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SEASONAL VARIATIONS IN TWO-YEAR TREASURY NOTE YIELDS

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ABSTRACT

We study seasonality in the two-year Treasury Note yields. We find that most anecdotally observed seasonal variations of yields do not pass the more rigorous statistical significance test. In addition, the seasonality findings depend on how me measure yields and what kind of seasonal patterns we test. No statistical significance is found with tests using nominal yields, most likely due to the fact that yields have been dropping substantially since the 1980s which distorted the mean values of yields. When we instead use the rank of monthly yields in a year to test the seasonality, however, we find strong statistical significance to support the variation of high yields from March to August and low yields from September to February.

JEL: G10, G12, G14

KEYWORDS: Seasonality, Treasury Yields, Asset Pricing

INTRODUCTION

Persistent seasonal asset pricing anomalies have important implications for market efficiency, thus it is important to understand seasonality and where it might have come from. Treasury yields play a central role in determining and influencing interest rates and interest rates movements, which both directly and indirectly affect the seasonality in all asset prices. To the best of our knowledge, academic research on yields seasonality is very limited to almost nonexistent. Most research on seasonality has focused on the risky assets while the few available ones on the risk free assets have focused on returns instead of yields. Even then, their findings are mixed. For example, while Schneeweis and Woolridge (1979), Chang and Pinegar (1986), Sharp (1988) and Krehbiel (1993) find no seasonalities in Treasury bond's monthly returns, others like Flannery and Protopapadakis (1988), Clayton, Delozier and Ehrhardt (1989), and Athanassakos and Tian (1998) find Treasury returns' seasonality in days-of-the-week, month-of-the-year, and quarter-of-the-year.

In this paper, we study the seasonality in Treasury yields with a focus on the two-year Treasury Note. The two-year Note is one of the five intermediate term Treasury securities issued by the US government, which includes Notes with fix maturities of two, three, five, seven and ten years. It is auctioned on a monthly basis, typically on the last day of the month. If the last day of the month is a Saturday, Sunday, or federal holiday, the securities are issued on the first business day of the following month ("General Auction Timing", www.TreasuryDirect.Gov). The two-year Note yields fluctuate over time, perhaps more significantly than any other intermediate term Treasuries given its shortest maturity. While the ten-year Note is the most popular Note and followed closely by many investors, the two-year Note is also very important and perhaps deserves more attention than it receives currently. With a much shorter maturity compared to the ten-year Note (but not too much longer than the deeply discounted one-year Bill) and offering coupons, the two-year Note offers a lot of flexibility and value especially in an uncertain market.

We find that although anecdotally the two-year Note yields seem to have a clear pattern of seasonality, with some months having higher yields than the others, statistically these seasonal patterns do not hold in terms of the nominal yields. However, if we look at the rank of monthly yields in its calendar year, we find strong statistical evidence to support a half-year variation of high and low yields, where months from March until August have higher yield than months from September until February. The rest of the paper is organized in the following ways. Section 2 presents the literature review. Section 3 explains the data and methodology. Section 4 reports and discusses the test results and their implications. Section 5 concludes the findings.

LITERATURE REVIEW

Persistent asset pricing anomalies have important implications for market efficiency as discovered anomalies typically disappear quickly through arbitrage in efficient markets. Finance literature has over the years documented a variety of seasonal anomalies across different markets and asset classes. The most well-known anomalies include the turn-of-the-year effect, the turn-of-the-month effect and the day-of-the-week effect. Explanations offered for such anomalies include macroeconomic seasonalities (Kramer, 1994), standardization of payments which results in concentrations of cash flows at certain times (Ogden, 1987, 1990), portfolio rebalancing (Ritter and Chopra, 1989), and behavioral perspective such as seasonal mood swings (Kamstra, Kramer and Levi, 2015).

The focus of the seasonality studies has been on the risky assets such as stocks and corporate bonds. Only a few have studied risk free assets such as the U.S. Treasury securities, and their findings have been mostly inconclusive with some supporting seasonalities while others not. In addition, all of these studies have been on the returns rather than the yields of the Treasuries. For example, Athanassakos and Tian (1998) investigate the seasonality in quarterly returns in the Canadian government bond market and find that government bond returns in the last quarter of the year are significantly higher than any other quarter of the year. Chen and Chan (1997) examine the January effect in returns of a number of asset classes including stocks, U.S. government bonds and Treasury-bills with additional tests for auto-correlated and heteroskedastic residuals in the data series, on top of the standard dummy regression analysis. They find that the January effect is robust in the returns of risky assets such as small stocks and low grade bonds, but does not exit in the government bonds and T-bills. Kamstra, Kramer and Levi (2015) examine the U.S. Treasury securities returns and find an annual cycle with variation in mean monthly returns of over 80 basis points from peak to trough. Our earlier study Liu, Lin and Varshney (2018) is probably the first academic research paper that looks at the seasonalities in the Treasury yields. We studied the ten-year Treasury Note yields and find that most anecdotally observed seasonalities are not statistically significant.

