Tom's Bond

Group 4

Problem Statement

Purchase

Tom purchased the bond on July 20, 2020, spending 98.56

Sale

Tom sold his bond on July 20, 2023, for a quoted price of 101.55

Accumulation

The new bond-holder was able to deposit each coupon into an account earning a nominal annual interest of 5% convertible semi-annually

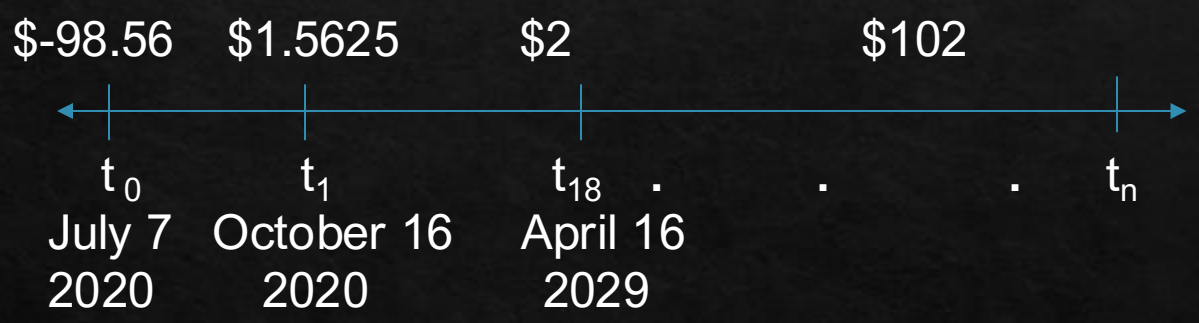
Bond Information

Security Term	Auction Date	Issue Date	Maturity Date	Coupon Rate	Coupon Frequency
20 years	October 15, 2018	October 16, 2018	October 16, 2038	3.125% 0<t<10 4% 10<t<20	Semi annual

Part A

Cash Flow Stream

Bond Cash Flow Stream



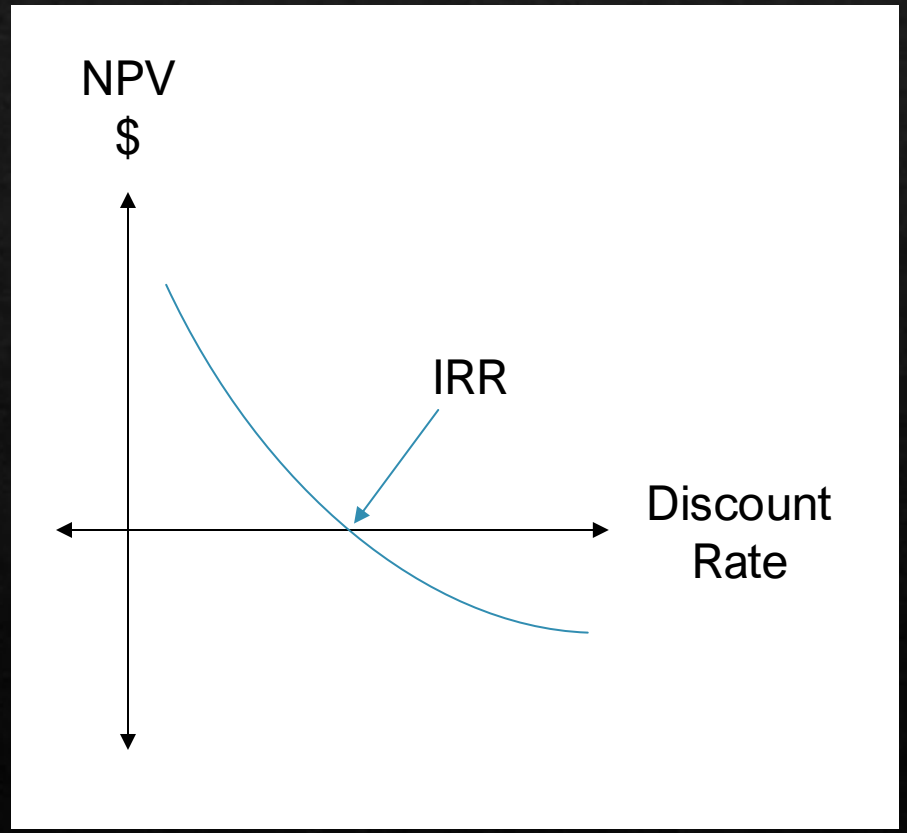
Date	Cash Flow
7/20/20	-$98.56
10/16/20	1.5625
4/16/21	1.5625
10/16/21	1.5625
4/16/22	1.5625
10/16/22	1.5625
4/16/23	1.5625
10/16/23	1.5625
. . .	
4/16/29	2
10/16/29	2
4/16/30	2
10/16/30	2
4/16/31	2
10/16/31	2
4/16/32	2
10/16/32	2
4/16/33	2
. . .	
10/16/38	102

Internal Rate Calculation

part a

Excel
=XIRR(cash flow, dates)

