July 10, 2019

Quantitative Investment Decisions

The Safety Net For Your Portfolio

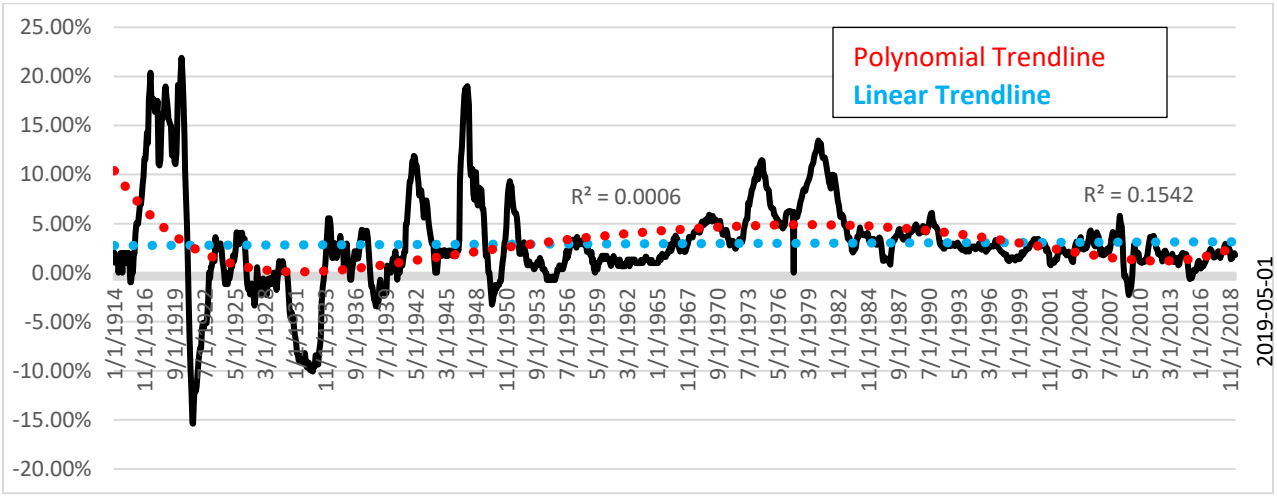
Inflation: Up, Up, And Away

Executive Summary:

- **Inflation tends to have long term cycles, 30-40 years in duration.**
- **Early signals indicate that Inflation has switched to a long-term upward trend.**
- **This would be the first change in the long-term inflation trend since the early 1980's.**
- **The switch to an upward trend in inflation may preclude the Fed from cutting rates too aggressively near-term.**
- **In addition, it appears that the Fed's reluctance to reduce rates may be an attempt to keep real wage growth above trend.**
- **The impact of rising inflation will be felt by creditors vs savers as well as raw material producers versus users over the next 30-40 years to name a few.**

Inflation tends to have long term cycles, 30-40 years in duration. The inflationary linear trend line from 1914 to May 2019 appears to be flat, see blue dotted line in exhibit 1 below. However, if we add a polynomial trend line, red dashed, the story appears much different and indicates at least 2 changes in the long-term inflation trend overtime. A polynomial trend line is a curved line used in graphs to model nonlinear data points. A polynomial trend line will have a different number of peaks and valleys depending on its order. A second-order polynomial has a parabolic shape with one main curved change of direction, while a third-order polynomial has two curves, etc. The polynomial trendline with the highest r-squared for period 1914 to 2019 was 0.1542. The low r-square may cause one to question the relevancy of the curve data but if we break down the trendlines into three different periods noted in exhibit 1 the message is different.

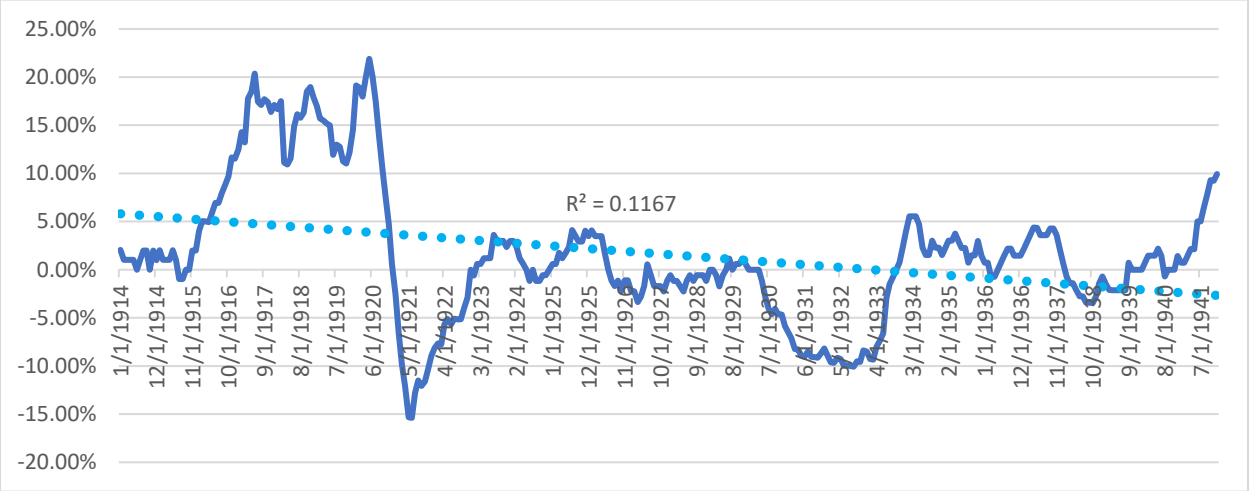
Exhibit 1. Annualized Inflation 1914-2019



