



SIFMA Insights

Spotlight: Inflation 101

June 2021

Key Takeaways

As inflation continues to be a hot topic in markets, we thought we would take a deeper look, including:

- Terminology: Underlying (sustained) versus transitory (temporary); core inflation; base effect (impact from different reference points in comparing data points); etc.
- Measurement: Walking through index calculations; comparing CPI versus Core CPI (ex-energy and food); additional information on PCE and PPI
- Historical trends: Charts on the long view of inflation trends; a look at normal inflation over the last two decades; and the COVID impact on inflation



Spotlight: Inflation 101

Conceptually, everyone knows what inflation is: an indicator of price increases over time. In everyday life we experience inflation as we pay more for the items in our shopping cart (be it online or in person). More technically, inflation, as reflected quantitatively by an increase of an average price level of a basket of selected goods and services in an economy, is the rate of decline of purchasing power of a given currency over some period of time. In other words, as prices rise, each unit of currency can buy fewer goods and services.

Inflation is measured as the growth rate of a price index over some period of time (often expressed as a percentage), where the index measures the general price level compared to a select base year. Many economic factors – changes in energy prices, an increase in the money supply, a decline in the demand for money, demand for goods and services going up or the supply of goods going down – determine the inflation rate.

Since inflation continues to be a hot topic in markets, we thought we would take a deeper look into inflation terminology, measurement, and historical trends.

Inflation Terminology

We begin by reviewing common terminology used in conversations about inflation:

- **Underlying Inflation:** A measurement of the sustained upward movement in the overall level of prices, separate from the more aggregate measures which can reflect events that are exerting only a temporary effect on prices. For example, a hurricane destroys the Florida orange crop. While orange prices will be higher for some time, that represents only a temporary increase in the aggregate price index and therefore inflation. This noise is not expected to persist over the medium-run inflation measurement, in terms of several years. Underlying inflation refers to the inflation component that would prevail if the transitory effects, or noise, could be removed from the price data.
- **Transitory Inflation:** The Oxford Dictionary defines transitory as not permanent. Economists consider inflation to be transitory if price increases are expected to be temporary or one-off causes of inflation, not to be considered underlying or persistent components of inflation. For example, recent inflation data has been called transitory, as we transition out of last year's COVID shutdowns. Prices have risen in part as the supply side works through COVID-driven bottlenecks, or temporary restrictions in supply chains, and adapts to the reopening of the economy (ex: opening new or formerly closed restaurants). On the demand side, consumers are fueled by fiscal transfers of money (stimulus checks) ramping up demand for everything from travel to dining out. Additionally, Americans are returning to work, both the return to office for currently employed people and the rehiring of the unemployed. In general, the economy is slowly getting back to normal. As the economy recalibrates, this search for a new post-pandemic equilibrium will at least temporarily drive up prices across multiple measured segments in the inflation index.

- **Base Effect:** In general, this is the impact of choosing a different reference point when comparing two data points, or the contribution to Y/Y changes that stems from a deviation of the M/M rate of change in the base month from the usual seasonal pattern. The distortion results from abnormally high or low levels in the reference month (an outlier in trend such as a one-off spike or sudden drop in the inflation rate). For Y/Y inflation comparisons, economists analyze how much higher or lower prices are today than they were one year ago. If the reference month displayed a spike/drop, it produces the opposite effect a year later, implying inflation has slowed/increased. This can make it difficult to accurately assess inflation levels over time.

For example, around this time last year the country went into lockdown. Tens of millions of jobs were lost within a matter of weeks and consumption and production were shuttered virtually overnight, undermining market activity and price sustainability. As a result, headline costs increases fell well below 1% in April 2020, with energy costs alone down nearly 20%. As these lower lows, or lower data points, from late spring/early summer 2020 serve as the basis for comparison in this year's inflation equation, topline prices will – and are – moving higher, at least in the short term.

