



CDIAC

**CALIFORNIA
DEBT AND
INVESTMENT
ADVISORY
COMMISSION**

ADVANCED CREDIT ANALYSIS

DAVID CARR
KEVIN WEBB, CFA



1/17/18

Disclaimer

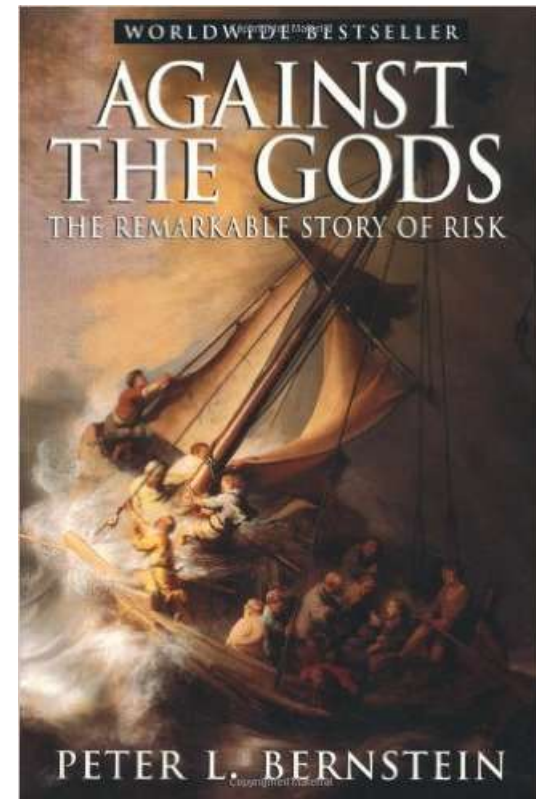
The information presented in this presentation is intended to assist public investment professionals. The content presented is informational and does not constitute investment advice or the recommendation to invest in any or all of the investment instruments discussed. When choosing an investment instrument for a public portfolio, the whole portfolio, investment policy, suitability, financial needs of the public agency and any associated risks should be considered. In addition, the information in this presentation is set to reflect the period in time in which it is presented and any changes that may affect any of the instruments discussed, such as legislation, reform or market conditions, or that may alter the relevancy of any of these instruments, will not be reflective in the post archival records. In such instances, viewers should be advised to use the information only as a reference as no updates to the records will be made. Please consult the California Debt and Investment Advisory Commission's publication *Local Agency Investment Guidelines* for any interpretive updates.

Agenda

- It's All About Risk & Reward
 - ▣ Treasury Yield Curve
 - ▣ Default Risk
 - ▣ Credit Spread Risk
 - ▣ Downgrade Risk
- Limited Time, Staff & Resources: What to do?
 - ▣ WolframAlpha/WSJ
 - ▣ FRED
- SRI/ESG

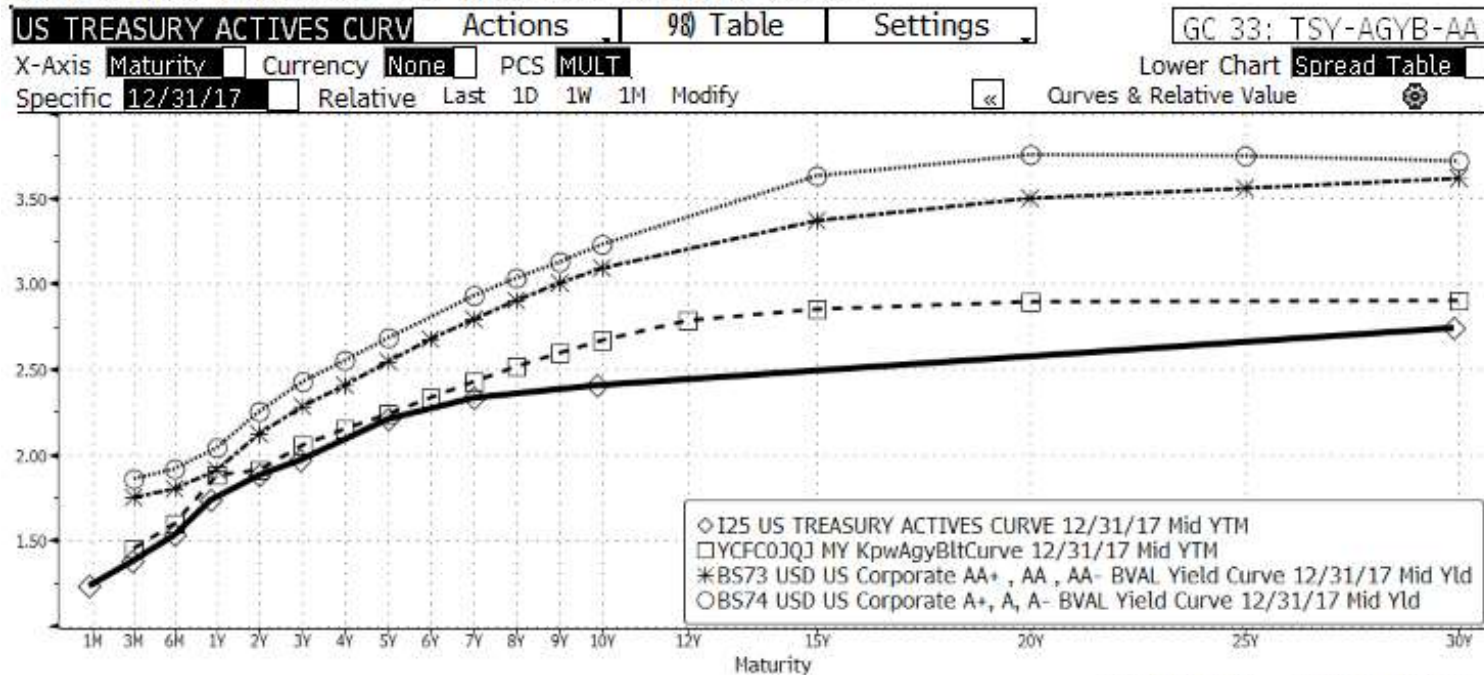
Risk & Reward

"You want a valve that doesn't leak and you try everything possible to develop one. But the real world provides you with a leaky valve. You have to determine how much leaking you can tolerate."



The Yield Curve Framework

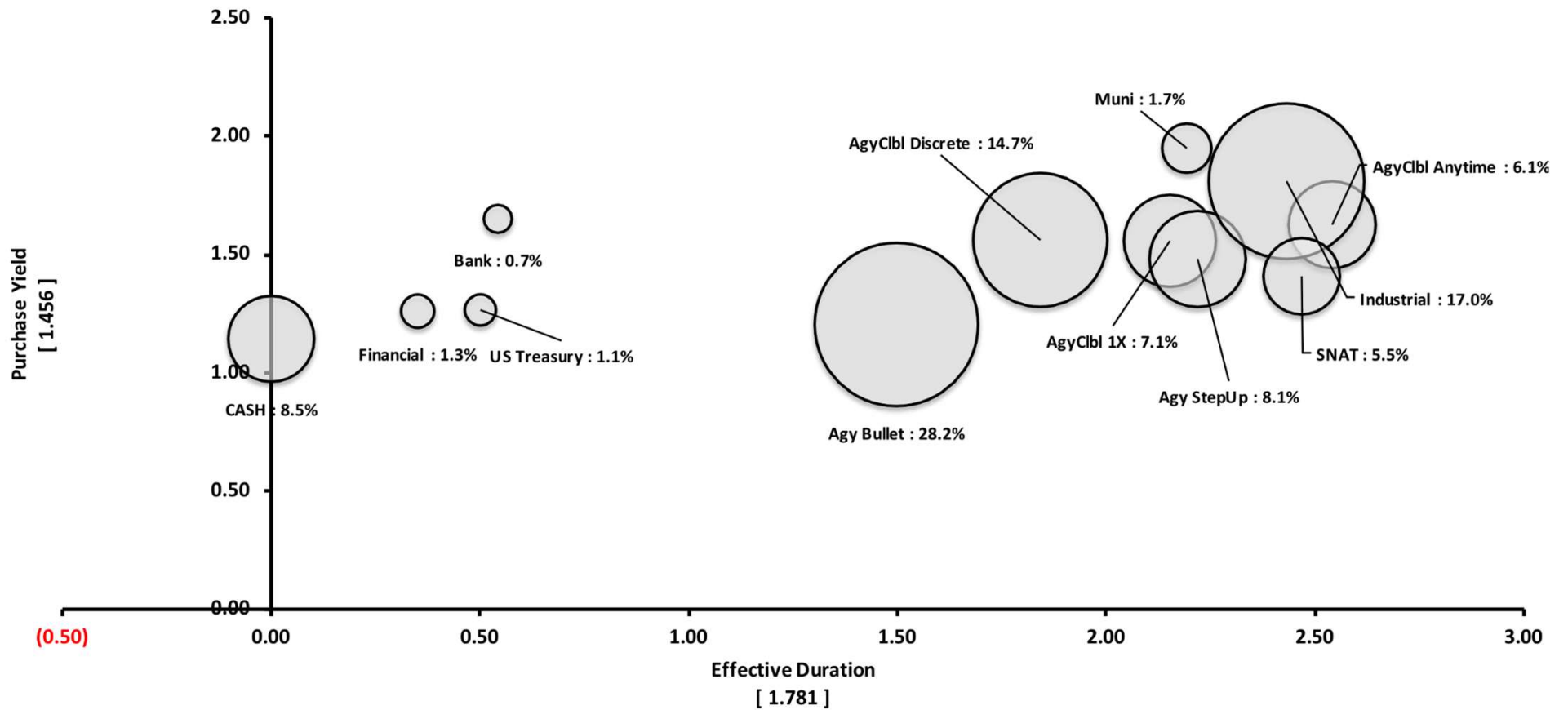
Base Curve Selected: US TREASURY ACTIVES CURVE



Curve Id	3M	1Y	2Y	3Y	5Y	10Y	15Y	30Y
BS73	1.749	1.911	2.123	2.281	2.542	3.091	3.367	3.613
BS74	1.860	2.039	2.253	2.426	2.684	3.230	3.629	3.715
YCFC0JQJ - I25	7.1	14.0	2.7	8.2	3.3	26.4		16.4
BS73 - I25	36.7	17.3	23.8	30.9	33.5	68.5		87.3
BS74 - I25	47.8	30.1	36.8	45.4	47.7	82.4		97.5

The Yield Curve Framework: Santa Monica

Santa Monica-20180104 (Using 12/19/17 Portfolio Data)
Effective Duration versus Purchase Yield Where Bubble Size is MktWgt Purchase Yield [1.456]
Par Amount (\$000): 715,947.33 | Effective Duration: 1.78 | OAS: 25.42



Ratings: Letters

Moody's		S&P		Fitch		Rating description	
Long-term	Short-term	Long-term	Short-term	Long-term	Short-term		
Aaa	P-1	AAA	A-1+	AAA	F1+	Prime	Investment-grade
Aa1		AA+		AA+		High grade	
Aa2		AA		AA			
Aa3		AA-		AA-			
A1	P-2	A+	A-1	A+	F1	Upper medium grade	
A2		A		A			
A3		A-	A-2	A-	F2		
Baa1	BBB+	BBB+					
Baa2	P-3	BBB	A-3	BBB	F3	Lower medium grade	
Baa3		BBB-		BBB-			

Bond credit rating. (2016, January 15). In Wikipedia, The Free Encyclopedia. Retrieved 07:22, January 21, 2016, from https://en.wikipedia.org/w/index.php?title=Bond_credit_rating&oldid=691840556

Credit Risk

□ Default Risk

- ▣ the risk that the issuer will fail to satisfy the terms of the obligation with respect to the timely payment of interest and principal.

