

MONTHLY SEASONALITY IN U.S. LONG TERM CORPORATE BONDS

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ABSTRACT

We explore monthly seasonality in high grade long term corporate bonds from January 1926 to December 2008. We test three types of month effects. In addition, we analyze the data based on Republican and Democratic presidencies. The mean of monthly total returns for the entire data set (0.50%) is significantly greater than zero. The mean return of January is significantly higher than the mean of the other eleven months stacked together; the mean of March is significantly lower. We find significantly higher or lower volatilities for some months compared to the other months. January experienced the highest mean monthly return, followed by a dip in February and March, and then an upward trend until January. The mean of monthly returns during the Republican presidencies (0.66%) is significantly higher than during the Democratic presidencies (0.33%). Though not fully efficient the U.S. corporate bond market exhibits a high degree of efficiency.

INTRODUCTION

Since the time stock exchanges were first established, traders and investors have exhaustively looked for patterns in securities prices that they could exploit to realize superior returns. However, as early as 1900, Bachelier characterized security prices as being efficient. Over thirty years later came the landmark work by Cowles (1933) in which he documented the inability of forty-five professional agencies to forecast stock prices. The conclusion was that stock prices are random – in general they do not exhibit patterns. A large array of research – bulk of them devoted to analysis of the stock markets has looked at the issue of efficiency of financial markets. The evidence with regard to efficiency is mixed.

The corporate bond market is a very sizable market, and trading in bonds, especially treasury bonds, is very brisk. Bonds are appropriate for investors seeking income, as well as for investors looking for broad diversification. In contrast to research with regard to the stock markets, a small number of researchers have looked at the issue of efficiency of the bond markets. An aspect that has possibly not been rigorously looked at is whether the corporate bond market exhibits monthly seasonality. This research seeks to fill that void. Our findings indicate the presence of January effect: the mean return of January is significantly higher than the mean of the other eleven months stacked together. We also find a March effect: the mean of March is significantly lower than the mean of the other eleven months stacked together. We also find significantly higher or lower volatilities for some months compared to the other months.

In subsequent sections we review previous research on the efficiency of the bond markets, outline the research methodology of this study, analyze results, and round off with summary and conclusion.

LITERATURE SURVEY

In contrast to the extensive research on equity returns, few investigations examine seasonality in the fixed income market. Schneeweis and Woolridge (1979) find evidence of a January effect in various municipal, corporate, public utility, and government bond series using data from 1952-1977. Smirlock (1985) finds a January effect for low-grade corporate bonds, but not for high-grade corporate or U.S. Government bonds using data from 1953-1981. Chang and Pinegar (1986) also find a January effect for lower quality bonds. Work by Wilson and Jones (1990) finds a January effect for corporate bonds and commercial paper. Jordan and Jordan (1991) examine seasonality in daily corporate bond returns using the Dow Jones Composite Bond Average and compare it to seasonality of equity using daily S&P 500 stock returns. For the period 1963-1986, corporate bond returns exhibit January, turn of the year, and week of the month effects, but no significant day of the week effects or turn of the month effects. And finally, Cooper and Shulman (1994) find significant year-end effect in junk bond prices using data from 1980-1991.

We carry out a rigorous analysis of existence or non-existence of seasonality in the U.S. corporate bond market by analyzing data for a much longer period (1926-2008) and using a different methodology compared to the previous studies. This will further increase our understanding of how efficient the U.S. corporate bond market has been over a long period. It will also help investors to time their investments and corporate bond issuers to time bond issues. In addition we examine whether there is difference in returns of corporate bonds during Republican versus Democratic presidential periods.

We hypothesize that the ideology of smaller government embraced by Republicans will cause lower demand for funds during Republican presidential months and so lower Treasury borrowing, which will cause yields to go down and total returns to go up because of higher monthly capital gains. This should create a situation in which the total returns during Republican periods should be higher than Democratic periods, which is what we find.