Source: BLS.gov

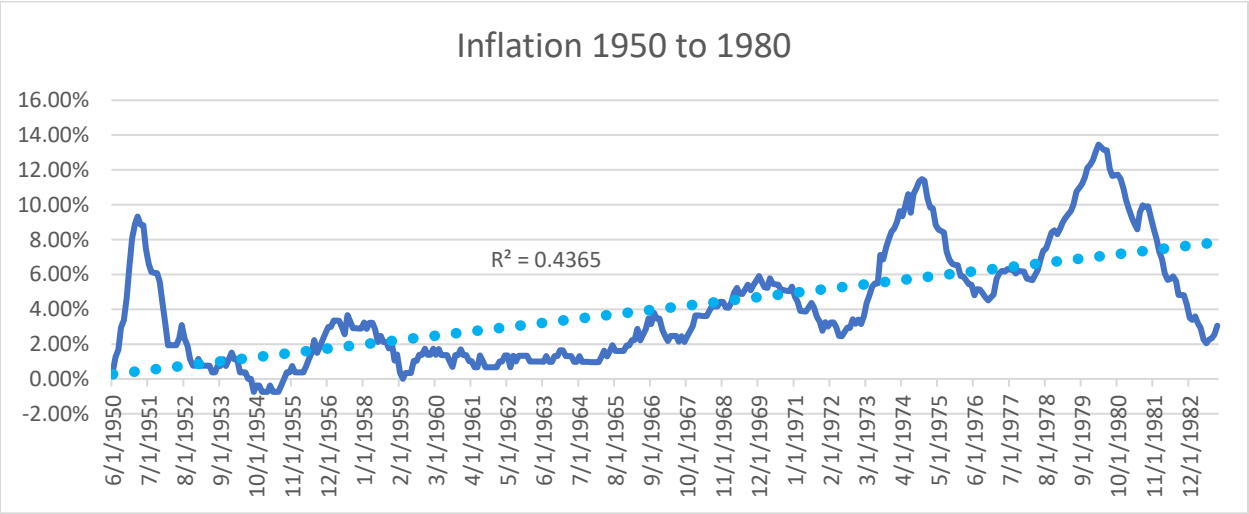
The period prior to 1950, exhibit 2, appears to have a downward trending inflation rate with a slight improvement in the linear trendline r-squared from 0.0006 to 0.1167. Inflation from 1950 to 1980, exhibit 3, indicates an upward trend in inflation. The r-square increases dramatically from 0.0006 to 0.4365. From 1981 to 2019 the inflationary trend shifts to decreasing trend, exhibit 3, with an increase in the r-square from 0.0006 to 0.3457.