The focus of this paper is on the seasonality in the two-year Treasury Note yields. The two-year Note has the shortest fixed maturity among all Treasury Notes, thus offers the most flexibility and extra value that comes with it, especially when the market is uncertain. Given its shorter terms, the two-year Note yields would also fluctuate over time more significantly than any other intermediate term Treasury Notes. The research on the two-year Treasury Note yields is almost nonexistent, not even much from the practitioners. We intend to fill in this gap in the literature.

DATA AND METHODOLOGY

Our monthly two-year Treasury Note yields data is obtained from FRED (Federal Research Economic Database) Federal Reserve Bank of St. Louis. The earliest available data is from 1976.06 and the latest is on 2018.06. The total time series observations consist of 505 months (42 years and 1 month). Our study of the yields seasonality follows the standard dummy variable regression analysis methods used in the 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 seasonality in monthly yields and month-over-month changes of yields using, respectively

$$Y_t = \alpha_0 + \sum_{j\neq 5}^{12} \beta_j M_t^j + \varepsilon_t \quad (1)$$

$$\Delta Y_t = \alpha_0 + \sum_{j\neq 5}^{12} \beta_j M_t^j + \varepsilon_t \quad (2)$$

where Y_t is the monthly two-year Note yields and ΔY_t represents the month-over-month changes of yields $\Delta Y_t = Y_t - Y_{t-1}$. 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 May. Many practitioners have found that May has on average the largest ten-year Treasury Note yields. Since we do not find past seasonality research on the two-year Treasury Note yields, we use May as the reference month in our study. The choice of this reference month should not affect the seasonality results. β_j measures the average difference in yields between the month j and May in Equation (1); and the average difference of the month-over-month changes of yields between those of month j and May in Equation (2). α_0 measures the average yield in May in Equation (1); and average month-over-month changes of yields in May in Equation (2). A statistically significant and negative β_j indicates that the associated month j has lower yields (month-over-month changes of yields) than May, and vice versa.

The null hypothesis is that yields and month-over-month changes of yields do not vary across different months of the year, i.e., all βs are simultaneously equal to 0, or $\beta_1 = \beta_2 = \cdots = \beta_j = 0$. If the null hypothesis is rejected, then there is a seasonality because some month(s) always have higher (or lower) yield or changes of yields than those in May. F-test is used to test the joint null hypothesis and the overall fitness of the regression. To make conclusions more reliable, we also check the serial correlation and heteroscedasticity of the regression residuals using the Durbin-Watson d statistics and the White's χ^2 test. 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. Given that we do not know the probability distribution of the two-year Note yields; we also conduct a non-parametric test. Kruskal-Wallis test is used because it is similar to the F-test regarding the joint null hypothesis but compares medians instead of means, and does not make specific assumptions regarding the probability distribution of the variables.