IRR = 3.73%



Part B

Dirty Price Calculation

Formulas

$$P_t = P_c + C_t$$

$$C_t = C * \frac{t - t_1}{t_2 - t_1}$$

Calculations

$$P_t = 101.55 + 0.811134 = \$102.36$$

$$C_t = 1.5625 * \frac{0.263888889}{0.508333333} = 0.811134$$

Use of YEARFRAC Excel function to calculate decimals

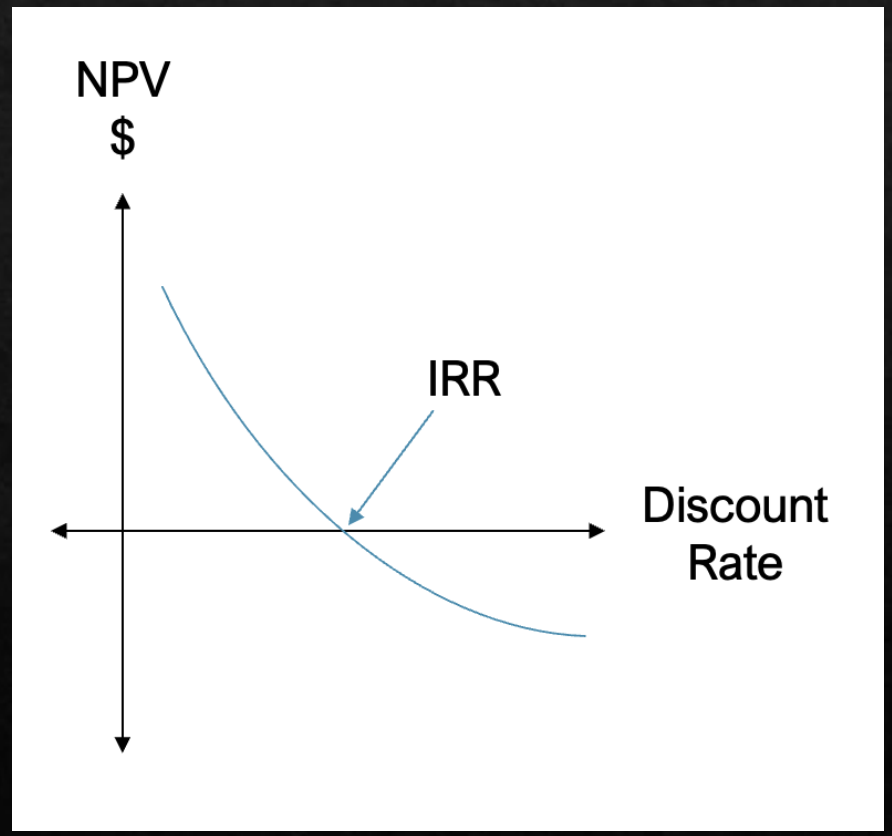
Internal Rate

part b

Excel
=XIRR(cash flow, dates)

IRR = 5.45%

Date	Cash Flow
7/20/20	-$98.56
10/16/20	1.5625
4/16/21	1.5625
10/16/21	1.5625
4/16/22	1.5625
10/16/22	1.5625
4/16/23	1.5625
10/16/23	1.5625
4/16/24	1.5625
7/20/23	102.36

