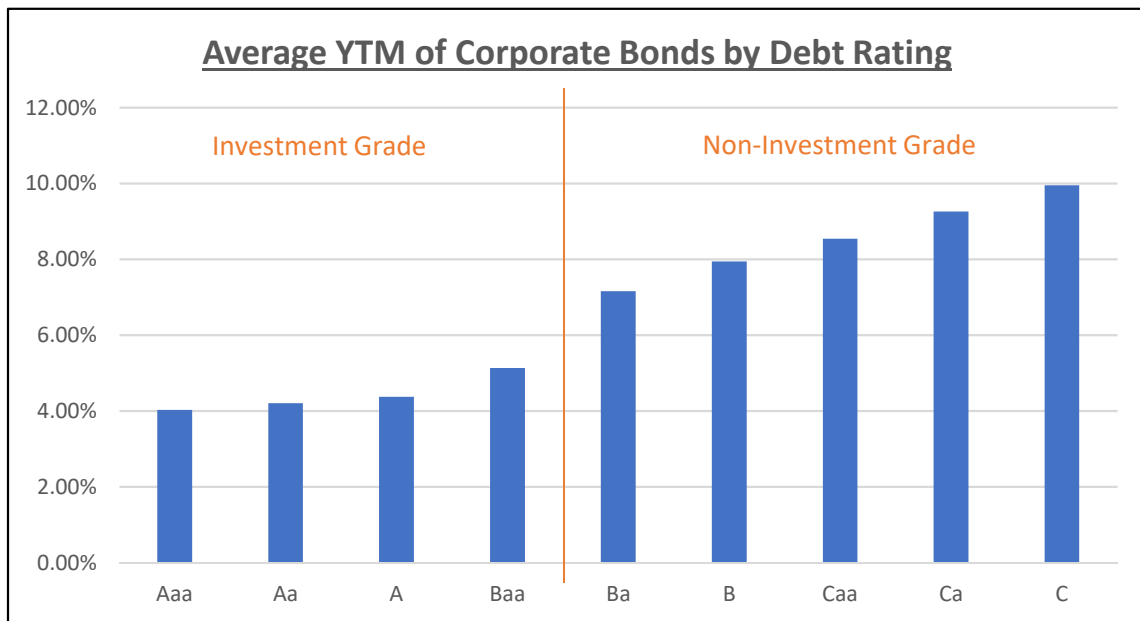


MONTANA DEPARTMENT OF REVENUE

Cost of Debt Study
Yield to Maturity of Debt by Rating
Based on Corporate Bond Yields
For Tax Year 2019

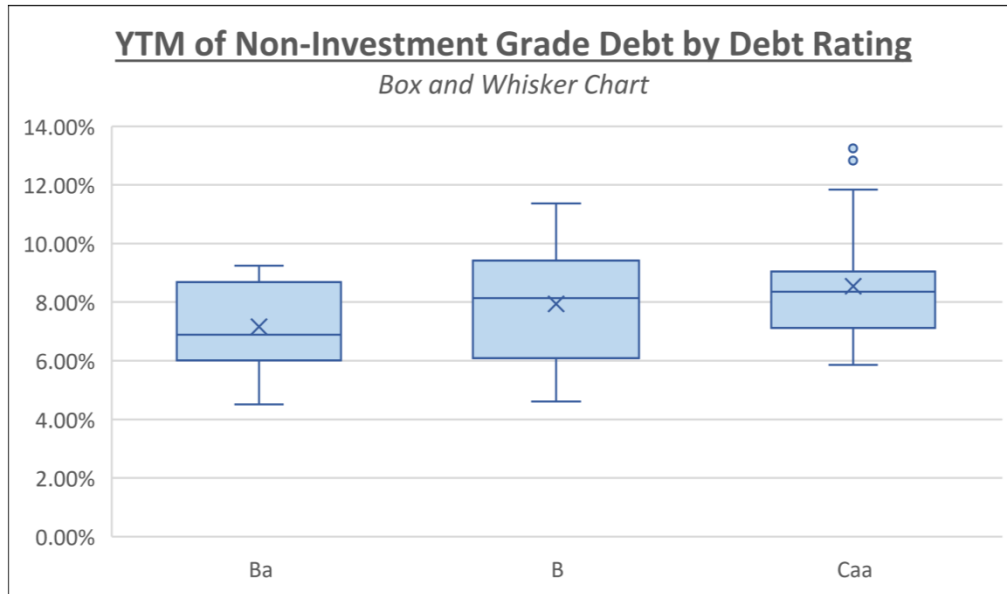
Rating	Average YTM of Corporate Bonds	Risk Free Rate (R_f)	Spread Over R_f	Source
Aaa	4.02%	2.87%	1.15%	<i>Mergent Bond Record, January 2019</i>
Aa	4.20%	2.87%	1.33%	<i>Mergent Bond Record, January 2019</i>
A	4.37%	2.87%	1.50%	<i>Mergent Bond Record, January 2019</i>
Baa	5.13%	2.87%	2.26%	<i>Mergent Bond Record, January 2019</i>
Ba	7.16%	2.87%	4.29%	<i>Mergent Bond Record, January 2019 and Moodys.com</i>
B	7.94%	2.87%	5.07%	<i>Mergent Bond Record, January 2019 and Moodys.com</i>
Caa	8.54%	2.87%	5.67%	<i>Mergent Bond Record, January 2019 and Moodys.com</i>
Ca	9.26%	2.87%	6.39%	<i>Linear forecast based on Ba, B, and Caa data</i>
C	9.95%	2.87%	7.08%	<i>Linear forecast based on Ba, B, and Caa data</i>