RESULTS

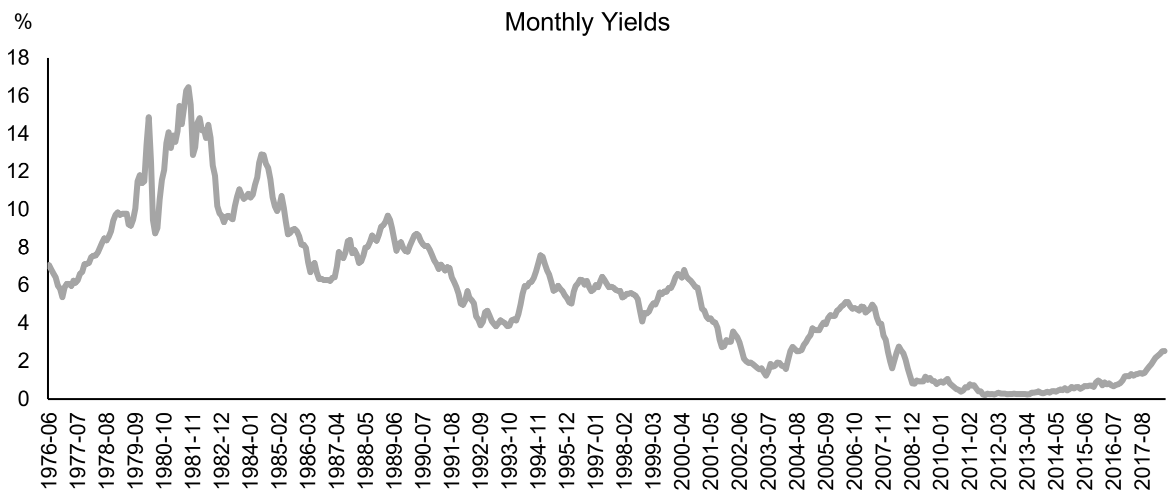
Anecdotal Observations

Table 1 reports the key summary statistics of the nominal monthly two-year Treasury Note yields from 1976.06 to 2018.06. The most noticeable number is the wide range of yields over the period: the minimum is only 0.21% while the maximum is 16.46%. Figure 1 plots the monthly two-year yields over the sample period and confirms that yields have been coming down substantially since the 1980s.

Table 1: Summary Statistics of Two-Year Treasury Note Yields (1976.06-2018.06)

	Yield (%)
Mean	5.39
Median	5.38
Standard Deviation	3.78
Kurtosis	-0.27
Skewness	0.52
Range	16.25
Minimum	0.21
Maximum	16.46
Count	505

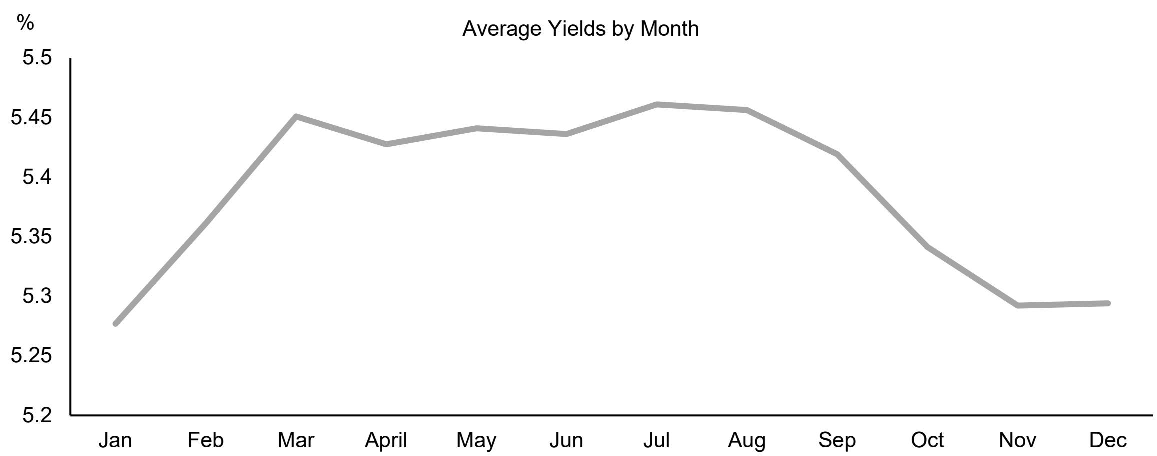
Figure 1: Two-Year Treasury Note Yields (1976.06-2018.06)



This figure shows the monthly yields of the two-year Treasury Note since it first started in 1976.06. until 2018.06.

Figure 2 plots the average two-year yields by months for the period under study. The yields exhibit a noticeable pattern of being higher from March until August before heading down for the rest of the year.

