Carter's Cut, or How to Lose Money on Junk Bonds
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Carter's Cut, or How to Lose Money on Junk Bonds

Here, for review, are a paragraph, an Equation, and two more paragraphs from a foregoing paper on "Rate of Return" (IV, D). Equation numbers are changed, so this paper may begin with (1).

Rate of Return on Redeemable Bond, or "Yield-to-Maturity"

This rate is also called the "yield to maturity" (YTM). It combines two yields: the "current yield," a/P; and the bond appreciation from now to year n. You find it by solving the valuation equation for i.

$$i = a \cdot \frac{1-I^{-n}}{P-FI^{-n}} \qquad (1)$$

Equation is solved using Newton's method of systematic trial and error.

YTMs on redeemable bonds are published daily in the Wall St. Journal. Lots of people are interested. Many papers just publish what are called the "current yields," meaning just i = a/P. Anyone who invests based purely on current yield is cruising for a losing. He may often luck out, because for many bonds the appreciation element is minor; but for others it is major, and then you need Eqn. (1).

Carter and his Clever Cut

It is tempting to simplify by decomposing Eqn. (1) into two parts, finding ROR separately, and adding. Don't: it's wrong, and in some cases very wrong.

A dear old friend of mine, a Mr. Carter,[1] tried to simplify Eqn. (1) by cutting it in two. His procedure looks reasonable, but isn't. It lost him a lot of money -- and he never even knew it! He reasoned that the YTM is the sum of a/P + appreciation, so why not just figure each one separately and add them together? Here is what Carter figured.

$$i = a/P + [F/P]^{1/n} - 1 \qquad (2)$$

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[1]No relation to UCR's Professor Susan Carter.

Carter's Cut just adds together two of our 3 basic "building-block" Equations. He had a good intuition. It works out pretty well if F/P is close to one. Otherwise, however, it leads you by the hand down the primrose path to poverty. If Eqn. (1) were a robot like Hollywood's Johnny #5, it would be pleading "No Disassemble! No Disassemble #1!".

It led Carter to invest heavily in "deep-discount" bonds -- bonds with high F/P ratios. He would compare his figures from Eqn. (2) with those published in the *Wall Street Journal*, which uses Eqn. (1), and notice that his figures were higher than theirs, for the discount bonds. (They were lower for bonds selling at a premium.) He was a man of independent mind and action, who insisted on figuring things out for himself: a true contrarian he was, and usually right. He despised complexity because so much is humbug. He liked to reduce problems to simple elements. He had once worked for Thomas A. Edison, and said that's how "the old man" worked.

Those are admirable qualities in principle, which I cherish in students who show them. Ralph Waldo Emerson wrote a wonderful essay on *Self-Reliance* we should all read, full of familiar quotations. The only problem was, in this case Carter was wrong.

He was dead sure, though, and thought the *WSJ* and the whole financial community were missing his point, and were misstating the true YTM. Try as I might, I could never make a dent in his conviction. He was sure he was beating the market. He died (R.I.P.) thinking he did it; he'd have left his widow more if he had thought it out again.

I'll say this for my good old friend, he had self-confidence: never occurred to him maybe they were right, and he was wrong. I couldn't talk him out of it. But in fact, Eqn. (2) is wrong. It overstates the true yield on discount bonds. The reason, in words, is that it credits the bond with a current yield of a/P_o for every one of n years. That is fine if P remains constant over the life of the bond, but with discount bonds, it doesn't. P rises every year, to reach its terminal level of F. So:

the current yield on a discounted bond (high F/P) is less than a/P in every year after the first; and,

the current yield on a premium bond (low F/P) is more than a/P in every year after the first.

If the last three sentences make your head swim, let's try a *reductio ad absurdum*. A quick and dirty test of any proposition is how it behaves with extreme values. Try Carter's Cut when F = 0, and therefore, of course, F/P = 0. This *reductio* is not, actually, absurd in the sense of being unusual, but only in being extreme. Lots of investments have no salvage value. Most capital, in fact, just wears out and becomes junk. This is the first case we met in Paper IV, D, "Finding the Rate of Return."

Evaluate Eqn. (2) with F = 0, and a/P = .10. You get i = -.90, regardless of the value of n. This has to be wrong. Common sense tells you that when n=10, you will have recovered your entire P without interest, so i = 0. This is not so hot, but a sight better than i = -.90. Common sense also tells you that as n rises above 10, and gets very large, your true return ---> .10. That's simple enough: if an asset lasts forever, and yields 10% forever, it's true return is 10%. Eqn. (2), though, says it is still
-.90.

