Computation of Bond YTM

PURPOSE

To explain how YTM is computed for a bond[1] in the CS Lucas system.

WHY IS THIS IMPORTANT?

Allows users to verify the formulae and methodology used by CS Lucas to compute the bond YTM.

BACKGROUND

In a period, the relationship between the opening and closing value of a bond can be expressed as follows:

$$B_n = B_{n-1} + (B_{n-1} * y) - c$$

Where

B_n	Bond Price at the start of period n
y	Period yield
c	Coupon income in period n

FORMULA AND EXAMPLE

To compute the yield on a bond transaction, the CS Lucas system assumes that it will be held to maturity. The YTM is the constant yield for each day in the period to maturity that will accrete/ amortize the purchase price to par value (100). See Appendix 1 for Report 8001.

Example: (Accretion – Purchase below par value)

VDate	5-Jan-17	
Termination Date	1-Apr-18	
Coupon	0.50000%	c
Constant Effective Yield	1.0375852%	YTM
Purchase Price	99.340	
Par Value	100.000	

		A	B	C	D
EndDate	Days from VDate	Opening	Yield	Coupon	Closing
06-Jan-17 Fri	1	99.340000	0.00282393727	0.00136986301	99.341454
07-Jan-17 Sat	2	99.341454	0.00282397860	0.00136986301	99.342908
08-Jan-17 Sun	3	99.342908	0.00282401994	0.00136986301	99.344362
09-Jan-17 Mon	4	99.344362	0.00282406128	0.00136986301	99.345817
10-Jan-17 Tue	5	99.345817	0.00282410261	0.00136986301	99.347271
28-Mar-18 Wed	447	99.992636	0.00284248975	0.00136986301	99.994109
29-Mar-18 Thu	448	99.994109	0.00284253162	0.00136986301	99.995582
30-Mar-18 Fri	449	99.995582	0.00284257348	0.00136986301	99.997054
31-Mar-18 Sat	450	99.997054	0.00284261534	0.00136986301	99.998527
01-Apr-18 Sun	451	99.998527	0.00284265721	0.00136986301	100.000000

Where

$$B = A * YTM / 365$$

$$C = c/365$$

$$D = A + B - C$$

The closing price bond price at the end of each day (D) is carried forward to opening price (A) of the next period.

Goal seek formula is used to iterate the values of YTM so that the model of 451 rows will accrete the closing bond price to par value of 100 on maturity date.

<u>Example: (Amortization – Purchase above par value)</u>

VDate	6-Jan-17	
Termination Date	9-Dec-18	
Coupon	2.750000%	C
Constant Effective Yield	0.1313768%	YTM
Purchase Price	105.030	
Par Value	100.000	

EndDate	Days from VDate	Opening	Yield	Coupon	Closing
07-Jan-17 Sat	1	105.030000	0.00037804126	0.00753424658	105.022844
08-Jan-17 Sun	2	105.022844	0.00037801550	0.00753424658	105.015688
09-Jan-17 Mon	3	105.015688	0.00037798974	0.00753424658	105.008531
10-Jan-17 Tue	4	105.008531	0.00037796399	0.00753424658	105.001375
06-Dec-18 Thu	699	100.028698	0.00036003975	0.00753424658	100.021524
07-Dec-18 Fri	700	100.021524	0.00036001393	0.00753424658	100.014349
08-Dec-18 Sat	701	100.014349	0.00035998811	0.00753424658	100.007175
09-Dec-18 Sun	702	100.007175	0.00035996228	0.00753424658	100.000001