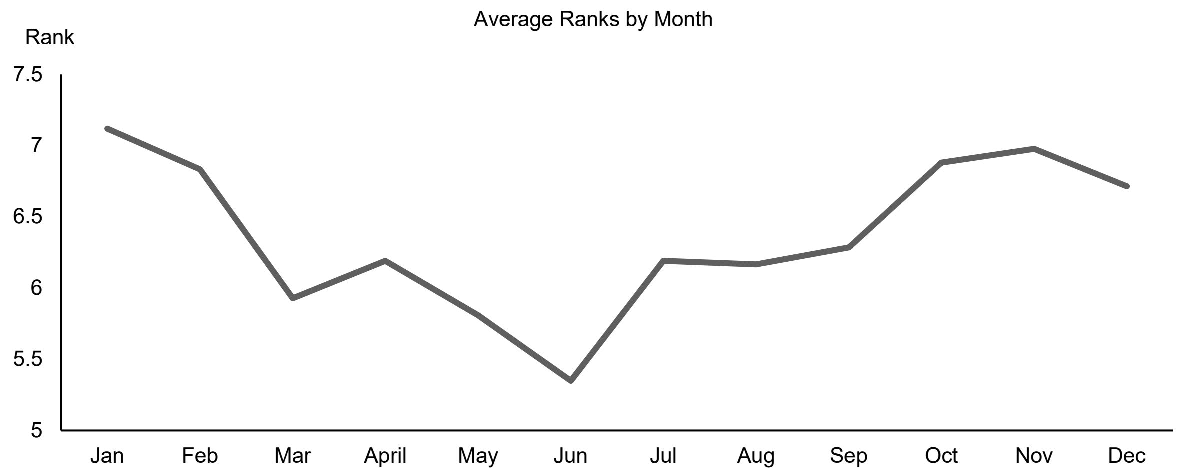
Figure 2: Average Two-Year Treasury Note Yields by Month (1976.06 - 2018.06)



This figure shows the average two-year Treasury Note yields by month for the period from 1976.06. to 2018.06.

Since yields have dropped a lot over the years which may have distorted the average yields shown in Figure 2, we also take a look at the average ranks of monthly yields in a year. The ranks will be independent of the levels of yields at different periods of time. Figure 3 plots the average ranks of yields by months over the period under study, with the highest ranks noted as 1 and lowest as 12. We can see that on average June has the highest yields (with the lowest rank) of the year. In addition, the months from March to August have higher yields (lower ranks) than other months of the year, which is consistent with the findings of Figure 2.

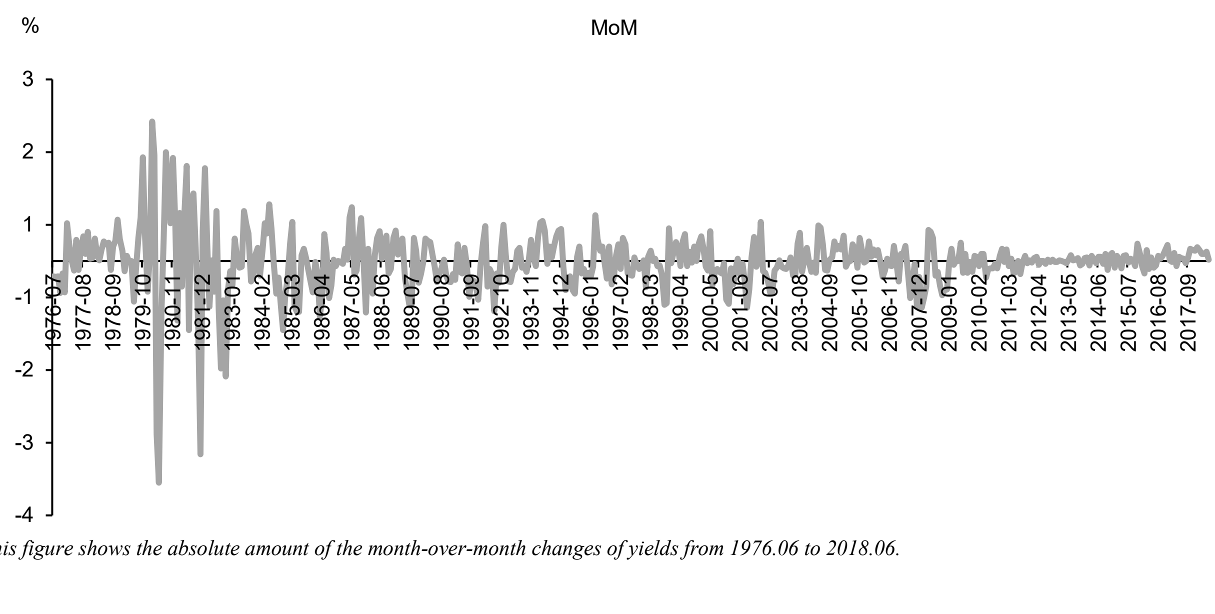
Figure 3: Average Ranks of Two-Year Treasury Note Yields by Month (Highest As 1 and Lowest As 12)



This figure shows the average ranks of the monthly yields in the calendar year for the period of study from 1976.06. to 2018.06.

