation rates. Thus, to investigate whether revisions to the non-market-based PCE inflation measure play a larger role in driving revisions in the aggregate PCE inflation measure—while abstracting from the high volatility and revisions to food and energy components—we compare the magnitude of revisions in core PCE inflation to that of market-based core PCE inflation. If the size of revisions is greater for core PCE than market-based core PCE,

we can infer that, on average, the revisions for the non-market-based category are larger than for the market-based category.

Table 2 presents statistics on the differences between initial and final vintage data for both quarterly and monthly inflation rates. While the average revision is near zero because upward and downward revisions largely offset each other, the average absolute revision was not negligible. As Table 2 indicates, quarterly core PCE revisions were larger in absolute terms and more volatile than those in market-based core PCE, indicating that non-market-based components are subject to larger revisions on average.

Table 2: Differences between initial and "final" vintage inflation rates

	Core PCE inflation		Core market-based PCE inflation	
	Difference	Absolute difference	Difference	Absolute difference
Monthly data				
Average	-0.01	0.04	0.00	0.04
Standard deviation	0.05	0.03	0.05	0.03
Quarterly data				
Average	-0.12	0.27	0.04	0.19
Standard deviation	0.36	0.26	0.24	0.15

Sources: Bureau of Economic Analysis, authors' calculations

Notes: Monthly inflation rates are nonannualized percent changes, while quarterly inflation rates are annualized percent changes. Difference measures are initial readings less final readings. "Final" or latest vintage inflation data were downloaded on March 28, 2025. The comparisons begin in March 2013 (2013:Q2) and end in November 2024 (2024:Q3).

Differential sensitivity to economic activity (aka the Phillips curve)

Previous work (for example, Mahedy and Shapiro, 2017; Zaman, 2019; Stock and Watson, 2020) has demonstrated that some inflation categories are more sensitive to the business cycle and to economic slack than others. In this section, we examine the strength of the relationship between estimates of economic slack and a) market-based inflation, b) non-market-based inflation, and c) aggregate inflation. We define economic slack in the economy as the difference between the rate of unemployment and the natural rate of unemployment as calculated by the Congressional Budget Office. [3] We examine its relationship to 12-month changes in the market-based core PCE index, non-market-based core PCE index, and core PCE index.

To assess cyclical sensitivity, we estimate a simple Phillips curve formulation for each of our inflation measures, similar to the formulation used in Zaman (2019). [4] The specification is a linear regression of the inflation measure of interest (for example, market-based core PCE) on the economic slack measure. If the regression parameter, which determines the strength of the cyclical relationship between the inflation measure and the labor market slack, is far from zero and statistically significant, then the corresponding inflation measure is deemed cyclically "sensitive" to economic slack.

We find that core PCE inflation and market-based PCE inflation are cyclically sensitive; for both variables, the estimated parameter is -0.20 and is statistically different from zero. A negative parameter indicates an inverse relationship between movements in the unemployment rate and inflation, as suggested by economic theory. Put differently, the estimate implies that a 1 percentage point increase in the unemployment rate relative to its natural rate is associated with a reduction in inflation of 0.2 percentage points. In contrast, non-market-based inflation is not cyclically sensitive; the parameter estimate is not statistically distinguishable from zero. [5]

This empirical evidence provides us with a lens through which to view inflation developments in the past two years. Since the start of 2023, labor market conditions have gradually loosened, with the unemployment rate increasing from 3.5 percent to around 4.1 percent. Our estimates of cyclical sensitivity suggest that this weakening in conditions helped provide some downward pressure on market-based PCE inflation. Conversely, given its cyclical insensitivity, non-market-based PCE has not been pushed down by the weakening labor market. In fact, a strong stock market has pushed non-market-based PCE inflation in the other direction.

Predicting PCE inflation: Does excluding non-market-based components help?