- **Core Inflation:** An inflation measure which excludes temporary price changes in certain goods which are known to have volatile or seasonal price fluctuations, such as food and energy prices. When temporary price shocks in these commodities are considered in the inflation equation, they may skew estimated overall inflation numbers in a way that differs from actual inflation. As such, core inflation is calculated to gauge the actual inflation apart from temporary shocks and volatility. (Core CPI equals CPI minus food and energy.)
- **Deflation:** A period where the overall price levels of goods fall for a sustained period of time. While most people's initial thought is that declining prices are good for consumers, deflation is the exact opposite. There are too many goods chasing too few dollars, which can be caused either by a leftward shift in demand (a decrease in demand because consumers are purchasing fewer products for the same price) or a rightward shift in supply (an increase in the quantity supplied at the same price due to favorable changes in non-price factors of production of the good). With deflation, people may put off spending today, assuming prices will decline further in the future. With less purchases today, businesses could be forced to lower wages or lay off employees. These actions cause a deflationary spiral. This in turn can lead to lower overall economic activity and a faster decline in prices...and we repeat the cycle.
- **Disinflation:** Disinflation differs from deflation – with disinflation price levels are still rising but at a slower pace, versus declining price levels under deflation. Disinflation is a decrease in the rate of inflation, for example from 6% to 4% (a second derivative decline), or a slowdown in the rate of increase in the price levels of goods and services over a period of time.
- **Hyperinflation:** A period where inflation is extremely high and typically accelerating, i.e. prices are rising rapidly and at an increasing pace (even doubling in just a few days), often defined as greater than 50% per month. This type of inflation is typically associated with times of social unrest in emerging markets, for example: Yugoslavia in the 1990s, Zimbabwe in the 2000s, or Venezuela starting in 2017. It has also been shown to appear around major wars, such as seen in Germany between World War I and World War II.

- **Stagflation:** A period where high inflation occurs with a weak economy, bringing about a period of slow economic growth and rising prices. While the inverse relationship between unemployment and inflation as presented by the Philips Curve¹ holds in the short run, it can (and has) fallen apart in the long run. In the early 1970s, for example, the economy was running (a little too) hot. Employment was low, and inflation was on the rise. As such, the Nixon administration altered its fiscal policy by reducing government spending in an effort to cool the economy. The idea was that inflation would go down, and unemployment, which was already low, would move back up a little bit. Naturally, the administration was shocked when unemployment rose and inflation rose (to over 5%), leading to a period of stagflation.

Measurements of Inflation

Next, we look at measurements of inflation. To measure inflation, statistical agencies collect the prices of a basket of goods and services that reflects the items consumed by households (not every item, but a solid representation). Agencies then use the basket to construct a price index by:

1. Assigning relative weights to the prices of items in the basket, driven by expenditure patterns identified in consumer and business surveys
2. Determining today's basket value by multiplying each item's quantity by its price today and summing up
3. Determining the base period basket value by multiplying each item's quantity by its base period price and summing up
4. Divide the value of the basket today by the value of the base period basket

Of note, the price index is not the measure of inflation. Rather, it is a measure of the general price level compared to a base year. Inflation is the growth rate (percentage change) of the price index over some period of time.

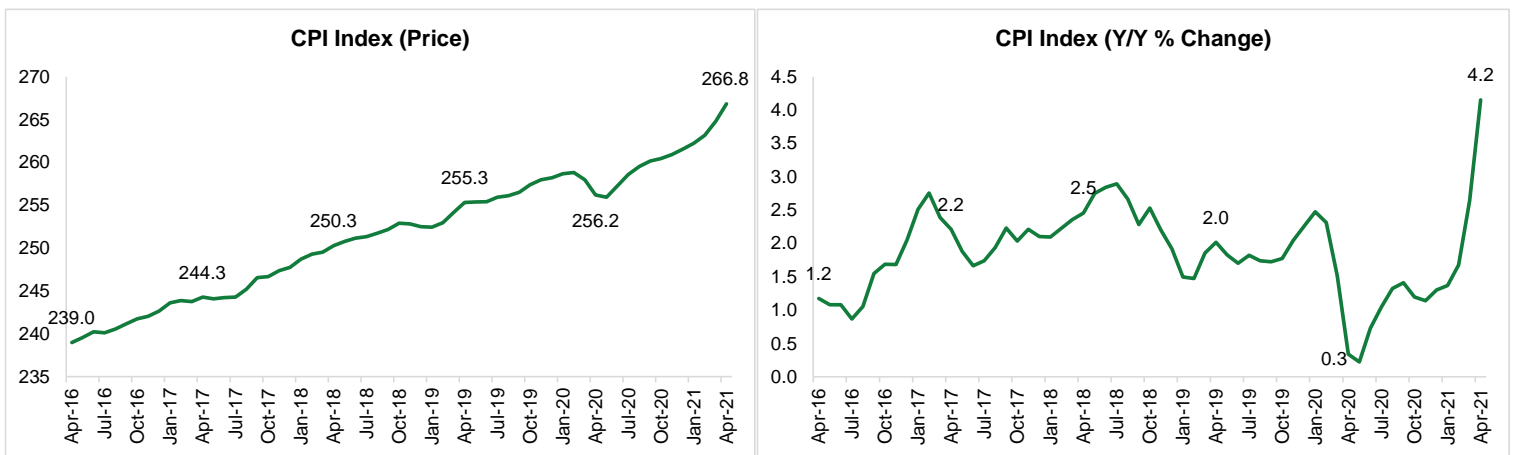
Inflation rates exhibit both temporary and persistent movements. As such economists have measures to capture overall inflation trends (headline inflation), as well as methods to identify the persistent movements in inflation, viewed as the underlying inflation trend excluding temporary factors. Different groups also focus on different types of inflation, typically in the areas that are most impactful to their specific situation. Households, for example, are most sensitive to price changes in non-discretionary goods such as food, utilities, or gasoline. Companies, on the other hand, are more concerned with input prices, including raw materials like coal and oil, intermediate products like flour and steel, and machinery. To reflect these varying areas, there are many price indexes to monitor developments in different segments of the economy. We highlight a select few below.

