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SEASONAL VARIATIONS IN TREASURY NOTES YIELDS

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ABSTRACT

We study seasonalities in the yields of Treasury notes (T-Notes) with fixed maturities of two, three, five, seven and ten years. We find that although there are a number of anecdotal patterns, only one passes the more rigorous statistical tests, which is the half-year high (March to August) versus half-year low (September to February) yield measured in terms of their ranks in a year. The results across T-Notes of different maturities also exhibit a striking resemblance. Further analysis on the yield spread of the 10-Year and 2-Year T-Notes shows that although their nominal yield differences have been similar in recent economic cycles, the percentage values of the differences have been increasing quickly especially since the 2010s due to the low levels of short-term Treasury yields.

JEL: G10, G12, G14

KEYWORDS: Seasonality, Treasury Yield, Yield Spread, Asset Pricing

INTRODUCTION

Persistent seasonal anomalies have important implications for market efficiency and asset pricing. Studies of these anomalies contribute to the understanding of where the anomalies come from and help us explore a better-informed price discovery process. Understanding the Treasury yields seasonality is crucial because the Treasury yields play a central role in determining all asset prices as they directly and indirectly affect the interest rates and interest rates movements.

Academic research on the Treasury yields seasonality is very limited. Most research focuses on the seasonalities in the risky assets. The few available research that looks into the risk free assets such as the US Treasury securities studies returns instead of yields. Liu, Lin and Varshney (2018) study the 10-Year Treasury note yields and find that most anecdotally observed yield patterns do not pass the statistical significance test as a seasonal variation. Liu (2018) studies the 2-Year Treasury note yields and find that variations in nominal yields do not pass the statistical significance test. However, when the rank of the monthly yields in a year is used to test the seasonality, there is a statistically significant half-year variation of higher yields from March to August and lower yields from September to February.

This paper expands the scope of the previous seasonality studies on Treasury yields to include all five intermediate term securities issued by the US government, which includes Treasury notes (T-Notes) with fix maturities of two, three, five, seven and ten years. Because of their relative long-term maturities, the yields of these securities are not as heavily influenced by the government policies as the shorter term Treasury Bills. Investors watch and follow the yields of these securities closely. Changes in these yields, especially the yield inversions where the yields of longer-term maturity T-Notes drop below those of the shorter-term maturity T-Notes, typically have a huge impact on the market.

We find that the yields of the five Treasury notes exhibit strikingly similar patterns in both the anecdotal seasonal variations and statistical tests results. Consistent with the findings of the previous 10-Year and 2-Year Treasury notes studies, variations in the nominal yields do not pass the rigorous statistical seasonality tests. However, tests using the ranks of the monthly yields in their calendar years show strong statistical significance to support a half-year seasonal variation of higher yields from March to August and lower yields from September to February.

These findings are both expected and surprising. We expect the Treasury notes with maturities fall in between the two end spectrums would somewhat conform to the patterns and results of those of the 10-Year and 2-Year T-Notes. However, we are surprised at the high similarity of their results. A number of factors come into the play to affect the yield curve, among which levels of short-term interest rate, market expectation of inflation premium and risk premium, and demand for securities of different maturities. We do not expect a uniform combined effect on the Treasury yields of different fixed maturities. When we explore further the yield differences of the 10-Year and 2-Year T-Notes, we notice that while the nominal differences have been holding near constant during the recent economic cycles, the percentages differences have been increasing and are dramatically different since the 2010s. This raises an important question for future studies: would the yield spread be more appropriately measured in nominal or percentage terms?

We organize the rest of the paper in the following way. Section II is literature review. Section III explains the data and methodology. Section IV reports and discusses the results. Section V provides the concluding comments.

LITERATURE REVIEW

A persistent seasonality or seasonal anomaly in asset pricing has important implications for market efficiency because discovered anomalies typically disappear quickly through arbitrage in an efficient market. Research over the years has documented a number of seasonal anomalies across different markets and asset classes. For example, Branch (1977), Gultekin and Gultekin (1993), Wilson and Jones (1990), Maloney and Rogalski (1989) find the turn-of-the-year effect where the return in January is higher than the rest months in the year in both domestic and international stocks, corporate bonds and derivative products. Ariel (1987) among others finds the turn-of-the-month effect where return is only positive around the beginning of the calendar month. French (1980) and Gibbons and Hess (1981) find the day-of-the-week effect where Monday return is negative due to higher Friday prices. Explanations for these anomalies include portfolio rebalancing (Ritter and Chopra, 1989), tax-loss selling (Keim, 1983), macroeconomic seasonalities (Kramer, 1994), standardization of payments at certain times (Ogden, 1987, 1990) and behavioral effect such as variations in risk aversion linked to seasonal mood swings (Kamstra, Kramer and Levi, 2015).

Research on the seasonality of risk free assets such as the US Treasury securities is limited as most research is on the risky assets such as stocks and corporate bonds. The few available ones have mixed findings. For example, Sharp (1988), Krehbiel (1993) and Chen and Chan (1997) find no seasonalities in the Treasury Bond's monthly returns, while other studies such as Flannery and Protopadakis (1988), Clayton, Delozier and Ehrhardt (1989), and Athanassakos and Tian (1998) find Treasury returns have seasonalities in the days-of-the-week, month-of-the-year, and quarter-of-the-year. One thing these studies have in common is that they look at the Treasury holding period returns backed out from some bond indices or portfolios. The problem with using the holding period returns is that they are impossible to calculate without making additional assumptions about the coupon payments and time-to-maturity of the bonds in the indices and portfolios.