Past research has extensively documented the usefulness of core PCE inflation when predicting future headline PCE inflation over the next few years (Carroll and Verbrugge, 2019). Reflecting that research, policymakers routinely cite developments in core PCE inflation to explain prospects for future headline PCE inflation. Similarly, recent research (Bognanni, 2020) has shown that market-based core PCE inflation has historically been a good predictor of headline inflation. Accordingly, we assess the predictive performance of various inflation measures using parsimonious in-sample predictive regressions to obtain a sense of how these measures fare in predicting future headline PCE inflation. Predictions based on in-sample regressions use the entire data sample to estimate the parameters, thereby enabling the best prediction of observations within the sample. We assess performance in predicting overall PCE inflation 12, 24, and 36 months ahead for the sample spanning January 1988 through May 2025 (denoted as “full sample”). Specifically, we regress 12-months-ahead PCE inflation on each alternative inflation measure of interest, in turn. The alternative inflation measures are PCE inflation (that is, PCE inflation’s own past), core PCE, and market-based core PCE. We re-run the regressions for 24-months-ahead and 36-months-ahead PCE inflation, respectively. For robustness purposes, we repeat the exercise for the sample that ends prior to the COVID-19 period, the sample ending in 2019 (denoted as “pre-COVID-19 sample”).

Table 3 reports the predictive accuracy metric, the root mean squared errors (RMSEs) in predicting future PCE inflation from the various regression runs. RMSE measures by how much the forecasts miss on average; therefore, lower RMSEs indicate smaller prediction errors, hence more accurate predictions. For each row, the number in bold indicates the predictor with the most accurate

prediction for PCE inflation. As can be seen, in both sample periods, core PCE inflation is the best predictor of 12-months-ahead PCE inflation, whereas market-based core PCE inflation is the best performer for 24-months-ahead and 36-months-ahead inflation. For all horizons considered, non-market-based PCE inflation is the worst predictor of future headline inflation. However, for a 36-months-ahead horizon, the gains of market-based core PCE over core PCE and non-market-based core PCE are only marginal. On balance, both core PCE and market-based core PCE perform comparably in predicting headline PCE inflation.

Table 3: In-sample predictability of PCE inflation, root mean squared errors (RMSE)

		Predictors			
Sample	Horizon	PCE inflation	Core PCE inflation	Core market-based PCE inflation	Core non-market-based PCE inflation
Full sample	12-months ahead	1.217	**1.160**	1.192	1.319
	24-months ahead	1.310	1.292	**1.285**	1.320
	36-months ahead	1.282	1.278	**1.277**	1.284
Pre-COVID-19 sample	12-months ahead	1.017	**0.916**	0.926	1.111
	24-months ahead	0.972	0.914	**0.906**	1.019
	36-months ahead	0.900	0.886	**0.885**	0.920

Sources: Bureau of Economic Analysis, authors' calculations

Notes: The table reports the root mean squared error of each predictor (PCE inflation, core PCE inflation, core market-based PCE inflation, and core non-market-based PCE inflation) in predicting future headline PCE inflation in-sample. The results are shown for two sample periods: full sample (January 1988 to May 2025) and pre-COVID-19 sample (January 1988 to December 2019). For each row, the number in bold indicates the predictor with the most accurate prediction for PCE inflation.

Conclusion

In this *Economic Commentary*, we examine the recent behavior and the longer-term properties of market-based and non-market-based PCE inflation. Market-based components account for the vast majority of the overall basket—roughly 86 percent. Disinflation in overall PCE inflation over the course of 2023 and 2024 was largely driven by disinflation in the market-based components. This progress was not unexpected, because it coincided with a gradual loosening in labor market conditions, and we have shown that there is a statistically significant association between market-based PCE inflation and estimates of labor market slack. By contrast, non-market-based components showed far less deceleration over this timeframe, which has helped to keep overall PCE inflation elevated. We find a strong positive association between movements in the stock market and in some of the financial services components of non-market-based PCE inflation. The upward trend in the stock market from mid-2023 through early 2025 helps us understand why non-market-based PCE inflation remained elevated.

References

- Ashley, Richard, and Randal Verbrugge. 2025. "The Intermittent Phillips Curve: Finding a Stable (but Persistence-Dependent) Phillips Curve Model Specification." *Economic Inquiry* 63(3): 926–944. doi.org/10.1111/ecin.13281.