Exhibit 2 1914 to 1940 Downtrend



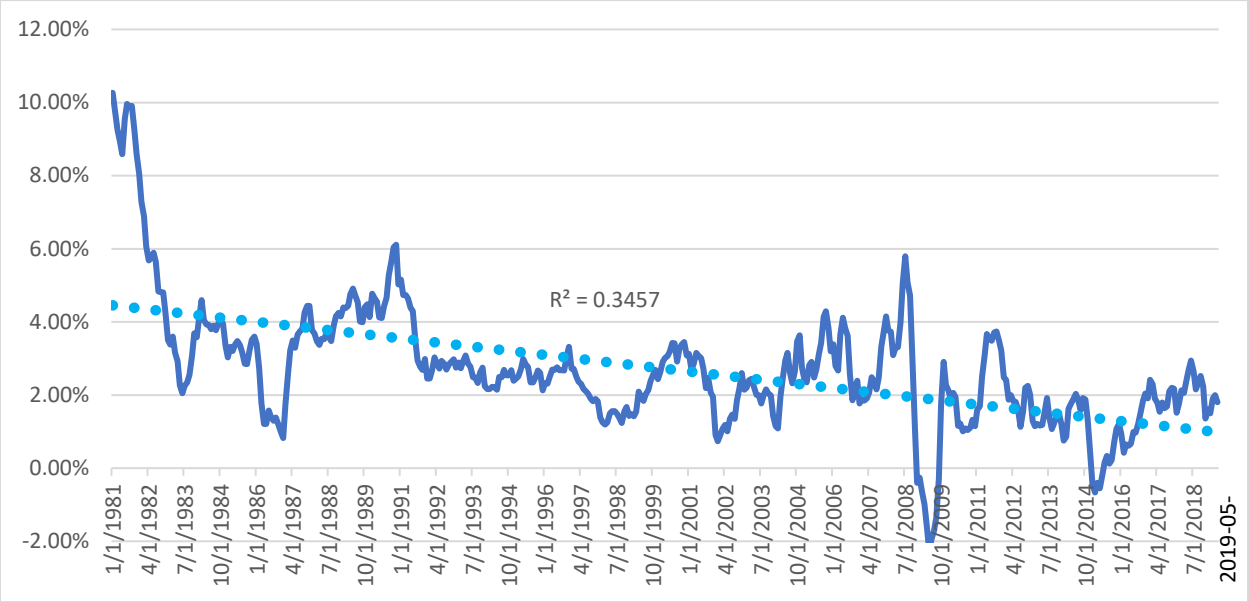
Source: Source: BLS.gov

Exhibit 3 Inflation 1950-1980 Uptrend



Source: Source: BLS.gov

Exhibit 4. Inflation 1981 to 2019 Downtrend

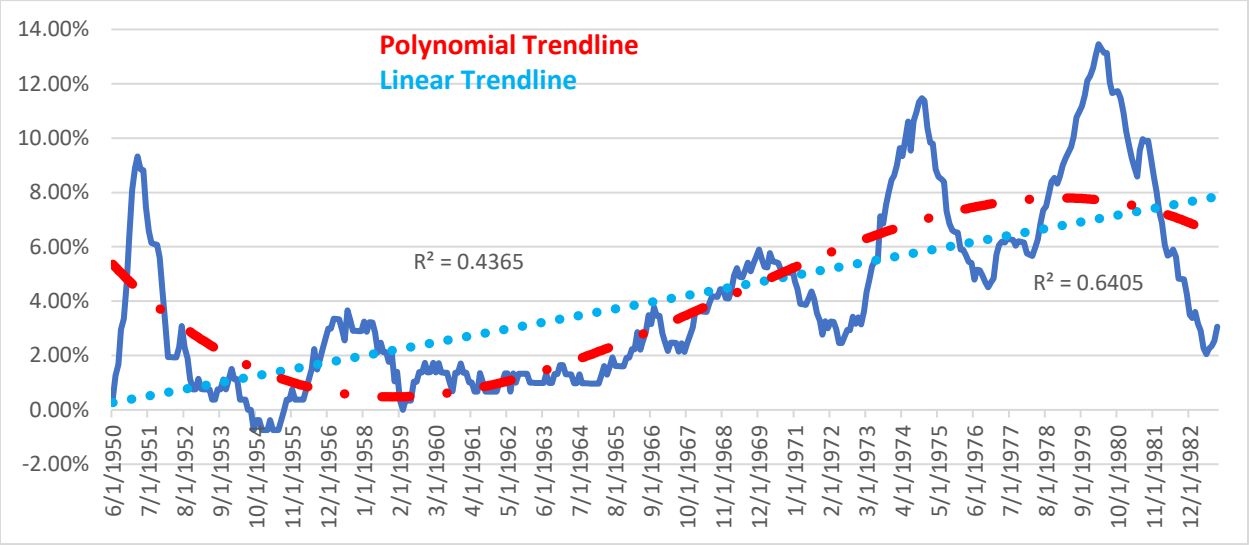


Source: Source: BLS.gov

Inflation appears to have switched to an upward Trend. The question becomes how to identify when the inflation trend changes. As mentioned above polynomial trend lines appear to be a much better measure of non-linear data considering multiple cycles within each major change in direction. The polynomial trendline from 1914 to 2019 did not have a very high r-square at 0.1542. What if we used the polynomial trendlines on two of the shorter periods 1950-1981 and 1981 to 2019 to try and improve the r-squared and determine whether it can signal changes in long-term trends.

