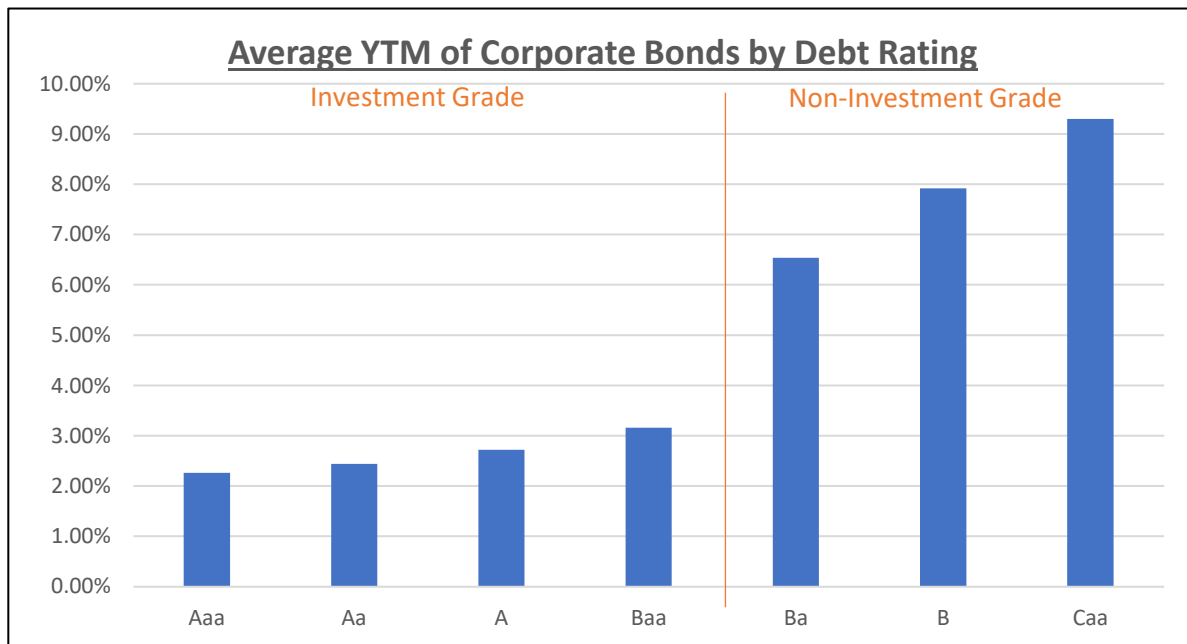


MONTANA DEPARTMENT OF REVENUE

High Yield Debt Study
Yield to Maturity of Debt by Rating
Based on Corporate Bond Yields
For Tax Year 2021

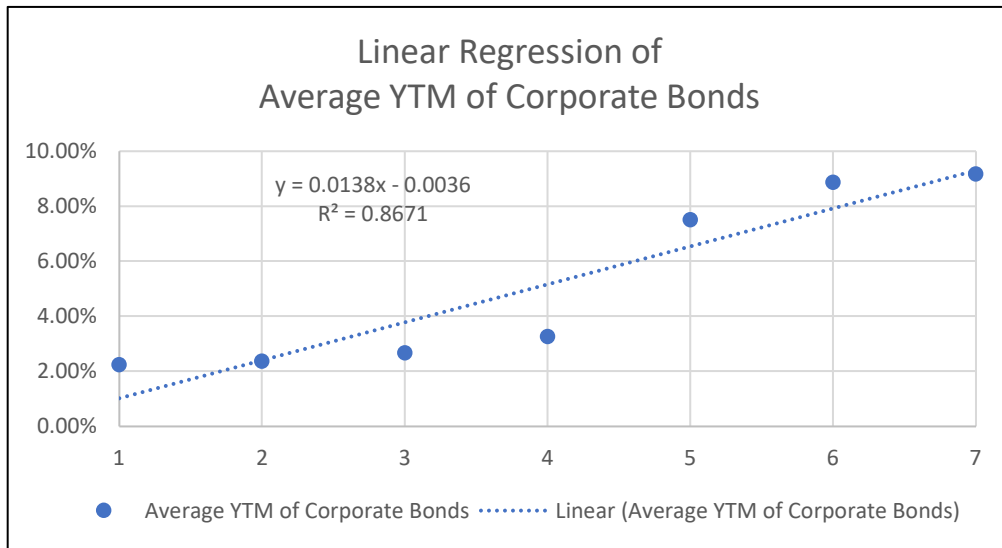
Rating	Average YTM of Corporate Bonds	Risk Free Rate (R _f)	Spread Over R _f	Source Note
Aaa	2.26%	1.45%	0.81%	Mergent Bond Record, January 2021
Aa	2.44%	1.45%	0.99%	Mergent Bond Record, January 2021
A	2.72%	1.45%	1.27%	Mergent Bond Record, January 2021
Baa	3.16%	1.45%	1.71%	Mergent Bond Record, January 2021
Ba	6.54%	1.45%	5.09%	Mergent, Moodys.com, & Linear Regression
B	7.92%	1.45%	6.47%	Mergent, Moodys.com, & Linear Regression
Caa	9.30%	1.45%	7.85%	Mergent, Moodys.com, & Linear Regression