A few studies that use the Treasury yield information focus on extracting information from the yield curves. For example, Campbell and Shiller (1991) find the yield spread has a prediction power of the future interest

rate movement. Estrella and Hardouvelis (1991) find the slope of the yield curve contains information of future real economic activities. Estrella and Mishkin (1996) find that yields, especially yield spread, significantly outperformed other financial and macroeconomic indicators in predicting recession two to six quarters ahead.
Academic research on the seasonality of Treasury yield is non-existent until recently when Liu, Lin and Varshney (2018) study the 10-Year Treasury note yields and Liu (2018) studies the 2-Year Treasury note yields. They find that most anecdotally observed yields patterns do not pass the rigorous statistical significance tests as a seasonal variation. In addition, the seasonality findings also depend on the measure of the yields and the seasonal patterns in the test. Variations measured in nominal yields do not pass the statistical significance test due to the substantial drop in the yield levels over the years. However, variation measured in the rank of the monthly yields in a year has a statistically significant half-year variation of higher yields from March to August and lower yields from September to February.

This paper expands the scope of the previous seasonality studies on Treasury yields to include all five intermediate term securities issued by the US government, which includes Treasury notes (T-Notes) with fix maturities of two, three, five, seven and ten years. Investors watch and follow the yields of these securities closely. The purpose is to understand how these important securities behave as a group and their similarities and differences.

DATA AND METHODOLOGY

We use the monthly Treasury Constant Maturity Rate (Not Seasonally Adjusted) for 2-Year, 3-Year, 5-Year, 7-Year and 10-Year Treasury notes obtained from FRED (Federal Research Economic Database) Federal Reserve Bank of St. Louis. The data spans from 1976.06 to 2020.06. This consists of 529 months (44 years and 1 month) of time series observations for each T-Notes.

Our methodology to study the yields seasonality follows the standard dummy variable regression analysis methods used in the earlier seasonality studies of the Treasury returns in Athanassakos and Tian (1998), Chen and Chan (1997) and Kamstra, Kramer and Levi (2015). Specifically, we test the seasonalities in month and in half-year using, respectively,

$$Y_t = \alpha_1 + \sum_{j \neq 5}^{12} \beta_j M_t^j + \varepsilon_t \quad (1)$$

$$Y_t = \alpha_2 + \beta H_t + \varepsilon_t \quad (2)$$

Where Y_t represents the nominal monthly yields. In Equation (1), M_t^j is a dummy variable that is equal to 1 if the month is j and 0 otherwise. j varies from 1 to 12 except 5, i.e., there are 11 dummy variables for every month except the month of May. We use May as the reference month following the earlier Treasury yields studies since May has relatively high yields on average. However, the choice of this reference month should not affect the seasonality result. β_j measures the average difference of yields between the month j and May. α_1 measures the average yield in May. A statistically significant and positive β_j indicates that the associated month j has on average higher yields than May, and vice versa.

In Equation (2), H is a dummy variable that is equal to 1 if the month is from March to August and 0 otherwise. β measures the average difference in monthly yields between the higher-half of the year (from March to August) and the lower-half of the year (from September to February). We follow the same months for higher-half and lower-half year used in Liu (2018). α_2 measures the average monthly yield in the lower-half of the year (from September to February). Similarly, a statistically significant and positive β indicates that the months in the higher-half of the year have on average higher yields than the months in the lower-half of the year, and vice versa.

The null hypothesis is that yields do not vary across different months of the year (or half of the year), i.e., all βs are simultaneously equal to 0, $\beta_1 = \beta_2 = \cdots = \beta_j = 0$ (or $\beta = 0$). If the null hypothesis is rejected, then there is a seasonality because some month(s) (or half of the year) always have higher or lower yield than those in May (or the other half of the year).

F-test is used to test the joint null hypothesis and the overall fitness of the regression. We also use the Durbin-Watson d statistics and the White's x^2 test to check the serial correlation and heteroscedasticity of the regression residuals. The presence of serial correlation and heteroscedasticity in the regression residuals invalidates the normality assumptions of the F-test and OLS, therefore inferences of seasonalities based on their results may become less reliable. In other words, the conclusion will be more reliable when all three tests give consistent results.

In addition, we conduct a non-parametric Kruskal-Wallis test since we do not know for sure the exact probability distribution of the yields. Kruskal-Wallis test is similar to the F-test regarding the joint null hypothesis but compares medians instead of means. It does not make specific assumptions regarding the probability distribution of the variables.