□ Credit Spread Risk

- ▣ The risk that an issuer's debt obligation will decline due to an increase in the credit spread is called credit spread risk.

□ Downgrade Risk

- ▣ An unanticipated downgrading of an issue or issuer

Default Rates

Average Cumulative Default Rates For Corporates By Region (1981 - 2016) (%)

--Time horizon (years)--

Rating	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
U.S.															
AAA	0.00	0.04	0.17	0.29	0.42	0.54	0.59	0.67	0.76	0.85	0.90	0.94	0.99	1.09	1.20
AA	0.03	0.08	0.18	0.31	0.45	0.60	0.74	0.86	0.96	1.07	1.17	1.25	1.34	1.42	1.51
A	0.07	0.20	0.36	0.54	0.73	0.95	1.19	1.41	1.65	1.89	2.11	2.32	2.52	2.69	2.89
BBB	0.22	0.58	0.99	1.50	2.05	2.60	3.09	3.58	4.07	4.55	5.02	5.37	5.71	6.06	6.42
BB	0.80	2.52	4.57	6.57	8.38	10.14	11.62	12.98	14.17	15.25	16.13	16.91	17.61	18.22	18.84
B	3.92	9.00	13.43	16.88	19.57	21.76	23.56	24.98	26.24	27.42	28.42	29.20	29.90	30.53	31.16
CCC/C	28.85	39.23	44.94	48.55	51.31	52.53	53.95	55.00	55.96	56.66	57.32	57.93	58.60	59.14	59.14
Investment grade	0.12	0.32	0.56	0.86	1.17	1.49	1.80	2.09	2.38	2.67	2.95	3.17	3.39	3.59	3.81
Speculative grade	4.18	8.25	11.81	14.68	17.00	18.95	20.59	21.95	23.16	24.26	25.18	25.95	26.64	27.24	27.83
All rated	1.80	3.59	5.16	6.48	7.57	8.52	9.32	10.01	10.63	11.21	11.71	12.12	12.49	12.82	13.16

Bloomberg DRSK (Merton Model)

What is the 'Merton Model'

The Merton model is an analysis model – named after economist [Robert C. Merton](#) – that is used to assess the [credit risk](#) of a company's debt. [Analysts](#) at [brokerage](#) firms and investors utilize the Merton model to understand how capable a company is at meeting financial obligations, servicing its debt and weighing the general possibility that the company will go into credit default. This model was later built out by Fischer Black and Myron Scholes to develop [the Black-Scholes pricing model](#).



Main Driver of Default: Distance-to-Default

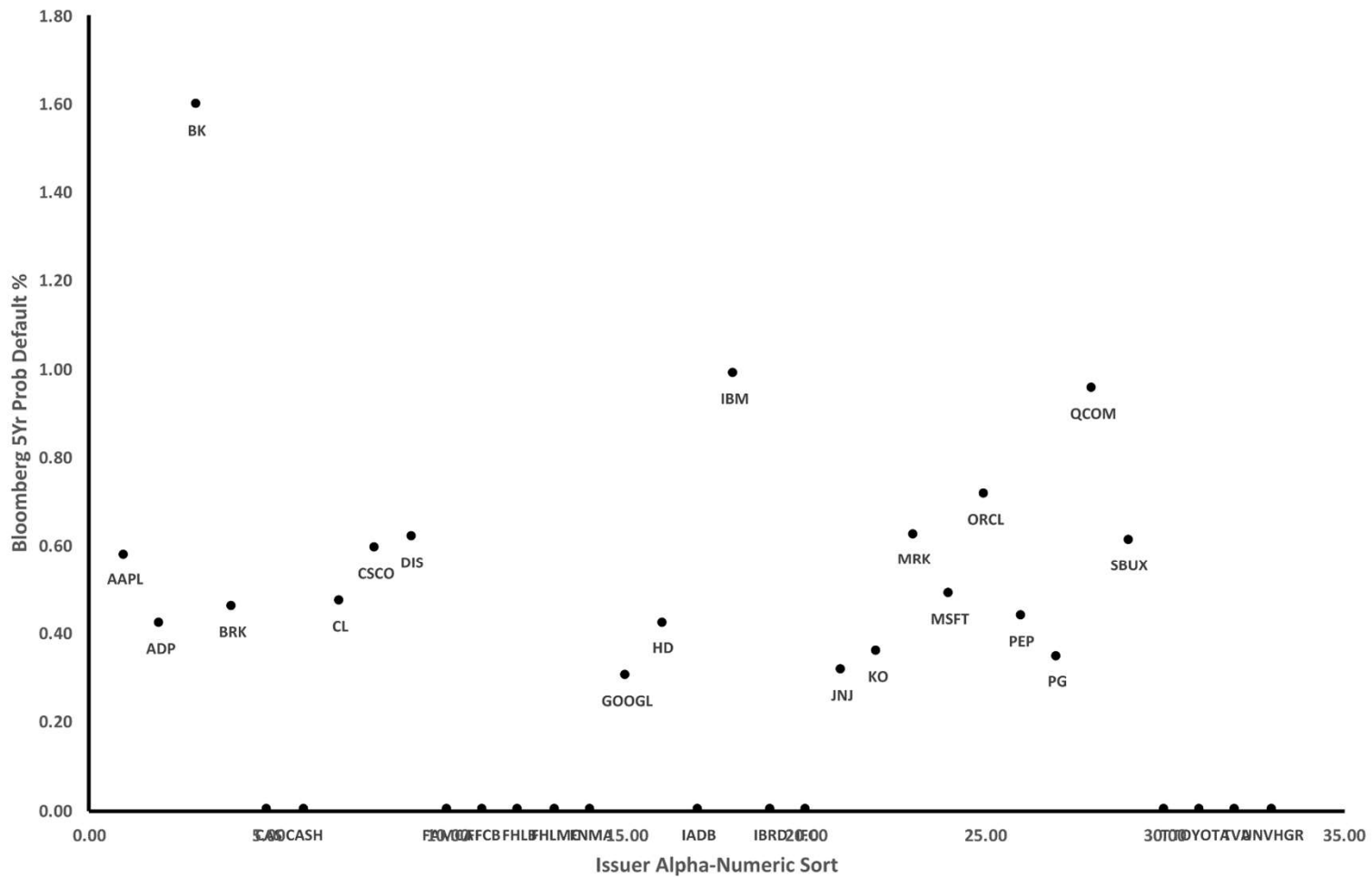
The DRSK<GO>framework for modeling default has its origins in the structural model proposed by Robert Merton.¹ In this model, a firm is viewed as solvent as long as the value of the firm's assets is larger than the value of its liabilities. The issue is that the value of the assets of the firm is not observable and must thus be inferred. The Merton model links the value of the assets to the market cap and debt of a firm, both of which are observable. The key insight of the Merton framework is that the equity of the firm can be viewed as a call option on the total assets of the firm where the strike price is equal to its liabilities. This allows us to infer the value of the assets from the observed equity value using a BlackScholes option pricing approach. ...

Santa Monica Overview

Ticker	Par Amount (\$000)	% Portfolio	Effective Duration	Bloomberg 5Yr Prob Default %	Analyst % Buy Hold	Purchase Yield
AAPL	7,000.00	0.98	1.20	0.58	100.00	1.22
ADP	2,500.00	0.35	2.56	0.42	95.00	2.11
BK	5,000.00	0.71	0.54	1.60	90.91	1.65
BRK	2,000.00	0.28	0.60	0.46	0.00	1.16
CAS	8,500.00	1.20	2.50	0.00	0.00	2.08
CASH	60,372.33	8.48	0.00	0.00	0.00	1.14
CL	1,500.00	0.21	0.32	0.47	96.15	1.40
CSCO	12,000.00	1.68	1.92	0.59	100.00	1.77
DIS	13,000.00	1.83	2.00	0.62	92.59	1.90
FAMCA	16,850.00	2.35	1.68	0.00	0.00	1.48
FFCB	42,500.00	5.92	1.82	0.00	0.00	1.41
FHLB	116,900.00	16.28	2.04	0.00	0.00	1.49
FHLMC	166,761.00	23.25	1.85	0.00	0.00	1.44
FNMA	117,150.00	16.30	1.66	0.00	0.00	1.24
GOOGL	4,800.00	0.71	3.16	0.30	97.62	1.88
HD	7,000.00	0.99	4.12	0.42	100.00	2.18
IADB	6,000.00	0.84	2.58	0.00	0.00	1.72
IBM	7,500.00	1.06	0.09	0.99	89.29	1.24
IBRD	23,500.00	3.26	2.19	0.00	0.00	1.44
IFC	10,000.00	1.37	3.05	0.00	0.00	1.13
JNJ	10,000.00	1.40	2.85	0.32	88.46	1.63
KO	7,000.00	1.00	2.72	0.36	93.75	1.88
MRK	3,000.00	0.42	0.07	0.62	100.00	1.09
MSFT	12,000.00	1.68	2.41	0.49	94.29	1.77
ORCL	5,500.00	0.77	2.13	0.71	100.00	1.86
PEP	7,000.00	0.97	3.80	0.44	100.00	2.26
PG	2,500.00	0.35	2.70	0.35	92.59	1.90
QCOM	7,500.00	1.06	4.07	0.95	100.00	2.30
SBUX	10,984.00	1.55	2.94	0.61	97.22	1.92
T	8,000.00	1.12	0.50	0.00	0.00	1.27
TOYOTA	7,000.00	0.99	0.28	0.00	0.00	1.29
TVA	1,000.00	0.14	0.77	0.00	0.00	1.36
UNVHGR	3,630.00	0.51	1.46	0.00	0.00	1.65

Santa Monica Overview

Issuer Matrix for Santa Monica-20180104 (Using 12/19/17 Data)
Showing All Issuers
Data Labels Showing Ticker

