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## Analysis of the 10-yearly US Government Bond yield

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### ABSTRACT

*In this Paper with the help of mathematical tools, I will analyse how the US Government Bond Yield (long-term interest rates) have fared over the span of 42 years from 1<sup>st</sup> September 1978 to 1<sup>st</sup> September 2019. The tools will help to forecast the future value of the interest rates but the values forecasted do not consider any external factors and is based on the previous values. I will also use time series tools like moving averages to find the general trend rate of the interest rate.*

**Keywords**— Government Bond, 10-Yearly Yield, Long Term Interest Rate

### 1. INTRODUCTION

The 10-year Treasury note is a loan you make to the U.S. federal government. It's the only one that matures in a decade. The U.S. Department of the Treasury auctions the 10-year Treasury note. The note is the most popular debt instrument in the world because it's backed by the guarantee of the U.S. economy. Compared to most other countries' sovereign debt, there is little risk of a U.S. debt default. The 10 Year Treasury Rate is the yield received for investing in a US government issued treasury security that has a maturity of 10 year. The 10-year treasury yield is included on the longer end of the yield curve. Many analysts will use the 10-year yield as the "risk free" rate when valuing the markets or an individual security. Historically, the 10 Year treasury rate reached 15.84% in 1981 as the Fed raised benchmark rates in an effort to contain inflation.

As yields on the 10-year Treasury notes rise, so do the interest rates on 10 to 15-year loans, such as the 15-year fixed-rate mortgages. Investors who buy bonds are looking for the best rate with the lowest return. If the rate on the Treasury note drops, then the rates on other, less safe investments can also fall and remain competitive. The 10-year Treasury note yield is also the benchmark that guides other interest rates. The major exception is adjustable-rate mortgages, which follow the federal funds rate. The Federal Reserve watches the 10-year Treasury yield before making its decision to change the federal funds rate. The 10-year Treasury note, like all other Treasury's, is sold at an auction. The yield indicates the confidence that investors have in economic growth.

