



GOVERNOR GREG GIANFORTE
DIRECTOR BRENDAN BEATTY

TO: Revenue Interim Committee

FROM: Dylan Cole, Tax Policy and Research

DATE: March 21, 2024

RE: Inflation Factor for Mill Levy Calculation in 15-10-420, MCA

This memo explains Department of Revenue (DOR) procedure for calculating the inflation factor referenced in 15-10-420, MCA and explores differences in outcomes for the inflation factor based on the mathematical application of the statute.

What is Inflation?

The U.S. Department of Labor defines inflation as “the overall general upward price movement of goods and services in an economy”. This is usually discussed as comparing the price of something today to the price of that same thing in a prior reference period. The most common index for measuring this change is the Consumer Price Index (CPI) produced by the Bureau of Labor Statistics (BLS). This index compares the cost of a combination of goods referred to as a “basket” with the price of the basket in a default period, which is currently a 1982-1984 baseline of 100. Any index value over 100 represents a higher price (inflation) for the basket than it cost in the base period, while a value less than 100 represents lower prices (deflation). The most common CPI index is the CPI-U, which stands for the consumer price index, U.S. city average, all urban consumers. In December of 2023, the CPI-U had a value of 306.746 which implies that prices are, on average, a little over 3 times as expensive now as they were in the 1982-84 base period ($306.746 / 100 = 3.067$).

What is DOR’s Role in Calculating the Inflation Factor in 15-10-420?

15-10-420(1)(c), MCA states “the department shall calculate one-half of the average rate of inflation for the prior 3 years by using the consumer price index, U.S. city average, all urban consumers, using the 1982-1984 base of 100, as published by the bureau of labor statistics of the United States department of labor.” The resulting calculation is something the BLS refers to as an **escalation agreement**. See the attached memorandum at the end of this document to Danielle Vincent, Department of Administration for details of how DOR performed this calculation for fiscal year 2024.

How Does DOR Perform the Inflation Calculation?

The DOR must determine a couple parameters for performing this calculation, namely:

- Which month(s) should the calculation compare to?
- What is meant by “average rate of inflation for the prior 3 years”?

The DOR has historically considered December to be the reference month, and the average rate of inflation to mean the compounding rate of inflation. This memorandum will look at alternatives to these choices and compare outcomes.

Month of Comparison

There are a handful of options that could have reasonably been selected. January or December are logical comparisons as the first and last months of the year. Comparing CPI values in these months shows change over a year at the open or close of a year. Since governments budget from July to June for their fiscal year, an argument could be made for one of those two months. A fifth option is an annual average of inflation. The benefit of using the annual average is that monthly anomalies are smoothed over. The benefit of choosing a specific month is that the calculation represents a specific point in time, in our case the inflation level at the end of the calendar year. Comparing the December value to the annual average, the December value is almost always higher than the average, because inflation tends to rise over the year, although it does tend to decrease in the fall months. The table below compares the difference in 15-10-420 cumulative half rate of inflation factor using the current method versus an annual average since the calculation's beginning.

| Tax Year | DEC Method | Annual Method | Difference |
|----------|------------|---------------|------------|
| 2001 | 100 | 100 | 0 |
| 2002 | 101.27 | 101.40 | -0.13 |
| 2003 | 102.50 | 102.72 | -0.21 |
| 2004 | 103.49 | 103.86 | -0.37 |
| 2005 | 104.79 | 104.99 | -0.20 |
| 2006 | 106.28 | 106.45 | -0.17 |
| 2007 | 107.91 | 108.10 | -0.18 |
| 2008 | 109.72 | 109.80 | -0.08 |
| 2009 | 110.94 | 111.61 | -0.68 |
| 2010 | 112.20 | 112.78 | -0.58 |
| 2011 | 113.01 | 113.74 | -0.73 |
| 2012 | 114.36 | 114.57 | -0.22 |
| 2013 | 115.54 | 115.88 | -0.35 |
| 2014 | 116.73 | 117.17 | -0.44 |
| 2015 | 117.51 | 118.18 | -0.67 |
| 2016 | 118.09 | 118.81 | -0.72 |
| 2017 | 118.79 | 119.41 | -0.61 |
| 2018 | 119.77 | 120.10 | -0.34 |
| 2019 | 120.98 | 121.27 | -0.29 |
| 2020 | 122.25 | 122.56 | -0.31 |
| 2021 | 123.39 | 123.68 | -0.29 |
| 2022 | 125.56 | 125.27 | 0.30 |
| 2023 | 128.65 | 128.16 | 0.50 |

The way to interpret the table is that in TY 2023, a taxing jurisdiction has been allowed to increase their collections by 28.65% under current DOR calculations, and if we had been using

annual averages instead of December, they would have been allowed to increase their collections by 28.16% instead, or a half percentage point less. However, for all years prior to 2022, the annual average would have produced a higher inflation escalation than the December value.

