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CIFA PART III SECTION 5

FIXED INCOME INVESTMENTS ANALYSIS

WEDNESDAY: 23 May 2018.   **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)   With respect to bond indenture:

      (i)   Differentiate between "affirmative bond covenants" and "negative bond covenants".   (2 marks)

      (ii)   Highlight three affirmative bond covenants.   (3 marks)

(b)   Explain three reasons why tenor is important in the bond market.   (3 marks)

(c)   Evaluate three embedded options that could be granted to bond issuers.   (3 marks)

(d)   Best Food Limited has a Sh.10 million outstanding bond issue, carrying a 12% coupon rate with 20 years remaining to maturity. This issue was undertaken 5 years ago and can be called by the company at a premium of 7% above its par value. Currently, new 20-year bonds can be floated at a coupon interest rate of 9% to ensure the availability of funds to pay off the old debt. The new bonds would be sold one month before the old issue is called, so for one month, interest would have to be paid on both issues. Floatation costs, mainly comprising issued and underwriting expenses for the new debt would be Sh.150,000. Currently, short-term interest rates are at 10% per annum. Best Food Limited's marginal tax rate is 30%.

    Required:
    Advise the management on whether to refinance the bond.   (9 marks)
                                               (Total: 20 marks)

QUESTION TWO

(a)   Analyse two types of credit risk that a bond investor could be exposed to.   (2 marks)

(b)   (i)   Assess two bond features that would affect the interest rate risk of a bond.   (2 marks)

      (ii)   Evaluate two benefits of using swap rate curve compared to government bond yield curve in fixed income valuation.   (2 marks)

(c) The binomial interest rate tree for valuing a putable corporate bond with three years to maturity and a coupon rate of 5.25% putable in one year at Sh.100 is provided below:

| Year 1 | Year 2 | Year 3 |
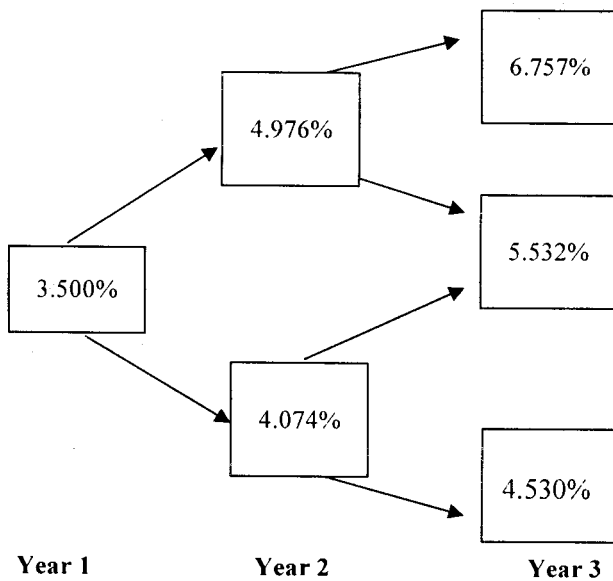
Required:
The value of the putable bond. (6 marks)

(d) A fixed income analyst is asked to rank three bonds; A, B and C in terms of interest rate risk. The interest rate risk here means the potential price decrease on a percentage basis given a sudden change in financial market conditions.

The increases in the yield-to-maturity represent the "worst case" for the scenario being considered:

Bond	Modified Duration	Convexity	Change in yield (Basis points)
A	3.72	12.10	25
B	5.81	40.70	15
C	12.39	158.0	10

Additional information:
1. The modified duration and convexity statistics are annualised.
2. The change in yield is the increase in the annual yield-to-maturity.

Required:
Determine the bond with the highest interest rate risk. (4 marks)

(e) A 15-year deferred coupon bond has a face value of Sh.1,000. The bond is yielding 7% annually and selling for Sh.926.21 at the secondary bond markets. The deferred period is the first 5 years in the life of the bond. After the deferred period, the issuer is expected to pay a percentage of the par value annually as the coupon until maturity. The first coupon payment occurs one year after the end of the deferred period.