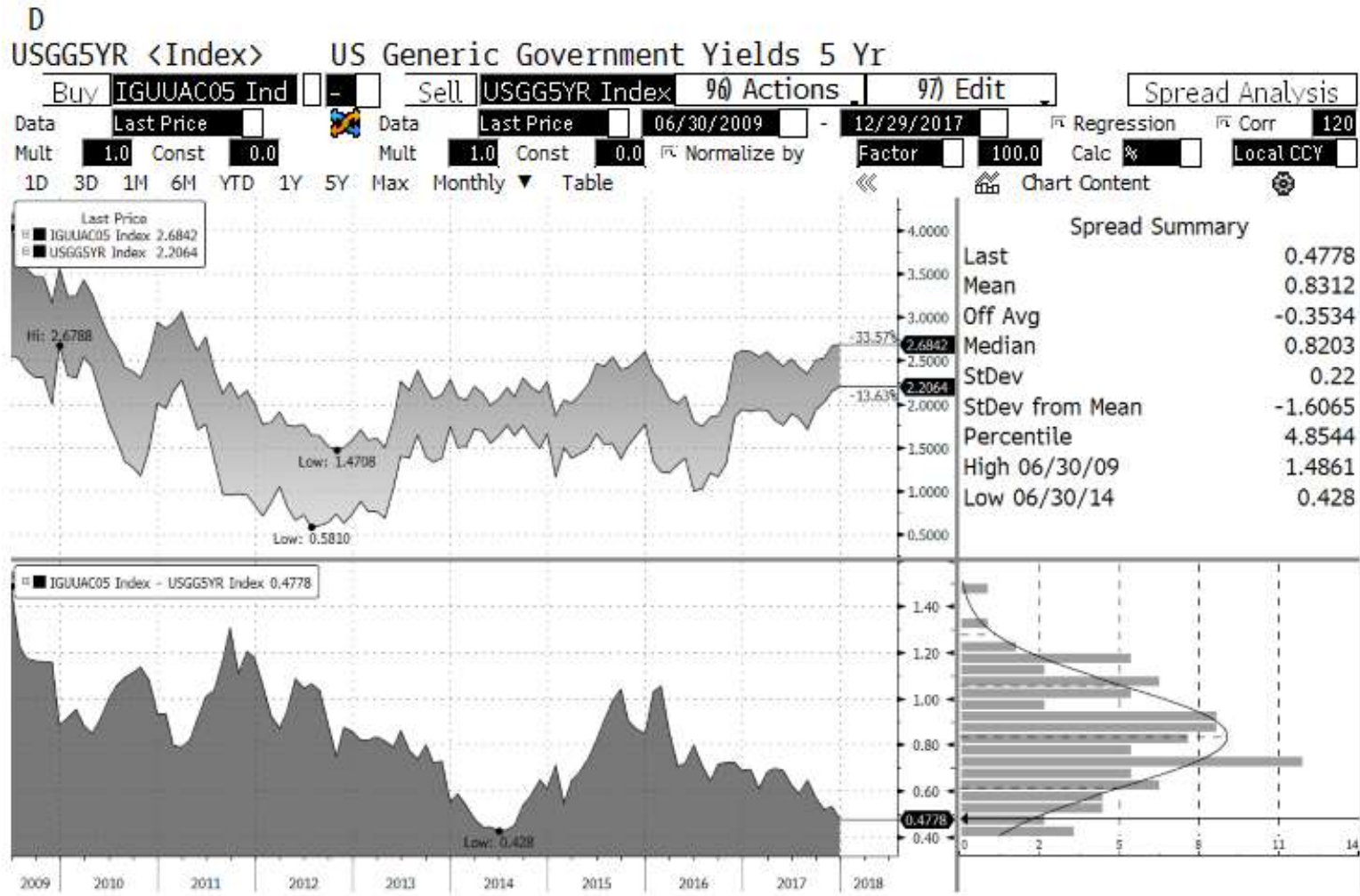


Credit Spread Risk

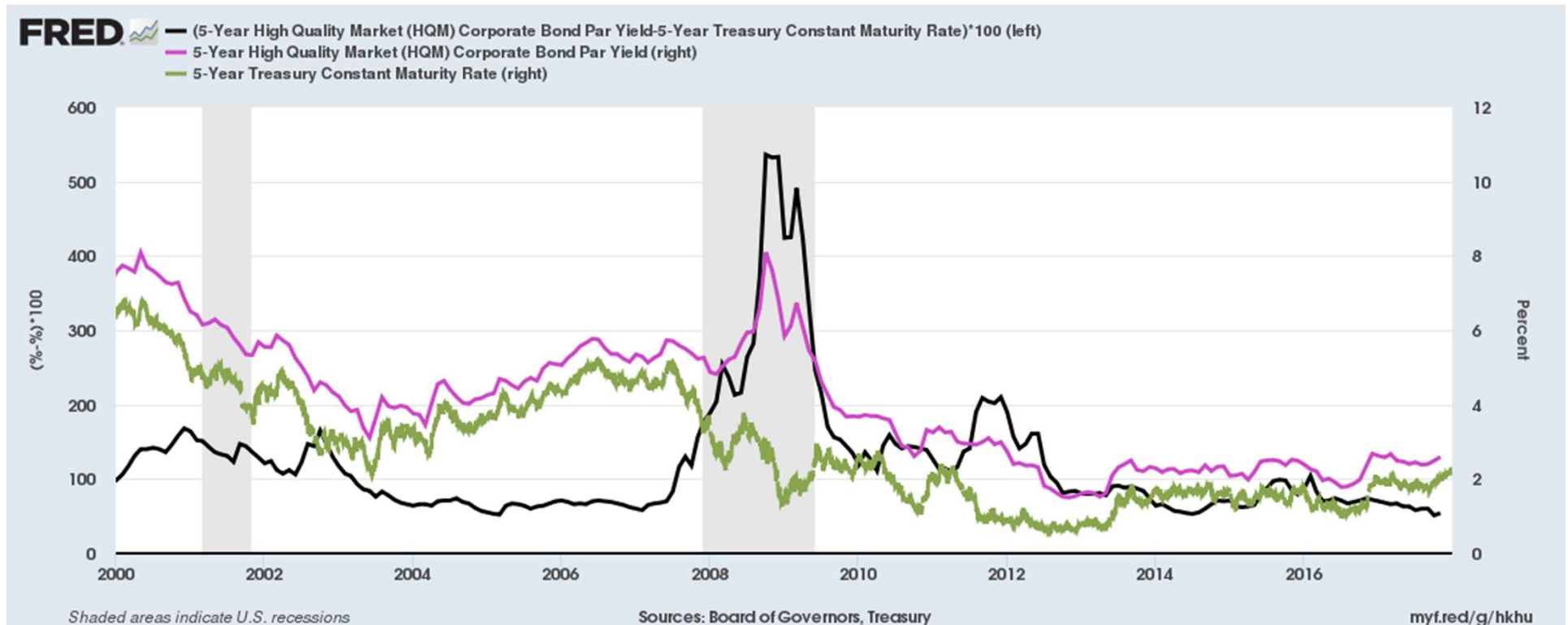
□ What is it?

- “Even in the absence of default, an investor is concerned that the market value of a bond will decline and/or the price performance of a bond will be worse than that of other bonds. To understand this, recall that the price of a bond changes in the opposite direction to the change in the yield required by the market. Thus, if yields in the economy increase, the price of a bond declines, and vice versa.” ...
- “The risk that an issuer's debt obligation will decline due to an increase in the credit spread is called credit spread risk.”

Credit Spread History



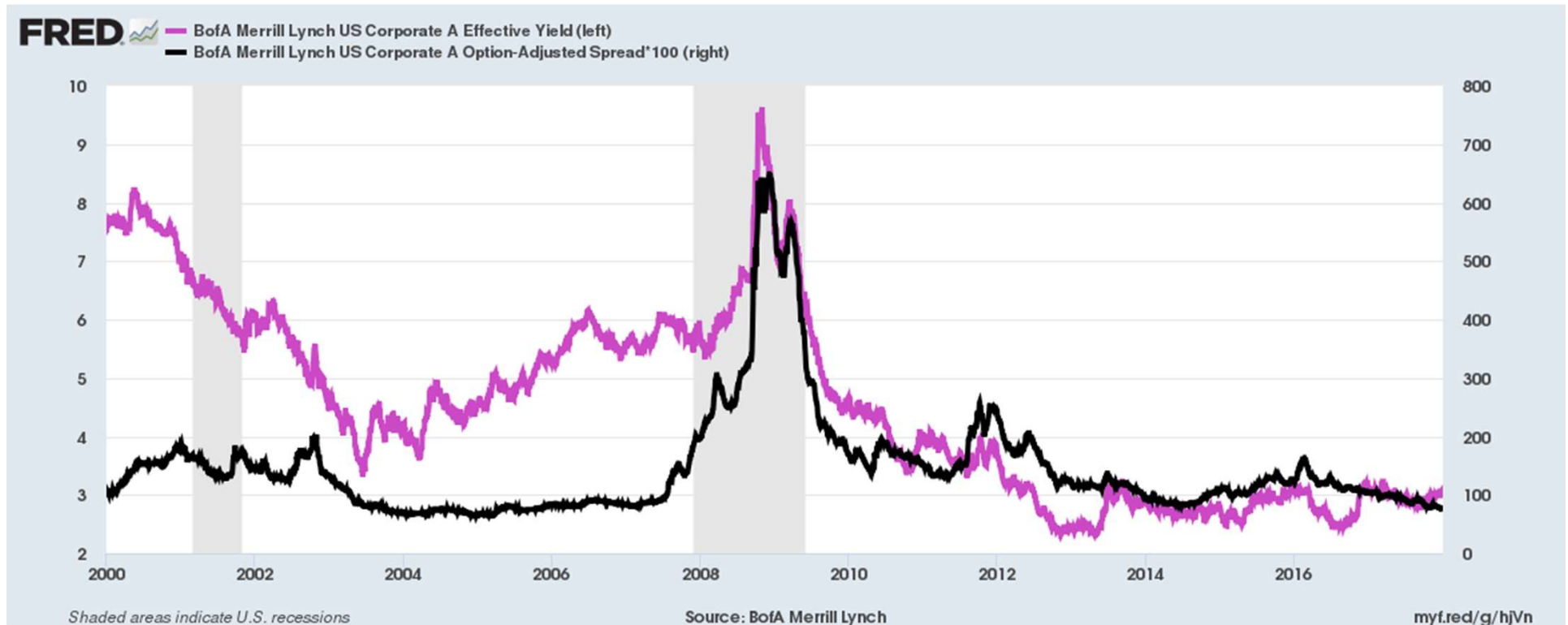
Credit Spread History



U.S. Department of the Treasury, 5-Year High Quality Market (HQM) Corporate Bond Par Yield [HQMCB5YRP], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/HQMCB5YRP>, January 4, 2018.