Table 1 compares Carter's YTM and the *Wall Street Journal* YTM over a range of values of F/P. There is one value for n (10), one value for a/P (.08), and many values of F/P. In column 1 put F/P; in 2, put YTM according to Carter's Eqn. (2); in column 3, put YTM according to the *WSJ*, using Eqn. (1). You'll see the difference.

Working out Eqn. (1) is no picnic, unless you have a calculator that does it for you (many business calculators do, and some of you have them). Anyway, I've worked out an example. See Table 1. I've left a blank row at the bottom for you to fill in, choosing whatever value of F/P interests you.

Table 1: Yield to Maturity, Carter vs. the *Wall Street Journal*
Based on a/P=.08, and n=10.

F/P	Carter	*Wall Street Journal*	Carter/ *WSJ*[2]	% Error in Carter
(1)	(2)	(3)	(2)/(3)	[(2)/(3)-1] x 100
0.0	-.92	-.039	(23.6)[1]	(2260)[1]
0.1	-.126	.003	-42.0	-4300.
0.3	-.033	.017	-1.98	-298.
0.5	.013	.037	.35	-64.9
0.7	.045	.057	.79	-21.1
0.9	.070	.073	.96	-4.1
1.0	.080	.080	1.00	0.0
1.1	.090	.087	1.03	3.4
1.3	.107	.099	1.08	8.1
1.5	.121	.110	1.10	10.0
2.0	.152	.133	1.14	14.3
3.0	.196	.170	1.15	15.3

Notice that Carter overstates the yield on deep discount bonds (high F/P); and enormously understates the yield on premium bonds (low F/P), especially perpetual bonds (F = 0).

For more detail on this, see the Appendix, "More on Carter's Cut."

Now you've seen the Tables, go back to the equations and be sure you understand what is happening. If you really want to understand what finance is all about -- really understand, deep inside -- you want to roll it over in your mind like that, until

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[2]A number in () indicates both (2) and (3) are negative.

Getting back to Carter, and repeating, Eqn. (2) overstates the YTM on discounted bonds; and understates the YTM on bonds selling "at a premium," i.e. with P > F. So it leads you into bad deals with discount bonds (aka junk bonds). Mike Milken made a bundle, (and got a jail term), selling to people with Carter's approach to math.

It leads you away from good deals with premium bonds. Worse, it leads you away from productive investments that yield only "ordinary income."[3] This means income from providing people with real services. It makes anything that wears out, as all human works do, look bad. It makes you look for so-called "capital gains" instead. Mere cash flow without any prospect of resale value seems to have no value at all. Speculative gains are what look good.[4]

It might seem that no real managerial issues hang on what kinds of bonds people buy, but they do. The kinds of real investing borrowers do depends a lot on what kinds of bonds they can sell. If a lot of bond buyers make Carter's mistake it leads borrowers to finance more things that yield deferred cash, as opposed to fast cash. That slows down the turnover of real capital.

Turning from bonds to direct investments, a lot of direct investments resemble redeemable bonds in this way: they show a mediocre current yield, followed by a "pot of gold at the end of the rainbow," a hoped-for resale to some rich investor after a few years. The classic and obvious example is speculative real estate in growth areas. (See the paper on "Quantum Leaps and

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crowd. If you want to spend your life as a wage-slave, be like that. But if you can make that time, and break through the mental blocks that hold most people down, who knows, maybe you will figure out how to beat the market. Better yet, you may contribute something to improve human understanding, the most gratifying achievement of all.

[3]There is a plutocratic bias in the use of this term. It connotes disdain for what "ordinary" useful folk do, and get taxed for. The other kinds of income, much of it unearned or predatory, are called "capital gains," and get favorable p.r. and tax breaks. It is a usage that would seem more suited to a society divided on old European lines into lordly and peasant classes.

[4]Ironically, this is the opposite of Carter's moral creed - and he was a very moral person. His error in math led him away from his own ideals.

Ecotones.") There is a strong tendency to overvalue that future pot of gold, especially when the herd psychology is running like a buffalo stampede. A lot of bad investing results. Carter's artless error is just one example of a large genus.

Investments that are bad for the investor are also bad for society, especially if the capital gets frozen or destroyed. As Winston Churchill said, "Capitalism is not a social evil because investors make profits, but because they fail to."[5] So this is more than a selfish individual concern. People who misallocate land and capital are hurting everyone.