RESEARCH METHODOLOGY

The goal of this research was to find out, for the length of period of study, if there was a month effect in U.S. long term government bonds total monthly returns, and if so, was it more pronounced during certain periods. We studied the month effect in three different ways. .

Was the mean of monthly total returns of long term government bonds different from zero? We tested this by subjecting the mean of monthly returns for a given month i to the following hypothesis test: $H_0: \mu_i = 0$ vs. $H_a: \mu_i \neq 0$.

Was the mean of monthly total returns of long term government bonds of a given month different from the mean of the other months stacked together? We performed this by conducting the following hypothesis test for a given month i : $H_0: \mu_i = \mu_j$ vs. $H_a: \mu_i \neq \mu_j$, where j represents the remaining 11 months other than i .

Was the variance of the monthly total returns of long term government bonds for a given month different from the variance for the other months stacked together? We tested this by conducting the following hypothesis test for a given month i : $H_0: \sigma_i^2 = \sigma_j^2$ vs. $H_a: \sigma_i^2 \neq \sigma_j^2$, where j

represents the remaining 11 months other than i . We used the standard F-test for testing this hypothesis. In addition to the t-tests and F-tests, we used Kruskal-Wallis nonparametric tests for differences in population medians. We also use the Mood's Median test which is more robust against outliers.

Many studies have used the dummy variable methodology to detect market seasonality. Chien, Lee and Wang (2002) provide statistical analysis and empirical evidence that the methodology may lead to misleading results. We avoided this problem by following the methodology used in Hamid and Dhakar (2005) using which they analyze seasonality in the Dow Jones Industrial Average.

ANALYSIS OF RESULTS

We analyze the entire U.S. long term corporate bond total monthly returns data set from January 1926 to December 2008. Table 1 summarizes the statistical output and results of the tests.

Table 1: Month effect in Long Term Corporate Bonds Total Returns (%): 1926 to 2008

	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	996	83	83	83	83	83	83	83	83	83	83	83	83
Mean	0.50	0.89	0.18	0.04	0.15	0.50	0.52	0.31	0.59	0.46	0.69	0.79	0.88
Median	0.40	0.59	0.34	0.25	0.18	0.20	0.44	0.28	0.38	0.40	0.50	0.62	0.67
Minimum	-8.9	-6.45	-6.65	-4.04	-7.69	-4.83	-4.68	-8.81	-4.45	-8.63	-8.9	-4.71	-5.8
Maximum	15.6	5.96	7.52	3.56	13.76	8.2	3.95	5.86	8.37	6.23	8.85	12.67	15.6
Range	24.5	12.41	14.17	7.6	21.45	13.03	8.63	14.67	12.82	14.86	17.75	17.38	21.4
Standard Deviation	2.10	1.85	2.02	1.49	2.41	2.10	1.44	2.16	2.06	2.01	2.44	2.40	2.46
Sample Variance	0.04	0.03	0.04	0.02	0.06	0.04	0.02	0.05	0.04	0.04	0.06	0.06	0.06
p-value (m=0)	0.00	0.00	0.41	0.83	0.57	0.03	0.00	0.20	0.01	0.04	0.01	0.00	0.00
p-value (t test)		0.05	0.14	0.01	0.17	1.00	0.88	0.40	0.68	0.84	0.45	0.24	0.14
p-value (F test)		0.06	0.31	0.00	0.04	0.52	0.00	0.37	0.41	0.30	0.03	0.05	0.02
Mean % Change	Pos	Pos				Pos	Pos		Pos	Pos	Pos	Pos	Pos
Month Effect (Mean)		Higher		Lower									
Month Effect (Var)				Lower	Higher		Lower				Higher	Higher	Higher

Notes:

1. "Pos" implies that the mean of monthly returns was significantly greater than zero.
2. "Higher" implies that the mean of monthly returns was significantly greater than the rest of the months. "Lower" implies that the mean of monthly returns was significantly smaller than the rest of the months.