Required:
Calculate the coupon rate of the deferred coupon bond. (4 marks)
(Total: 20 marks)

QUESTION THREE
(a) In relation to credit analysis models:

    (i) Differentiate between "structured model" and "reduced form model". (2 marks)

    (ii) Discuss three models that could be used in evaluating credit risk of a fixed income security. (3 marks)

(b) A bond is purchased between coupon periods. The number of days between the settlement date and the next coupon payment is 45 days. There are 360 days in the coupon period. The bond has a face value of Sh.1,000 and a coupon rate of 12%. There are 5 annual coupon payments remaining. The discount rate is 10%.

Required:

(i)   The clean price of the bond.   (3 marks)

(ii)   The dirty price of the bond.   (2 marks)

(c)   A bond issued by your country has the following features:

Par value	Sh.1,000
Coupon rate	8%
Tenor	10 years

The bond market yield is 10% and the interest is payable annually. The spot market yields over the term of the bond are provided below:

Year	Rate (%)
1	10.0
2	10.5
3	11.0
4	12.0
5	12.5
6	12.75
7	13.0
8	13.25
9	13.5
10	13.75

Required:

(i)   The value of the bond using the traditional valuation approach.   (3 marks)

(ii)   The value of the bond using the arbitrage-free valuation approach.   (5 marks)

(iii)   Comment on the results obtained in (c) (i) and (c) (ii) above.   (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a)   Discuss two theories relating to the term structure of interest rates.   (4 marks)

(b)   A bank based in the United States (US) and a German Industrial Company have issued a Sh.50 million, 180-day, 5% commercial paper. The US bank has issued its commercial paper domestically and the German Industrial Company has issued Eurocommercial paper.

Required:

(i)   Calculate the rate of return on the US commercial paper.   (2 marks)

(ii)   Calculate the rate of return on the Eurocommercial paper.   (2 marks)

(c)   Tumtum Ltd. has issued an 8% bond which has a face value of Sh.100 and a premium of 2% on redemption in three years time. The coupon on the bond is payable on an annual basis. The government has three bonds in issue. They all have a face value of Sh.100 and are redeemable at par. They are of the same risk class and the coupon on each bond is payable annually.

The following information relates to the three government bonds:

Bond	Redeemable period (years)	Coupon %	Current market value (Sh.)
1	1	9	104
2	2	7	102
3	3	6	98

Tumtum Ltd. is downgraded by the rating agencies from a credit rating of grade AA to BBB.

The credit spreads published by the credit rating agency are as follows (in basis points)

Rating	1 year	2 years	3 years
AA	18	31	45
BBB	54	69	86

Required:

(i)   The value of Tumtum Ltd.'s bond under its old and new credit rating.   (7 marks)

(ii)   The yield-to-maturity (YTM) of Tumtum Ltd.'s bond under its old and new credit rating.   (5 marks)

(Total: 20 marks)

QUESTION FIVE

(a)   Illustrate four areas that a credit rating agency should focus on when assessing credit risk of a country intending to issue a sovereign bond.   (4 marks)

(b)   A 365-day year bank certificate of deposit has an initial principal amount of Sh.96.5 million and a redemption amount due at maturity of Sh.100 million. The number of days between settlement and maturity is 350.

Required:
The bond equivalent yield.   (3 marks)

(c)   A bond that pays coupons annually is issued with a coupon rate of 4%. The bond has a par value of Sh.1,000, maturity period of 30 years and a yield-to-maturity of 8%. After one year, the yield-to-maturity is expected to be 9%.

Required:
The rate of return earned by an investor who holds the bond for a period of one year.   (4 marks)

(d)   An analyst identifies two corporate bonds that have similar credit quality as a four-year, 4.5% annual coupon payment corporate bond which is illiquid. One bond is a three-year, 5.5% annual coupon bond priced at Sh.107.5 per Sh.100 of par value and the other is a five-year, 4.5% annual coupon bond priced at Sh.104.75 per Sh.100 of par value.

Required:
The estimated price of the illiquid bond per Sh.100 of par value.   (5 marks)

(e)   An investor buys a three-year bond with a 5% coupon rate payable annually. The bond, with a yield-to-maturity of 3%, is purchased at a price of Sh.105.657223 per Sh.100 of par value.

Required:
Assuming a 5 basis point change in the yield, compute the bond's approximate modified duration.   (4 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	.5674	.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	.2083	.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:

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

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	9.8986	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	12.4090	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