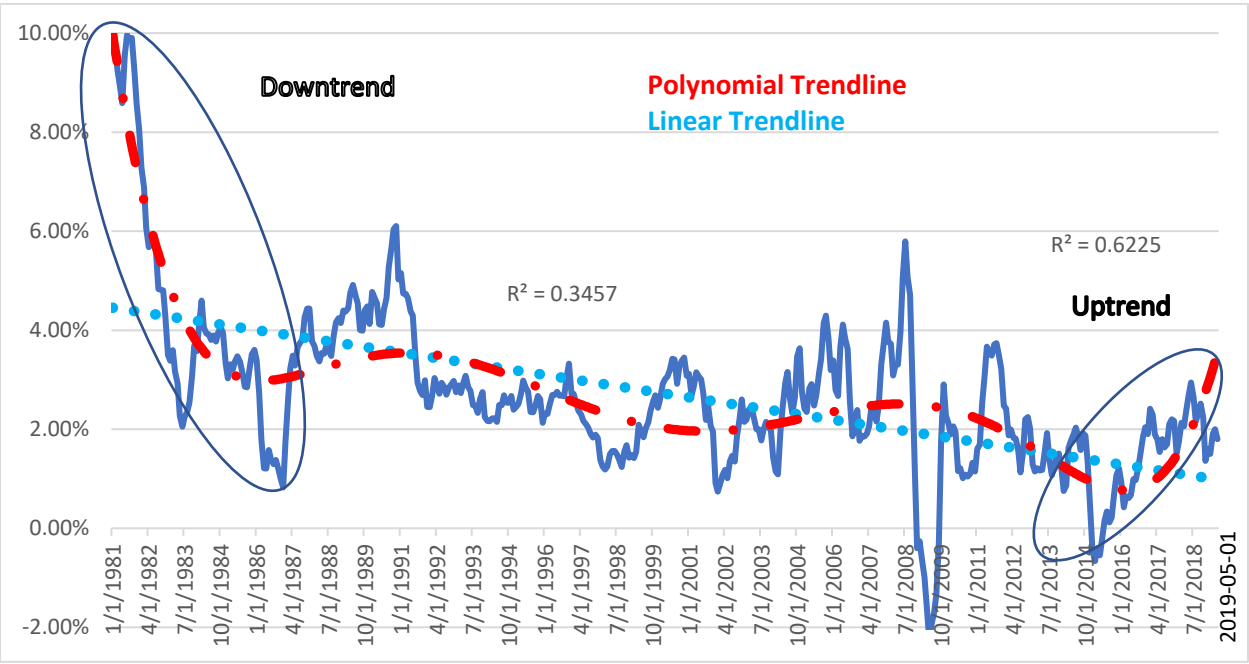
Based on exhibit 5 below, the linear trendline indicates that inflationary levels increased from 1950 to 1980. The r-squared of the linear trendline improved from 0.0006 to 0.4365. By adding a polynomial trendline we see a clear transition to rising inflationary period starting in early 1950's. The r-squared of the polynomial trendline improved from 0.1542 to 0.6405. Interestingly at the beginning of the 1980's the trend appears to rollover. Looking at the period 1981 to 2019 in exhibit 6 the roll-over came to fruition as inflationary trend decreases over the ensuing 35 years. The r-square for this polynomial trendline increased dramatically from the linear trendline 0.3457 to 0.6225. The trend does appear to roll-up in the 2007 period, it was short lived as we entered a difficult economic period of slow growth over the last 10 years. In late 2016 and early 2017 inflation seems to be accelerating again. Is this a breakout to upside that the Fed seems to have on its radar, transitory period, or will inflation roll back down as the economy stalls from trade tariffs?

Exhibit 5. Inflation 1950-1980 with Polynomial Trendline



Source: Source: BLS.gov

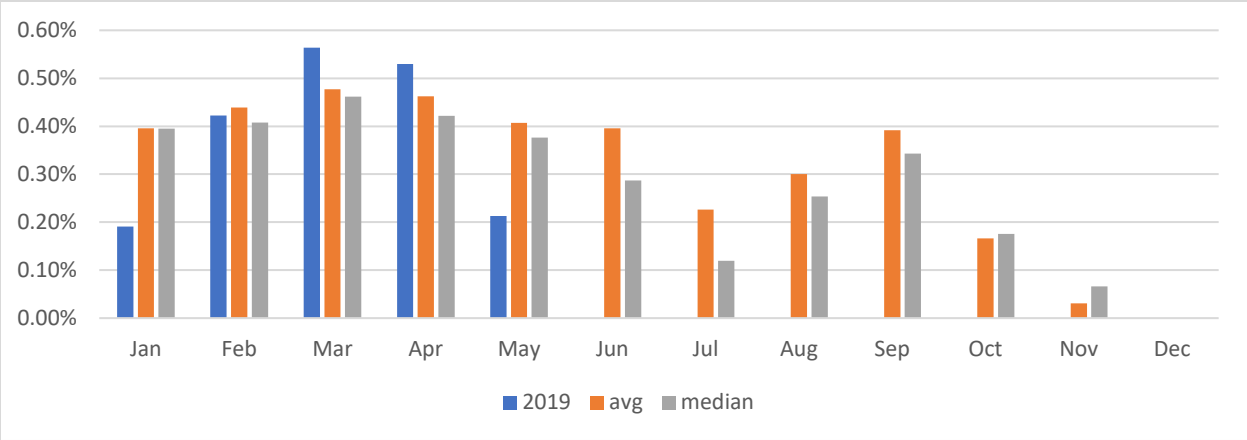
Exhibit 6. Inflation 1981-2019 with Polynomial Trendline with Order of 6



Source: Source: BLS.gov

Monthly inflation versus historical average and median levels seems to be increasing. In the month of May inflation was affected by plummeting energy prices due to higher levels of inventory as U.S. fracking wells continued to pump at high levels. Excluding energy, inflation would have been above average.