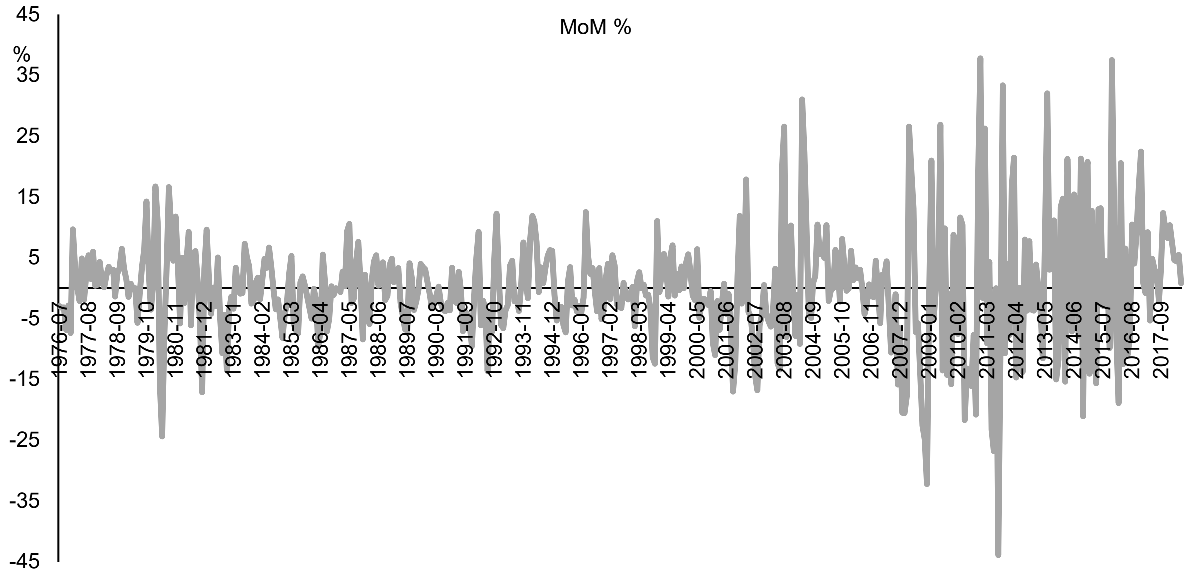
Figures 4 and 5 plot the month-over-month changes of yields over the period under study, both in absolute values and in percentages respectively. We see that although the month-over-month changes of yields vary in larger absolute values in the 1980s, they vary a lot more in terms of the percentage changes in more recent years especially after 2008. This means that although the yields in recent years are at lower levels compared to those in the past, their variations in percentage terms nevertheless are much bigger. In addition, plots in both figures show mean reversion, that is, the differences in yields tend to fluctuate but towards a central value. This indicates that the monthly yields probably have a unit root and are difference stationary. The Augmented Dickey-Fuller tests (results not reported here) confirm that yields are indeed difference stationary.

Figure 4: Month-Over-Month Changes of Two-Year Treasury Note Yields (Absolute Values)



This figure shows the absolute amount of the month-over-month changes of yields from 1976.06 to 2018.06.

Figure 5: Month-Over-Month Changes of Two-Year Treasury Note Yields (Percentages)



This figure shows the percentage amount of the month-over-month changes of yields from 1976.06 to 2018.06.

Statistical Analysis

The anecdotal seasonal variations observed in the previous section are tested here using more rigorous statistical methods. Tables 3 and 4 report the results of seasonality tests conducted using monthly yields and the month-over-month changes of yields in the sample period. Table 5 reports the results of tests on the half year variation pattern observed in Figures 2 and 3, where the months from March until August have higher yields than the rest months of the year. Table 3 shows that months with negative β coefficients in general belong to the half of the year with lower yields, which is from September to February. April and June are also found to have negative betas or smaller yields than May but their difference with May is much smaller than the other months.