¹ Looking at wages in the U.K., Phillips found that in the short run, there is a tradeoff between inflation and unemployment – high unemployment/low inflation, low unemployment/inflation rose rapidly. The Phillips Curve tells us it may not be possible for an economy to achieve both goals of low inflation and low unemployment at the same time. However, this specific economic condition is only one of the factors that determine inflation, and, as such, inflation may not always be tightly connected to economic conditions and the ups/downs of the business cycle.

Consumer Price Index (CPI)

CPI measures the change in direct expenditures for all urban households for a defined basket of goods and services (one exception is that it measures rents homeowners implicitly pay instead of renting their home, not a direct payment). This can be referred to as headline inflation. All expenditure items are placed into over 200 categories, arranged into eight major groups: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services. The three largest components of the CPI are housing, transportation, and food/beverages. CPI also includes various government-charged user fees, such as water and sewerage charges, auto registration fees, and vehicle tolls, as well as taxes (sales, excise) directly associated with the prices of these specific goods and services. It excludes taxes (income, social security) not directly associated with the purchase of consumer goods and services and investment items (stocks, bonds, real estate, and life insurance).

The CPI is constructed by the Bureau of Labor Statistics (BLS) and is released around the middle of each month, with a one-month publication lag: <https://www.bls.gov/cpi/>.



Source: FRED Economic Data, SIFMA estimates

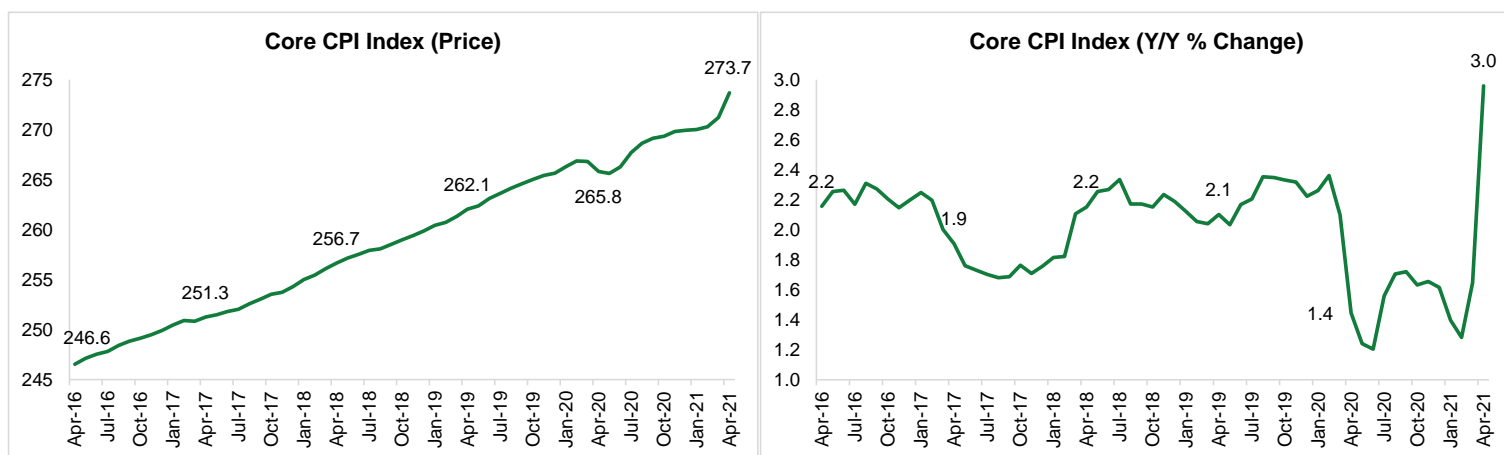
Note: All urban consumers, all items, U.S. city average, monthly, seasonally adjusted; (left) index 1982-1984=100, (right) percent change from year ago