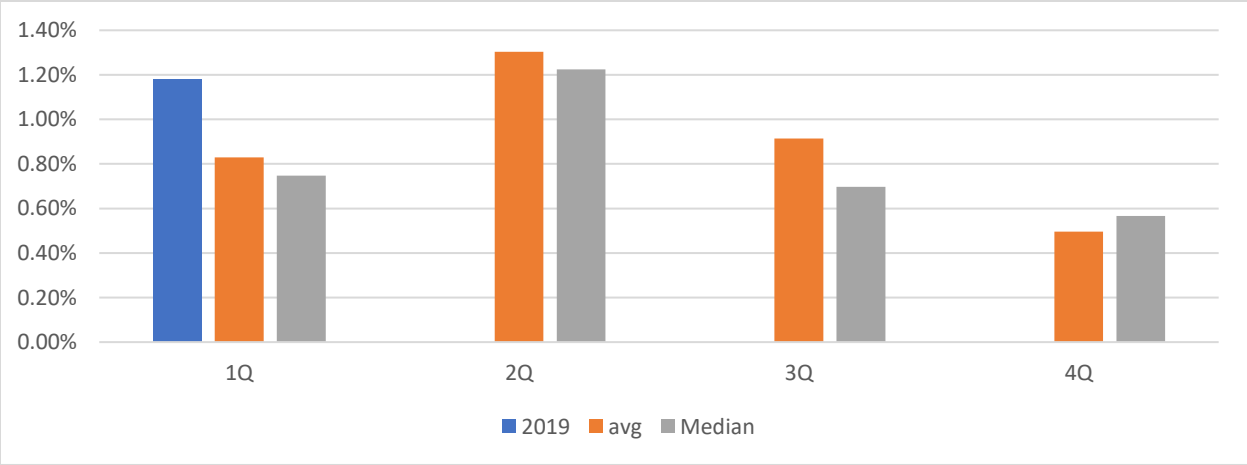
Exhibit 8 Monthly Average Inflation 1974-2019



Source: BLS.gov

Quarterly inflation was also high for Q1 versus historical levels. It will be interesting to see the impact to quarterly inflation in q2 as oil prices rebounded as political concerns with Iran after a tanker exploded in the Strait of Hormuz and a U.S. drone was attacked in the same area.

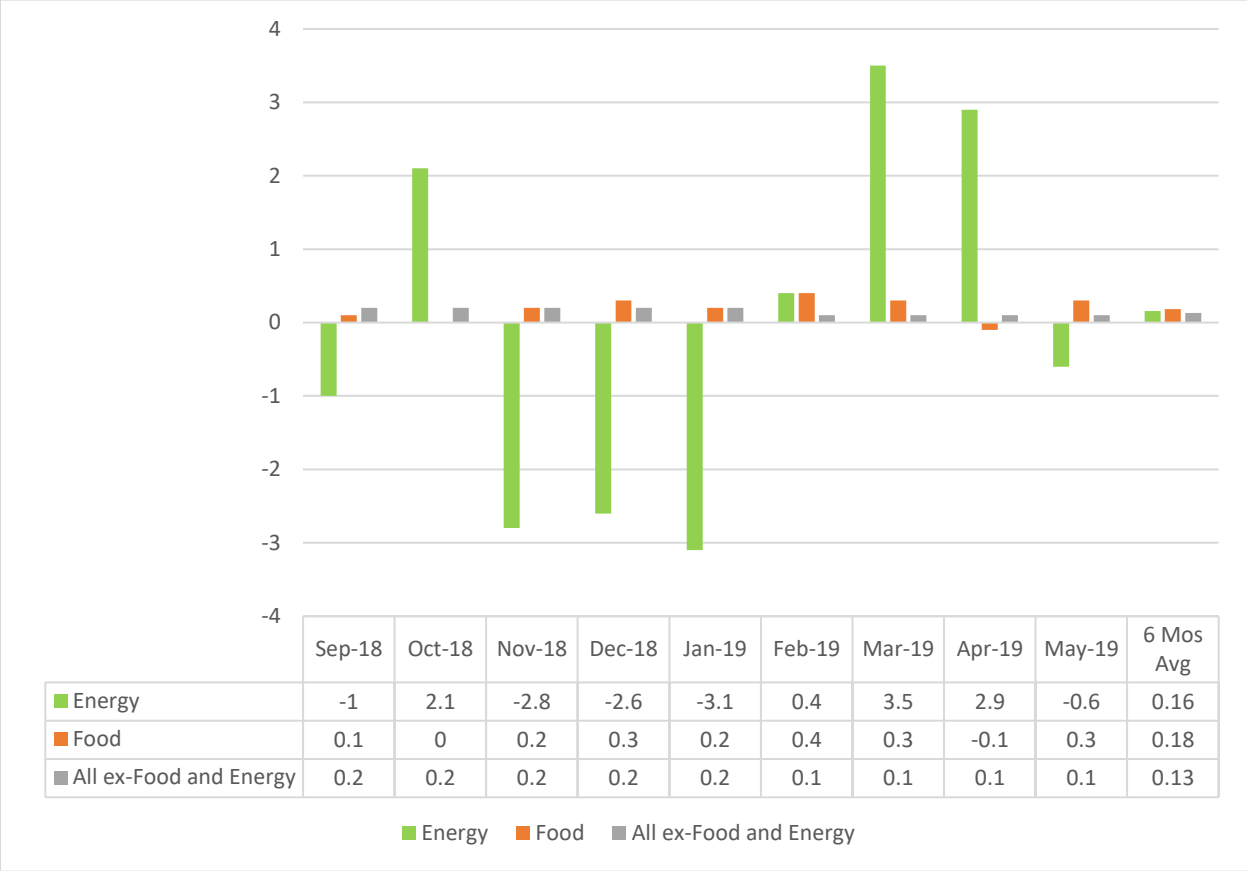
Exhibit 9. Quarterly Inflation history 1974-2019