Board of Governors of the Federal Reserve System (US), 5-Year Treasury Constant Maturity Rate [DGS5], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DGS5>, January 4, 2018. <https://fred.stlouisfed.org/graph/?g=hkhD>

Credit Spread History



BofA Merrill Lynch, BofA Merrill Lynch US Corporate A Effective Yield [BAMLC0A3CAEY], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/BAMLC0A3CAEY>, January 3, 2018.

BofA Merrill Lynch, BofA Merrill Lynch US Corporate A Option-Adjusted Spread [BAMLC0A3CA], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/BAMLC0A3CA>, January 3, 2018.

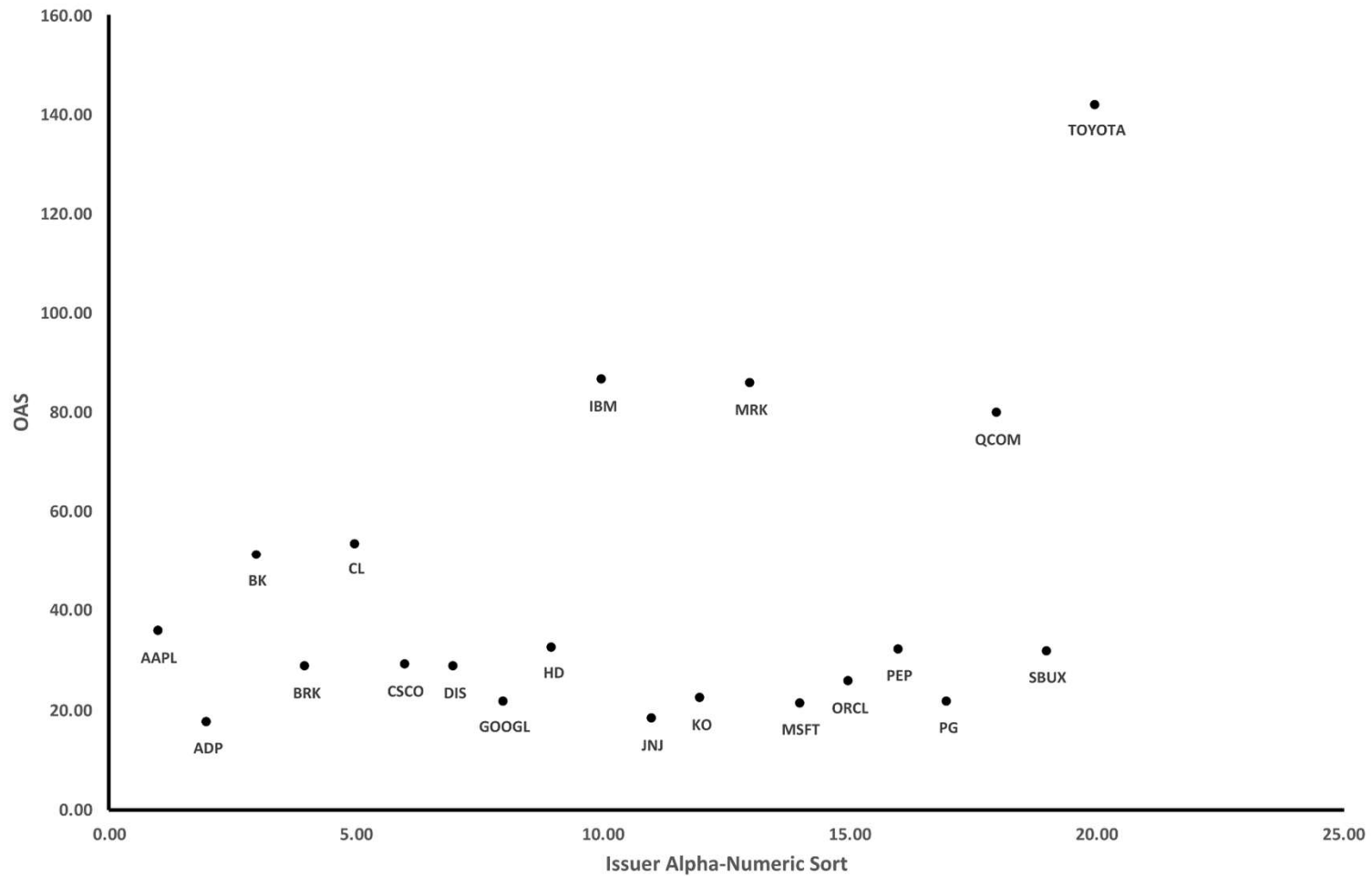
<https://fred.stlouisfed.org/graph/?g=hjVl>

Santa Monica Corporate Spreads

Ticker	Par Amount (\$000)	% Portfolio	Effective Duration	Bloomberg 5Yr Prob Default %	Analyst % Buy Hold	OAS
AAPL	7,000.00	0.98	1.20	0.58	100.00	35.42
ADP	2,500.00	0.35	2.56	0.42	95.00	17.27
BK	5,000.00	0.71	0.54	1.60	90.91	50.97
BRK	2,000.00	0.28	0.60	0.46	0.00	28.33
CL	1,500.00	0.21	0.32	0.47	96.15	53.27
CSCO	12,000.00	1.68	1.92	0.59	100.00	28.70
DIS	13,000.00	1.83	2.00	0.62	92.59	28.33
GOOGL	4,800.00	0.71	3.16	0.30	97.62	21.55
HD	7,000.00	0.99	4.12	0.42	100.00	32.34
IBM	7,500.00	1.06	0.09	0.99	89.29	86.22
JNJ	10,000.00	1.40	2.85	0.32	88.46	17.90
KO	7,000.00	1.00	2.72	0.36	93.75	22.01
MRK	3,000.00	0.42	0.07	0.62	100.00	85.48
MSFT	12,000.00	1.68	2.41	0.49	94.29	20.98
ORCL	5,500.00	0.77	2.13	0.71	100.00	25.35
PEP	7,000.00	0.97	3.80	0.44	100.00	31.92
PG	2,500.00	0.35	2.70	0.35	92.59	21.30
QCOM	7,500.00	1.06	4.07	0.95	100.00	79.50
SBUX	10,984.00	1.55	2.94	0.61	97.22	31.54
TOYOTA	7,000.00	0.99	0.28	0.00	0.00	141.80

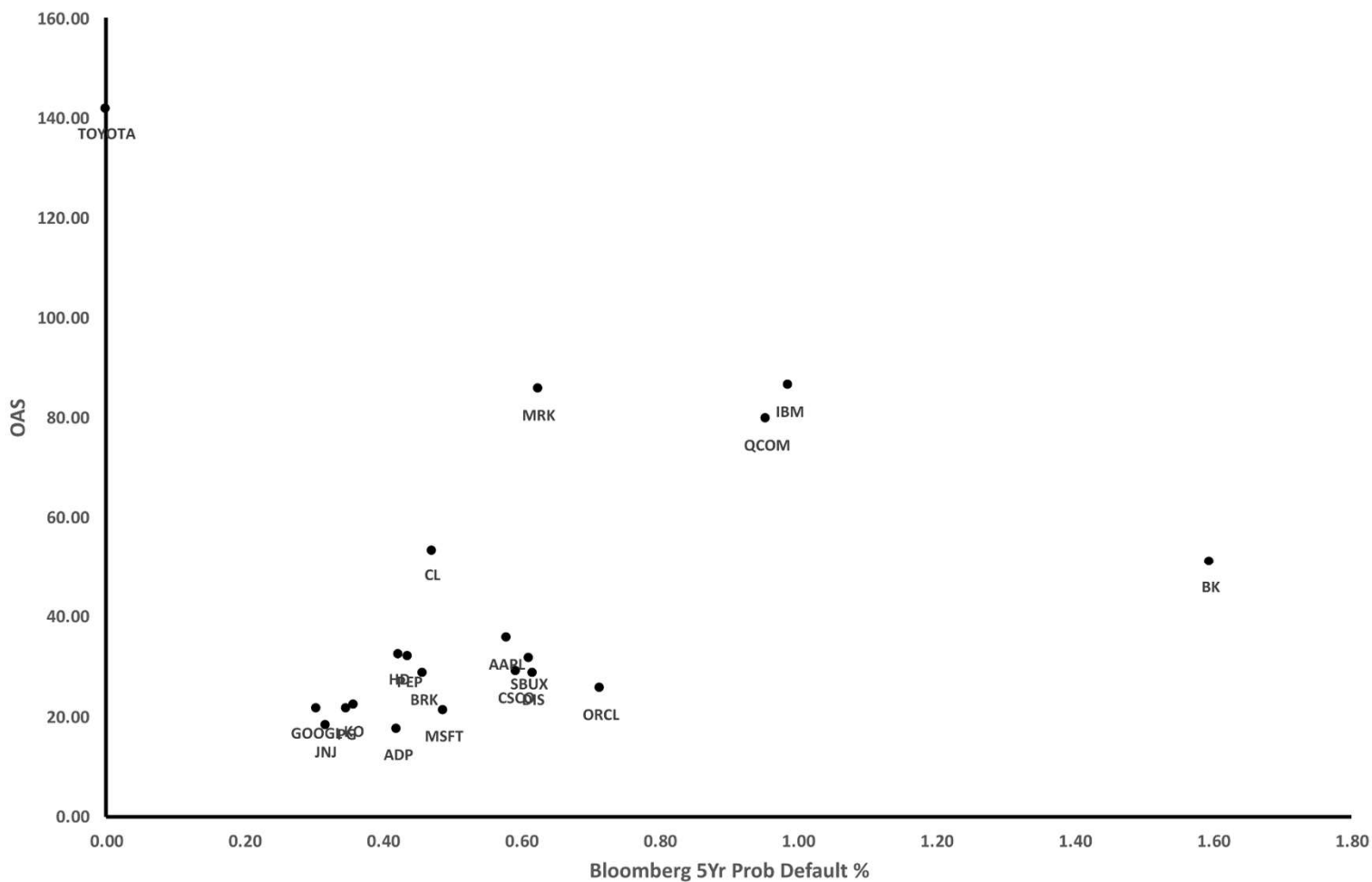
Santa Monica Corporate Spreads

Issuer Matrix for Santa Monica-20180104 (Using 12/19/17 Data)
Showing Corporates Issuers
Data Labels Showing Ticker



Santa Monica OAS vs Default %

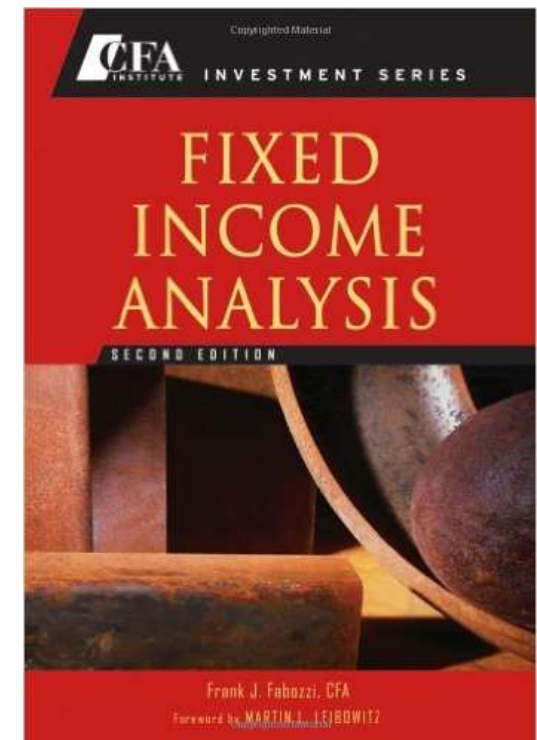
Issuer Matrix for Santa Monica-20180104 (Using 12/19/17 Data)
Showing Corporates Issuers
Data Labels Showing Ticker



Transition Matrix

□ What is it?

