

The Average Cost of Debt for Companies with Multiple Bonds Outstanding

Robin Grieves*
Clinical Faculty
Department of Finance
Darla Moore School of Business
University of South Carolina
Columbia, South Carolina 29208
1-251-223-3474
robin.grieves@moore.sc.edu

Mark D. Griffiths
Jack Anderson Professor of Finance
Department of Finance
Miami University
Oxford, Ohio
1-602-882-0092
mark.griffiths@muohio.edu

*Corresponding author

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1. Introduction

As a first approximation, every company, everywhere in the world that reports the average interest rate on its debt gets it wrong, every time. Why is this approximation correct? We looked at S&P 500 companies and selected eight that report average interest on their long term debt. They all do it wrong. Those eight companies are audited by all of the Big Four auditing firms. If one auditing firm made one of its customers report the correct number, it would be reasonable to suspect that they would make all of their customers report the correct number. In addition, if one auditing firm made one or all of its customers report the correct number, the other auditing firms, upon seeing the correct solution, would almost certainly require all of their customers to use the correct calculation.

If US companies reported the correct number, much of the rest of the world would follow. In this case, the US is not leading.

If major companies abroad were reporting the correct calculation, one or more of the US auditing firms would almost certainly observe it and adopt it.

Average interest on long-term debt is one of the important inputs for analyzing a company and its prospects. Not all companies with multiple bonds outstanding report average interest on long-term debt, but they should. Even though every company gets it wrong, divisions within companies may well get it right. For example, the investments desks of major banks almost certainly use the correct average interest rate in their decisions, even if the company discloses a mistaken number.

For some debt structures and during some yield curve scenarios, explained below, the reporting error is material, which implies that financial analysts should either transform the company data that are provided or gather their own information.

A recent CFA Institute Centre for Financial Market Integrity publication, *A Comprehensive Business Reporting Model* (2007), says, "We must make clear that our proposed additions and other amendments to the framework are not considered lightly but are based upon the changes to the current financial statements that investors routinely must make in order to try to generate the data they need to analyze and value securities. Perhaps the most compelling argument for requiring that the reporting changes be made is that if investors must transform financial statements, and the information they contain, into a different form so that they can use the information in their decision making, then the statements and information should be presented in that form in the first place. Such a change would promote both market efficiency and effectiveness."¹

Currently, there is no requirement that companies report the average yield on their long-term debt. Consequently, there is no standard for reporting its value. Nevertheless, many companies do report their average yield presumably because they believe that the information is useful to investors and other stakeholders. The purpose of this paper is to demonstrate that the current calculations are incorrect and to present the correct calculation.

The correct calculation of the average yield on a company's long-term debt is important not only for reporting purposes, but for managing the company's business. Investment decisions that depend on the company's weighted average cost of capital (WACC) include the cost of debt. Companies that misreport the cost of debt are

¹ CFA Institute Centre for Financial Market Integrity, *A Comprehensive Business Reporting Model* (2007), p. 5

likely to be using the same, erroneous value for investment decisions, which can lead to errors in deciding which projects to pursue and which ones to drop.

For companies to persist in this error is something of a mystery because the correct answer to bond portfolio yield has been known and published for more than twenty years for those with access to Wall Street research.² Fixed income portfolio managers know that the correct measure of their portfolio yield is the duration-dollar weighted average of the individual security yields. Duration-dollar weights are calculated by multiplying the market value of each issue times the bond's modified duration or, where applicable, its effective duration. Each value divided by the sum of the duration-dollars is that issue's weight in the yield calculation.

Ambrose and Warga (1996) explored average interest measures on fixed income target portfolios (index -bogeys), which almost always used market value weighted yield to maturity. The value being sought, the yield to maturity on a collection of bonds, is the internal rate of return of the collection's cash flows. Yield to maturity is the discount rate that makes the present value of the cash flows equal to the full price of the bonds (quoted prices plus accrued interest). When a company has two or more bonds outstanding, especially when their maturities are quite different as in 5-years and 30-years, the current accounting practice of reporting market weighted average yield of the debt outstanding can be far from the internal rate of return on the combined cash flows and prices of those bonds.

² Ambrose and Warga (1996) and Garbade (1988) in Garbade (1996).

2. How Do Companies Report Average Interest Rates and what is the Correct Calculation?

Let's consider a simple numerical example. Suppose the XYZ Corp. has \$20 million each of a 2-year note and a 30-year bond outstanding. Further suppose that the 2-year has a 4% coupon priced at par to yield 4% and the 30-year has an 8% coupon, priced at par to yield 8%. While this sounds extreme, the steepest 2s/30s in the past thirty years was 401bp in on February 1, 2011. For the eight months, November 30, 2010 to July 31, 2011, the average slope (both mean and median) was 383bp.

The market weighted average yield to maturity on that (two bond) portfolio of liabilities is 6%. The duration-dollar weighted average yield to maturity is 7.42%. That difference is material.