The mean of monthly returns for the entire data set (0.50%), is significantly greater than zero ($p = 0.00$). Except for February, March, April and July the mean of monthly total returns of the remaining eight months were significantly greater than zero. January experienced the highest mean monthly return (0.89%) followed by December (0.88%) and November (0.79%). March had the lowest mean (0.04%), followed by April (0.15%) and February (0.18%). January experienced the highest mean monthly return, followed by a dip in February and March. There is an upward trend from April to June, followed by fall in July, and rapid increase from September to January. In more simplistic terms, after a falling trend from January to March, we see an upward rising trend from March to January.

We see a January effect: the mean of monthly returns of January is significantly greater than the mean of the returns of the other eleven months stacked together. We also find a March effect: The mean of monthly returns of March is significantly lower than the mean of the returns of the other eleven months. This phenomenon can be explained by two factors. First, individual investors may create seasonal demand for non-investment grade bonds, and second, there may be a shift in demand for high-rated bonds at year end that is related to institutional “window dressing”. Previous researchers also found January effect for corporate bonds. But we also find a March effect.

In terms of the month-effect, the total returns of none of the months were significantly different from the total return of the other months. The total return for January was greater than the other months, and April was lower than the other months both at 10% level of significance. The difference in monthly changes in medians of total returns long term corporate bond was significant based on two non-parametric tests (Kruskal-Wallis test H statistic = 21.40 with p value = 0.03). Mood’s Median test yields slightly less significant result with a (Chi-square = 19.23 with p value = 0.059). In regard to volatility, only April, October, November and December exhibited higher variance compared to the other months, while March and June exhibited lower variance compared to the other months.

Returns in Real Terms

Table 2 below shows the monthly returns in real terms for the entire study period and the three sub-periods. It shows the mean long term corporate bond return, mean CPI, and their difference. We see a positive mean monthly real return of 0.25% for the entire study period. The first and third sub-periods have positive mean monthly real returns (0.46% and 0.35% respectively). However, the second sub-period has a negative mean monthly real return of 0.04%. This period coinciding with the Breton Woods fixed exchange rate era was the most stable period in terms of asset prices, commodity prices, interest rates, and exchange rates. Since in this period a risk was lower real return also was lower.

Table 2: Mean Real Monthly returns for Long Term Corporate Bonds

Period	Mean LTCB	Mean CPI	Difference
1926-2008	0.50	0.25	0.25
1926-1945	0.47	0.01	0.46
1946-1972	0.22	0.26	-0.04
1973-2008	0.73	0.38	0.35

Month Effect: Republican and Democratic Presidential Periods

Given the important impact party philosophies have on the economy, we explore the three types of month effects in corporate bonds total monthly returns during the Republican and Democratic presidencies.

Republican Presidencies

Table 3 shows the statistical output for monthly total returns of corporate bonds during Republican presidencies over the period 1926-2008. The mean (0.65%) over the 517 Republican months was significantly greater than zero. The means of five of the months were significantly greater than zero (January, August, October, November and December)

In terms of month effect, the means of total returns for March was lower than the mean of the other eleven months; similar is case with the mean of April. Kruskal-Wallis test found significant difference in the medians of the various months at 6% level (Kruskal-Wallis H-statistic = 19.19 with p value = 0.06). But Mood's Median test shows significant difference in the medians (Chi-square of 21.63 with p value = 0.03). October and December had the highest average rank based on median followed by November and January. April had the lowest average rank followed by March and July. In regard to month effect with respect to variance, June and March experienced lower variance than the other months.