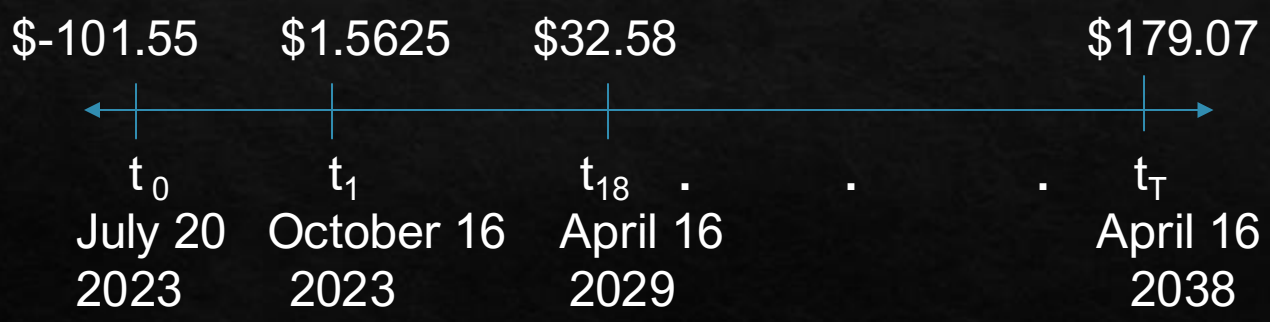


Part C

New Bond Holder's Savings

The new bond holder places his earnings into an account accumulating interest

Accumulated Cash Flow Stream



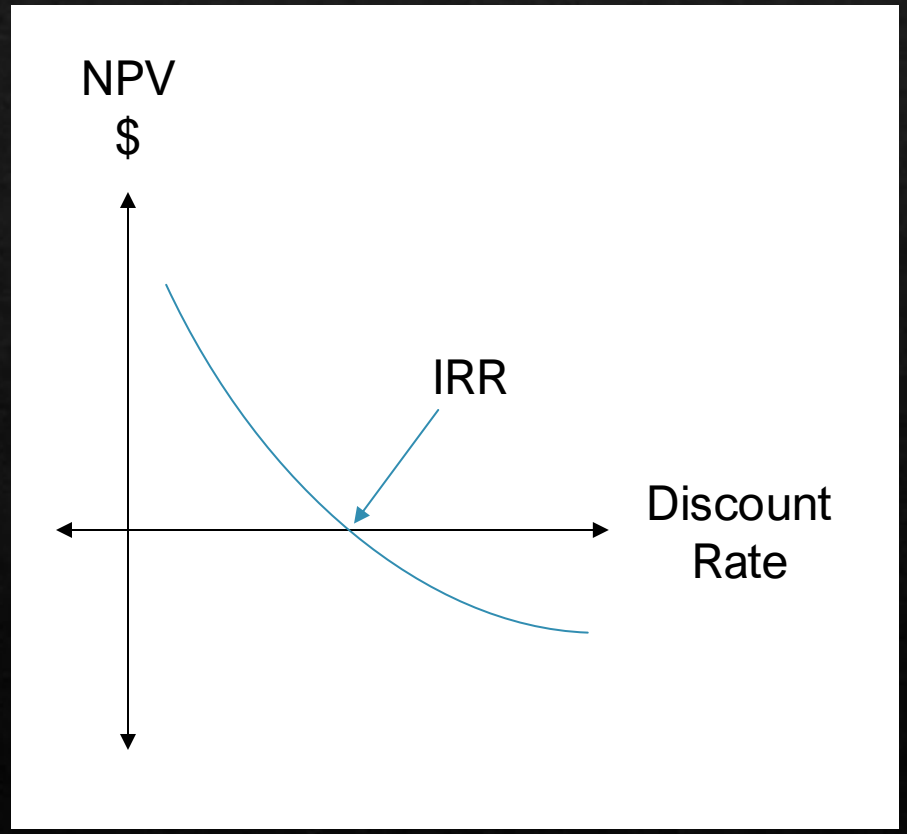
Date	Cashflows	Amount in Account	Interest Added	Amount Added to Account During Period
7/20/23		0		-102.36
10/16/23	1.5625	1.5625	0.0390625	1.6015625
4/16/24	1.5625	3.1640625	0.079101563	1.641601563
10/16/24	1.5625	4.805664063	0.120141602	1.682641602
4/16/25	1.5625	6.488305664	0.162207642	1.724707642
10/16/25	1.5625	8.213013306	0.205325333	1.767825333
4/16/26	1.5625	9.980838638	0.249520966	1.812020966
10/16/26	1.5625	11.7928596	0.29482149	1.85732149
4/16/27	1.5625	13.65018109	0.341254527	1.903754527
10/16/27	1.5625	15.55393562	0.388848391	1.951348391
4/16/28	1.5625	17.50528401	0.4376321	2.0001321
10/16/28	1.5625	19.50541611	0.487635403	2.050135403
4/16/29	2	21.99305152	0.549826288	2.549826288
10/16/29	2	24.5428778	0.613571945	2.613571945
4/16/30	2	27.15644975	0.678911244	2.678911244
10/16/30	2	29.83536099	0.745884025	2.745884025
4/16/31	2	32.58124502	0.814531125	2.814531125
10/16/31	2	35.39577614	0.884894404	2.884894404
4/16/32	2	38.28067055	0.957016764	2.957016764
10/16/32	2	41.23768731	1.030942183	3.030942183
4/16/33	2	44.26862949	1.106715737	3.106715737
10/16/33	2	47.37534523	1.184383631	3.184383631
4/16/34	2	50.55972886	1.263993222	3.263993222
10/16/34	2	53.82372208	1.345593052	3.345593052
4/16/35	2	57.16931513	1.429232878	3.429232878
10/16/35	2	60.59854801	1.5149637	3.5149637
4/16/36	2	64.11351171	1.602837793	3.602837793
10/16/36	2	67.71634951	1.692908738	3.692908738
4/16/37	2	71.40925824	1.785231456	3.785231456
10/16/37	2	75.1944897	1.879862242	3.879862242
4/16/38	2	79.07435194	1.976858799	3.976858799
10/16/38	102	183.0512107	4.576280269	106.5762803

Internal Rate Calculation

part c

Excel
=XIRR(Accumulated cash flow, dates)

i_m = 2.5%
Nominal rate 5%
Accumulation factor 1.025
IRR 5.215%



Key Takeaways

- Bonds are secure investments
- When purchasing a bond between coupon periods, after its been issued and before maturity, the buyer must pay the dirty price including accrued interest from the previous coupon payment
- By placing earnings into a savings account you can increase your cash flow, however you should be mindful of the nominal annual interest rate
- If you purchase a bond after halfway to maturity, it is not guaranteed that you will make back what you invested
- When doing bond calculations, the utilization of Excel facilitates problem solving

Thank You