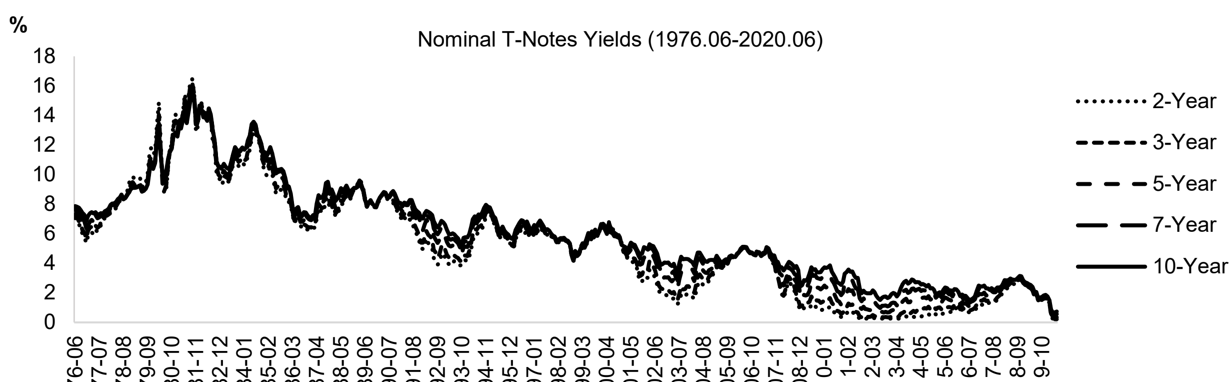
We use the same set up described above to test a number of seasonal variations and measures, therefore Y_t also represents in the other tests: the month-over-month changes of nominal yields, the percentage changes of month-over-month nominal yields, and the ranks of the nominal monthly yields in its calendar year.

RESULTS AND DISCUSSION

Anecdotal Observations

Figure 1 plots the monthly yields of the five Treasury notes (T-Notes) over the period of study. We see that yields have been coming down substantially across board since the 1980s. Yields of the 2-Year T-Note drop more than the longer-term T-Notes. As a result, differences in yields (or yield spread) among the T-Notes of different fixed maturities have been more visible in the recent years.

Figure 1: Monthly Treasury Notes Yields (1976.06-2020.06)

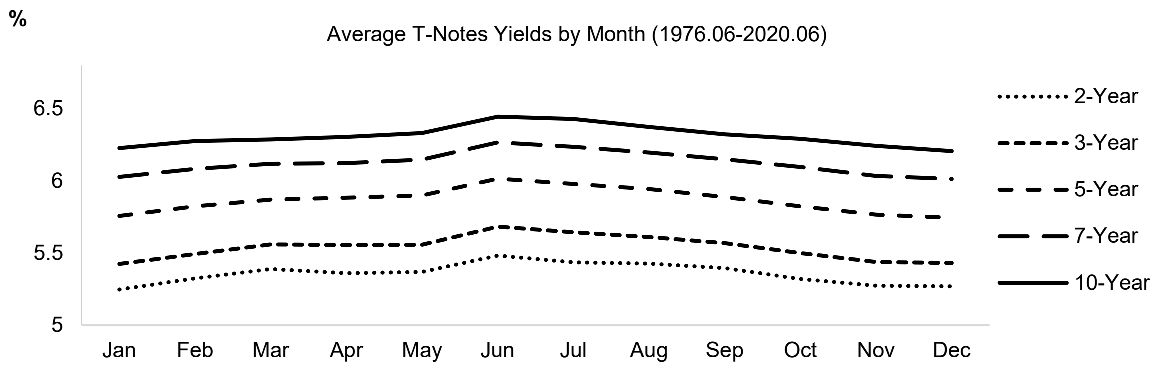


This figure shows the monthly yields of the five Treasury notes for the period from 1976.06 to 2020.06.

Figure 2 plots the average yields by months for the five T-Notes over the period of study. Two things stand out. First, average monthly yields first go up before heading down for the rest of the year. Second, the differences in average yields or yield spreads among the T-Notes of different maturities seem to be almost constant across the months, resulting in curves for longer maturity T-Notes shifting up almost in parallels.

The second finding is a little unexpected as we thought there might be more differences among the T-Notes due to their different maturities.

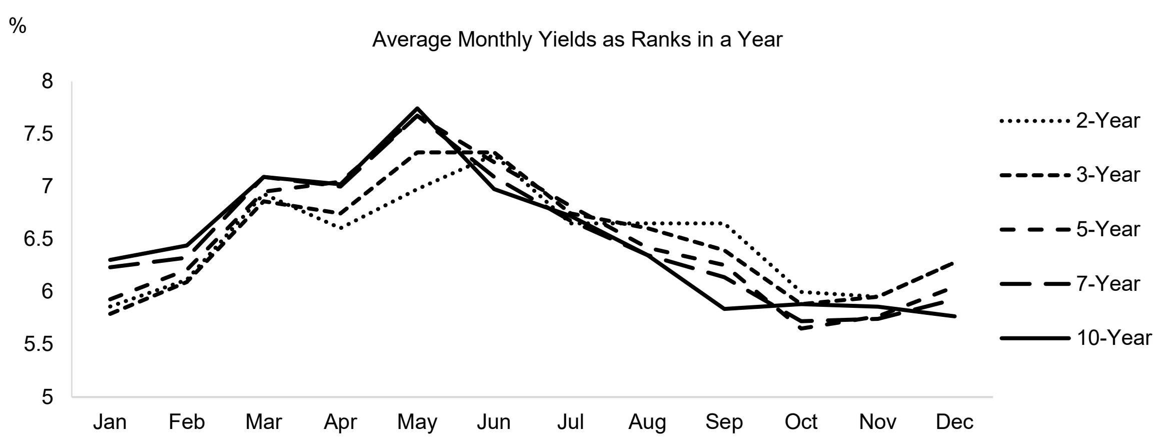
Figure 2: Average Treasury Notes Yields by Month (1976.06-2020.06)



This figure shows the average yields by month for all five Treasury notes for the period from 1976.06 to 2020.06.