- “A popular tool used by managers to gauge the prospects of an issue being downgraded or upgraded is a rating transition matrix. This is simply a table constructed by the rating agencies that shows the percentage of issues that were downgraded or upgraded in a given time period. So, the table can be used to approximate downgrade risk and default risk.”



Transition Rates: 5 Year

Average Multi-Year Global Corporate Transition Matrices (1981 - 2016) (%)

--Five-year transition rates (%)--

From/to	AAA	AA	A	BBB	BB	B	CCC/C	D	NR
AAA	49.58	28.37	4.86	0.81	0.24	0.16	0.08	0.35	15.53
	(11.91)	(13.14)	(2.67)	(1.54)	(0.47)	(0.41)	(0.28)	(0.60)	(6.45)
AA	1.49	50.29	24.87	3.71	0.59	0.39	0.04	0.34	18.26
	(0.93)	(7.74)	(4.69)	(1.65)	(0.63)	(0.59)	(0.10)	(0.38)	(4.55)
A	0.08	5.22	54.95	15.13	2.15	0.71	0.16	0.57	21.04
	(0.10)	(2.31)	(6.65)	(2.21)	(1.11)	(0.88)	(0.18)	(0.42)	(4.05)
BBB	0.03	0.47	10.51	51.02	7.68	2.29	0.40	1.93	25.68
	(0.07)	(0.54)	(3.25)	(7.46)	(1.74)	(1.46)	(0.40)	(1.46)	(4.32)
BB	0.01	0.08	1.06	12.72	30.83	11.08	1.32	7.84	35.06
	(0.06)	(0.18)	(0.99)	(3.26)	(6.80)	(2.19)	(0.91)	(4.84)	(4.51)
B	0.01	0.03	0.28	1.63	10.55	24.83	2.99	19.25	40.42
	(0.11)	(0.09)	(0.58)	(1.22)	(2.73)	(5.50)	(1.02)	(8.87)	(5.51)
CCC/C	0.00	0.00	0.12	0.74	2.98	12.18	2.53	46.96	34.49
	(0.00)	(0.00)	(0.51)	(1.85)	(2.08)	(4.73)	(3.78)	(12.36)	(9.21)

Numbers in parentheses are weighted standard deviations, weighted by the issuer base. Sources: S&P Global Fixed Income Research and S&P CreditPro®.

Standard & Poors "Default, Transition, and Recovery: 2016 Annual Global Corporate Default Study And Rating Transitions", Table 36 on Page 83.

http://media.spglobal.com/documents/SPGlobal_Ratings_Article_13+April+2017_Annual+Corporate+Default+Study+and+Rating+Transitions.pdf

A Ratings Digression Part 1

Lehman Brothers Credit Rating History

Moody's Senior Unsecured Debt		
Rating	Watch	Effective
WR		12/10/2008
C		12/08/2008
B3	*-	09/15/2008
A2	*	09/10/2008
A2		07/17/2008
A1	*-	06/13/2008
A1		10/22/2003
A2	*+	06/24/2003
A2		11/03/2000

Up / Down / No Change / Initial

Close

S&P LT Local Issuer Credit		
Rating	Watch	Effective
NR		09/25/2008
D		09/16/2008
SD		09/15/2008
A	*	09/12/2008
A	*-	09/09/2008
A		06/02/2008
A+		10/11/2005
A		02/22/2002

Fitch Senior Unsecured Debt		
Rating	Watch	Effective
NR		10/27/2008
CCC		09/15/2008
A+	*-	09/09/2008
A+		06/09/2008
AA-		06/28/2007
A+		06/20/2001
A		05/31/1994

Up / Down / No Change / Initial

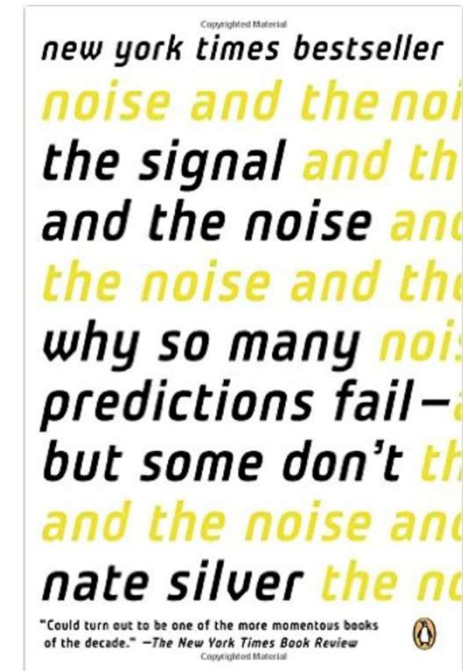
Close

Source: Bloomberg

A Ratings Digression Part 2

“The ratings agencies had given their AAA rating, normally reserved for a handful of the world’s most solvent governments and best-run businesses, to thousands of mortgage-backed securities, financial instruments that allowed investors to bet on the likelihood of someone else defaulting on their home. The ratings issued by these companies are quite explicitly meant to be predictions: estimates of the likelihood that a piece of debt will go into default. Standard & Poor’s told investors, for instance, that when it rated a particularly complex type of security known as a collateralized debt obligation (CDO) at AAA, there was only a 0.12 percent probability— about 1 chance in 850— that it would fail to pay out over the next five years. ...

In fact, around 28 percent of the AAA-rated CDOs defaulted, according to S&P’s internal figures. ... This is just about as complete a failure as it is possible to make in a prediction: trillions of dollars in investments that were rated as being almost completely safe instead turned out to be almost completely unsafe. It was as if the weather forecast had been 86 degrees and sunny, and instead there was a blizzard.”



Silver, Nate (2012-09-27).
The Signal and the Noise:
Why So Many Predictions Fail-
but Some Don't (pp. 20-21).
Penguin Group US. Kindle
Edition.

WolframAlpha

□ Computational Knowledge Engine

□ www.wolframalpha.com



The screenshot displays the WolframAlpha PRO interface. At the top, the logo features a red starburst icon followed by the text "WolframAlpha" in red and "PRO" in grey. Below the logo is a search bar with the text "what are you?". To the right of the search bar are a star icon and a red square icon. Below the search bar are four icons: a keyboard, a camera, a list, and a refresh icon. To the right of these icons are the links "Examples" and "Random". Below the search bar is a light blue box containing the text "Assuming 'what are you' is a phrase | Use as a word instead". Below this box is a section titled "Input interpretation:" containing the text "What are you?". Below this section is a section titled "Response:" containing the text "I am a computational knowledge engine."

What is a Computational Knowledge Engine?



what is a computational knowledge engine?



Examples Random

Input interpretation:

What is a computational knowledge engine?

Response:

An engine, such as Wolfram | Alpha, that generates output by doing computations from its own internal knowledge base instead of searching the web and returning links.

So What? What can it do?



what is the probability of 4 heads in a row with 50 coin tosses? ☆

what airplanes are overhead? ☆



Examples Random



Examples Random

Input interpretation:

Input interpretation:

sequence of coin flips	number of flips	50
	consecutive heads	4

flights seen from current geoIP location

Probability:

More digits

$$\frac{931\,585\,354\,543\,339}{1\,125\,899\,906\,842\,624} \approx 0.827414$$

Result:

Show metric

	altitude	angle
SkyWest Airlines flight 6238	19 700 feet	43° up
Lufthansa flight 454	31 000 feet	8.4° up
Asiana Airlines flight 204	39 000 feet	6.1° up
China Eastern Airlines flight 2856	34 000 feet	5.9° up

Approximate chance:

1 in 1.2

Approximate expected length of longest run of heads:

More digits

$$-\frac{1}{2} + \frac{\gamma}{\log(2)} + \frac{\log(25)}{\log(2)} \approx 4.9766$$

$\log(x)$ is the natural logarithm
 γ is the Euler-Mascheroni constant

	type	slant distance
SkyWest Airlines flight 6238	Embraer 175	5.5 miles WSW
Lufthansa flight 454		38 miles NNW
Asiana Airlines flight 204		66 miles SW
China Eastern Airlines flight 2856	Airbus A330-200	61 miles SSE

Simulation:

Flip again

H | T | H | T | H | H | H | T | H | T | T | H | T |
H | H | T | H | T | H | T | H | H | H | H | T | H |
T | H | T | H | H | T | H | T | H | H | H | T | T |
H | H | T | H | H | T | H | H | H | T | T |

Hmmm... What else?



San Diego, CA | San Francisco, CA



Examples Random

Input interpretation:

San Diego, California | San Francisco, California

Populations:

	San Diego	San Francisco
city population	1.381 million people (country rank: 8 th) (2014)	852 469 people (country rank: 14 th) (2014)
urban area population	2.674 million people (San Diego (CA) urban area) (country rank: 15 th) (2000)	3.229 million people (San Francisco-Oakland urban area) (country rank: 12 th) (2000)
metro area population	3.14 million people (San Diego-Carlsbad-San Marcos metro area) (country rank: 17 th) (2011)	4.391 million people (San Francisco-Oakland-Fremont metro area) (country rank: 11 th) (2011)

Demographics:

Less

	San Diego	San Francisco
race	white: 65.2% Asian: 16.2% black/African American: 6.8% other: 6.1% two or more races: 4.5% American Indian/Alaska native: 0.6% Hawaiian/Pacific Islander: 0.6%	white: 50.7% Asian: 33.5% black/African American: 6% other: 4.8% two or more races: 4.1% American Indian/Alaska native: 0.5% Hawaiian/Pacific Islander: 0.4%

Educational attainment:

Hide enrollment

	San Diego	San Francisco
college degree and above	49% (1.35 × national average)	57.4% (1.59 × national average)
high school diploma	16.3% (0.577 × national average)	13.7% (0.485 × national average)
less than high school diploma	13.4% (0.939 × national average)	14.1% (≈ national average)

(for population age 25 and older)

female:

15 to +:

Current enrollment:

	San Diego	San Francisco
college, graduate or professional school	12.1% (1.56 × national average)	11.5% (1.48 × national average)
pre-K to 12th grade	17.8% (0.892 × national average)	10.6% (0.533 × national average)
not enrolled	70.1% (0.97 × national average)	77.9% (1.08 × national average)

(for population age 3 and older)

I bet it doesn't know football!