Definition of Average Rate of Inflation for Prior 3 Years

The current way of calculating average inflation compares two numbers, the index in the current period and the index from 3 years prior. Let's take the calculation from the above memo:

$$\frac{296.797}{256.974} = 1.1550$$

From December 2019 to December 2022 there has been a 15.5% increase in inflation. If we take the cube root (for three years), we get the compounding inflation.

$$\sqrt[3]{1.1550} = 1.0492$$

If we took 256.974 and grew it by 4.92% each year, it would be equal to 296.797 after three years. So 4.92 is the average rate of inflation from December 2019 to December 2022 because it is the inflation rate that moves us from December 2019 to December 2022 over 3 years.

The other option is to find the inflation rate from 2019 to 2020, 2020 to 2021, and 2021 to 2022 and take the average of these three.

$$\frac{260.474}{256.974} = 1.0136 \quad \frac{278.802}{260.474} = 1.0704 \quad \frac{296.797}{278.802} = 1.0645$$

The average of these three years of inflation is:

$$\frac{1.0136 + 1.0704 + 1.0645}{3} = 1.0495$$

This number represents the average of inflation over the prior three years because it averages the rate of inflation experienced in 3 distinct years.

The difference between the compounded annual inflation rate and the average of three years of inflation is 3 one hundredths of a percentage point difference.

Compounded inflation produces a lower value in all years than the average of three years inflation, but the difference is small. That difference compounded from 2001 to 2023 is equal to 0.07 percentage points.

Should a Different Index Be Used?

While DOR is directed to use the CPI-U by 15-10-420, MCA, there are other options for escalation indices besides CPI-U. The BLS analyzes data regionally and has a CPI-U West index. The table below compares outcomes under current CPI-U methodology and the CPI-U West. Overall inflation appears to be higher in the western region of the United States, especially

since 2015, which may suggest that CPI-U West better captures the escalation in cost to local governments than the country-wide CPI-U.

| Tax Year | 15-10-420 Calc. | | CPI-U | CPI-U-W | Difference |
|----------|-----------------|---------|--------|---------|------------|
| | CPI-U | CPI-U-W | | | |
| 2001 | | | 100 | 100 | 0 |
| 2002 | 1.27% | 1.54% | 101.27 | 101.54 | -0.27 |
| 2003 | 1.22% | 1.43% | 102.50 | 102.99 | -0.49 |
| 2004 | 0.97% | 1.03% | 103.49 | 104.05 | -0.56 |
| 2005 | 1.25% | 1.13% | 104.79 | 105.23 | -0.44 |
| 2006 | 1.42% | 1.27% | 106.28 | 106.56 | -0.28 |
| 2007 | 1.53% | 1.54% | 107.91 | 108.20 | -0.29 |
| 2008 | 1.67% | 1.70% | 109.72 | 110.04 | -0.33 |
| 2009 | 1.11% | 1.19% | 110.94 | 111.36 | -0.42 |
| 2010 | 1.14% | 1.04% | 112.20 | 112.52 | -0.31 |
| 2011 | 0.72% | 0.56% | 113.01 | 113.15 | -0.14 |
| 2012 | 1.20% | 1.02% | 114.36 | 114.31 | 0.05 |
| 2013 | 1.03% | 0.95% | 115.54 | 115.39 | 0.15 |
| 2014 | 1.03% | 1.03% | 116.73 | 116.58 | 0.15 |
| 2015 | 0.67% | 0.79% | 117.51 | 117.50 | 0.01 |
| 2016 | 0.50% | 0.81% | 118.09 | 118.45 | -0.35 |
| 2017 | 0.59% | 0.93% | 118.79 | 119.55 | -0.75 |
| 2018 | 0.82% | 1.24% | 119.77 | 121.03 | -1.27 |
| 2019 | 1.02% | 1.45% | 120.98 | 122.79 | -1.80 |
| 2020 | 1.05% | 1.50% | 122.25 | 124.62 | -2.37 |
| 2021 | 0.93% | 1.22% | 123.39 | 126.14 | -2.75 |
| 2022 | 1.77% | 1.87% | 125.56 | 128.50 | -2.93 |
| 2023 | 2.46% | 2.45% | 128.65 | 131.64 | -2.99 |