Tax policy is biased in favor of discount bonds, too. The "capital gain" on bonds, and many real investments, is partly exempt from income tax. Presidential Candidates Bush (R), Clinton (D) and Tsongas (D) (March, 1982) all wanted to exempt even more of it, back to the way it was before the reform of 1986. Capital gains are the source of most campaign contributions, so some politicians sacrifice many other issues to show favor to capital gains.

In Bush's case, he deemed it so important that in 1990 he broke his magic pledge, "read my lips, no new taxes" in order to secure another break for capital gains. (This was a deal with Democrats in the House: Bush accepted a tax hike to swap for a break for capital gains.) Can you believe that anything as theatrical as who wins the next election hangs on something as dull and abstract as Eqn. 1? Believe it! You'll read and hear volumes on this subject between now and November. The public rhetoric on both sides, naturally, will be pitched to the Yahoo level. Behind the scenes, though, calculating accountants will be studying these equations, rubbing their hands, and studying the pathway to the bank.

ADDENDUM, 9 April, 1996. I left the above paragraph just as written in Spring, 1992. As we now know, Bush did lose that election of 1992, and this was a big reason why. I'd say, "I told you so," but a certain radio-TV talk show host has already copyrighted that line.

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[5]He might have qualified the point, but he was making a speech, and that would have spoiled the epigram. He <u>did</u> have a point, a very good one. He could have gone on to discriminate between profits from production and others from predation. Some of his other speeches reveal that's what he meant.

There are more tables in the Appendix, comparing Carter's and the *WSJ* YTM calculations. They show Carter's bias in favor of longer-term bonds and investments. These are for your possible interest, and are optional.

APPENDIX: Carter's Bias Against Short Terms (Low "n" Values)

Table 2A gives values of YTM for many values of n. Table 2B gives corresponding Carter values. Table 2C gives the ratios of the corresponding values. Reading from left to right, note Carter's bias against low values of n.

Table 2A: Yield to Maturity, when a/P = .08

n--->	3	6	10	15	20	30	40
F/P							
0	-.476	-.176	-.039	.023	.050	.069	.076
.5	-.106	.004	.037	.058	.067	.075	.078
.7	.001	.034	.057	.068	.073	.077	.079
.9	.049	.066	.073	.076	.078	.079	.080^{-}
1.0	.08	.08	.08	.08	.08	.08	.08
1.1	.110	.093	.087	.084	.082	.081	.080^{+}
1.3	.165	.117	.099	.090	.086	.083	.081
1.5	.215	.139	.110	.096	.090	.084	.082^{-}
2.0	.325	.185	.133	.109	.098	.088	.084
3.0	.501	.255	.170	.130	.111	.094	.086

Table 2B: ***FALSE*** YTM Using Carter's Cut
FIGURES ARE IN "SHADOW" TYPE. This is to help you stay aware of the difference in the two Tables, when you compare them.

n--->	3	6	10	15	20	30	40
F/P							
0.0	**-.92**	**-.92**	**-.92**	**-.92**	**-.92**	**-.92**	**-.92**
.5	**-.126**	**-.029**	**.013**	**.035**	**.046**	**.057**	**.063**
.7	**-.032**	**.022**	**.045**	**.057**	**.062**	**.068**	**.071**
.9	**.045**	**.063**	**.070**	**.073**	**.075**	**.076**	**.077**
1.0	**.080**	**.080**	**.080**	**.080**	**.080**	**.080**	**.080**
1.1	**.112**	**.096**	**.090**	**.086**	**.085**	**.083**	**.082**
1.3	**.171**	**.125**	**.107**	**.098**	**.093**	**.089**	**.087**
1.5	**.225**	**.150**	**.121**	**.107**	**.100**	**.093**	**.091**
2.0	**.340**	**.202**	**.152**	**.127**	**.115**	**.103**	**.097**
3.0	**.522**	**.281**	**.196**	**.156**	**.136**	**.117**	**.108**

Table 2C: Carter/YTM
Note: a number in () indicates both Carter and YTM are negative

n--->	3	6	10	15	20	30	40
F/P							
0.0	(1.93)	(5.23)	(23.8)	-40	-18.4	-13.3	-12.11
0.5	(1.19	-7.25	.35	.60	.69	.76	.81
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.5	1.04	1.08	1.10	1.11	1.11	1.11	1.11
3.0	1.04	1.10	1.15	1.20	1.23	1.24	1.26