Input interpretation:

Los Angeles Rams (NFL team) | Atlanta Falcons (NFL team)

Team history:

Hide history

	Los Angeles Rams	Atlanta Falcons
name	Cleveland Rams (1937 to 1945) Los Angeles Rams (1946 to 1994) St. Louis Rams (1995 to 2015) Los Angeles Rams (2016 to present)	Atlanta Falcons (1966 to present)
city	Cleveland, Ohio (1937 to 1945) Los Angeles, California (1946 to 1994) Saint Louis, Missouri (1995 to 2015) Los Angeles, California (2016) Saint Louis, Missouri (2016) Los Angeles, California (2017) Saint Louis, Missouri (2017)	Atlanta, Georgia (1966 to present)
league	Western Conference (1937 to 1969) National Football Conference (1970 to present)	Eastern Conference (1966) Western Conference (1967 to 1969) National Football Conference (1970 to present)
division	Coastal Division (1967 to 1969) NFC West (1970 to present)	Coastal Division (1967 to 1969) NFC West (1970 to 2001) NFC South (2002 to present)

2017 game stats:

	Rams	Falcons
games played	16	16
wins	11	10
points scored	478	353
plays	1000	984
yards	5784 yards	5837 yards
touchdowns	51	36
extra points	48	35
two point conversions	0	0
field goals	40	34
safeties	2	0
first downs	311	330
third down percentage	41.12%	44.67%
fourth down percentage	41.67%	30.77%

2017 season standings:

NFC West:

	W	L	Pct	GB	L10	Streak	Home	Away
Rams	11	6	.647	-	6-4	L1	4-4	7-2
Seaha: wks	9	8	.529	2	4-6	L1	4-5	5-3
Cardi: nals	8	9	.471	3	5-5	W2	5-3	3-6
49ers	6	10	.375	4.5	6-4	W5	3-5	3-5

Definitions →

NFC South:

	W	L	Pct	GB	L10	Streak	Home	Away
Saints	12	5	.706	-	7-3	L1	8-1	4-4
Panth: ers	11	5	.688	.5	7-3	L1	6-2	5-3
Falco: ns	11	6	.647	1	7-3	W1	5-3	6-3
Bucca: neers	6	11	.353	6	4-6	W1	4-4	2-7



Source: WolframAlpha on 1/4/18

<http://www.wolframalpha.com/input/?i=compare+the+Rams+and+Falcons&rawformassumption=%7B%22C%22,+%22Rams%22%7D+-%3E+%7B%22NFLTeam%22%7D>

WolframAlpha & Credit Analysis



AAPL vs IBM vs MSFT



Fundamentals and financials:

Fundamentals ▾

	Apple	IBM	Microsoft
market cap	\$876.1 billion	\$146.7 billion	\$666.2 billion
revenue	\$229.2 billion	\$78.37 billion	\$94.04 billion
employees	123 000	414 400	124 000
revenue / employee	\$1.864 million	\$189 100	\$758 300
net income	\$48.35 billion	\$11.31 billion	\$23.09 billion
shares outstanding	5.087 billion	925.8 million	7.715 billion
annual earnings / share	\$9.26	\$12.01	\$2.99
P/E ratio	18.6	13.2	28.88

(based on trailing 12-month totals, last close price and annual employees)

Fundamentals and financials:

Ratios ▾

	Apple	IBM	Microsoft
P/E ratio	18.6	13.2	28.88
price / book			
price / sales			
price / free cash flow			
return on equity	+ 36.87%	+ 14.33%	+ 8.12%
return on assets	+ 13.87%	+ 2.25%	+ 2.68%
leverage	2.8	6.197	2.779
current ratio	1.276	1.412	3.12
debt / capital	0.4203	0.678	0.4778
net profit margin	+ 20.38%	+ 14.23%	+ 26.8%

(based on last close price, 12-month sales and 12-month averages)

Source: WolframAlpha on 1/4/18

<http://www.wolframalpha.com/input/?i=AAPL+vs+IBM+vs+MSFT>

WolframAlpha & Credit Analysis

Relative price history:

Last 5 years ▼

Separate plots



(normalized relative to January 8, 2013 starting date)

Source: WolframAlpha on 1/4/18

<http://www.wolframalpha.com/input/?i=AAPL+vs+IBM+vs+MSFT>

WolframAlpha & Credit Analysis

Performance comparisons:

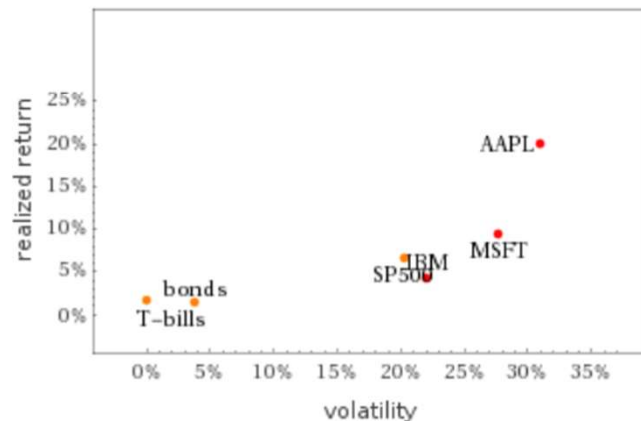
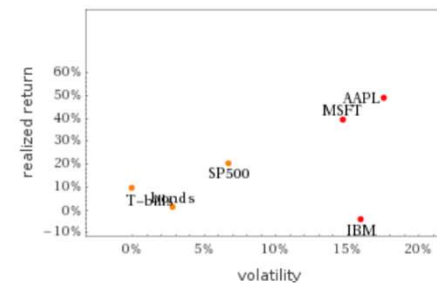
Last 10 years ▼

	average daily return	daily volatility	annual return	annual volatility
AAPL	+ 0.072%	1.96%	+ 19.9%	31.09%
IBM	+ 0.016%	1.39%	+ 4.2%	22.1%
MSFT	+ 0.035%	1.75%	+ 9.3%	27.76%
SP500	+ 0.025%	1.28%	+ 6.42%	20.32%
bonds	+ 0.005%	0.25%	+ 1.31%	3.91%
T-bills	+ 0.006%	0%	+ 1.64%	0%

Performance comparisons:

Last year ▼

	average daily return	daily volatility	annual return	annual volatility
AAPL	+ 0.157%	1.11%	+ 48.7%	17.72%
IBM	- 0.018%	1.01%	- 4.52%	16.05%
MSFT	+ 0.13%	0.93%	+ 38.96%	14.77%
SP500	+ 0.073%	0.43%	+ 20.17%	6.79%
bonds	+ 0.003%	0.18%	+ 0.75%	2.87%
T-bills	+ 0.035%	0%	+ 9.23%	0%



Correlation matrix:












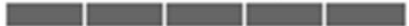
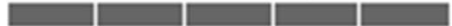
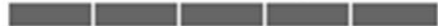
	AAPL	IBM	MSFT	SP500
AAPL	1	0.174	0.472	0.548
IBM	0.174	1	0.304	0.509
MSFT	0.472	0.304	1	0.667
SP500	0.548	0.509	0.667	1

Source: WolframAlpha on 1/4/18

<http://www.wolframalpha.com/input/?i=AAPL+vs+IBM+vs+MSFT>
















Equity Analysts Rating Analysis

Analyst Ratings Apple Inc.

	3 Months Ago	1 Month Ago	Current
Buy	 24	 27	 26
Overweight	 5	 5	 5
Hold	 7	 6	 7
Underweight	0	0	0
Sell	 1	 1	0
Consensus	 OVERWEIGHT	 OVERWEIGHT	 OVERWEIGHT
















Equity Analysts Rating Analysis

Analyst Ratings International Business Machines Corp.

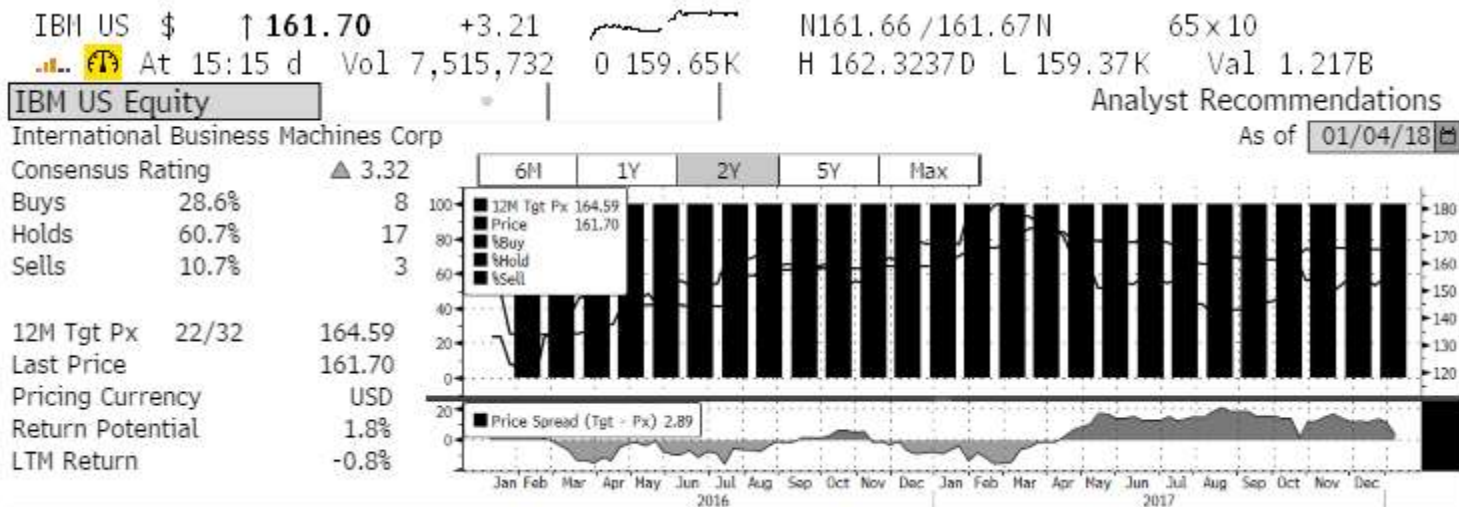
	3 Months Ago	1 Month Ago	Current
Buy	 6	 7	 8
Overweight	 1	 1	 1
Hold	 16	 17	 15
Underweight	0	0	0
Sell	 4	 3	 3
Consensus	 HOLD	 HOLD	 HOLD

Equity Analysts Rating Analysis

Analyst Ratings Microsoft Corp.

