

How do you measure, measure a year?

Seasonally-adjusting TIPS yields

- We extend the framework presented in our recently updated seasonally-adjusted fitted TIPS curve model to derive seasonally-adjusted yields and breakevens. This is particularly crucial in the current environment now that Treasury has introduced a new 5-year maturity point along the curve
- Using seasonally-adjusted yields and breakevens allows us to put April and October issues on a comparable basis and improve the way we analyze rolling hot run series
- Seasonally-adjusted prices and yields will soon be available on our DataQuery platform

Fixed Income Strategy

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Seasonally-adjusting TIPS yields

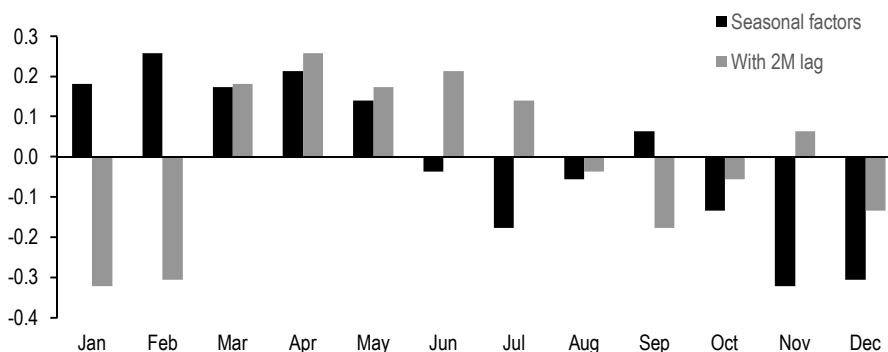
Two months ago, we revised our seasonally- and option- adjusted TIPS fitted curve (see [Revising our TIPS fitted curve](#), 8/16/19). In this paper, we discuss the important extensions of that framework into other areas of our TIPS analytics. Looking at seasonally-adjusted yields and breakevens is particularly crucial in the current environment now that Treasury has introduced a new 5-year maturity point along the curve: we estimate that seasonality in headline CPI alone accounts for about 11bp in yield differential between the previous 0.5% April 2024s and the 0.125% October 2024s (not accounting for curve, liquidity, and other factors), and thus the roll to the new issue has contributed to substantial, optical widening in the benchmark 5-year breakeven and flattening in the benchmark breakeven curve. **Using seasonally-adjusted yields and breakevens, however, allows us to put April and October issues on a comparable basis and improve the way we analyze rolling hot run series.**

Why does seasonality matter?

Headline CPI inflation tends to be strong in the first few months of the year, moderate in the middle of the year, and soften in the last quarter of the year. This comes from various seasonal factors that drive each of the CPI components—for example, energy price inflation tends to firm into the peak of the summer travel season before moderating, while retail discounts around the holiday season in November and December tend push apparel prices lower, etc. The BLS uses statistical methods to derive these seasonal factors and seasonally-adjusted CPI is often a better indicator of underlying trends in inflation. However, TIPS are indexed to unadjusted CPI, since seasonal adjustment factors are subject to revision for up to five years after their original release. Thus, it is unsurprising that TIPS prices reflect the expected changes in CPI that normally occur at the same time every year.

Exhibit 1: Headline CPI exhibits predictable seasonality, with inflation firmer early in the year and weakest late in the year

Difference between non-seasonally adjusted and seasonally-adjusted monthly changes in headline CPI derived from BLS multiplicative seasonal factors; also shown with 2-month lag; %



Source: BLS, J.P. Morgan

Consider the relative pricing of securities maturing in different maturity months.

Exhibit 1 shows the additive 2018 seasonal adjustment factors from BLS by month—i.e., the difference between the m/m % changes in unadjusted and adjusted headline CPI. As mentioned, these seasonals tend to be very positive in the first few months of the year and very negative in late in the year. Because of the lag in the

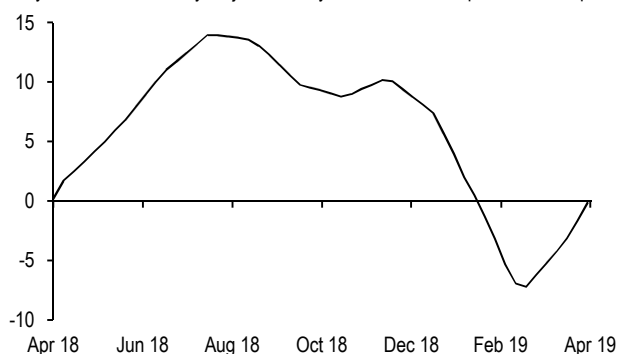
indexation process, this means that July TIPS mature after several months of positive seasonals, while January and April TIPS mature when CPI seasonal are negative. As a result, July TIPS trade rich relative to January and April TIPS with similar maturities.

