

CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 19 May 2021.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

- (a) The promises of the issuer and the rights of the bondholders are set forth in great detail in a bond's indenture. As part of the indenture, there are affirmative covenants and negative covenants.

In light of the above statement, highlight four affirmative covenants that could be captured in a bond indenture. (4 marks)

- (b) Assess six types of risks that could be faced by fixed income investors. (6 marks)

- (c) The following information is provided for three bonds:

	Bond A	Bond B	Bond C
Coupon rate	0%	10%	10%
Maturity years	15	20	20
Maturity value	Sh.1,000	Sh.1,000	Sh.1,000
Required yield	9.4%	11%	10%
Par value	Sh.1,000	Sh.1,000	Sh.1,000

Required:

- (i) The price of each bond, assuming interest is paid semi-annually. (6 marks)
- (ii) Comment on the results obtained in (c) (i) above. (1 mark)
- (d) The price of a five year, zero coupon bond is Sh.0.7835 for Sh.1 par and the price of a two year, zero coupon bond is Sh.0.9426 for Sh.1 par

Required:

Determine the three year forward rate two years from now. (3 marks)

(Total: 20 marks)

QUESTION TWO

- (a) Explain four classifications of corporate bonds by issuer. (4 marks)

- (b) Consider the following data relating to a convertible bond currently trading at Sh.104.80:

Par value	Sh.1,000
Coupon	4.50%
Maturity	15 years
Conversion price	Sh.25 per share
The issuer's shares are currently trading at Sh.19.50.	

Required:

- (i) The number of shares into which the bond is convertible. (1 mark)
- (ii) The conversion value. (1 mark)
- (iii) The conversion premium. (1 mark)
- (iv) The effective conversion price. (1 mark)

- (c) A 5% coupon bond matures ten years from now. Its price is Sh.96.23119 and the yield is 5.5%. The modified duration is 7.64498.

Required:

- (i) The approximate price change assuming the yield rises or falls by 200 basis points. (1 mark)
- (ii) The convexity assuming yield changes by 200 basis points. (2 marks)
- (iii) The net percentage change in the price of the bond. (1 mark)
- (iv) Highlight two limitations of duration as a measure of term structure of a bond and interest rate risk. (2 marks)

- (d) A corporate bond based on a 30/360 day-count conversion, with a coupon rate of 10% is maturing on 1 March 2022 and is purchased with a settlement date of 17 July 2020. The yield is 6.5%. The bond's par value is Sh.100.

Required:

The bond's clean price. (6 marks)

(Total: 20 marks)

QUESTION THREE

- (a) Differentiate between a "credit score" and a "credit rating". (4 marks)

- (b) John Kisire, a financial analyst at Kawi Ltd. has gathered some financial information for the year ended 31 December 2020. He has also projected the amounts for the year ending 31 December 2021:

End of year	Kawi Ltd.	
	2020 Sh. "000"	2021 Sh. "000"
Amortisation/depreciation	250	300
Interest expense	350	350
Earnings before interest, tax, depreciation and amortisation (EBITDA)	1,250	800

Kawi Ltd. is a company that specialises in power production.

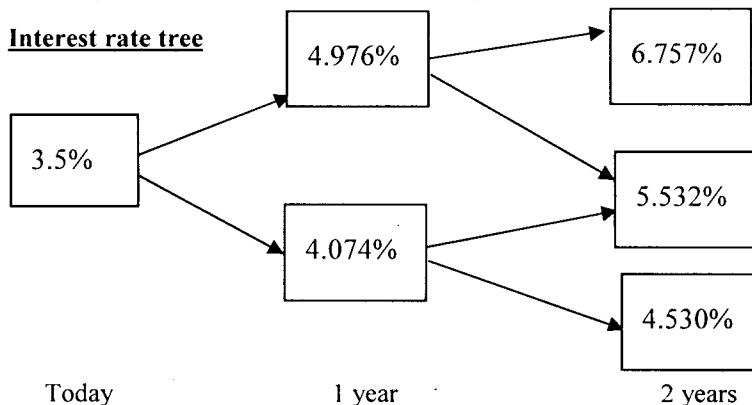
John Kisire is concerned that the heavy rains and government expansion of geothermal source of power will affect Kawi Ltd.'s bond covenant compliance. The bond covenant requires an EBITDA coverage ratio of 3.5 times and an earnings before interest and tax (EBIT) coverage ratio of 2.0 times.