	3 Months Ago	1 Month Ago	Current
Buy	 23	 25	 25
Overweight	 1	 1	 1
Hold	 8	 7	 7
Underweight	0	0	0
Sell	 1	 1	 1
Consensus	 OVERWEIGHT	 OVERWEIGHT	 OVERWEIGHT

Equity Analysts Rating Analysis



Showing 29 of 33 sources

Firm	Analyst	Recommendation	Tgt Px	Date	1 Yr Rtn	BARR	Rank
1) RBC Capital Markets	Amit Daryanani	outperform	183.00	01/04/18	0.00%	4	7
2) Pivotal Research Group L...	Louis R Miscioscia	buy	180.00	01/03/18			
3) EVA Dimensions	Anthony Campagna	overweight		12/27/17	8.49%	1	
4) Wedbush	Moshe Katri	neutral	155.00	12/22/17			
5) Guggenheim Securities	Robert Cihra	neutral		12/21/17	0.00%	4	5
6) J.P. Morgan	Tien-Tsin Huang	neutral	157.00	12/12/17	0.00%	4	10
7) KeyBanc Capital Markets	Arvind Ramnani	sector weight		12/11/17			
8) Morningstar, Inc	Andrew Lange	hold		12/11/17	0.00%	4	
9) Cantor Fitzgerald	Joseph D Foresi	neutral	154.00	12/01/17	0.00%	4	9
10) Tigress Financial Partners	Ivan Feinseth	neutral		11/30/17	0.00%	4	8
11) Argus Research Corp	James Kelleher	buy	175.00	11/28/17	-1.52%		2
12) Edward Jones	Josh Olson	hold		11/28/17			

Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S.: 1 212 318 2000 Copyright 2018 Bloomberg Finance L.P.
 SN 160910 CST GMT-6:00 6747-3051-3 04-Jan-2018 16:11:20

SRI/ESG Considerations

ENVIRONMENTAL,
SOCIAL, AND
GOVERNANCE
ISSUES IN
INVESTING

A Guide for Investment Professionals

CFA Institute

“A critical factor in the financial performance of investments is the investor’s ability to identify drivers of the expected risk and return of investments. Financial analysts and portfolio managers are expected to be familiar with the financial factors that drive the value of an investment. However, issues that are difficult to measure in monetary terms and that do not form part of traditional financial metrics also affect the risk and return of investments—at times, decisively. **In general, they are referred to as environmental, social, and governance (ESG) issues.**”

Environmental Issues

- Climate change and carbon emissions
- Air and water pollution
- Biodiversity
- Deforestation
- Energy efficiency
- Waste management
- Water scarcity

Social Issues

- Customer satisfaction
- Data protection and privacy
- Gender and diversity
- Employee engagement
- Community relations
- Human rights
- Labor standards

Governance Issues

- Board composition
- Audit committee structure
- Bribery and corruption
- Executive compensation
- Lobbying
- Political contributions
- Whistleblower schemes

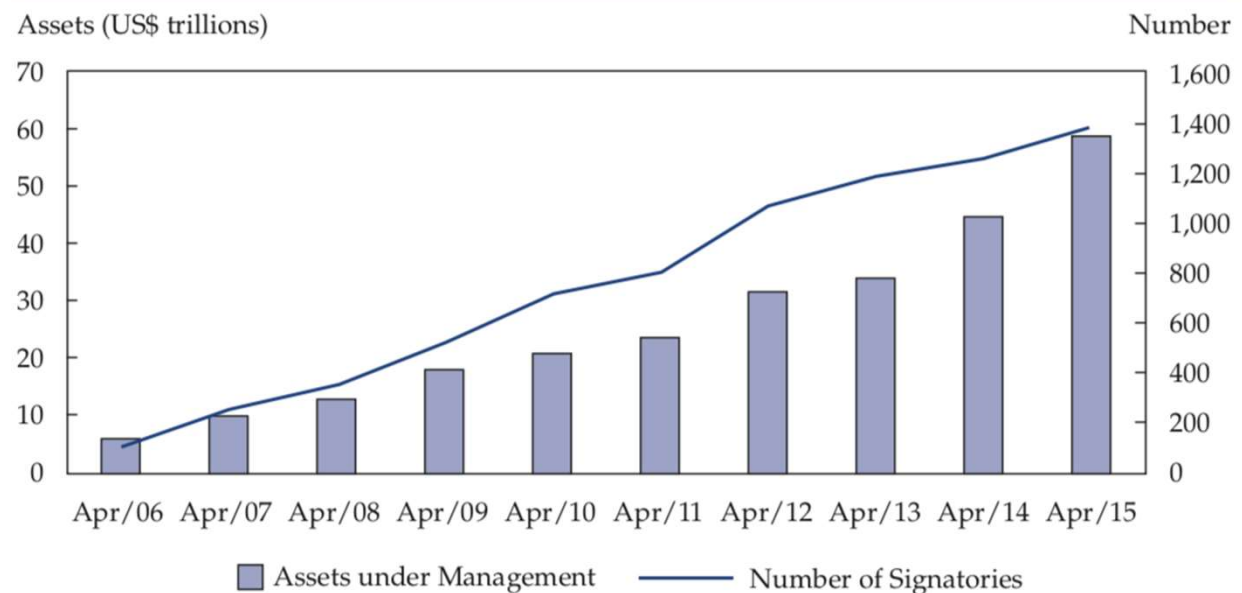
Awareness is Growing

ENVIRONMENTAL,
SOCIAL, AND
GOVERNANCE
ISSUES IN
INVESTING

A Guide for Investment Professionals

CFA Institute

“A well-known indicator of the increasing awareness of ESG issues is the rapidly growing list of signatories to the United Nations–supported Principles for Responsible Investment (PRI), the principal framework for investors who wish to integrate the consideration of ESG issues into their investment decision making. According to PRI, the assets under management (AUM) of its signatories have grown from less than \$6 trillion at PRI’s launch in 2006 to nearly \$60 trillion as of April 2015 .”



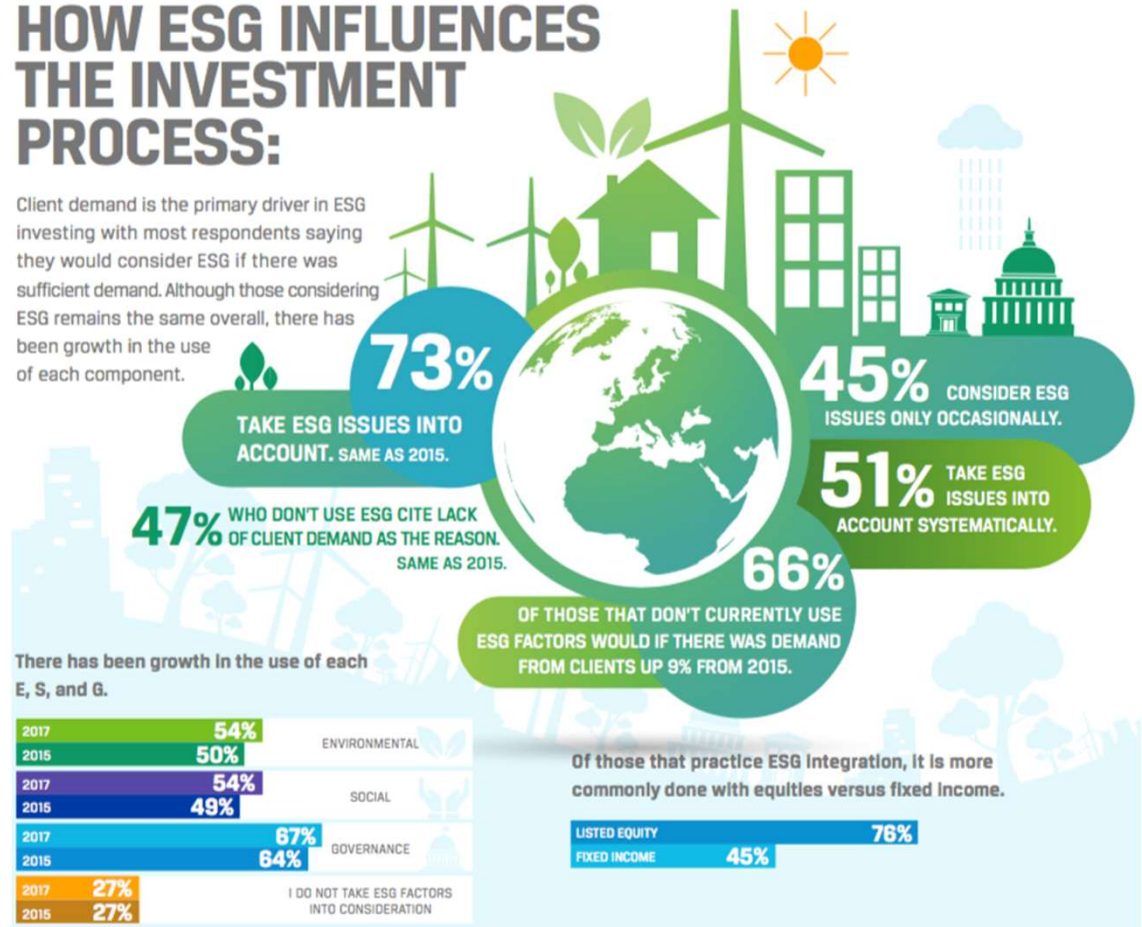
ESG Resources (CFA Institute)

GLOBAL PERCEPTIONS OF ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) INVESTING 2017



HOW ESG INFLUENCES THE INVESTMENT PROCESS:

Client demand is the primary driver in ESG investing with most respondents saying they would consider ESG if there was sufficient demand. Although those considering ESG remains the same overall, there has been growth in the use of each component.