Table 3: Month effects in Long Term Corporate Bonds Total Returns (%):
Republican Presidencies

	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	517	43	44	43	43	43	43	43	43	43	43	43	43
Mean	0.66	1.06	0.49	0.03	-0.18	0.43	0.39	0.17	1.03	0.63	1.30	1.24	1.30
Median	0.57	0.99	0.68	0.24	0.14	-0.11	0.43	0.30	0.83	0.76	0.88	0.78	1.04
Minimum	-8.81	-3.03	-5.23	-4.04	-7.69	-4.83	-4.68	-8.81	-3.45	-8.63	-4.5	-4.71	-5.8
Maximum	15.6	5.96	7.52	3.56	5.48	8.2	3.95	5.86	8.37	6.23	8.85	12.67	15.6
Range	24.41	8.99	12.75	7.6	13.17	13.03	8.63	14.67	11.82	14.86	13.35	17.38	21.4
Standard Deviation	2.48	1.98	2.20	1.76	2.49	2.40	1.63	2.68	2.42	2.54	2.72	3.05	3.15
Sample Variance	0.06	0.04	0.05	0.03	0.06	0.06	0.03	0.07	0.06	0.06	0.07	0.09	0.10
p-value (m=0)	0.00	0.00	0.15	0.92	0.64	0.24	0.13	0.68	0.01	0.11	0.00	0.01	0.01
p-value (t test)		0.18	0.60	0.02	0.03	0.53	0.29	0.22	0.29	0.94	0.11	0.19	0.16
p-value (F test)		0.03	0.15	0.00	0.50	0.40	0.00	0.25	0.43	0.44	0.21	0.03	0.02
Mean % Change	Pos	Pos							Pos		Pos	Pos	Pos
Month Effect (Mean)				Lower	Lower								
Month Effect (Var)		Lower		Lower			Lower					Higher	Higher

Notes:

1. "Pos" implies that the mean of monthly returns was significantly greater than zero.
2. "Higher" implies that the mean of monthly returns was significantly greater than the rest of the months. "Lower" implies that the mean of monthly returns was significantly smaller than the rest of the months

Democratic Presidencies

Table 4 shows the statistical output for monthly total returns of corporate bonds during Democratic presidencies over the period 1926-2008. The mean (0.33%) over the 479 Democratic months was significantly greater than zero. January, May, June and December produced monthly total returns which were significantly greater than zero.

Though the means of four months were significantly greater than zero, no month experienced mean returns significantly greater than the mean of the other eleven months. We got similar findings from Kruskal-Wallis and Mood's Median tests for difference in the medians of the monthly returns:

there is no significant difference in the medians of various months (Kruskal-Wallis H-statistic = 12.95 with p value = 0.3, Mood's Median test Chi Square = 8.28 with p value= 0.69). Though the result is not significant, October had the highest average rank based on median followed by January.

There was quite a bit of month-effect in terms of variance. March, June, September, November and December exhibited lower standard deviations; April and October exhibited higher standard deviations compared to the other months. The standard deviations were lower under Democratic presidents (ranging from 1.15% to 2.29%) than under Republican presidents (ranging from 1.63 % to 3.15 %).

Table 4: Month effect in Long Term Corporate Bonds Total Returns (%):
Democratic Presidencies

	All	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	479	40	39	40	40	40	40	40	40	40	40	40	40
Mean	0.33	0.71	-0.16	0.04	0.51	0.57	0.67	0.45	0.12	0.27	0.03	0.32	0.43
Median	0.34	0.49	0.21	0.26	0.22	0.26	0.48	0.25	0.34	0.21	0.40	0.35	0.54
Minimum	-8.90	-6.45	-6.65	-3.83	-1.60	-2.54	-2.23	-4.29	-4.45	-2.65	-8.90	-2.72	-2.33
Maximum	13.76	4.50	2.89	1.87	13.76	6.31	3.41	5.28	2.87	4.13	3.61	2.70	2.70
Range	22.66	10.95	9.54	5.70	15.36	8.85	5.64	9.57	7.32	6.78	12.51	5.42	5.03
Standard Deviation	1.58	1.69	1.75	1.15	2.29	1.76	1.21	1.43	1.47	1.22	1.92	1.28	1.26
Sample Variance	0.02	0.03	0.03	0.01	0.05	0.03	0.01	0.02	0.02	0.01	0.04	0.02	0.02
p-value (m=0)	0.00	0.01	0.57	0.81	0.17	0.05	0.00	0.05	0.62	0.17	0.92	0.13	0.04
p-value (t test)		0.14	0.07	0.12	0.61	0.37	0.08	0.57	0.34	0.76	0.30	0.94	0.63
p-value (F test)		0.28	0.19	0.01	0.00	0.18	0.02	0.22	0.28	0.02	0.05	0.04	0.03
Mean % Change	Pos	Pos				Pos	Pos						Pos
Month Effect (Mean)													
Month Effect (Var)				Lower	Higher		Lower			Lower	Higher	Lower	Lower