MONTANA DEPARTMENT OF REVENUE

High Yield Debt Study
Linear Regression of Yield to Maturity by Combined Debt Rating
Based on Corporate Bond Yields
For Tax Year 2021

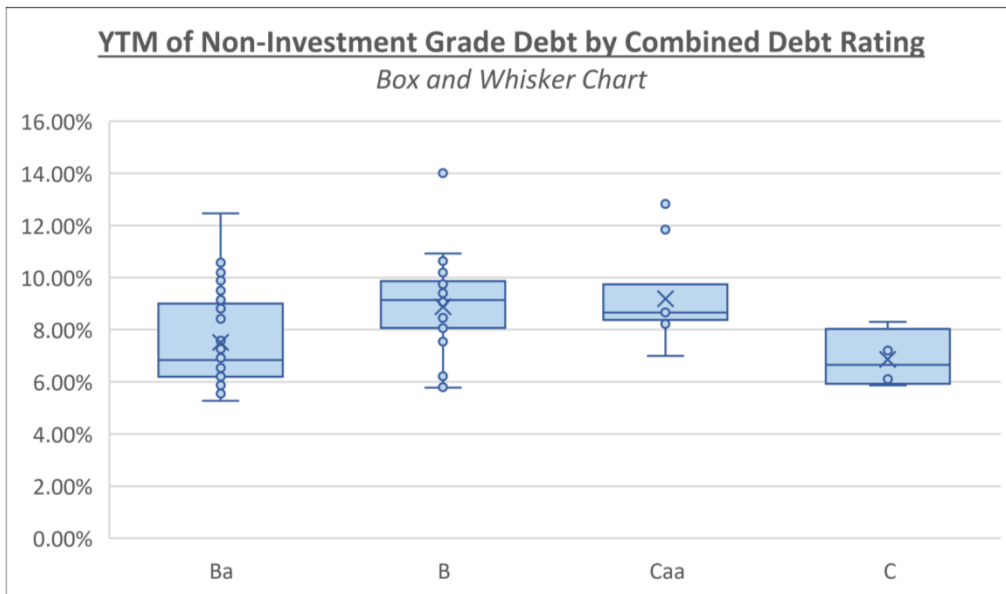
	<i>X-Axis</i>	<i>Y-Axis</i>				
Rating	Combined Numeric Rating	Average YTM of Corporate Bonds	Risk Free Rate (R_f)	Spread Over R_f	YTM Using Linear Regression	Selected YTM
Aaa	1	2.25%	1.45%	0.80%		2.25%
Aa	2	2.37%	1.45%	0.92%		2.37%
A	3	2.68%	1.45%	1.23%		2.68%
Baa	4	3.27%	1.45%	1.82%		3.27%
Ba	5	7.51%	1.45%	6.06%	6.54%	6.54%
B	6	8.88%	1.45%	7.43%	7.92%	7.92%
Caa	7	9.19%	1.45%	7.74%	9.30%	9.30%



MONTANA DEPARTMENT OF REVENUE

High Yield Debt Study
Average and Median Yield to Maturity by Combined Rating
Based on Corporate Bond Yields
For Tax Year 2021

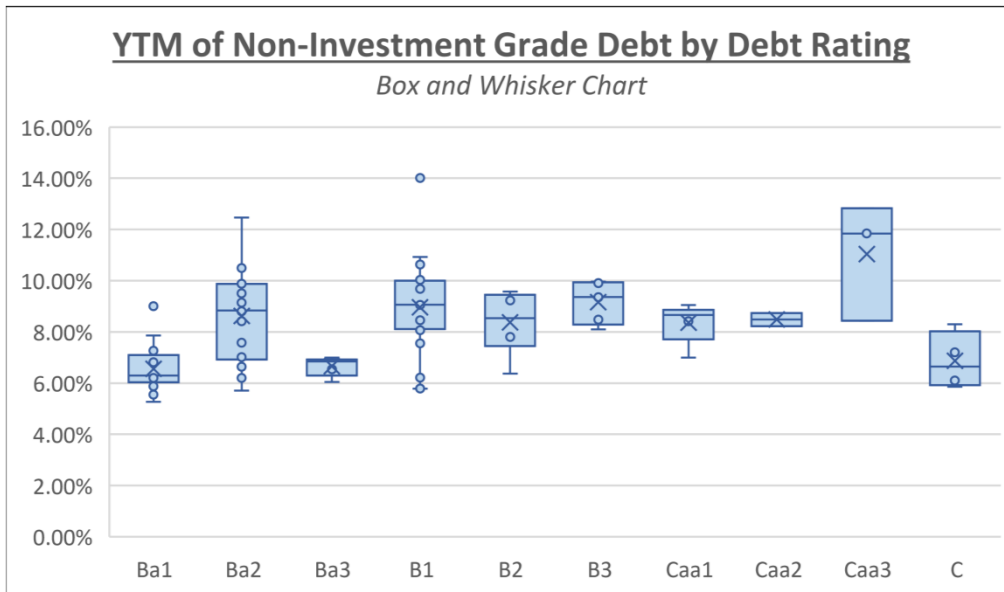
Rating	Average YTM	Median YTM	# of Securities
Ba	7.51%	8.10%	59
B	8.88%	9.15%	32
Caa	9.19%	8.67%	10
Ca			
C	6.87%	6.65%	4