Which is correct? The internal rate of return on the \$20 semi-annual coupon payments for the two year, \$40 semi-annual coupon payments on the 30-year, the \$1000 face value of the two year two years hence, the \$1000 face value of the 30-year thirty years hence and the \$2000 required to buy one of each of the bonds today is 7.47%. The duration-dollar weighted average yield is quite close while the market value weighted average is not close at all.³

The difference between market weighted average and duration-dollar weighted average depends on how different the maturities (actually, durations) of the company's issues are and how steep the yield curve is. If the bond's maturities (and, consequently, their durations) are close, duration-dollar weights and market weights

³ The correct calculations are covered in many fixed income texts. For example, see Fabozzi and Mann (2001) and Grieves and Griffiths (2005).

are also close. If the bonds yields are the same or they are similar, the weights in a weighted average do not matter very much.

Does this matter? Does anyone actually get it wrong? We have chosen eight large US companies that disclose the average cost of their outstanding debt. They all get it wrong.

Table 1 presents our eight companies, sorted by credit rating. We display the market value weighted average interest rate and the duration-dollar average interest rate. The difference between the measures ranges from 47bp to 140bp. Getting the interest rate wrong by 1.4% on a 5.45% level is material.⁴

[Table 1 about here.]

Table 2 displays the mapping of major auditing firms to our selected companies. All are represented.

[Table 2 about here.]

3. How Did this Appalling Circumstance Arise?

There are two culprits in this matter, the accounting profession and finance professors. The accounting profession gets blame because there is no standard for reporting average interest, leaving the calculation methodology to companies to decide. And lemming-like, they have chosen a mistaken calculation.

Finance professors are to blame because no introductory finance text and no intermediate corporate finance text include the correct calculation. This is all the more surprising because when they teach fixed income, finance professor teach proper technique for portfolio yield to maturity.

Table 3 lists the introductory and intermediate finance texts that we have examined in search for the correct calculation. The flaw almost always comes down

⁴ **Table 4** in Appendix A contains two examples of the detailed calculations presented in Table 1.

to assuming a single debt issue or simply announcing an average interest rate on a company's debt, without explaining how one should calculate that value.

[Figure 3 about here.]

If a corporate CFO had taken only corporate finance courses, he or she would fall in line with current practice without hesitation. If a bond analyst looked at a portfolio containing only one company's bonds, he or she would calculate a different average yield from the CFO on exactly the same set of bonds. That cannot be right.

4. Consequences

Does the error matter? As in so many cases, it depends. If the yield curve happens to be flat, which occurs from time to time, then average interest on a company's debt would not depend on which weighting scheme is used. If companies have several-to-many bond issues -laddered along the yield curve, the average interest rate from the competing calculation methods would be quite similar. For example, if a company's outstanding debt comprised four bond issues with equal market value and maturities 5-years, 10-years, 20-years, 30-years, their reported average interest rate would be 6.04% with a yield curve that slopes linearly in maturity from 4.5% to 8%. The duration dollar weighted average would be 6.43%. The gap between market weights and duration-dollar weights is much smaller than for the barbell we considered above.

If companies have no long term bank loans, then analysts need consider only their traded debt, which is observable. In this case, the aggregation rule that the company uses for its financial reports is not misleading. Investors can undertake the correct calculation for themselves. In fact, CFA charter holders, who populate buy side firms heavily, are taught the correct analysis, and they can choose the right measure for their valuation estimations.

When the company has a mix of bank loans and traded debt, analysts can make an educated guess at the company's average interest rate, but standard disclosures come up short on the required information.

The main difficulty with reporting the wrong average interest rate on debt is that companies may be deluding themselves on how much their debt costs, leading to a mis-estimation of weighted average cost of capital and faulty investment decisions.

What does it take for the average interest rate calculation to matter? First, the yield curve must be steep, as it is now. Second, the company's debt must be a barbell. For example, they have a 2-year bond outstanding and a 30-year bond outstanding. Finally, debt must be a significant portion of the company's capital structure. In that case, companies can end up with the wrong WACC and the wrong investment level or mix.

To be sure, companies' measures and application of WACC most nearly resembles, "measure with a micrometer, mark it with chalk and cut it with an axe." Still, there is no reason to use a broken micrometer willingly.

Even if their funding were barbells, some companies would still use the right measure for average interest internally, while reporting the flawed measure. Financial firms, in particular, have plenty of expertise in measuring portfolio yield, irrespective of whether the positions are long (assets) or short (debt). Typically, they use the correct calculation on both sides, consistently.

5. Conclusion

Current reporting practice nearly certainly has all companies reporting a mistaken average yield on their debt. Analysts can undo the error when evaluating the company, but the companies may be using the wrong interest rate in deciding on capital budgeting decisions.