Figure 3 plots the average monthly yields in terms of their ranks in a year. The highest and lowest rank values are 12 and 1 respectively. A higher rank value indicates a higher relative monthly yield compared to the other months in a calendar year. Since yields have dropped substantially over the years, the ranks of the monthly yields in a year would be a good measure of the relative high and low positions of the yields in the year as the annual rank measure is independent of the overall levels of yields. We see that although there are similarities in the general pattern of curves going up before heading down, there are more differences among the T-Notes compared to Figure 2. For example, longer-term maturity T-Notes such as the 10-Year and 7-Year T-Notes peak earlier in May while the shorter-term maturity T-Notes such as 2-Year and 3-Year T-Notes peak a little later in June.

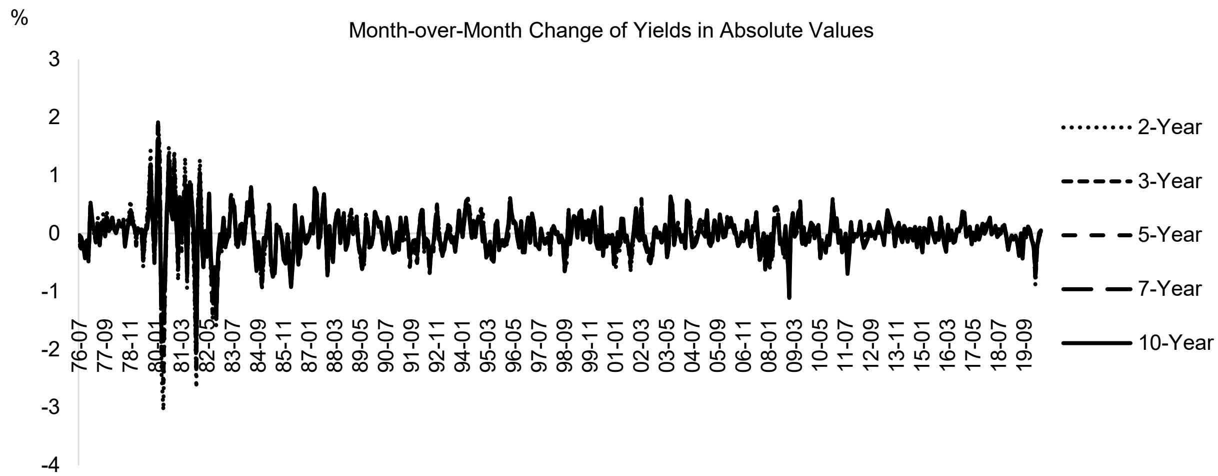
Figure 3: Average Ranks of T-Notes Monthly Yields in a Year (Highest as 12 and Lowest as 1)



This figure shows the average ranks of the monthly yields in a calendar year for all five Treasury notes for the period from 1976.06 to 2020.06. The highest and lowest rank values are 12 and 1 respectively. A higher rank value indicates a higher relative monthly yield compared to the other months in a calendar year.

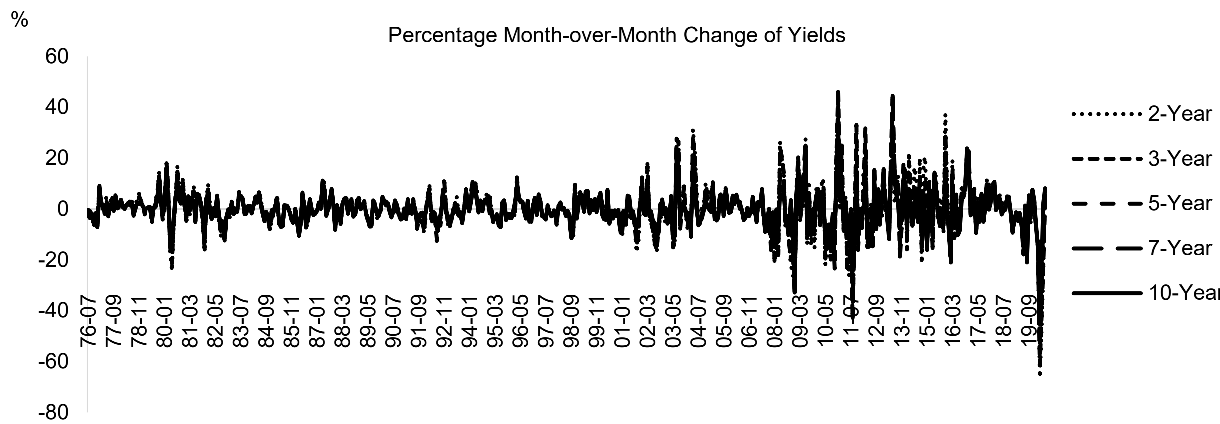
Figures 4 plots the month-over-month changes of the T-Notes yields in absolute value amount, while Figures 5 plots the percentage values of these changes. We see that although the month-over-month changes of yields in the 1980s are large in absolute values in Figure 4; their percentage values are much smaller in Figure 5. The opposite happens for the more recent years in the 2010s, where the month-over-month changes of yields in absolute values are small but their percentage values are much higher. While the yields of the shorter-term maturity T-Notes, such as the 2-Year, have bigger changes, all T-Notes seem to move in tandem. In other words, Treasuries of different maturities are not the same as stocks and bonds to investors where they would pull away from one and move into another. Yields of all Treasuries notes move in the same directions.