The differences in yields compared to May from the months in the lower yields half of the year are at least 2 basis points (September) and can be as large as over 16 basis points (January). The differences for April and June are only 1 and 0.5 basis points respectively. However, none of the above differences are statistically significant. In addition, R-squared value is very low and the Adjusted R-squared value is negative, which indicate a poor model overall. The null hypothesis of no monthly differences in yields cannot be rejected by the F-test with p-value almost equal to 1. In other words, there is no seasonalities in the nominal monthly yields in the period under study. While the Durbin-Watson d statistics finds positive first order serial correlation in yields, the White's χ^2 test finds no heteroscedasticity. The nonparametric Kruskal-Wallis test also shows that there is no seasonality in the monthly yields. Therefore, the findings from both the parametric and nonparametric tests do not support the existence of a statistically significant seasonality in monthly yields in the period under study.

Table 4 reports the seasonality test results on the month-over-month changes of yields. We see that other than February and March, the month-over-month changes of yields in all other months are smaller than those in May. This indicates that while May has on average higher yields, it also has more changes of yields from the previous month. Durbin-Watson statistic indicates that there is still some but much weaker serial correlation among the month-over-month changes of yields.

Table 3: Seasonality in Monthly Two-Year Treasury Note Yields

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	5.4410	0.5896	9.2289	0.0000
Jan	-0.1640	0.8338	-0.1968	0.8441
Feb	-0.0798	0.8338	-0.0957	0.9238
Mar	0.0098	0.8338	0.0117	0.9907
Apr	-0.0136	0.8338	-0.0163	0.9870
Jun	-0.0049	0.8289	-0.0059	0.9953
Jul	0.0200	0.8338	0.0240	0.9809
Aug	0.0152	0.8338	0.0183	0.9854
Sep	-0.0219	0.8338	-0.0263	0.9791
Oct	-0.0998	0.8338	-0.1197	0.9048
Nov	-0.1488	0.8338	-0.1785	0.8584
Dec	-0.1469	0.8338	-0.1762	0.8602
R-Squared			0.0003	
Adjusted R-Squared			-0.0220	
F-Statistic (P-Value)			0.0143	1
White's Chi-Square (P-Value)			0.5081	1
Durbin-Watson Stat			0.0115	
Kruskal-Wallis (P-Value)			0.1845	1

Regression results are based on Equation (1) $Y_t = \alpha_0 + \sum_{j\neq 5}^{12} \beta_j M_t^j + \varepsilon_t$. M_t^j *is a dummy variable that varies from 1 to 12 except 5.* β_j *is reported as "Coefficient". *, **, and *** indicate significance at the 10, 5 and 1 percent levels respectively. None of the* β_j *coefficients are significant at 10% level of significance.*

Again, none of the reported results are statistically significant. Therefore, there is no evidence to support a statistically significant seasonality in the month-over-month changes of yields. Since we have observed a seasonal pattern of higher yields in months from March to August in the previous section, we also test if there is a half year pattern of high versus low yields. Table 5 reports the results. We use similar regression methods employed earlier. We find that while the half-year high versus low yields pattern seems pretty convincing in Figures 2 and 3, results presented in Table 5 confirm that it does not pass the statistical significance test.

Table 4: Seasonality in the Month-Over-Month Changes of Yields

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	0.0136	0.0633	0.2146	0.8302
Jan	-0.0307	0.0895	-0.3434	0.7315
Feb	0.0707	0.0895	0.7905	0.4296
Mar	0.0760	0.0895	0.8491	0.3962
Apr	-0.0369	0.0895	-0.4126	0.6801
Jun	-0.0571	0.0895	-0.6388	0.5232
Jul	-0.0579	0.0895	-0.6468	0.5181
Aug	-0.0183	0.0895	-0.2050	0.8377
Sep	-0.0507	0.0895	-0.5670	0.5710
Oct	-0.0914	0.0895	-1.0221	0.3072
Nov	-0.0626	0.0895	-0.7000	0.4842
Dec	-0.0117	0.0895	-0.1304	0.8963
R-squared			0.0145	
Adjusted R-squared			-0.0076	
F-statistic (p-value)			0.6568	0.7795
White's Chi-square (p-value)			8.7753	0.6426
Durbin-Watson stat			1.2858	
Kruskal-Wallis (p-value)			0.4924	1

*Regression results are based on Equation (2) $\Delta Y_t = \alpha_0 + \sum_{j\neq5}^{12} \beta_j M_t^j + \varepsilon_t$, where ΔY_t is the month-over-month change of yields $\Delta Y_t = Y_t - Y_{t-1}$. M_t^j is a dummy variable with j varies from 1 to 12 except 5. β_j is reported as "Coefficient". *, **, and *** indicate significance at the 10, 5 and 1 percent levels respectively. None of the β_j coefficients are significant at 10% level of significance.*

Since yields have dropped significantly during the period under study, we also test the ranks of monthly yields in a year that removes the effect of the differences in the levels of yields. Tables 6 and 7 report the results on the monthly seasonality and the half-year seasonality of the ranks respectively. As we can see that the results using ranks are much stronger compared to those using nominal yields. In Table 6, although the *p*-value of the *F*-test statistics is much closer to 0 than any previously reported results, it is still not statistically significant at the 10% level. However, January is found to have lower yields (higher ranks) than May at the 10% significance level.