MONTANA DEPARTMENT OF REVENUE

Cost of Debt Study
Yield to Maturity of Non-Investment Grade Debt by Rating
Based on Corporate Bond Yields
For Tax Year 2019

Rating	Average YTM	Median YTM	# of Securities
Ba	7.16%	6.89%	38
B	7.94%	8.14%	16
Caa	8.54%	8.36%	31
Ca			0
C	7.50%	7.50%	1



S&P 500, 3 Stage Dividend Growth Model

Developed by the Montana Department of Revenue
To Be Used in Conjunction with the 2019 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 @:	13.08%
2nd Stage	6-15 years	Linear from:	12.33% to 4.88%
			Real Growth
3rd Stage	15 years -perpetuity	GDP Growth: Real and Inflation	1.70% to 2.80%
		GDP Growth*: Real + Inflation	4.88%
		UPDATE	1.7 2.8

OR

Model 2
13.76%
12.85% to 3.77%
Inflation
2.07% 4 2.08%
3.77%

+
TO

S & P Dow Jones Indices Index Earnings, S&P 500 Earnings Estimate Report, January 9, 2019
Linear from 1st Stage to 3rd Stage

Inflation Range = Federal Reserve, Treasuries Inflation -

*GDP Growth = Real growth + Inflation
First Quarter 2018 Survey of Professional Forecasters - Philadelphia Federal Reserve Release Date 2/9/2018
Livingston Survey Release Date December 21, 2018 DELAYED

Model 1

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Starting Industry	Start Price	Expected Dividends	1st Stage Growth Rates					2nd Stage Growth Rates										
S & P 500	\$ (2,506.85)	\$ 57.00	13.080%	13.080%	13.080%	13.080%	13.080%	12.33%	11.589%	10.844%	10.099%	9.353%	8.608%	7.862%	7.117%	6.372%	5.626%	4.881%
Implied Market Return =		9.10%																

Model 2

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Starting Industry	Start Price	Expected Dividends	1st Stage Growth Rates					2nd Stage Growth Rates										
S & P 500	\$ (2,506.85)	\$ 57.00	13.760%	13.760%	13.760%	13.760%	13.760%	12.85%	11.944%	11.035%	10.127%	9.219%	8.311%	7.403%	6.495%	5.586%	4.678%	3.770%
Implied Market Return =		8.58%																

Conclusions:

Implied Market Rate Range = 8.58% to 9.10%

Mean 8.84%
Market Rate Selected 8.84%

2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 273.43	\$ 286.78	\$ 300.77	\$ 315.46	\$ 330.85	\$ 347.00	\$ 363.94	\$ 381.70	\$ 400.33	\$ 419.87	\$ 440.37	\$ 461.86	\$ 484.41	\$ 508.05	\$ 532.85	\$ 558.86	\$ 586.13	\$ 614.74