Core CPI

There are three measures of underlying inflation: median inflation, trimmed-mean inflation, and core inflation. All start with the main CPI index, then make adjustments to remove transitory changes (noise) to get a measure of the underlying, or persistent, component of inflation. The median and trimmed mean² both attribute the noise in the price data to the lowest and highest price changes in the basket; the difference between the two is the cutoffs for the lowest and highest price changes to be excluded from the index.

The core measure, on the other hand, associates the source of the noise in the price data with particular items, i.e. food and energy. These components are removed, and the index is reweighted using a similar approach to that for the trimmed mean.

Core CPI is constructed on a monthly basis by the Bureau of Labor Statistics and is released around the middle of each month, with a one-month publication lag: <https://www.bls.gov/cpi/>.



Source: FRED Economic Data, SIFMA estimates

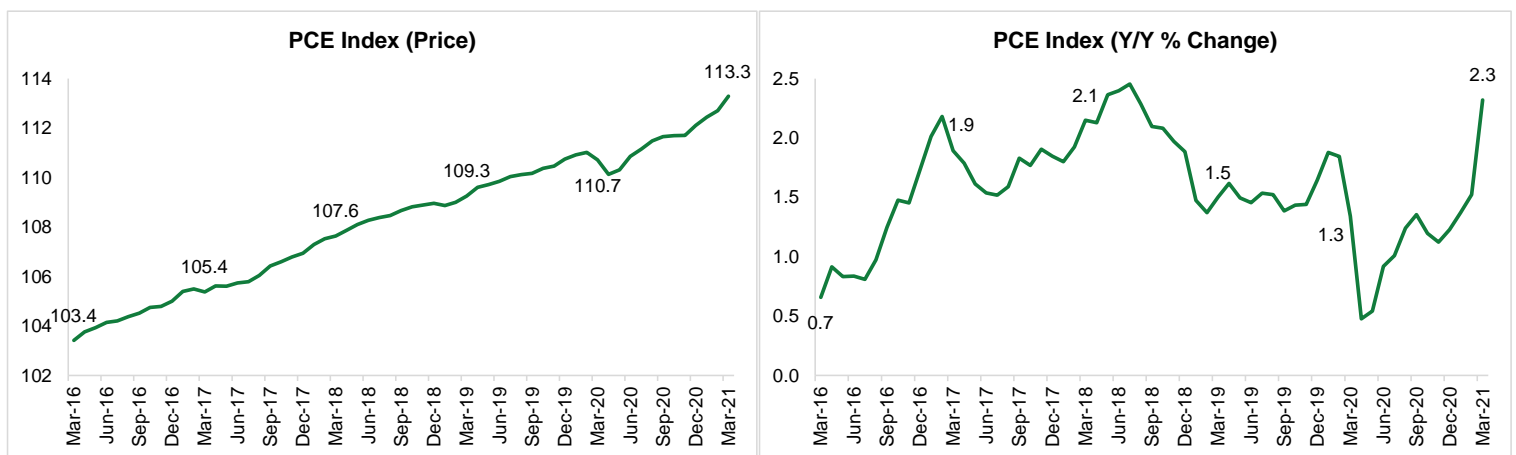
Note: All urban consumers, all items less food and energy, U.S. city average, monthly, seasonally adjusted; (left) index 1982-1984=100, (right) percent change from year ago

² Median CPI = eliminate all price changes except the one in the middle = ranks all price changes in the index from smallest to largest and then selects the price change of the item whose expenditure weight is the 50th percentile. Trimmed-Mean CPI = find the percentages that eliminate noise but retain enough of the price change data to be informative = ranks all price changes in the index from smallest to largest, but then removes price changes whose expenditure shares fall below the 8th percentile and above the 92nd percentile (the 16% trimmed-mean)

Personal Consumption Expenditures Price Index (PCE)

PCE measures the change in the prices of goods and services consumed by all households and nonprofit institutions serving households. Like CPI, it has different measurements for headline versus underlying inflation. It has a broader coverage than CPI as it includes (a) spending made directly by or on behalf of households and (b) a larger range of non-market prices for goods and services for which households receive some benefit.