Figure 4: Month-Over-Month Changes of the T-Notes Yields in Absolute Value Amount (in %)



This figure shows the average absolute amount of the month-over-month changes of yields for all five Treasury notes from 1976.06 to 2020.06.

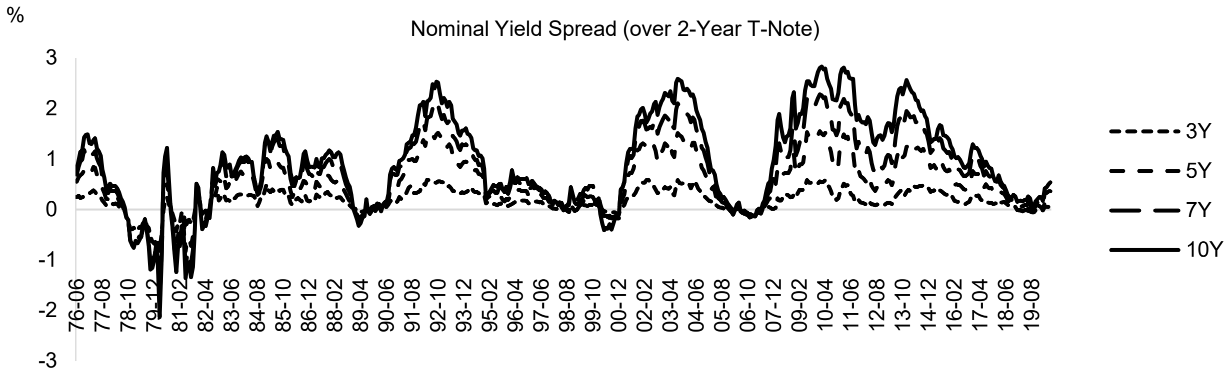
Figure 5: Percentage Month-Over-Month Changes of the T-Notes Yields



This figure shows the percentage amount of the month-over-month changes of yields for all Treasury notes from 1976.06 to 2020.06.

Figure 6 plots the nominal yield spreads of the longer-term maturity T-Notes over the 2-Year T-Note.

Figure 6: Nominal Yield Spread of T-Notes over 2-Year T-Note

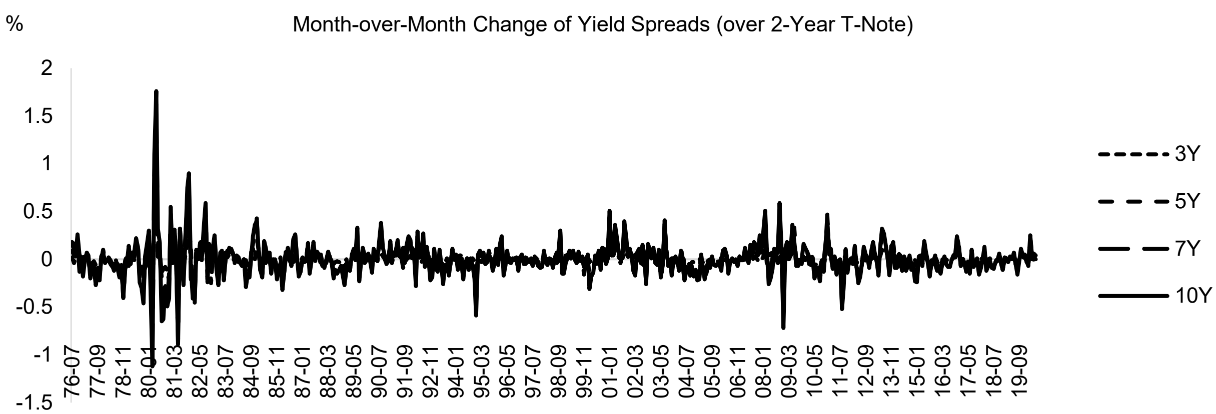


This figure shows the yield spreads (or yield differences) of the Treasury notes with longer-term maturities (3-Year, 5-Year, 7-Year and 10-Year) over the 2-Year T-Note from 1976.06 to 2020.06.

We see from Figure 6 that the fluctuation of the yield spreads since the 1990s seem to exhibit a stable pattern, where the yield inversions (where yield spreads become negative) coincided with onset of the three recessions and the peaks of the yield spreads are about the same amount. For example, the peaks of the yield spread between the 10-Year and 2-Year T-Notes stay close to 2.5% in the three economic cycles.