Source: BLS.gov

The Personal Consumer Expenditure Index is showing the same trends as CPI. This economic index is used to quantify the changes in the prices of consumer services and goods. The Fed tends to focus on this factor as its inflation indicator. Below are the key factors effecting the PCE level. Inflation levels ex-Food and Energy appear to remain subdued. The Fed may be watching the July numbers closely to determine if they substantiate the fact that inflation is in a transition to an upward trend or just another slight roll up in a continued downward trend.

Exhibit 10 Personal Consumption Expenditure Index Inflation Ex- Food and Energy, Food and Energy

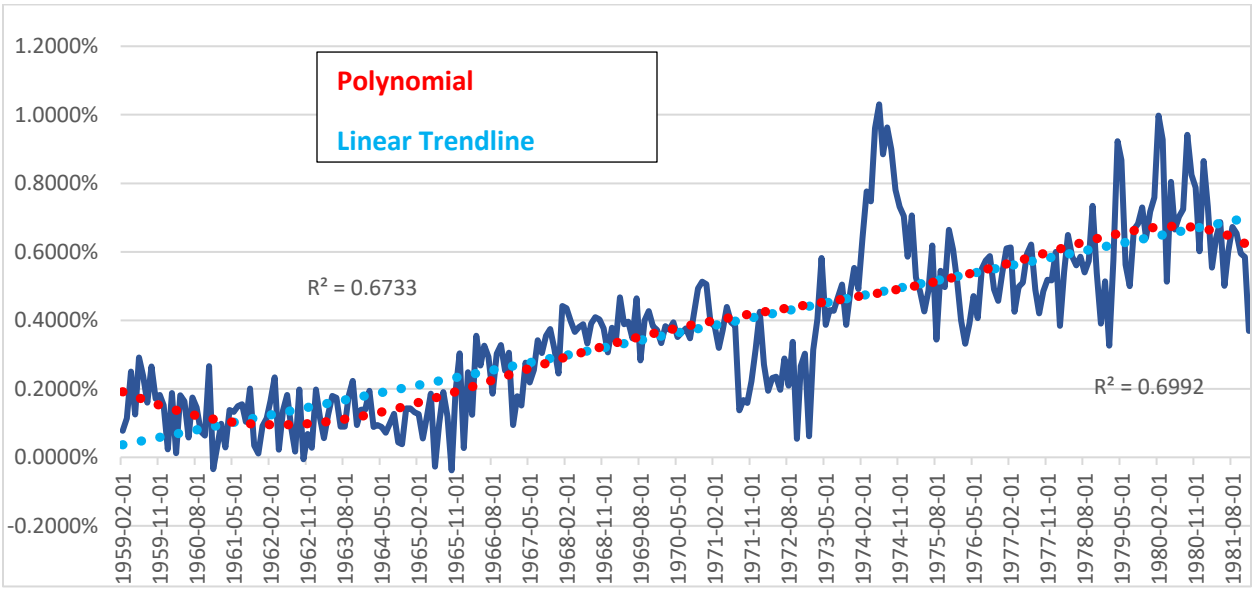


	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	6 Mos Avg
Energy	-1	2.1	-2.8	-2.6	-3.1	0.4	3.5	2.9	-0.6	0.16
Food	0.1	0	0.2	0.3	0.2	0.4	0.3	-0.1	0.3	0.18
All ex-Food and Energy	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.13