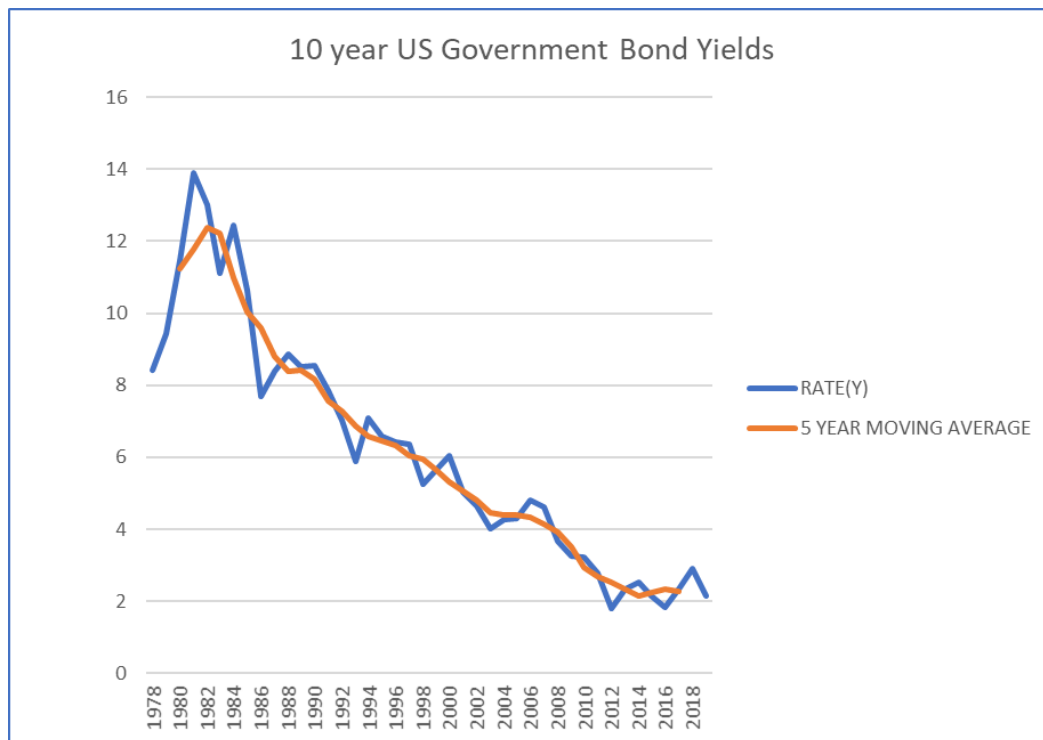
### 2. DATA

No. of Year	Year	Rate (Y) (Yearly Average)	5 Yearly Moving Average	X(No.of Year-22)	Y^(Trendline)
1	1978	8.41		-21	11.33853282
2	1979	9.4425		-20	11.08554646
3	1980	11.46	11.245	-19	10.8325601
4	1981	13.91083333	11.784	-18	10.57957373
5	1982	13.00166667	12.38316667	-17	10.32658737
6	1983	11.105	12.21583333	-16	10.07360101
7	1984	12.43833333	10.97016667	-15	9.820614652
8	1985	10.62333333	10.04666667	-14	9.567628291
9	1986	7.6825	9.594833333	-13	9.31464193
10	1987	8.384166667	8.806833333	-12	9.06165557
11	1988	8.845833333	8.392166667	-11	8.808669209
12	1989	8.498333333	8.427333333	-10	8.555682848
13	1990	8.55	8.1525	-9	8.302696487
14	1991	7.858333333	7.558	-8	8.049710126
15	1992	7.01	7.274333333	-7	7.796723765
16	1993	5.873333333	6.880333333	-6	7.543737404
17	1994	7.08	6.596333333	-5	7.290751043
18	1995	6.58	6.464833333	-4	7.037764682

19	1996	6.438333333	6.337984848	-3	6.784778322	
20	1997	6.3525	6.049318182	-2	6.531791961	
21	1998	5.239090909	5.939151515	-1	6.2788056	
22	1999	5.636666667	5.654984848	0	6.025819239	
23	2000	6.029166667	5.317212121	1	5.772832878	
24	2001	5.0175	5.072393939	2	5.519846517	
25	2002	4.663636364	4.799893939	3	5.266860156	
26	2003	4.015	4.452060606	4	5.013873795	
27	2004	4.274166667	4.406893939	5	4.760887434	
28	2005	4.29	4.4	6	4.507901074	
29	2006	4.791666667	4.330333333	7	4.254914713	
30	2007	4.629166667	4.126833333	8	4.001928352	
31	2008	3.666666667	3.911666667	9	3.748941991	
32	2009	3.256666667	3.5105	10	3.49595563	
33	2010	3.214166667	2.945166667	11	3.242969269	
34	2011	2.785833333	2.682	12	2.989982908	
35	2012	1.8025	2.538833333	13	2.736996547	
36	2013	2.350833333	2.323166667	14	2.484010186	
37	2014	2.540833333	2.134333333	15	2.231023826	
38	2015	2.135833333	2.239833333	16	1.978037465	
39	2016	1.841666667	2.351666667	17	1.725051104	
40	2017	2.33	2.272333333	18	1.472064743	
41	2018	2.91		19	1.219078382	
42	2019	2.144166667		20	0.966092021	
43	2020	<b>FORECAST</b>			21	0.71310566
44	2021				22	0.460119299
45	2022				23	0.207132938