Figure 7 plots the month over month change of the yield spreads (or yield differences) of the longer-term maturity T-Notes over the 2-Year T-Note. The changes of the yield spreads since the 1990s tend to fluctuate towards a stable central value.

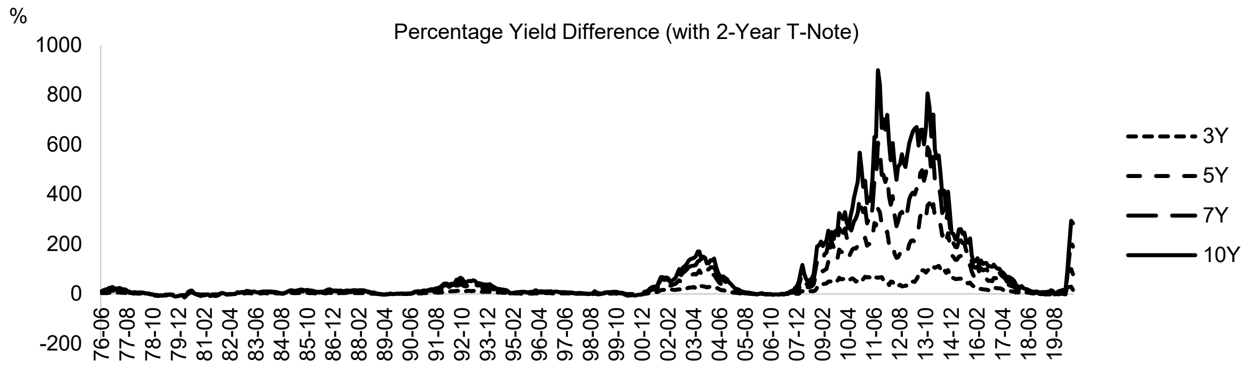
Figure 7: Month-Over-Month Change of T-Notes Yield Spreads over 2-Year T-Note



This figure shows the month-over-month changes of the yield spreads (or yield differences) of the Treasury notes with longer-term maturities (3-Year, 5-Year, 7-Year and 10-Year) over the 2-Year T-Note from 1976.06 to 2020.06.

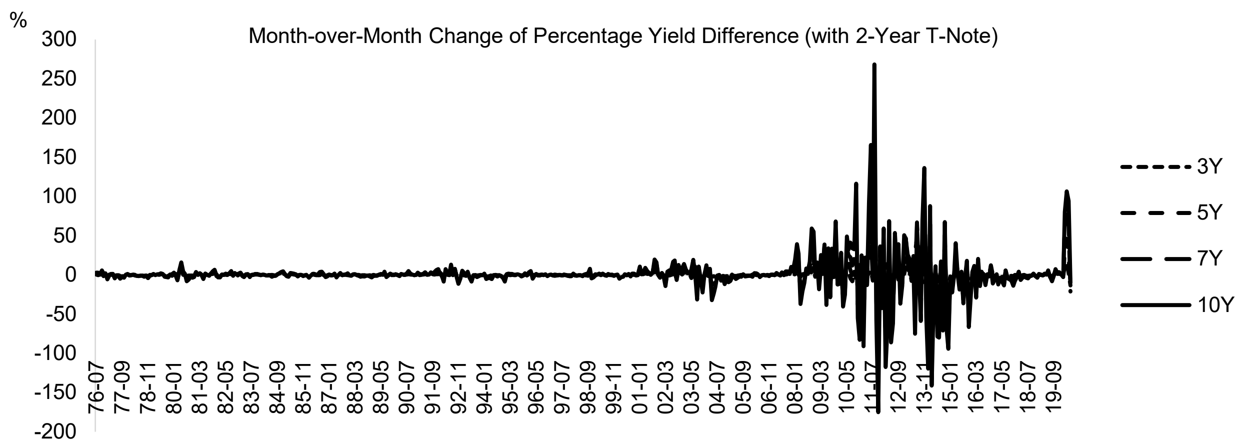
While Figure 6 and Figure 7 show the nominal yield differences of longer-term maturity T-Notes with the 2-Year T-Note have been holding stable over the recent economic cycles, Figure 8 and Figure 9 show a very different picture when we look at these yield differences in percentages. Figure 8 shows that the percentage yield differences of longer-term maturity T-Notes over the 2-Year T-Note have been increasing over the last three economic cycles in the 1990s, 2000s and 2010s, with a most notable quadrupling increase in the 2010s. For example, yields of the 10-Year T-Note are at least 400% higher than the 2-Year T-Note in half of the time, at the highest point of over 900%.

Figure 8: Percentage Yield Difference with 2-Year T-Note



This figure shows the percentage yield differences of the Treasury notes with longer-term maturities (3-Year, 5-Year, 7-Year and 10-Year) over the 2-Year T-Note from 1976.06 to 2020.06.

Figure 9: Month-Over-Month Change of Percentage Yield Difference (with 2-Year T-Note)



This figure shows the percentage month-over-month changes of the yield spreads (or yield differences) of the Treasury notes with longer-term maturities (3-Year, 5-Year, 7-Year and 10-Year) over the 2-Year T-Note from 1976.06 to 2020.06.