Source: BLS.gov

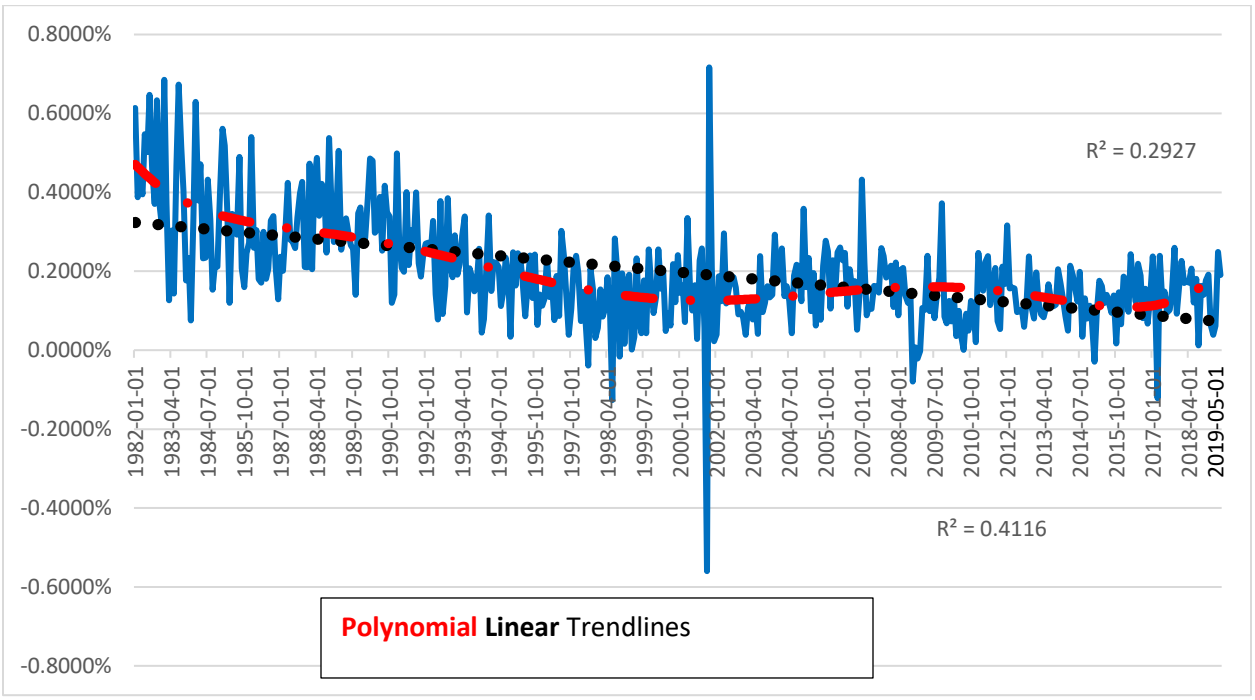
The PCE Index appears to mimic the CPI trend. From 1959-1981 the PCE was in an uptrend with an r-square of high 60's, see exhibit 10 below. The r-square for the data 1982 to 2019, exhibit 11, were similar to CPI. Both CPE and CPI indicate a potential change in inflationary trend to up.