The Personal Consumption Expenditure (PCE) from the Bureau of Economic Analysis is also an option. This index is currently used for adjusting qualifying income levels for the Property Tax Assistance Program (PTAP) and Montana Disabled Veterans (MDV) programs in 15-6-301, MCA. In general, the PCE tends to grow less quickly than CPI because the PCE considers substitution effects, like consumers purchasing more chicken if the price of pork rises. Also, the PCE and CPI have different weightings of categories like housing (CPI weights higher) and medical expenses (PCE weights higher). Debate over which of these two indices better measures inflation is robust, and economists do not have consensus about which is preferable. The PCE is the preferred metric of the Federal Reserve, which utilizes monetary policy to target an inflation rate. The table below compares rates calculated under both indices.

| Tax Year | 15-10-420 Calc. | | CPI-U | PCE | Difference |
|----------|-----------------|-------|--------|--------|------------|
| | CPI-U | PCE | | | |
| 2001 | | | 100 | 100 | 0 |
| 2002 | 1.27% | 0.87% | 101.27 | 100.87 | 0.40 |
| 2003 | 1.22% | 0.96% | 102.50 | 101.84 | 0.67 |
| 2004 | 0.97% | 0.96% | 103.49 | 102.82 | 0.68 |
| 2005 | 1.25% | 0.88% | 104.79 | 103.72 | 1.07 |
| 2006 | 1.42% | 1.13% | 106.28 | 104.89 | 1.39 |
| 2007 | 1.53% | 1.33% | 107.91 | 106.29 | 1.63 |
| 2008 | 1.67% | 1.32% | 109.72 | 107.69 | 2.03 |
| 2009 | 1.11% | 1.41% | 110.94 | 109.21 | 1.73 |
| 2010 | 1.14% | 1.10% | 112.20 | 110.40 | 1.80 |
| 2011 | 0.72% | 0.97% | 113.01 | 111.47 | 1.54 |
| 2012 | 1.20% | 0.63% | 114.36 | 112.17 | 2.18 |
| 2013 | 1.03% | 0.87% | 115.54 | 113.15 | 2.39 |
| 2014 | 1.03% | 0.96% | 116.73 | 114.24 | 2.50 |
| 2015 | 0.67% | 0.93% | 117.51 | 115.30 | 2.21 |
| 2016 | 0.50% | 0.67% | 118.09 | 116.07 | 2.03 |
| 2017 | 0.59% | 0.41% | 118.79 | 116.55 | 2.25 |
| 2018 | 0.82% | 0.46% | 119.77 | 117.08 | 2.68 |
| 2019 | 1.02% | 0.58% | 120.98 | 117.76 | 3.22 |
| 2020 | 1.05% | 0.87% | 122.25 | 118.78 | 3.47 |
| 2021 | 0.93% | 0.85% | 123.39 | 119.79 | 3.60 |
| 2022 | 1.77% | 0.76% | 125.56 | 120.70 | 4.86 |
| 2023 | 2.46% | 1.40% | 128.65 | 122.39 | 6.26 |

Conclusion

The DOR uses the CPI-U base period 1982-84 base of 100 as directed by statute to calculate the inflation factor in 15-10-420. The DOR has determined the intent of “average rate of inflation for the prior 3 years” to mean the compounding inflation rate over three years from December to December. [Best practices from the BLS](#) suggest defining the reference period and method of calculation explicitly so any changes to 15-10-420 may want to incorporate those ideas. If a change in index is desired, the index should be explicitly referenced including base period and what items are included or excluded.

If you have any questions, please feel free to contact me by way of email at dylan.cole@mt.gov or by phone at 406-444-6634.

TO: Danielle Vincent, Department of Administration
FROM: Dylan Cole, Tax Policy and Research
DATE: April 3, 2023
RE: Inflation Factor for Mill Levy Calculation in 15-10-420, MCA for FY 2024

The inflation factor for FY 2024 is 2.46%.

Per [15-10-420, MCA](#), “a governmental entity that is authorized to impose mills may impose a mill levy sufficient to generate the amount of property taxes actually assessed in the prior year plus one-half of the average rate of inflation for the prior 3 years.”

Additionally, the Department of Revenue shall, “calculate one-half of the average rate of inflation for the prior 3 years by using the consumer price index (CPI), U.S. city average, all urban consumers, using the 1982-84 base of 100, as published by the bureau of labor statistics of the [United States Department of Labor](#).”

One-half the average rate of (compounding) inflation was determined by taking the cubed root of the CPI for December 2022 (296.797) divided by the CPI for December 2019 (256.974), subtracting one, and multiplying the result by 50%.

$$\left(\begin{matrix} \text{Inflation} \\ \text{Factor} \end{matrix} \right) = \left(\sqrt[3]{\frac{CPI_{2022}}{CPI_{2019}}} - 1 \right) (50\%) = \left(\sqrt[3]{\frac{296.797}{256.974}} - 1 \right) (50\%) = 2.46\%$$

If you have any other questions, please feel free to contact me by way of email at dylan.cole@mt.gov or by phone at 406-444-6634.

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