The most interesting results are in Table 7, which tests the half-year high versus low yields seasonality using the ranks of the monthly yields in its calendar year. Once we compare yields using only relative performances in a year instead of their absolute values, we find a strong statistical significance to support the high versus low half-year yields pattern. Table 7 shows that the parametric *F*-test statistics is significant at the 1% level. The months from the lower yields half of the year are found to have ranks almost double those of the months from the higher yields half of the year, and significantly so at the 5% level. The only issue is that the White's χ^2 test finds heteroscedasticity in the regression residuals that cast some doubts on the normality assumptions of the parametric regression. However, we can reasonably assume that it is not affecting much of the seasonality findings, because the non-parametric Kruskal-Wallis test statistic is also significant at the 5% level.

Table 5: Seasonality in Half-Year High Versus Low Yields

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	5.4453	0.2378	22.8970	0.0000
LOW	-0.1146	0.3367	-0.3403	0.7337
R-squared			0.0002	
Adjusted R-squared			-0.0018	
F-statistic (p-value)			0.1158	0.7337
White's Chi-square (p-value)			0.0112	0.9157
Durbin-Watson stat			0.0116	
Kruskal-Wallis (p-value)			0.0003	0.9860

*Results are based on a regression similar to Equation (1) as $Y_t = \alpha_0 + \beta_{low} M_t + \varepsilon_t$. M_t is a dummy variable that is equal to 1 for the low yields months (September to February) and 0 otherwise (March to August). β_{low} is reported as "Coefficient". *, **, and *** indicate significance at the 10, 5 and 1 percent levels respectively.*

Table 6: Seasonality in Ranks of Monthly Yields

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	5.8095	0.5321	10.9180	0.0000
Jan	1.3095	0.7525	1.7402	0.0824*
Feb	1.0238	0.7525	1.3605	0.1743
Mar	0.1190	0.7525	0.1582	0.8744
Apr	0.3810	0.7525	0.5062	0.6129
Jun	-0.4607	0.7481	-0.6158	0.5383
Jul	0.3810	0.7525	0.5062	0.6129
Aug	0.3571	0.7525	0.4746	0.6353
Sep	0.4762	0.7525	0.6328	0.5272
Oct	1.0714	0.7525	1.4238	0.1551
Nov	1.1667	0.7525	1.5504	0.1217
Dec	0.9048	0.7525	1.2023	0.2298
R-squared			0.0225	
Adjusted R-squared			0.0007	
F-statistic (p-value)			1.0314	0.4170
White's Chi-square (p-value)			83.5458	0.0000***
Durbin-Watson stat			0.8116	
Kruskal-Wallis (p-value)			10.7418	0.4651

*Results are based on a regression similar to Equation (1) as $Rank_t = \alpha_0 + \beta M_t^k + \varepsilon_t$, where $Rank_t$ measures the rank of the monthly yield in its calendar year, highest as 1 and lowest as 12. M_t^k is a dummy variable with k varies from 1 to 12 except 5. β is reported as "Coefficient". *, **, and *** indicate significance at the 10, 5 and 1 percent levels respectively.*

Table 7: Seasonality in Half-Year High Versus Low Ranks of Monthly Yields

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	5.9368	0.2154	27.5648	0.0000
LOW	0.8648	0.3049	2.8365	0.0047**
R-squared			0.0157	
Adjusted R-squared			0.0138	
F-statistic (p-value)			8.0460	0.0047**
White's Chi-square (p-value)			30.5551	0.0000***
Durbin-Watson stat			0.8210	
Kruskal-Wallis (p-value)			4.5880	0.0322**

*Results are based on a regression similar to Equation (1) as $\overline{Rank_t} = \alpha_0 + \beta M_t + \varepsilon_t$, where $\overline{Rank_t}$ measures the average rank of yields in the high versus low half-year months, i.e. average yield of March to August and average yield of September to February (highest yields rank 1 and lowest rank 12). M_t is a dummy variable that is equal to 1 for the low yields months (September to February) and 0 otherwise (March to August). β is reported as "Coefficient". *, **, and *** indicate significance at the 10, 5 and 1 percent levels respectively.*