### 3. ANALYSIS

#### 3.1 Moving Averages



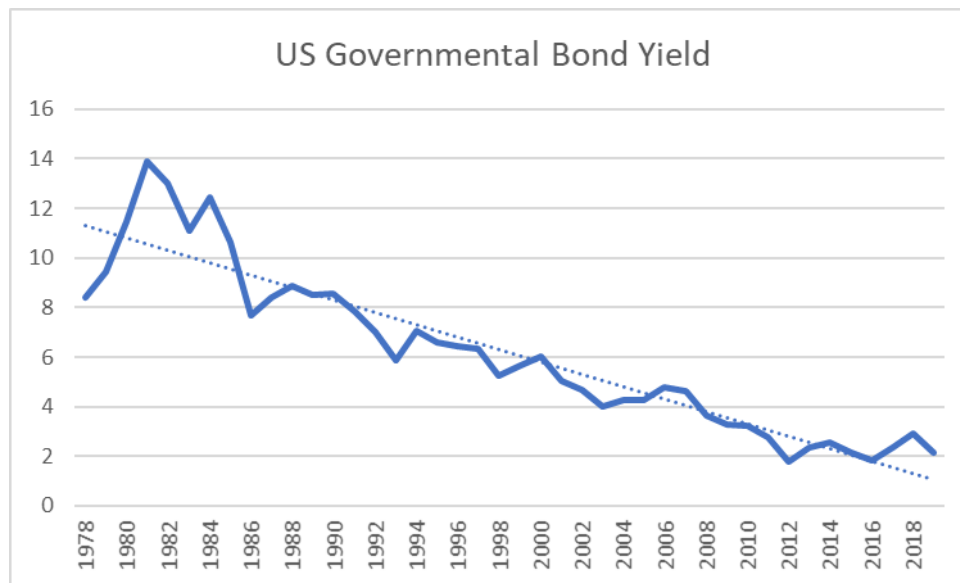
The graph indicates moving averages of 5 years of the US Government Bond Yields (10-yearly, long term) from 1<sup>st</sup> September 1978 to 1<sup>st</sup> September 2019. There is a continuous decline in the interest rates starting from 1980. This shows that post 1980 the US Government Bond Yields have fallen down and have affected interest rates in a negative manner.

On March 22, 2019, the yield curve inverted (An inverted yield curve is when the yields on bonds with a shorter duration are higher than the yields on bonds that have a longer duration. It's an abnormal situation that often signals an impending recession). The 10-year yield had fallen to 2.44%, below the three-month yield of 2.46%. That meant investors were more worried about the economy

in three months than in 10 years. When investors demand more return in the short term than in the long run, they think the economy is headed for a recession.

It recovered, then inverted again in May and, for the most part, remained inverted through mid-August. On August 15, the 30-year bond yield closed below 2% for the first time in U.S. financial history. The 10-year note yield rose to 1.83% on December 23, 2019.

**3.2 Trend Line**



A trendline is a line drawn over pivot highs or under pivot lows to show the prevailing direction of interest rates. Trendlines are a visual representation of support and resistance in any time frame. The trendline forecasts the long-term interest rates to fall in the long term. The general trend seems to be a downtrend and falling.

**Finding the trend line using Least Square Method**

**SUMMARY OUTPUT**

**Regression Statistics**

Multiple R	0.934757
R Square	0.873771
Adjusted R Square	0.870616
Standard Error	1.182554
Observations	42

**ANOVA**

	df	SS	MS	F	Significance F
Regression	1	387.2056	387.2056	276.8853	1.41E-19
Residual	40	55.93733	1.398433		
Total	41	443.1429			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	6.04404	0.182627	33.09497	1.11E-30	5.674937	6.413144	5.674937	6.413144
X Variable 1	-0.2505	0.015054	-16.6399	1.41E-19	-0.28093	-0.22008	-0.28093	-0.22008

**4. CONCLUSION**

To conclude, the paper analysed how the US Government Bond Yield Rates have fluctuated over the years but have maintained a general predictable downwards trend. The simple mathematical tools of moving averages and trendlines have been used to predict the future values. These do not consider any external factors and are just based on the previous trends.

**5. REFERENCES**

[1] <https://www.thebalance.com/10-year-treasury-note-3305795>)