Figure 9 confirms that the month over month changes of this percentage yield differences have also been dramatically increasing since the 2010s. This makes us wonder, what would be a good measure for the yield spread of the Treasury notes with different fixed maturities, nominal yield difference or percentage yield difference? Are the peak nominal yield spreads that we have been seeing in the recent economic cycles too high in the low-level short-term yield environment?

Statistical Analysis

Table 1 reports the key summary statistics of the nominal monthly yields of the T-Notes over the period of study. We see that the Mean values of the yields increase more with the maturities than the Median values. Yields of all T-Notes with different fixed maturities have fluctuated over a large range of about 15 percent, and the shorter-term T-Notes tend to fluctuate more and over a wider range.

Table 1: Summary Statistics of T-Notes Yields (in %) (1976.06-2020.06)

	2-Year	3-Year	5-Year	7-Year	10-Year
Mean	5.23	5.40	5.72	5.97	6.16
Standard Error	0.16	0.16	0.15	0.15	0.14
Median	5.05	5.24	5.51	5.71	5.81
Mode	6.28	7.83	6.30	1.98	5.09
Standard Deviation	3.77	3.68	3.52	3.40	3.27
Sample Variance	14.22	13.54	12.39	11.54	10.69
Kurtosis	-0.23	-0.27	-0.29	-0.31	-0.30
Skewness	0.59	0.57	0.57	0.58	0.60
Range	16.29	16.01	15.59	15.12	14.67
Minimum	0.17	0.22	0.34	0.53	0.66
Maximum	16.46	16.22	15.93	15.65	15.32
Sum	2764.87	2858.13	3026.99	3160.22	3256.83
Count	529	529	529	529	529

We conduct a series of tests on two kinds of seasonalities: the monthly yields seasonality and the half-year high versus low yields seasonality. In the unreported results (available upon request), we find that none of the seasonality tests using the nominal yields, month-over-month changes of yields or percentage month-over-month changes of yields shows statistically significant results. None of the coefficients for the month dummies or the half-year dummy is statistically significant. Neither the *F*-test statistics nor the Kruskal-Wallis test can reject the null hypothesis that yields do not vary across months. In other words, the anecdotally observed patterns of monthly and half-year variations in yields measured in nominal amounts are not statistically significant.

We report two tables with interesting results: Table 2 reports the monthly seasonality test results using the ranks of monthly yields in a year; and Table 3 reports the results of half-year high versus low yields seasonality test using the ranks of the monthly yields in a year.

Table 2: Seasonality in Ranks of Monthly Yields (1976.06-2020.06)

		2-Year			3-Year			5-Year			7-Year			10-Year	
Variable	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**
α_1	6.98	13.21	0.00	7.33	13.90	0.00	7.67	14.64	0.00	7.67	14.61	0.00	7.74	14.76	0.00
JAN	-1.12	-1.49	0.14	-1.53	-2.06	0.04**	-1.74	-2.35	0.02**	-1.44	-1.94	0.05**	-1.44	-1.94	0.05**
FEB	-0.86	-1.15	0.25	-1.23	-1.65	0.10*	-1.47	-1.98	0.05**	-1.35	-1.82	0.07*	-1.30	-1.76	0.08*
MAR	-0.05	-0.06	0.95	-0.47	-0.62	0.53	-0.72	-0.97	0.33	-0.58	-0.78	0.43	-0.65	-0.88	0.38
APRIL	-0.37	-0.50	0.62	-0.58	-0.78	0.44	-0.63	-0.85	0.40	-0.67	-0.91	0.36	-0.72	-0.97	0.33
JUN	0.33	0.44	0.66	0.00	0.00	1.00	-0.44	-0.60	0.55	-0.58	-0.78	0.43	-0.77	-1.03	0.30
JUL	-0.33	-0.44	0.66	-0.58	-0.78	0.44	-0.86	-1.16	0.25	-1.00	-1.35	0.18	-1.02	-1.38	0.17
AUG	-0.33	-0.44	0.66	-0.72	-0.97	0.33	-1.26	-1.69	0.09*	-1.33	-1.78	0.08*	-1.40	-1.88	0.06*
SEP	-0.33	-0.44	0.66	-0.93	-1.25	0.21	-1.42	-1.91	0.06*	-1.53	-2.07	0.04**	-1.91	-2.57	0.01***
OCT	-0.98	-1.31	0.19	-1.44	-1.93	0.05**	-2.02	-2.73	0.01***	-1.95	-2.63	0.01***	-1.86	-2.51	0.01***
NOV	-1.02	-1.37	0.17	-1.37	-1.84	0.07*	-1.91	-2.57	0.01***	-1.93	-2.60	0.01***	-1.88	-2.54	0.01***
DEC	-0.70	-0.93	0.35	-1.05	-1.40	0.16	-1.63	-2.20	0.03**	-1.74	-2.35	0.02**	-1.98	-2.66	0.01***
R-squared		0.02			0.02			0.03			0.03			0.03	
Adjusted R^2		-0.01													
F-statistic		0.75	0.69		0.99	0.45		1.47	0.14		1.36	0.19		1.41	0.16
Durbin-Watson		0.82			0.83			0.84			0.84			0.80	
White's χ^2		90.89	0.00		71.75	0.00		57.73	0.00		64.10	0.00		54.91	0.00
Kruskal-Wallis		8.18	0.70		10.84	0.46		15.94	0.14		14.70	0.20		15.31	0.17