APPENDIX 1 FOR REPORT 8001

8001

CS LUCAS

Investment Trade by Portfolio

Acct Cntr:TFI-SG Date: From 1-Jan-2017 to 30-Jun-2017 Portfolio: TACTICAL

B/S	TradeID	Security	Issuer	Coupon (%)	Ctpy	TDate	VDate	MDate	Ccy	Price	Quantity	Purc Int	Comm	Stamp	Fee	Others	Tax	Net Proceeds	YTM (%)
TACTICAL																			
Sell	IVM100008.00	AMZN:US	Amazon.com		GS	31-Jan-17	2-Feb-17		USD	823.48000	3,000.000	0.00	247.04	1.50	5.70	0.00	21.00	2,470,164.76	
Sell	IVM100010.00	GOOGL:US	Alphabet Inc		GS	31-Jan-17	2-Feb-17		USD	796.79000	3,000.000	0.00	239.04	1.50	7.00	0.00	20.32	2,390,102.14	
Sell	IVM100011.00	SIA:SP	Singapore		VICKERS	7-Feb-17	9-Feb-17		SGD	9.820000	300,000.000	0.00	294.60	1.50	20.00	0.00	20.62	2,945,663.28	
Sell	IVM100012.00	MSFT:US	Amazon.com		GS	14-Feb-17	16-Feb-17		USD	64.570000	15,000.000	0.00	96.86	1.50	5.70	0.00	8.23	968,437.71	
Sell	IVM100014.00	BARC:LN	Barclays PLC		CAZE	21-Feb-17	23-Feb-17		GBP	2.358500	300,000.000	0.00	70.76	1.50	7.00	0.00	14.15	707,456.59	
Sell	IVM100020.00	AMZN:US	Amazon.com		GS	4-Apr-17	6-Apr-17		USD	906.83000	4,000.000	0.00	362.73	1.50	5.70	0.00	30.83	3,626,919.24	
Sell	IVM100021.00	GOOGL:US	Alphabet Inc		GS	4-Apr-17	6-Apr-17		USD	834.57000	4,000.000	0.00	333.83	1.50	5.70	0.00	28.38	3,337,910.59	
Sell	IVM100022.00	SIA:SP	Singapore		VICKERS	11-Apr-17	13-Apr-17		SGD	10.210000	400,000.000	0.00	408.40	1.50	20.00	0.00	28.59	4,083,541.51	
Sell	IVM100023.00	MSFT:US	Amazon.com		GS	18-Apr-17	20-Apr-17		USD	65.390000	20,000.000	0.00	130.78	1.50	5.70	0.00	11.12	1,307,650.90	
Sell	IVM100024.00	BARC:LN	Barclays PLC		CAZE	25-Apr-17	27-Apr-17		GBP	2.187000	400,000.000	0.00	87.48	1.50	7.00	0.00	17.50	874,686.52	
Sell	IVM100034.00	Amundi MMF IC	Amundi		ICD	12-Jun-17	12-Jun-17		GBP	1.000000	20,000,000.000	0.00	0.00	0.00	0.00	0.00	0.00	20,000,000.00	
Sell	IVM100041.00	Amundi MMF IC	Amundi		ICD	28-Jun-17	28-Jun-17		GBP	1.000000	7,000,000.000	0.00	0.00	0.00	0.00	0.00	0.00	7,000,000.00	
Buy	IVM100001.00	SGS 0.5% 4/18	Singapore	0.500000	VICKERS	3-Jan-17	5-Jan-17	1-Apr-18	SGD	0.993400	15,000,000.000	19,315.07	3,000.00	0.00	0.00	0.00	600.00	14,923,915.07	1.037585
Buy	IVM100002.00	Lloyds Bank 2.75%	Lloyd Bank	2.750000	CAZE	4-Jan-17	6-Jan-17	9-Dec-18	GBP	1.050300	23,000,000.000	310,184.93	4,600.00	0.00	0.00	0.00	920.00	24,472,604.93	0.131376
Buy	IVM100003.00	CBA 2.25% 12/18	Commonwealth	2.250000	CAZE	5-Jan-17	9-Jan-17	7-Dec-18	GBP	1.037000	20,000,000.000	43,150.68	4,000.00	0.00	0.00	0.00	800.00	20,787,950.68	0.306722
Buy	IVM100004.00	AMZN:US	Amazon.com		GS	10-Jan-17	12-Jan-17		USD	795.90000	10,000.000	0.00	795.90	1.50	5.70	0.00	67.65	7,959,870.75	
Buy	IVM100005.00	GOOGL:US	Alphabet Inc		GS	10-Jan-17	12-Jan-17		USD	804.79000	10,000.000	0.00	804.79	1.50	7.00	0.00	68.41	8,048,781.70	
Buy	IVM100006.00	SIA:SP	Singapore		VICKERS	17-Jan-17	19-Jan-17		SGD	9.890000	1,000,000.000	0.00	989.00	1.50	20.00	0.00	69.23	9,891,079.73	
Buy	IVM100007.00	MSFT:US	Amazon.com		GS	24-Jan-17	26-Jan-17		USD	63.520000	50,000.000	0.00	317.60	1.50	5.70	0.00	27.00	3,176,351.80	
Buy	IVM100009.00	BARC:LN	Barclays PLC		CAZE	31-Jan-17	2-Feb-17		GBP	2.228000	1,000,000.000	0.00	222.80	1.50	7.00	0.00	44.56	2,228,275.86	

[1] This memorandum uses terminology in the context of a bond instrument. However, the concepts are equally applicable to borrowing and debt instruments.

FREQUENTLY ASKED QUESTIONS

CHANGE HISTORY

Date	By	Changes
13-Dec-2019	CS	Created.