2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 270.15	\$ 280.34	\$ 290.91	\$ 301.87	\$ 313.25	\$ 325.06	\$ 337.32	\$ 350.03	\$ 363.23	\$ 376.92	\$ 391.13	\$ 405.88	\$ 421.18	\$ 437.06	\$ 453.54	\$ 470.64	\$ 488.38	\$ 506.79

2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 644.75	\$ 676.22	\$ 709.22	\$ 743.84	\$ 780.15	\$ 818.23	\$ 858.17	\$ 900.05	\$ 943.98	\$ 990.06	\$ 1,038.38	\$ 1,089.07	\$ 1,142.23	\$ 1,197.98	\$ 1,256.45	\$ 1,317.78	\$ 1,382.10	\$ 1,449.56

2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 525.90	\$ 545.72	\$ 566.30	\$ 587.65	\$ 609.80	\$ 632.79	\$ 656.65	\$ 681.40	\$ 707.09	\$ 733.75	\$ 761.41	\$ 790.12	\$ 819.90	\$ 850.81	\$ 882.89	\$ 916.17	\$ 950.71	\$ 986.56

2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089
3rd Stage Growth Rates																	
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 1,520.31	\$ 1,594.52	\$ 1,672.35	\$ 1,753.97	\$ 1,839.59	\$ 1,929.38	\$ 2,023.55	\$ 2,122.32	\$ 2,225.91	\$ 2,334.55	\$ 2,448.50	\$ 2,568.02	\$ 2,693.36	\$ 2,824.82	\$ 2,962.70	\$ 3,107.31	\$ 3,258.98	\$ 3,418.05

2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089
3rd Stage Growth Rates																	
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 1,023.75	\$ 1,062.35	\$ 1,102.40	\$ 1,143.96	\$ 1,187.08	\$ 1,231.84	\$ 1,278.28	\$ 1,326.47	\$ 1,376.47	\$ 1,428.37	\$ 1,482.22	\$ 1,538.10	\$ 1,596.08	\$ 1,656.26	\$ 1,718.70	\$ 1,783.49	\$ 1,850.73	\$ 1,920.50

2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 3,584.89	\$ 3,759.86	\$ 3,943.38	\$ 4,135.86	\$ 4,337.73	\$ 4,549.46	\$ 4,771.52	\$ 5,004.41	\$ 5,248.68	\$ 5,504.87	\$ 5,773.56	\$ 6,055.37	\$ 6,350.93	\$ 6,660.92	\$ 6,986.04	\$ 7,327.03	\$ 7,684.66	\$ 8,059.75

2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 1,992.90	\$ 2,068.04	\$ 2,146.00	\$ 2,226.91	\$ 2,310.86	\$ 2,397.98	\$ 2,488.38	\$ 2,582.20	\$ 2,679.54	\$ 2,780.56	\$ 2,885.39	\$ 2,994.17	\$ 3,107.05	\$ 3,224.19	\$ 3,345.74	\$ 3,471.87	\$ 3,602.76	\$ 3,738.59

2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 8,453.14	\$ 8,865.74	\$ 9,298.48	\$ 9,752.34	\$ 10,228.35	\$ 10,727.59	\$ 11,251.21	\$ 11,800.38	\$ 12,376.35	\$ 12,980.44	\$ 13,614.02	\$ 14,278.52	\$ 14,975.45	\$ 15,706.41	\$ 16,473.04	\$ 17,277.08

2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 3,879.53	\$ 4,025.79	\$ 4,177.56	\$ 4,335.06	\$ 4,498.49	\$ 4,668.08	\$ 4,844.07	\$ 5,026.69	\$ 5,216.19	\$ 5,412.84	\$ 5,616.91	\$ 5,828.67	\$ 6,048.41	\$ 6,276.43	\$ 6,513.05	\$ 6,758.60

2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135
4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%	4.881%
\$ 18,120.38	\$ 19,004.83	\$ 19,932.46	\$ 20,905.36	\$ 21,925.76	\$ 22,995.95	\$ 24,118.38	\$ 25,295.60	\$ 26,530.28	\$ 27,825.22	\$ 29,183.37	\$ 30,607.81

2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135
3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%	3.770%
\$ 7,013.39	\$ 7,277.80	\$ 7,552.17	\$ 7,836.89	\$ 8,132.34	\$ 8,438.93	\$ 8,757.08	\$ 9,087.22	\$ 9,429.81	\$ 9,785.31	\$ 10,154.22	\$ 10,537.03