The PCE is constructed by the Bureau of Economic Analysis (BEA) and is released toward the end of each month, with a one-month publication lag: <https://www.bea.gov/data/personal-consumption-expenditures-price-index>.



Source: FRED Economic Data, SIFMA estimates

Note: Chain-type price index, monthly, seasonally adjusted; (left) index 2012=100, (right) percent change from year ago

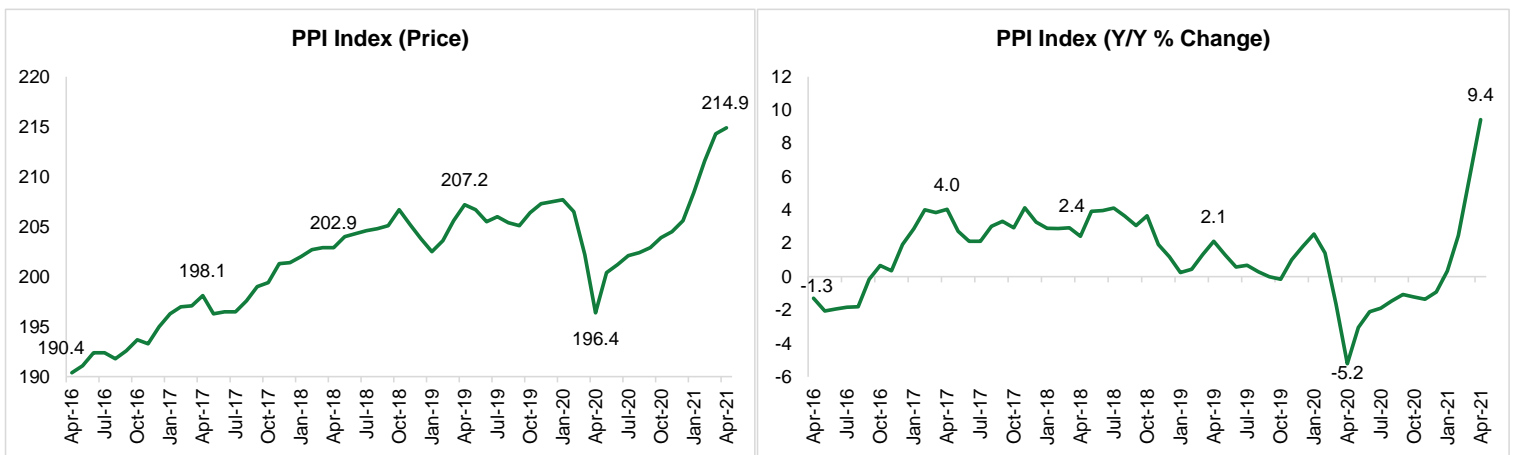
Differences between CPI and PCE

- The indices have different methods for estimating the composition of the baskets. The CPI is based on a survey of what households are buying, which would include foreign-made goods (imports). The PCE is based on surveys of what businesses are selling, which would include capital goods (goods used in producing other goods rather than being bought directly by consumers):
 - Capital goods – included in the PCE calculation, excluded from the CPI
 - Imports – included in the CPI, excluded from the PCE
- The indices have difference in calculation methodologies:
 - Weight effect – In calculating an index number, which is a sort of average, some prices are weighted more heavily than others. Expenditure weights assigned to the categories of basket items differ in the CPI and PCE, and one of the biggest weighting differences is housing.
 - Formula effect – Differences in how indexes account for changes in the basket. The PCE tries to account for substitution between goods when one good gets more expensive or falls out of favor. The CPI uses the same basket regardless of the increase in the price.
 - Other general calculation differences
- The CPI only covers out-of-pocket expenditures on goods and services purchased. The PCE on the other hand, includes expenses paid by employers and other federal programs. For example, CPI excludes medical care paid for by employer-provided insurance, Medicare, and Medicaid. These are, however, included in the PCE. As such, the number of basket items differs.
- Other, mostly minor differences include: how seasonal adjustments are handled; the PCE includes expenditures by both rural and urban consumers, the CPI includes only urban households; the PCE includes expenditures from non-profit institutions that serve households, the CPI is households only; etc.

Producer Price Index (PPI)

While CPI (and PCE) measure inflationary pricing from the consumer standpoint, there is another inflationary measure, the PPI. CPI measures the total value of goods and services consumers have bought over a specified period, versus PPI's measurement of inflation from the perspective of producers. PPI measures the average change over time in the selling prices received by domestic producers for their output, constructed from commodity-based producer output price indexes. The final demand portion of PPI measures price change for commodities sold for personal consumption, capital investment, government, and export. The system is composed of six main price indexes: final demand goods; final demand trade services; final demand transportation and warehousing services; final demand services less trade, transportation, and warehousing; final demand construction; and overall final demand. As PPI measures the costs of producing consumer goods, and commodity and food prices directly affect retail pricing, PPI is seen as a good pre-indicator of inflationary pressures.