- Bognanni, Mark. 2020. "A Forecasting Assessment of Market-Based PCE Inflation." *Economic Commentary*, no. 2020-01 (January). doi.org/10.26509/frbc-ec-202001.
- Carroll, Daniel, and Randal J. Verbrugge. 2019. “Behavior of a New Median PCE Measure: A Tale of Tails.” Federal Reserve Bank of Cleveland, *Economic Commentary*, no. 2019-10 (July). doi.org/10.26509/frbc-ec-201910.
- Knotek II, Edward S., and Saeed Zaman. 2017. “Nowcasting US Headline and Core Inflation.” *Journal of Money, Credit and Banking* 49(5): 931–968. doi.org/10.1111/jmcb.12401.
- Mahedy, Tim, and Adam Shapiro. 2017. “What’s Down with Inflation?” *FRBSF Economic Letter*, no. 2017-35 (November). frbsf.org/research-and-insights/publications/economic-letter/2017/11/contribution-to-low-pce-inflation-from-healthcare/.
- Stock, James H., and Mark W. Watson. 2020. “Slack and Cyclically Sensitive Inflation.” *Journal of Money, Credit and Banking* 52: 393–428. doi.org/10.1111/jmcb.12757.
- Verbrugge, Randal J., and Saeed Zaman. 2023. “The Hard Road to a Soft Landing: Evidence from a (Modestly) Nonlinear Structural Model.” *Energy Economics* 123(July): 106733. doi.org/10.1016/j.eneco.2023.106733.
- Zaman, Saeed. 2019. "Cyclical versus Acyclical Inflation: A Deeper Dive." *Economic Commentary*, no. 2019-13 (September). doi.org/10.26509/frbc-ec-201913.
- Zaman, Saeed. 2025. A Unified Framework to Estimate Macroeconomic Stars. *The Review of Economics and Statistics*. doi.org/10.1162/rest_a_01570.

Endnotes

1. As explained below, in general, if a given component has a corresponding price index constructed for use in the consumer price index or producer price index (both products of the Bureau of Labor Statistics), then that component has an observed price and is thus included in the market-based category. Return to 1
2. Bureau of Economic Analysis: Concepts and Methods of the US National Income and Product Accounts (pages 2–4, December 2024). Prices are economically significant “when they have a significant influence on the amounts the producers are willing to supply and on the amounts the purchasers are willing to buy.” Return to 2
3. Different estimates of the natural rate of unemployment exist; a recent semi-structural-model-based alternative appears in Zaman (2025). We use the CBO measure for comparability to previous work. Return to 3
4. The estimation sample spans from January 1988 to March 2025 but excludes the extreme observations from March 2020 to September 2020 (via dummy variables) that are associated with the COVID-19 pandemic. As in the case of natural rate estimates, there are different specifications for Phillips curves. A recent sophisticated alternative appears in Ashley and Verbrugge (2025); this specification has proven useful in forecasting (see Verbrugge and Zaman, 2023) and has sharp implications for monetary policy. For the present purpose, it suffices to use the simpler specification in Zaman (2019). Return to 4
5. To further investigate the weak sensitivity of non-market-based PCE inflation to economic slack, we performed supplementary analysis. This additional disaggregated analysis involved estimating a similar linear regression equation, as defined above, separately for each of the 30 subcomponents of non-market-based PCE reported in Table 1. The analysis reveals that only seven of these 30 components display statistically significant sensitivity to economic conditions. Since these components collectively comprise only a 40 percent share of non-market-based PCE, it is not surprising that overall non-market-based PCE has only weak sensitivity to economic slack. The seven components that exhibit cyclical sensitivity are gambling; social assistance; social advocacy, civic, and social organizations; religious organizations’ services to households; foundations, grant making, and giving

services to households; domestic services; and final consumption expenditures of nonprofit institutions serving households. Return to 5

Suggested Citation

Verbrugge, Randal J., and Saeed Zaman. 2025. “Understanding Inflation via Developments in Market and Nonmarket Inflation Rates.” Federal Reserve Bank of Cleveland, Economic Commentary 2025-09. https://doi.org/10.26509/frbc-ec-202509