Notes:

1. "Pos" implies that the mean of monthly returns was significantly greater than zero.
2. "Higher" implies that the mean of monthly returns was significantly greater than the rest of the months. "Lower" implies that the mean of monthly returns was significantly smaller than the rest of the months

SUMMARY AND CONCLUSION

We analyzed the monthly seasonality of total monthly returns of long term corporate bonds for the period of January 1926 to December 2008. We explored three types of month effects: if the mean of monthly returns for the entire data set as well as for each month was different from zero, if the mean of monthly returns for a month was different from the mean of the other eleven months stacked together, and if variance of monthly returns for a month was different from the variances for the other eleven months. Further, we explored monthly seasonality based on Republican and Democratic presidencies.

The mean of monthly long term corporate bonds total returns for the entire data set (0.50%) was found to be significantly greater than zero. January experienced the highest mean monthly change, continued by a dip in February and March. There is an upward trend from April to June, followed by trough in July, and rapid increase from September to January. We also found the mean of monthly long term corporate bonds total returns during the Republican presidencies (0.66%) to

be significantly higher than during the Democratic presidencies (0.33%). The U.S. Corporate long term bond market though not fully efficient exhibits a high degree of efficiency.

Similar analysis of intermediate term government market, the T-Bill market, high-grade corporate bond market, and the junk bond market will greatly increase our understanding of the behavior of bond markets. We plan to follow up with that line of research.

REFERENCES

- Bachelier, L. 1900. *Theorie de la Speculation*. Paris, Gauthier-Villars, reprinted 1964, in P. Cootner, ed.: *The Random Character of Stock Market Prices* (pp. 17-78). (Massachusetts Institute of Technology, Cambridge, Massachusetts).
- Chang, E.C. and J.M. Pinegar (1986). Return Seasonality and Tax-Loss Selling in the Market for Long-Term Government and Corporate Bonds. *Journal of Financial Economics*, 17, 391-415.
- Chien, Chin-Chen, Cheng-few Lee and Andrew M.L. Wang (2002). A note on stock market seasonality: The impact of stock price volatility on the application of dummy variable regression model. *The Quarterly Review of Economics and Finance*, 42, 155-162.
- Cooper, R.A. and J.M. Shulman (1994). The Year-End Effect in Junk Bond Prices. *Financial Analysts Journal*, 50, 61-65.
- Cowles, A. (1933). Can Economic Forecasters Forecast? *Econometrica*, 7(3), 229 – 263.
- Hamid, S. A. and T.S. Dhakar (2005). “Behavior of DJIA: A Hundred Year Analysis of Means and Volatility. *Working Paper No. 2005-04*, The Center for Financial Studies, Southern New Hampshire University.
- Jordan, S.D. and B.D. Jordan (1991). Seasonality in Daily Bond Returns. *Journal of Financial and Quantitative Analysis*, 26, 269-285.
- R.G. Ibbotson Associates, Ibbotson Associates (2008). *Stocks, Bonds, Bills and Inflation 2008 Yearbook*. R.G. Ibbotson Associates.
- Schneeweis, T. and J.R. Woolridge (1979). Capital Market Seasonality: The Case of Bond Returns. *Journal of Financial and Quantitative Analysis*, 14, 939-958.
- Smirlock, M.(1985). Seasonality and Bond Market Returns. *Journal of Portfolio Management*, Spring, 11, 42-44.
- Wilson, J.W. and C.P. Jones (1990). Is There a January Effect in Corporate Bond and Paper Returns? *The Financial Review*, 25, 55-75.