The PPI is constructed by the Bureau of Labor Statistics (BLS) and is released around the middle of each month, with a one-month publication lag: <https://www.bls.gov/ppi/>.



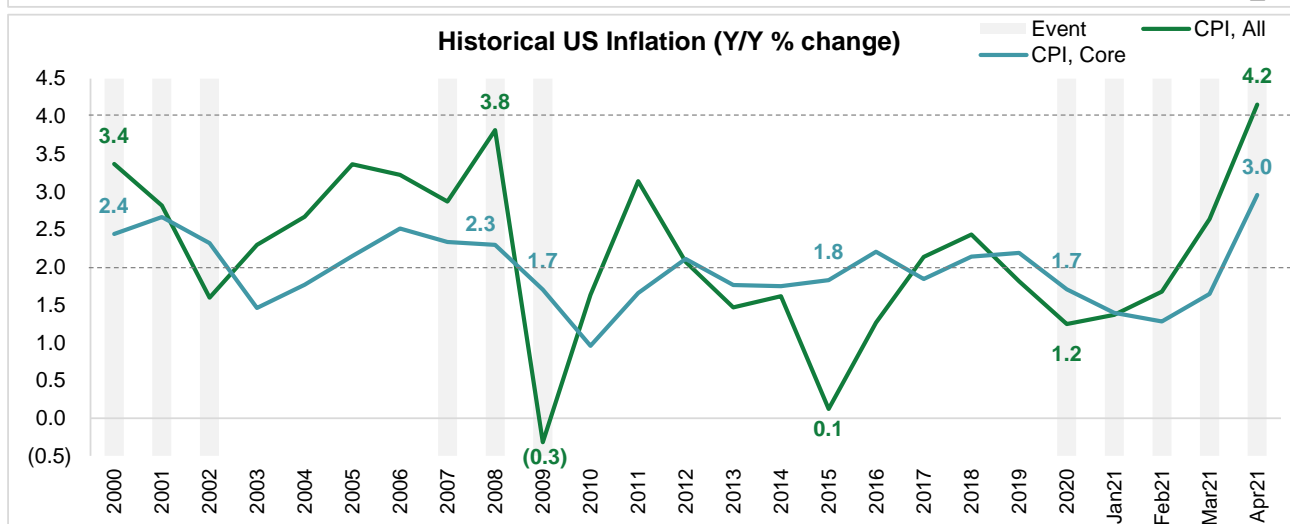
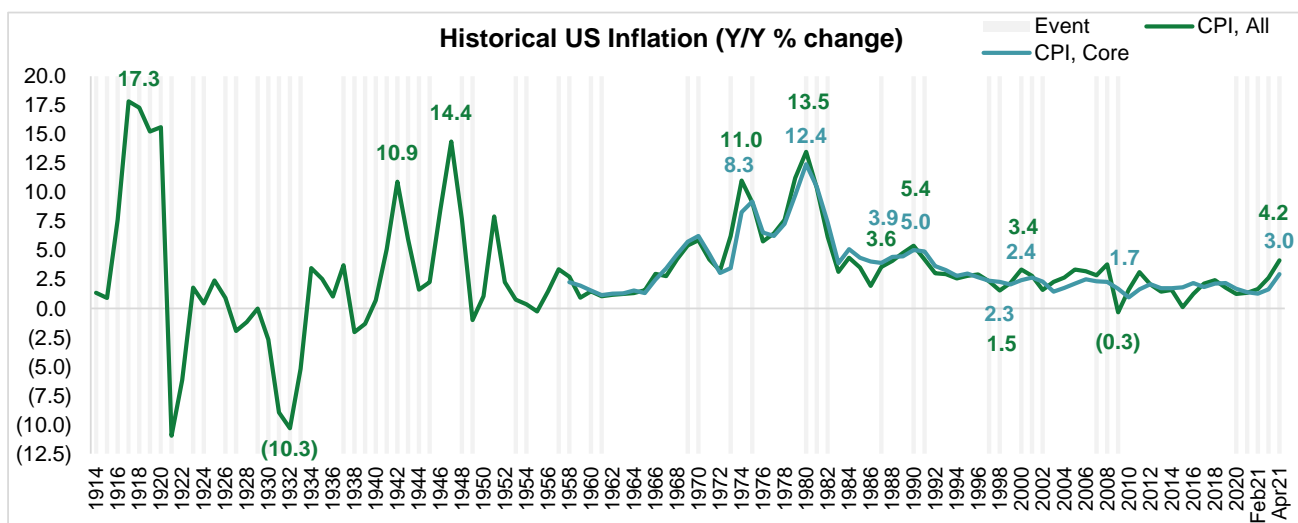
Source: FRED Economic Data, SIFMA estimates