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Table 1

Name	Rating	Market Value of Debt (\$M)	Traditional Average Interest	Dollar-Duration Average Interest	Difference (bp)
Sysco Corp	AA-	1238	3.621%	4.909%	128.8
The Chubb Company	A	1841	4.544%	5.163%	61.9
H.J. Heinz Company	A	3912	4.507%	5.165%	65.8
VF Corp	A-	1002	4.028%	5.203%	117.5
Nordstrom Inc	A-	1046	4.050%	5.452%	140.2
Baker Hughes International	A-	1292	4.875%	5.342%	46.7
Electronic Data Systems	BBB	3011	5.563%	6.500%	93.7
Motorola Inc	BBB	7710	4.898%	5.690%	79.2

Table 2
Auditing Firms for Selected Companies

Baker Huges International	Deloitte
Nordstrom, Inc.	Deloitte
The Chubb Company	Ernst and Young
Sysco Systems	Ernst and Young
Electronic Data Systems	KPMG
Motorola, Inc	KPMG
H.J.Heinz Company	PWC
VF Corp	PWC

Table 3
Survey of major academic texts 10/29/12
None of which calculate average yield correctly

Brigham, Houston	<i>Fundamentals of Financial Management, 7e</i>
Damodaran	<i>Applied Corporate Finance, 3e</i>
Ross, Westerfield, Jaffee	<i>Corporate Finance, 7e</i>
Brealey, Myers	<i>Principles of Corporate Finance, 7e</i>
Berk, DeMarzo	<i>Corporate Finance</i>
Grinblatt, Titman	<i>Financial Markets and Corporate Strategy</i>
Ross, Westerfield, Jordan	<i>Fundamentals of Corporate Finance, 7e</i>
Pratt	<i>Cost of Capital, 2e</i>
Eun, Resnick	<i>International Financial Management, 6e</i>
Benninga	<i>Principles of Finance with Excel</i>

Appendix A

Table 4 Panel A
SY Y: Sysco Corp
AA- Bonds

Yield-Traditional		SY Y Bonds						
	Coupon	Face (\$M)	Mkt (\$M)	wt	K	wk		
6/15/2005	0.06500	150	160	0.1292	0.01895	0.002449		
7/30/2005	0.04750	200	213	0.1721	0.0197	0.003389		
5/1/2006	0.07000	200	223	0.1801	0.02509	0.004519		
4/15/2007	0.07250	100	115	0.0929	0.02935	0.002726		
6/1/2012	0.06100	200	219	0.1769	0.04811	0.008511		
4/15/2027	0.07160	50	60	0.0485	0.05663	0.002745		
8/1/2028	0.06500	225	248	0.2003	0.05924	0.011867		
			<u>1,238</u>	1.0000		<u>3.621%</u>		

WACC-Dollar Duration		SY Y Bonds				t=0.4		
	Coupon	Face (\$M)	duration	Mkt (\$M)	Dollar duration	wt	K	wk
6/15/2005	0.06500	150	1.40	160	224	0.0343	0.01895	0.00065
7/30/2005	0.04750	200	1.51	213	321.63	0.0492	0.0197	0.00097
5/1/2006	0.07000	200	2.16	223	481.68	0.0738	0.02509	0.001851
4/15/2007	0.07250	100	2.95	115	339.25	0.0519	0.02935	0.001525
6/1/2012	0.06100	200	6.77	219	1482.63	0.2270	0.04811	0.010922
4/15/2027	0.07160	50	9.07	60	544.2	0.0833	0.05663	0.004719
8/1/2028	0.06500	225	12.65	248	3137.2	0.4804	0.05924	0.028458
				<u>1,238</u>	6530.59	1.0000		<u>4.909%</u>

Table 4 Panel B
CB: The Chubb Company
A Bonds

Yield-Traditional		CB Bonds				
	Coupon	Face (\$M)	Mkt (\$M)	wt	K	wk
8/15/2005	0.06150	300	327	0.1776	0.02019	0.003586
12/15/2007	0.07125	75	85	0.0462	0.03551	0.00164
4/1/2008	0.03950	225	229	0.1244	0.0372	0.004627
11/15/2011	0.06000	400	434	0.2357	0.04811	0.011342
4/1/2013	0.05200	275	283	0.1537	0.0496	0.007625
8/15/2018	0.06600	100	112	0.0608	0.05636	0.003429
2/1/2027*	0.08675	125	151	0.0820	0.07161	0.005873
11/15/2031	0.06800	200	220	0.1195	0.06124	0.007318
			<u>1,841</u>	1.0000		<u>4.544%</u>

WACC-Dollar Duration		CB Bonds						
	Coupon	Face (\$M)	duration	Mkt (\$M)	Dollar duration	wt	K	wk
8/15/2005	0.06150	300	1.53	327	500.31	0.0443	0.02019	0.000895
12/15/2007	0.07125	75	3.51	85	298.35	0.0264	0.03551	0.000939
4/1/2008	0.03950	225	3.90	229	893.1	0.0792	0.0372	0.002945
11/15/2011	0.06000	400	6.40	434	2777.6	0.2462	0.04811	0.011844
4/1/2013	0.05200	275	7.42	283	2099.86	0.1861	0.0496	0.009231
8/15/2018	0.06600	100	9.59	112	1074.08	0.0952	0.05636	0.005365
2/1/2027*	0.08675	125	4.74	151	715.74	0.0634	0.07161	0.004543
11/15/2031	0.06800	200	13.29	220	2923.8	0.2591	0.06124	0.01587
				<u>1,841</u>	11282.84	1.0000		<u>5.163%</u>

* rated BBB+