SRI/ESG Metrics

IBM US \$ C 162.49 +0.79
..... On 05 Jan d Vol 5,195,764 0 162.44P

N162.45 / 162.46N 25x26
H 162.90K L 161.101D Val 842.096H

IBM US Equity
International Business Machines Corp

Environmental, Social & Governance Analysis

History 5 Years Currency USD

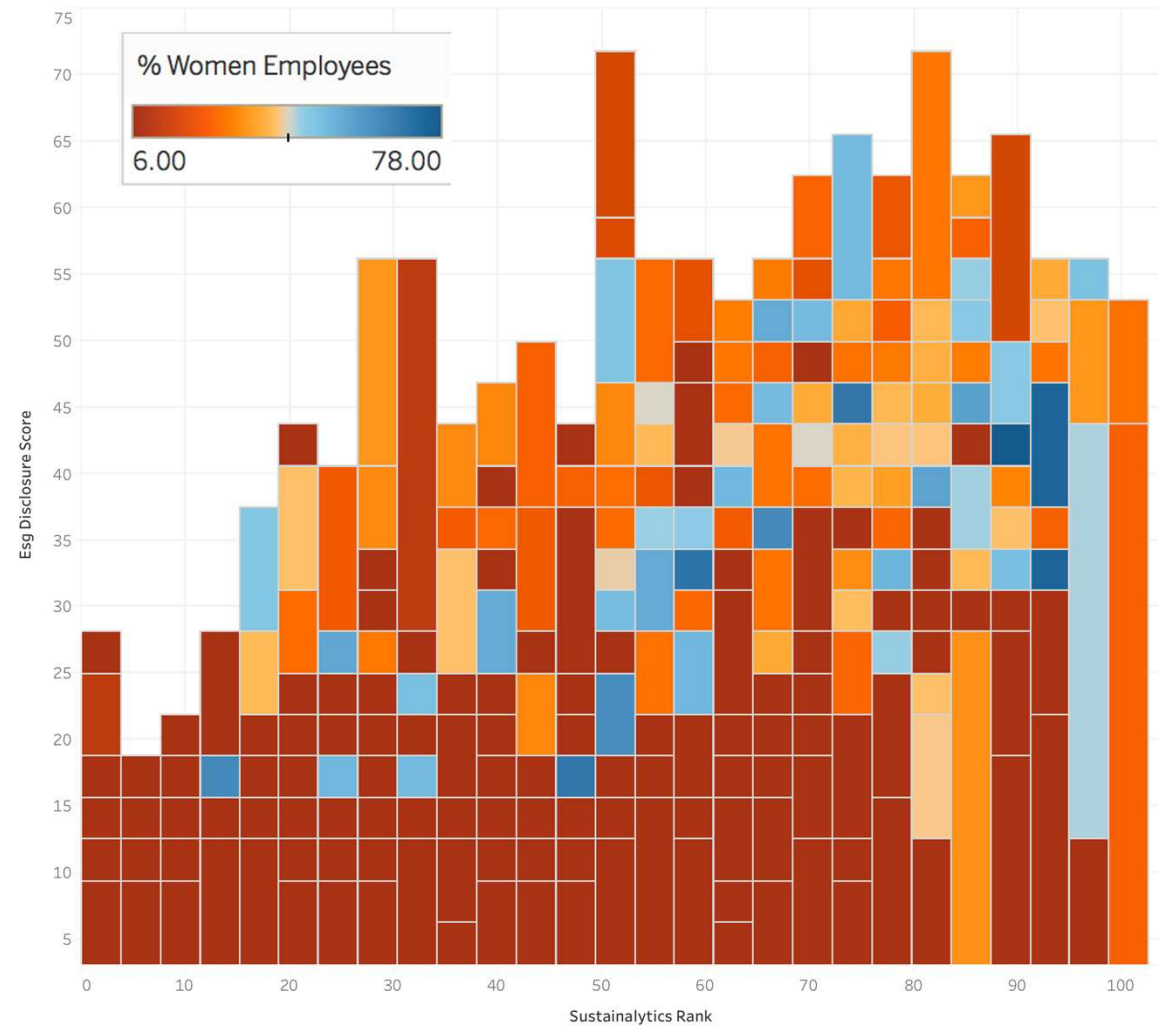
Summary	vs History	vs Peers
Environmental	Better	Worse
Social	Neutral	Better
Governance	Worse	Worse

ESG Scores RV ESG »			
RobecoSAM Rank	69	ISS QualityScore	10
Sustainalytics Rank	98.4	CDP Climate Score	6
Bloomberg ESG Disclosure	55.4		

Metrics	vs History			vs Peers					
	Current	History	Change	Low	Range	High	Median	Difference	History
1) Environmental									
11) GHG/Revenue	20.3		-5.1 B	10.1		93.1	13.6	6.6 W	
2) Social									
21) Women Empls Mgmt Ratio	0.84		-0.02 W	0.42		1.01	0.72	0.12 B	
22) Women Employees %	31.8		1.7 B	25.8		36	26.7	5.1 B	
23) Employee Turnover %	--		--	17.9		21.5	19.2	--	
24) Employees Unionized %	--		--	0.7		54	23.8	--	
25) Lost Time Incident Rate	0.17		0	0.04		0.04	0.04	0.13 W	
3) Governance									
31) Independent Directors %	92.9		8.2 B	16.7		91.7	72.7	20.1 B	
32) Percent of Board Members...	20		-3.1 W	0		45.5	18.1	1.9 B	
33) Director Avg Age	64		0 B	55		68	61	3 W	
34) Director Meeting Attd %	96		21 B	75		94.8	87	9 B	
35) Board Size	15		2 W	6		12	11	4 W	

Australia 61 2 9777 8600 Brazil 5511 2395 9000 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S.: 1 212 318 2000 Copyright 2018 Bloomberg Finance L.P.
SN 697674 CST GMT-6:00 H762-3644-2 07-Jan-2018 11:25:01

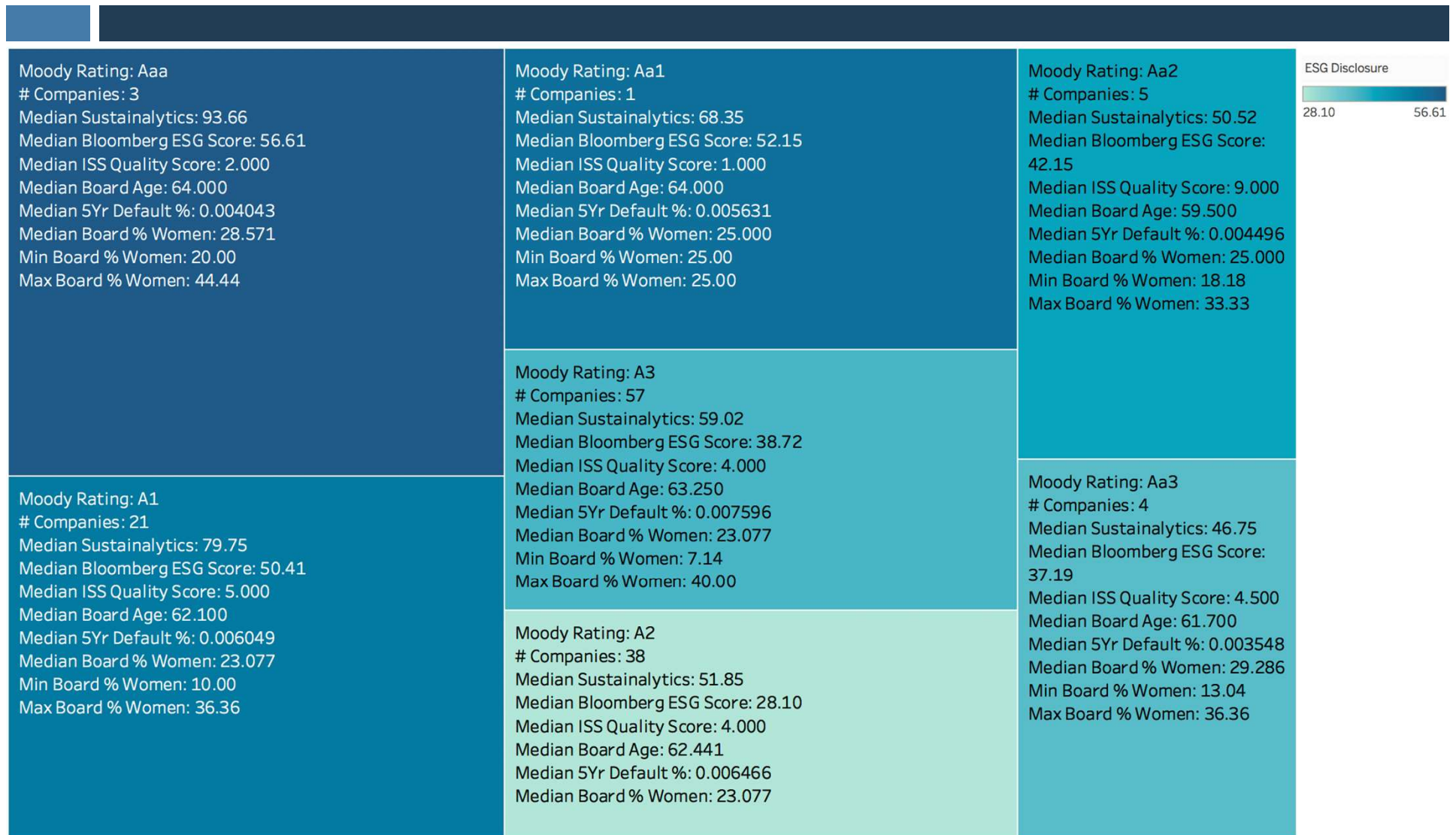
% Women by Sustainalytics vs ESG (1/3/18)



Sustainalytics Rank (bin) vs. Esg Disclosure Score (bin). Color shows average of Pct Women Employees.

Source: Bloomberg. Analysis and Graphs by David Carr & Kevin Webb, CFA

SRI/ESG Metrics by Moody Rating (1/3/18)



Source: Bloomberg. Analysis and Graphs by David Carr & Kevin Webb, CFA

Disclaimer

This presentation is intended to discuss broad investment principles and is should not be viewed as the Firm acting as an advisor to the Municipal Entity or Obligated Person. The Firm does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to the Municipal Entity or Obligated Person with respect to the information and material contained in this presentation. The Municipal Entity or Obligated Person should discuss any information and material contained in this communication with any and all internal or external advisors and experts that the Municipal Entity or Obligated Person deems appropriate before acting on this information or material.

While care has been taken in the preparation of the Presentation presented herein, information has been obtained from sources believed to be reliable but Cantor does not make any representations or warranties, express or implied, as to the accuracy, completeness, or appropriateness of the information contained herein. Additional information is available upon request. This Presentation may contain forward-looking statements, which give current expectations of future activities and performance. Any or all forward-looking statements in this Presentation may prove to be incorrect and such statements may be affected by inaccurate assumptions or by known or unknown risks and uncertainties. Cantor does not undertake any obligation to revise such forward-looking statements to reflect the occurrence or non-occurrence of events or circumstances, whether changed, anticipated, or unanticipated.

Presentations have been prepared by sales personnel who receive compensation based upon various factors, including, but not limited to, the overall profitability of Cantor. Cantor and its partners, officers, directors, or employees may sell to, or purchase from, customers securities, commodity futures, derivatives, or other financial instruments on a principal basis or as agent for another person, and may have interests different or adverse to the interests of the recipient of this communication. Cantor's representatives, other than the author of this communication, may provide oral or written market commentary or trading strategies to Cantor's clients that reflect opinions that are contrary to the opinions expressed in this communication or others at Cantor.

You are cautioned that there is no universally accepted method for analyzing financial instruments. Past performance is not indicative of future results. As a matter of policy, Cantor does not give tax, accounting, regulatory or legal advice to clients, and the information contained herein should not be considered to constitute such advice. Cantor strongly urges that the recipient seek independent legal, regulatory, accounting and tax advice regarding the contents of this communication and to make an independent determination regarding the suitability of any strategy or instrument identified herein. Cantor disclaims any and all liability for any loss that may arise from use of the information contained herein.