MONTANA DEPARTMENT OF REVENUE

High Yield Debt Study
Average and Median Yield to Maturity by Debt Rating
Based on Corporate Bond Yields
For Tax Year 2021

Rating	Average YTM	Median YTM	# of Securities
Ba1	6.56%	8.10%	27
Ba2	8.62%	8.84%	27
Ba3	6.65%	6.84%	5
B1	8.96%	9.06%	21
B2	8.37%	8.53%	6
B3	9.16%	9.36%	5
Caa1	8.36%	8.66%	5
Caa2	8.48%	8.48%	2
Caa3	11.03%	11.84%	3
Ca			
C	6.87%	6.65%	4



S&P 500, 3 Stage Dividend Growth Model

Developed by the Montana Department of Revenue
To Be Used in Conjunction with the 2021 Capitalization Rate Studies

Determines The Implied Risk Premium Using Macroeconomic Data
This type of calculation can also be found in Chapter 9 of Ibbotson's (MorningStar) SBI, Supply Side Model

3 Stage Dividend Growth Model

Assumptions:

Stages	Years	Growth	Model 1
1st Stage	1-5 years	Constant @:	13.25%
2nd Stage	6-15 years	Linear from:	12.45% to 4.45%
			Real Growth
3rd Stage	15 years -perpetuity	GDP Growth: Real and Inflation	1.70% to 2.50%
		GDP Growth*: Real + Inflation	4.45%

OR

Model 2
16.31%
15.12% to 3.19%
Inflation
1.49% to 1.95%
3.19%

+
TO

S & P Dow Jones Indices Index Earnings, S&P 500 Earnings Estimate Report, February 11, 2021
Linear from 1st Stage to 3rd Stage

Inflation Range = Federal Reserve, Treasuries Inflation - Indexed

*GDP Growth = Real growth + Inflation
First Quarter 2021 Survey of Professional Forecasters - Philadelphia Federal Reserve Release Date 2/12/2021

Model 1

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Starting Industry	Start Price	Expected Dividends	1st Stage Growth Rates					2nd Stage Growth Rates										
S & P 500	\$ (3,732.04)	\$ 57.39	13.250%	13.250%	13.250%	13.250%	13.250%	12.45%	11.650%	10.850%	10.050%	9.250%	8.450%	7.650%	6.850%	6.050%	5.250%	4.450%
			\$ 64.99	\$ 73.61	\$ 83.36	\$ 94.40	\$ 106.91	\$ 120.22	\$ 134.23	\$ 148.79	\$ 163.75	\$ 178.89	\$ 194.01	\$ 208.85	\$ 223.16	\$ 236.66	\$ 249.08	\$ 260.17
			Implied Market Return =		7.46%													

Model 2

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Starting Industry	Start Price	Expected Dividends	1st Stage Growth Rates					2nd Stage Growth Rates										
S & P 500	\$ (3,732.04)	\$ 57.39	16.310%	16.310%	16.310%	16.310%	16.310%	15.12%	13.925%	12.732%	11.539%	10.346%	9.154%	7.961%	6.768%	5.575%	4.383%	3.190%
			\$ 66.75	\$ 77.64	\$ 90.30	\$ 105.03	\$ 122.16	\$ 140.62	\$ 160.21	\$ 180.60	\$ 201.44	\$ 222.29	\$ 242.63	\$ 261.95	\$ 279.68	\$ 295.27	\$ 308.21	\$ 318.04
			Implied Market Return =		7.41%													

Conclusions:

Implied Market Rate Range = 7.41% to 7.46%

Mean 7.44%
Market Rate Selected 7.44%

2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 271.74	\$ 283.84	\$ 296.47	\$ 309.66	\$ 323.44	\$ 337.83	\$ 352.87	\$ 368.57	\$ 384.97	\$ 402.10	\$ 420.00	\$ 438.69	\$ 458.21	\$ 478.60	\$ 499.89	\$ 522.14	\$ 545.38	\$ 569.64

2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 328.19	\$ 338.66	\$ 349.46	\$ 360.61	\$ 372.11	\$ 383.98	\$ 396.23	\$ 408.87	\$ 421.92	\$ 435.37	\$ 449.26	\$ 463.59	\$ 478.38	\$ 493.64	\$ 509.39	\$ 525.64	\$ 542.41	\$ 559.71

2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 594.99	\$ 621.47	\$ 649.13	\$ 678.01	\$ 708.18	\$ 739.70	\$ 772.61	\$ 807.00	\$ 842.91	\$ 880.42	\$ 919.60	\$ 960.52	\$ 1,003.26	\$ 1,047.91	\$ 1,094.54	\$ 1,143.24	\$ 1,194.12	\$ 1,247.26

2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 577.57	\$ 595.99	\$ 615.00	\$ 634.62	\$ 654.87	\$ 675.76	\$ 697.31	\$ 719.56	\$ 742.51	\$ 766.20	\$ 790.64	\$ 815.86	\$ 841.88	\$ 868.74	\$ 896.45	\$ 925.05	\$ 954.56	\$ 985.01

2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091
3rd Stage Growth Rates																	
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 1,302.76	\$ 1,360.73	\$ 1,421.29	\$ 1,484.53	\$ 1,550.59	\$ 1,619.60	\$ 1,691.67	\$ 1,766.95	\$ 1,845.58	\$ 1,927.70	\$ 2,013.49	\$ 2,103.09	\$ 2,196.67	\$ 2,294.43	\$ 2,396.53	\$ 2,503.17	\$ 2,614.57	\$ 2,730.91

2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091
3rd Stage Growth Rates																	
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 1,016.43	\$ 1,048.86	\$ 1,082.31	\$ 1,116.84	\$ 1,152.47	\$ 1,189.23	\$ 1,227.17	\$ 1,266.31	\$ 1,306.71	\$ 1,348.39	\$ 1,391.41	\$ 1,435.79	\$ 1,481.60	\$ 1,528.86	\$ 1,577.63	\$ 1,627.96	\$ 1,679.89	\$ 1,733.48

2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 2,852.44	\$ 2,979.37	\$ 3,111.96	\$ 3,250.44	\$ 3,395.08	\$ 3,546.16	\$ 3,703.97	\$ 3,868.79	\$ 4,040.95	\$ 4,220.78	\$ 4,408.60	\$ 4,604.78	\$ 4,809.70	\$ 5,023.73	\$ 5,247.28	\$ 5,480.79	\$ 5,724.68	\$ 5,979.43

2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 1,788.77	\$ 1,845.84	\$ 1,904.72	\$ 1,965.48	\$ 2,028.18	\$ 2,092.88	\$ 2,159.64	\$ 2,228.53	\$ 2,299.62	\$ 2,372.98	\$ 2,448.68	\$ 2,526.79	\$ 2,607.39	\$ 2,690.57	\$ 2,776.40	\$ 2,864.97	\$ 2,956.36	\$ 3,050.67

2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 6,245.52	\$ 6,523.44	\$ 6,813.74	\$ 7,116.95	\$ 7,433.65	\$ 7,764.45	\$ 8,109.97	\$ 8,470.86	\$ 8,847.81	\$ 9,241.54	\$ 9,652.79	\$ 10,082.34	\$ 10,531.00	\$ 10,999.63	\$ 11,489.12	\$ 12,000.38

2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 3,147.98	\$ 3,248.40	\$ 3,352.03	\$ 3,458.96	\$ 3,569.30	\$ 3,683.16	\$ 3,800.65	\$ 3,921.89	\$ 4,047.00	\$ 4,176.10	\$ 4,309.32	\$ 4,446.79	\$ 4,588.64	\$ 4,735.02	\$ 4,886.06	\$ 5,041.93

2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137
4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%	4.450%
\$ 12,534.40	\$ 13,092.18	\$ 13,674.78	\$ 14,283.31	\$ 14,918.92	\$ 15,582.81	\$ 16,276.24	\$ 17,000.54	\$ 17,757.06	\$ 18,547.25	\$ 19,372.60	\$ 20,234.68

2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137
3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%	3.190%
\$ 5,202.77	\$ 5,368.73	\$ 5,540.00	\$ 5,716.72	\$ 5,899.09	\$ 6,087.27	\$ 6,281.45	\$ 6,481.83	\$ 6,688.60	\$ 6,901.97	\$ 7,122.14	\$ 7,349.33