Note: By commodity, final demand, finished goods, monthly, seasonally adjusted; (left) index 1982=100, (right) percent change from year ago

US Inflation History

In the charts below, we look at historical periods of U.S. inflation, highlighting key economic events. The highest periods of inflation occurred after World Wars I and II and in the 1970s (driven by monetary policy to finance large budget deficits, or Keynesian economic policies, the end of the Bretton Woods system/link to gold, etc.). The period of lowest inflation, technically deflation, was the Great Depression in the 1930s. The U.S. also dipped slightly and briefly into deflation during the Global Financial Crisis (GFC).

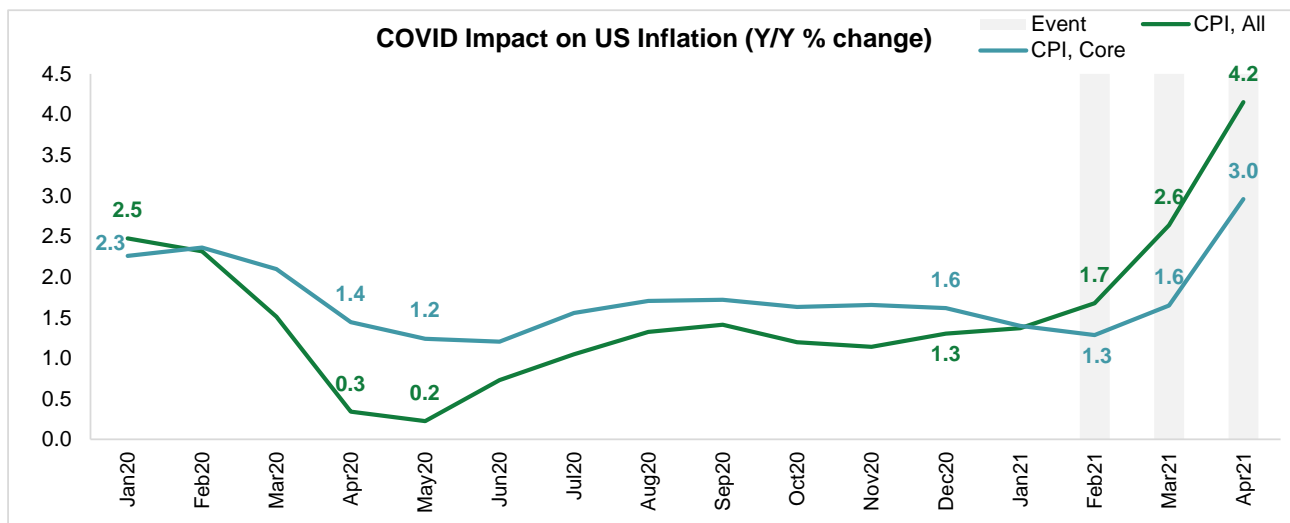
The annual inflation rate for the last two decades has ranged around 2% to 4%. Headline inflation also dipped in 2015 driven by weakness in oil prices.



Source: FRED Economic Data, SIFMA estimates

Note: CPI, All = all urban consumers, all items, U.S. city average, percent change from year ago, annual/monthly for 2021; seasonally adjusted from 1948+, not seasonally adjusted from 1914-1947. Core CPI = all urban consumers, all items less food and energy, U.S. city average, percent change from year ago, seasonally adjusted. Event descriptions in the Appendix