*Results are based on the regression Equation (1) $Y_t = \alpha_1 + \sum_{j\neq5}^{12} \beta_j M_t^j + \varepsilon_t$, where Y_t measures the rank of monthly yields in a calendar year, highest as 12 and lowest as 1. M_t^j is a month dummy variable varies from January to December except May. β_j is reported as "Coeff" for the respective months. ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.*

Table 3: Seasonality in Half-Year High versus Low Ranks of Monthly Yields (1976.06-2020.06)

	2-Year			3-Year			5-Year			7-Year			10-Year		
Variable	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**	**Coeff**	**t-stat**	**Prob.**
α_2	6.14	28.70	0.00	6.07	28.40	0.00	5.98	28.08	0.00	6.02	28.19	0.00	6.02	28.22	0.00
H	0.71	2.34	0.02**	0.87	2.87	0.00***	1.05	3.48	0.00***	0.97	3.20	0.00***	0.97	3.21	0.00***
R-squared		0.01			0.02			0.02			0.02			0.02	
Adjusted R^2		0.01													
F-statistic		5.49	0.02**		8.26	0.00***		12.09	0.00***		10.23	0.00***		10.33	0.00***
Durbin-Watson		0.83			0.83			0.85			0.85			0.81	
White's χ^2		39.84	0.00***		27.42	0.00***		22.95	0.00***		19.60	0.00***		16.33	0.00***
Kruskal-Wallis		5.40	0.02**		8.09	0.00***		11.75	0.00***		9.96	0.00***		10.07	0.00***

*Results are based on the regression Equation (2) $Y_t = \alpha_2 + \beta H_t + \varepsilon_t$, where Y_t measures the average rank of yields in the high versus low half-year months, i.e. average rank of March to August and average rank of September to February (highest yield is ranked 12 and lowest yield is ranked 1). H is a half year dummy variable that is equal to 1 if the month is from the high yields month of March to August and 0 otherwise (September to February). β is reported as "Coeff". ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.*

In Table 2, we see that although the *F*-test statistics and Kruskal-Wallis test cannot reject the null hypothesis, the coefficients of some months in the lower-half yield of the year show statistically significant negative values, indicating yields in these months are lower than May. A closer look shows that the 10-Year, 7-Year and 5-Year T-Notes each has seven such months (from August to February); the 3-Year T-Note has four such months (October, November, January and February) and the 2-Year T-Note has none. In this regard, the longer-term maturity 10-Year, 7-Year and 5-Year T-Notes are more similar to each other than the shorter-term 2-Year T-Note.

In Table 3, we find that once we compare yields using the relative yield levels in a year instead of the nominal values, we see a strong statistical significance to support the high versus low half-year yields seasonality for all five T-Notes. Both the *F*-test statistics and Kruskal-Wallis test to reject the null hypothesis of no variation in half-year pattern. The Durbin-Watson *d* statistics indicates there is some serial correlation in the regression residuals, while the White's x^2 test rejects the presence of heteroscedasticity. The high-half year also have a positive coefficient that is statistically significant at 5% level for the 2-Year T-Note and 1% level for all the other longer-term maturity T-Notes. These are strong evidence that there is a seasonality of high yields from March to August and low yields from September to February in the yields of Treasury notes of all different fixed maturities.

CONCLUDING COMMENTS

In this paper, we study the seasonality in the yields of all five intermediate term Treasury notes with the fixed maturities of two, three, five, seven and ten years. Our goal is to understand how these securities behave as a group and their similarities and differences. We believe understanding the Treasury yields seasonality is crucial because these yields play a central role in asset pricing as they directly and indirectly influence all interest rates and interest rates movements. Using the dummy variable regression method, we test a number of seasonal patterns in these yields since the inception of the 2-Year T-Note in 1976.06 until 2020.06. Consistent with the findings of the earlier studies on the 10-Year and 2-Year Treasury notes yields, we find that variations in the nominal yields of the five Treasury notes do not pass the rigorous statistical seasonality tests likely due to the significant drop of the yield levels since the 1980s. Similarly, we find strong statistical significant evidence of a high versus low half-year seasonality where yields are higher from March to August than from September to February using the rank of monthly yields in a year for all five Treasury notes.

Although we expect similarities in these Treasury notes, we are surprised to see all five Treasury notes have similar anecdotal patterns and variations of their yields as well as their statistical test results. We expect more differences due to the different maturities as some are closer than others do. For example, 2-Year T-Note might have more in common with the 3-Year T-Note than the 10-Year T-Note. Why they all act so similarly is puzzling but outside the scope of this paper. It would be an interesting area for our future research.

We also find that while the nominal yield spread of the 10-Year and 2-Year T-Notes have been holding near constant patterns at least in terms of the peaks and troughs during the recent economic cycles since the 1990s, their percentage yield differences have been increasing dramatically since the 2010s because of the low short-term yields. This raises an important question for further studies: is the yield spread better measured in a nominal or percentage term? What would be the implications for the investors and policy makers if the yield spread is measured differently?

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