Exhibit 10 PCE Index 1959-1981



Source:BLS.gov

Exhibit 11 PCFE Index 1982 to 2019

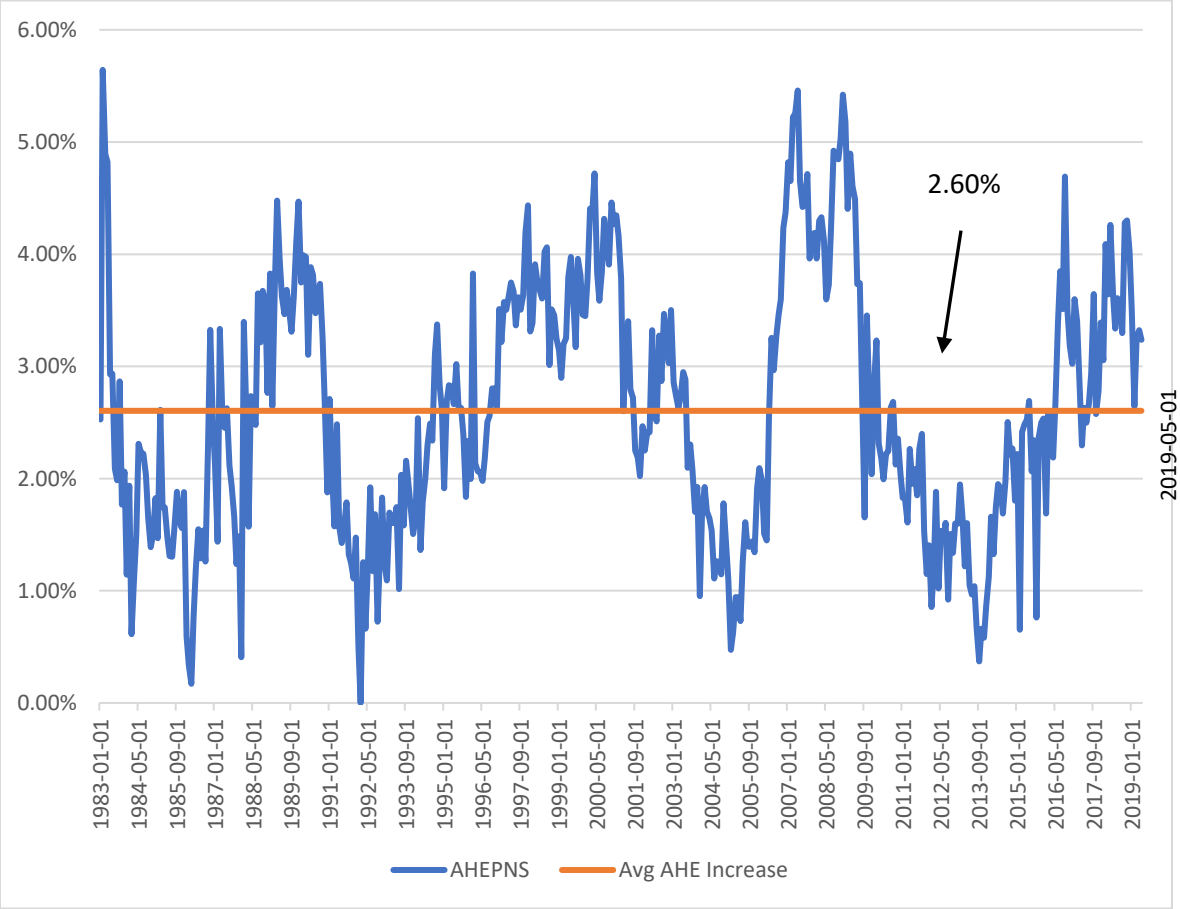


Source:BLS.gov

An alternative explanation as why the Fed may delay a rate change may be its attempt to help real wage growth for production and non-supervisory employees. These employees are typically at the lower end of the wage scales. As noted in exhibit 13 below the average wage increase from 1983 to 2019 averaged 2.6%. In May the average hourly wage increase for production and non-supervisory personnel was 3.24%, well above the average.

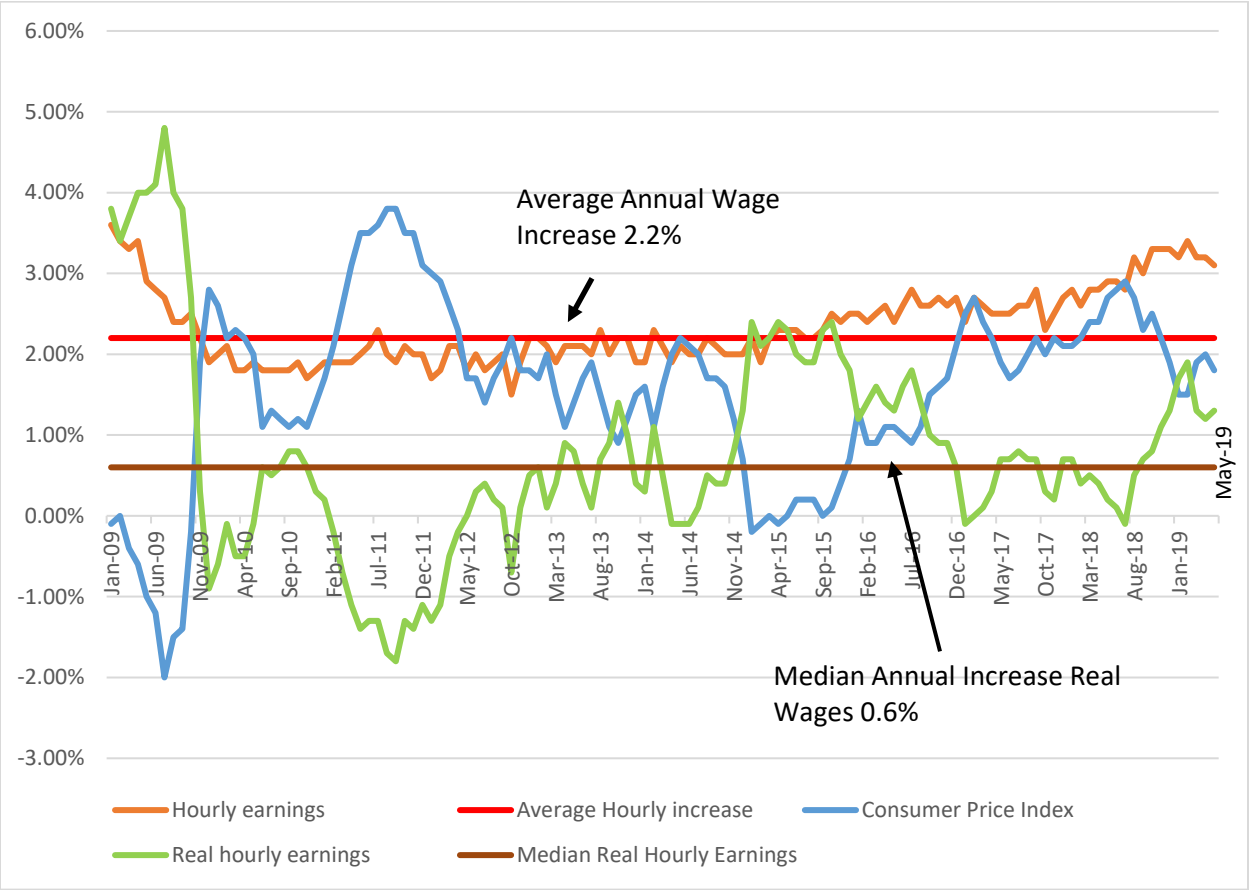
However, real wage increases for the last 10 years, exhibit 14, has been at 0.6% on average. May's reported number was 1.3%, well above the average but driven by lower inflation. By keeping inflation much lower than the 2% mandate could this be the Fed's attempt to help workers real wage growth?

Exhibit 13. Twelve Month Hourly Wage Increase for Production and Non-Supervisory Personnel 1983-2019



Source: BLS.gov

Exhibit 14. Hourly Earnings: Gross/Real 2009-2019



Source: BLS.gov

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Obtaining a Compliant Presentation and the Firm's List of Composite Descriptions

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