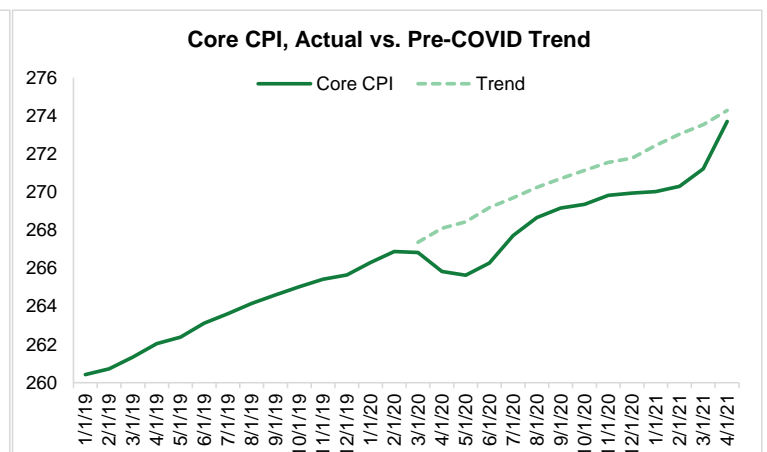
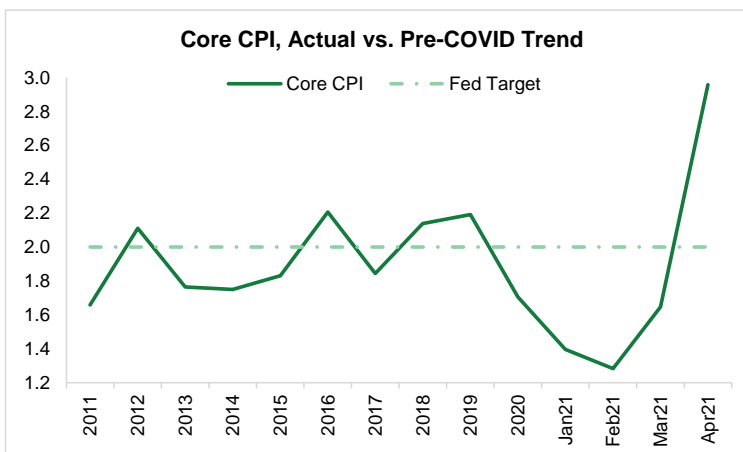
Looking more closely at the COVID impact on U.S. inflation, we map out monthly Y/Y changes from 2020 to present. We saw rates reach their lows (and almost dip into deflationary territory) in April/May 2020. The current uptrend is clear starting from February 2021, as the economy began preparing for a major reopening as vaccines were rolled out. In April, the inflation rate ticked even higher, on both the headline and core measures (+4.2% and +3.0%).



Source: FRED Economic Data, SIFMA estimates

Note: CPI, All = all urban consumers, all items, U.S. city average, percent change from year ago, monthly; seasonally adjusted. Core CPI = all urban consumers, all items less food and energy, U.S. city average, percent change from year ago, seasonally adjusted

This leaves markets wondering if the increase in inflation will be transitory, driven by COVID-related supply chain issues and a reopening-related increase in demand. The April spike in CPI drove both headline and core inflation well above the Fed's 2% target. However, Fed Chairman Powell has called this move transitory, caused by the economy's reopening and the Y/Y comparisons to last year's significant drops in prices seen at the height of the pandemic. And extrapolating the pre-COVID trend, core CPI has actually been below this trendline. With the data leading to more questions and the Fed currently in the transitory camp, markets will remain focused on inflation as they search for the answer – transitory or underlying?



Source: FRED Economic Data, SIFMA estimates

Note: All urban consumers, all items less food & energy, U.S. city average, % change from year ago, seasonally adjusted. 2.31% trend for 6 months pre COVID

Appendix: Event List

Major Events

- World War I: July 2014 – November 2018
- World War II: September 1939 – September 1945
- Great Depression: August 1929 – March 1933
 - Black Tuesday: October 29, 1929
- Black Monday: October 19, 1987
- Asian Financial Crisis, Russian Ruble Crisis & failure of Long-Term Capital Management: 1997 – 1998
- Dot-Com Bubble burst, Enron and WorldCom scandals: 2000 – 2002
- Global Financial Crisis/Recession: December 2007 – June 2009
- CVOID-19: February 2020 – Ongoing (first documented case emerged in Wuhan, China in November 2019; U.S. recession listed as starting in February 2020)

Other U.S. Recessions

- January 1913 – December 1914
- August 1918 – March 1919
- January 1920 – July 1921
- May 1923 – June 1924
- October 1926 – November 1927
- May 1937 – June 1938
- February 1945 – October 1945
- November 1948 – October 1949
- July 1953 – May 1954
- August 1957 – April 1958
- April 1960 – February 1961
- December 1969 – November 1970
- November 1973 – March 1975
- January 1980 – July 1980
- July 1981 – November 1982
- July 1990 – March 1991
- March 2001 – November 2001

Author

SIFMA Insights

Katie Kolchin, CFA
Director of Research
kkolchin@sifma.org

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