CONCLUSION

In this paper, we study the seasonality in the two-year Treasury Note yields. Our goal is to find out if there is any seasonality in the yields and what does it look like. Using the dummy variable regression method, we test a number of seasonal patterns in yields over the longest available period since the two-year Note's inception in 1976.06 until most recently in 2018.06. We find that the statistical significance of the seasonality depends on how we measure yields in the seasonality test and whether the focus is on months or in other patterns. We find that most anecdotally observed seasonalities do not pass the rigorous statistical tests for significance. This is perhaps due to the substantial drops of yields since the 1980s, which affect the mean of the nominal yields and make it no longer suitable for the seasonality tests. All our tests using nominal yields do not find any statistically significant seasonal variations. However, when we switch to the ranks of monthly nominal yields in a year, which is a different measure of the relative performance of monthly yields that removes the effect of differences in yields levels, we find statistically significant evidence that yields are higher in the half year from March to August than the other half year from September to February.

We note two areas that are beyond the scope of this paper but are worth further study. First, we need better methods to test seasonality. The standard dummy variable regression analysis method commonly used in the seasonality literature ignores the factors other than the monthly dummies as well as any interactions among other factors. Second, we need to better understand the contributing factors to the Treasury yields seasonalities. The monthly dummies may review where the seasonalities would show up but certainly do not explain why or how. We would like to have a theoretical model with sound variables that can be tested in order to better understand what contribute to the seasonality in the Treasury Note yields.

REFERENCE

Athanassakos, G. and Y.S. Tian (1998) "Seasonality in Canadian Treasury Bond Returns: An Institutional Explanation," *Review of Financial Economics*, 7(1), p. 65-86

Chang, E.C. and J.M. Pinegar (1986) "Return Seasonality and Tax-loss Selling the Market for Long-term Government and Corporate Bonds," *Journal of Financial Economics*, 17(2), p. 391-415

Chen, C.R. and A. Chan (1997) "From T-bills to Stocks: Seasonal anomalies revisited," *Journal of Business Finance and Accounting*, 24(5), p. 573-592

Clayton, R., J. Delozier and M.C. Ehrhardt (1989) "A Note on January Returns in the U.S. Government Bond Market: The Term Effect," *Journal of Financial Services Research*, 2, p. 307-318

Flannery, M.J. and A.A. Protopapadakis (1988) "From T-Bills to Common Stocks: Investigating the Generality of Intra-Week Return Seasonality," *Journal of Finance*, 43(2), p. 431-450

Kamstra, M.J., L.A. Kramer and M.D. Levi (2015) "Seasonal Variation in Treasury Returns," *Critical Finance Review*, 4, p. 45-115

Kramer, C. (1994) "Macroeconomic Seasonality and the January Effect," *Journal of Finance*, 49(5), p. 1883-1891

Krehbiel, T. (1993) "A Note on the Disappearance of Day-of-the-Week Seasonals in the Daily Price Changes of Treasury Bond Futures," *Applied Financial Economics*, 3, p. 73-78

Liu, L., H. Lin and S. Varshney (2018) "Seasonality in the 10-year Treasury Yield," *International Research Journal of Applied Finance*, 19, p. 291-302

Ogden, J.P. (1987) "The End of the Month as a Preferred Habitat: A Test of Operational Efficiency in the Money Market," *Journal of Financial and Quantitative Analysis*, 22(3), p. 329-344

Ogden, J.P. (1990) "Turn-of-Month Evaluations of Liquid Profits and Stock Returns: A Common Explanation for the Monthly and January Effects," *Journal of Finance*, 45(4), p. 1259-1272

Ritter, J.R., and N. Chopra (1989) "Portfolio Rebalancing and the Turn-of-the-Year Effect," Journal of Finance, 44(1), p. 149-166

Schneeweis, T. and J.R. Woolridge (1979) "Capital Market Seasonality: The Case of Bond Returns," *Journal of Financial and Quantitative Analysis*, 14(5), p. 939-958

Sharp, K.P. (1988) "Tests of U.S. Short and Long Interest Rate Seasonality," *Review of Economics and Statistics*, 70(1), p. 177-182

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BIOGRAPHY

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