Similarly, seasonality matters for the pricing of a given security at different times of the year. Consider a newly issued April-maturity 5-year TIPS: principal at maturity will be scaled based on CPI changes over five full years, so seasonality has no impact. As time passes from April through January, CPI (on a lagged basis) is seasonally positive. This suggests that if you purchase the security when it has 4.5 years to maturity, for example, seasonality is expected to pressure CPI lower over the final six months before maturity, so spot prices move lower (and yields higher) to reflect this. Conversely, from January to April, CPI is seasonally negative, so spot prices rise (yields fall). By seasonally adjusting TIPS yields, we can strip out these expected yield moves for a given security, which on April 5-year yields, we estimate to be worth up to 14bp in the third quarter and as much -7bp in the first quarter of the year (**Exhibit 2**).

Putting the pieces together, we also end up with a smooth hot run series that does not exhibit large seasonal rolls. Moreover, with the front end more sensitive to seasonality than longer-maturity points, this adjustment allows us to better assess whether the curve looks steep or flat relative to its recent history (**Exhibit 3**). Seasonally-adjusted prices and yields will soon be available on our DataQuery platform.

Exhibit 2: On April 5-year yields, we estimate seasonality in CPI to be worth up to 14bp in the third quarter and as much -7bp in the first quarter of the year

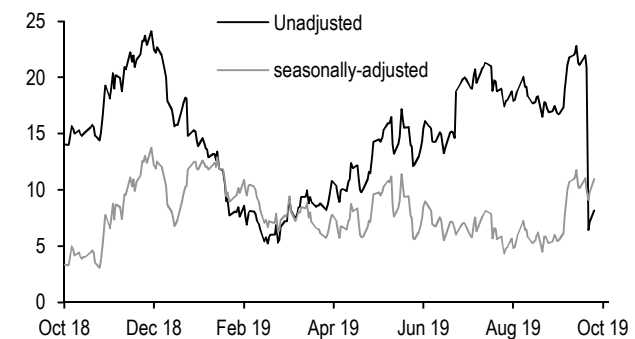
Real yields less seasonally-adjusted real yields on 0.625% April-23 TIPS; bp



Source: J.P. Morgan

Exhibit 3: Adjusting for seasonality allows us to better assess whether the curve looks steep or flat relative to its recent history

Hot run 5s/10s breakeven curve, with and without seasonality adjustment; bp



Source: J.P. Morgan

Methodology

Before turning to the calculation, a quick word on seasonal adjustment factors: we previously discussed additive seasonal factors—the difference between m/m % changes in adjusted and unadjusted CPI, which sum to zero over a year. For the purposes of our adjustment calculation that follows, we use the multiplicative factors, which are provided by BLS. The unadjusted index for month i , $CPI(i)$, is equal to the seasonally-adjusted index $T(i)$ multiplied by the multiplicative seasonal factor $A(i)$:

$$CPI(i) = A(i)T(i)$$

Using the monthly multiplicative seasonal factors $A(i), i = 1, \dots, 12$, we can calculate daily seasonal adjustment factors $A(t)$ for day t in month M based on linear interpolation between the monthly factors.

Next we present the theoretical dirty price \hat{P}_i of bond i , with principal and coupon cash flows at corresponding times $t_j, j = 1, \dots, n_i$, net of its floor option value, as

$$\hat{P}_i = 1 \frac{A(t_{n_i})}{A(t_{settle})} \frac{T(t_{n_i})}{T(t_{settle})} d(t_{n_i}) + C/2 \sum_{j=1}^{n_i} \frac{A(t_j)}{A(t_{settle})} \frac{T(t_j)}{T(t_{settle})} d(t_j)$$

where the discount factor function $d(t)$ for any time t is defined as the present value of \$1 of cash flow occurring at future time t .¹ We approximate the combined effects of trend inflation and discounting using the real yield, y :

$$\frac{T(t)}{T(t_{settle})} d(t) = e^{-y(t-t_{settle})}$$

Meanwhile, we incorporate known seasonality adjustment factors into the expected future cash flows. For each bond, we must calculate three interpolated seasonal adjustment factors: one on the settlement date $A(t_{settle})$ and the other two for each coupon payment month, $A(t_{odd})$ and $A(t_{even})$, where t_{even} denotes those payment dates in the same month as the issue date, while t_{odd} denotes other future payment dates. Thus, we can calculate the aggregate seasonal adjustment applied to the real dirty price as a weighted average of the interpolated seasonal factors. We then subtract accrued interest AI_{settle} to arrive at the adjusted clean price, \hat{P}_i^{sa} :

$$\hat{P}_i^{sa} = (P_i^c + AI_{settle}) \frac{\omega_1 + \omega_2}{\lambda_1 \omega_1 + \lambda_2 \omega_2} - AI_{settle}$$

where

$$\lambda_1 = \frac{A(t_{odd})}{A(t_{settle})}, \quad \lambda_2 = \frac{A(t_{even})}{A(t_{settle})},$$

$$\omega_1 = C/2 \sum_{odd j}^{n_i} e^{-y_n(t_j - t_{settle})}$$

$$\omega_2 = e^{-y_n(t_{n_i} - t_{settle})} + C/2 \sum_{even j}^{n_i} e^{-y_n(t_j - t_{settle})}$$

¹ We build off a framework presented in depth here: Paul Canty, *Seasonally adjusted prices for inflation-linked bonds*, Risk, May, 2007.

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