Required:

- (i) Explain whether or not Kawi Ltd. was in compliance with its EBITDA ratio at the end of year 2020. (2 marks)
- (ii) The amount by which Kawi Ltd. needs to increase the EBIT in order to be compliant with its EBIT ratio for the year ending 31 December 2021. (3 marks)

- (c) The yields and spot rates for an option-free, 5.25% bond with 3 years to maturity are as shown below:

Maturity (years)	Yield to maturity (%)	Value	Spot rate (%)
1	3.5	100	3.5
2	4.0	100	4.01
3	4.5	100	4.531



Required:

Construct a binomial tree for valuing an option-free bond with three years to maturity and a coupon of 5.25% and determine the value of the option free bond. (7 marks)

- (d) An investor buys a 10 year bond at Sh.85.503 and sells it in four years. The bond has a coupon rate of 8%. After the bond is purchased, the interest rate goes down from 10.40% to 9.40%. The bond has a par value of Sh.100.

Required:

Calculate the investor's realised yield.

(4 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) Describe how the following factors could affect the value of a callable or puttable bond:

- (i) Interest rate volatility. (2 marks)
- (ii) Level of interest rate. (2 marks)
- (iii) Shape of the yield curve. (2 marks)

- (b) A 7.5%, 15 year, annual pay option-free Zuraya corporate bond trades at a market price of Sh.95.72 per Sh.100 par. The government spot rate curve is flat at 5%.

Required:

The Z-spread on Zuraya's corporate bond.

(4 marks)

- (c) The following are the par rates of a government bond:

Year	Par rate (%)
1	5.00
2	6.00
3	7.00

Required:

Determine the 3 year spot rate using bootstrapping.

(4 marks)

- (d) The government par curve is provided below:

Maturity (years)	Par rate (%)
1	5.00
2	6.00
3	6.50
4	7.00

An analyst has a holding of a 4 year, 5% annual pay, Sh.100 par government bond.

Required:

The value of the government bond.

(6 marks)

(Total: 20 marks)

QUESTION FIVE

- (a) Describe two classes of modern term structure models. (4 marks)
- (b) Caroline Nyawira oversees five fixed income portfolios for one corporate client. Nyawira believes that interest rates will change over the next year, but is uncertain about the extent and direction of this change.

She is confident that the yield curve will change in a non-parallel manner and has assembled the table of key rate durations shown below:

Issue	Value (Sh."million")	Key rate duration				
		3 month	2 year	5 year	20 year	30 year
Portfolio 1	100	0.03	0.14	0.49	1.59	4.62
Portfolio 2	200	0.02	0.13	1.47	0	0
Portfolio 3	150	0.03	0.14	0.51	1.64	2.38
Portfolio 4	250	0.06	0	0	0	0
Portfolio 5	300	0.00	0.88	0	0	0

The total value of the portfolio is Sh.1,000,000,000.

The following key rates duration will change while the others will remain constant:

- The 3 month rate increases by 20 basis points.
- The 5 year rate increases by 90 basis points.
- The 30 year rate decreases by 150 basis points.

Required:

The new total value of the portfolio after these key rate duration changes.

(8 marks)

- (c) A 3 year, Sh.100 par, zero coupon bond has a hazard rate of 2% per annum. Its recovery rate is 60% and the benchmark rate curve is flat at 3%.

Required:

The bond's credit valuation adjustment (CVA).

(8 marks)

(Total: 20 marks)

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Present Value of 1 Received at the End of *n* Periods:

$$PVIF_{r,n} = 1/(1+r)^n = (1+r)^{-n}$$

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%
1	.9901	.9804	.9709	.9615	.9524	.9434	.9346	.9259	.9174	.9091	.8929	.8772	.8696	.8621	.8475	.8333	.8065	.7813	.7576	.7353
2	.9803	.9612	.9426	.9246	.9070	.8900	.8734	.8573	.8417	.8264	.7972	.7695	.7561	.7432	.7182	.6944	.6504	.6104	.5739	.5407
3	.9706	.9423	.9151	.8890	.8638	.8396	.8163	.7938	.7722	.7513	.7118	.6750	.6575	.6407	.6086	.5787	.5245	.4768	.4348	.3975
4	.9610	.9238	.8885	.8548	.8227	.7921	.7629	.7350	.7084	.6830	.6355	.5921	.5718	.5523	.5158	.4823	.4230	.3725	.3294	.2923
5	.9515	.9057	.8626	.8219	.7835	.7473	.7130	.6806	.6499	.6209	.5674	.5194	.4972	.4761	.4371	.4019	.3411	.2910	.2495	.2149
6	.9420	.8880	.8375	.7903	.7462	.7050	.6663	.6302	.5963	.5645	.5066	.4556	.4323	.4104	.3704	.3349	.2751	.2274	.1890	.1580
7	.9327	.8706	.8131	.7599	.7107	.6651	.6227	.5835	.5470	.5132	.4523	.3996	.3759	.3538	.3139	.2791	.2218	.1776	.1432	.1162
8	.9235	.8535	.7894	.7307	.6768	.6274	.5820	.5403	.5019	.4665	.4039	.3506	.3269	.3050	.2660	.2326	.1789	.1388	.1085	.0854
9	.9143	.8368	.7664	.7026	.6446	.5919	.5439	.5002	.4604	.4241	.3606	.3075	.2843	.2630	.2255	.1938	.1443	.1084	.0822	.0628
10	.9053	.8203	.7441	.6756	.6139	.5584	.5083	.4632	.4224	.3855	.3220	.2697	.2472	.2267	.1911	.1615	.1164	.0847	.0623	.0462
11	.8963	.8043	.7224	.6496	.5847	.5268	.4751	.4289	.3875	.3505	.2875	.2366	.2149	.1954	.1619	.1346	.0938	.0662	.0472	.0340
12	.8874	.7885	.7014	.6246	.5568	.4970	.4440	.3971	.3555	.3186	.2567	.2076	.1869	.1685	.1372	.1122	.0757	.0517	.0357	.0250
13	.8787	.7730	.6810	.6006	.5303	.4688	.4150	.3677	.3262	.2897	.2292	.1821	.1625	.1452	.1163	.0935	.0610	.0404	.0271	.0184
14	.8700	.7579	.6611	.5775	.5051	.4423	.3878	.3405	.2992	.2633	.2046	.1597	.1413	.1252	.0985	.0779	.0492	.0316	.0205	.0135
15	.8613	.7430	.6419	.5553	.4810	.4173	.3624	.3152	.2745	.2394	.1827	.1401	.1229	.1079	.0835	.0649	.0397	.0247	.0155	.0099
16	.8528	.7284	.6232	.5339	.4581	.3936	.3387	.2919	.2519	.2176	.1631	.1229	.1069	.0930	.0708	.0541	.0320	.0193	.0118	.0073
17	.8444	.7142	.6050	.5134	.4363	.3714	.3166	.2703	.2311	.1978	.1456	.1078	.0929	.0802	.0600	.0451	.0258	.0150	.0089	.0054
18	.8360	.7002	.5874	.4936	.4155	.3503	.2959	.2502	.2120	.1799	.1300	.0946	.0808	.0691	.0508	.0376	.0208	.0118	.0068	.0039
19	.8277	.6864	.5703	.4746	.3957	.3305	.2765	.2317	.1945	.1635	.1161	.0829	.0703	.0596	.0431	.0313	.0168	.0092	.0051	.0029
20	.8195	.6730	.5537	.4564	.3769	.3118	.2584	.2145	.1784	.1486	.1037	.0728	.0611	.0514	.0365	.0261	.0135	.0072	.0039	.0021
25	.7798	.6095	.4776	.3751	.2953	.2330	.1842	.1460	.1160	.0923	.0588	.0378	.0304	.0245	.0160	.0105	.0046	.0021	.0010	.0005
30	.7419	.5521	.4120	.3083	.2314	.1741	.1314	.0994	.0754	.0573	.0334	.0196	.0151	.0116	.0070	.0042	.0016	.0006	.0002	.0001
40	.6717	.4529	.3066	.2093	.1420	.0972	.0668	.0460	.0318	.0221	.0107	.0053	.0037	.0026	.0013	.0007	.0002	.0001		
50	.6080	.3715	.2281	.1407	.0872	.0543	.0339	.0213	.0134	.0085	.0035	.0014	.0009	.0006	.0003	.0001				
60	.5504	.3048	.1697	.0951	.0535	.0303	.0173	.0099	.0057	.0033	.0011	.0004	.0002	.0001						

* The factor is zero to four decimal places

Present Value of an Annuity of 1 Per Period for *n* Periods:

$$PVIF_{r,n} = \sum_{t=1}^n \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of Payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8996	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4019	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2402	5.5553	4.9999	4.1667	3.5714	3.1250