University of British Columbia

Commerce 474 – 201 Fixed Income Markets and Management

Midterm No. 1 - January 2015

Name: Answers

Student No.: ______________________

There are 6 questions worth 80 points, over 12 pages (including formula and tables pages). You have 80 minutes to complete the exam.

Note: Calculate interest rates to 4 decimals (e.g., .0264), calculate bond prices to three decimals (e.g., $104.578) and calculate discount factors to 5 decimals (e.g., .98934).

11 18 11

Question 1 (10 Marks)

A corporate 10-year maturity, 10% coupon bond is callable by the issuer, at a fixed price of $100, just one time: after 5 years (exactly half-way through the bond's original life). If the issuer doesn't call on that day, the bond will remain outstanding for its original full 10-year maturity.

Part a). Describe the situation such that the issuer, acting in only its financial interests, would call or not call the bond. Is this a risk for the bondholders? Why?

callable @ t=5 @ 100
- if the bond yld is < 10% at t=5, the economic value of the bond > $100 → issuer will call at $100
- if the bond yld is > 10% at t=5, → no call

Yes, this is a risk for the bondholder. If called, they get $100 (+AI) at t=5 and nothing thereafter. This is very different from "no call"

0 .5 5 10

$-P_0$ +5 ..... +5 .... +105 } no call

or

$-P_0$ +5 .... +105 } call

Part b) Suppose, when the 10-year bond was originally issued, it had a credit spread of 6%; that is, the yield at issue on the corporate bond was 6% higher than the 10-year GOC yield. Suppose instead of a fixed call price of $100, as in part a), the call price is now calculated as the GOC 5-year yield on the call date, plus 6% (i.e., the current 5-year GOC yield plus 6% is converted to a price and that is the call price). Under what conditions does the issuer call now, or not call?

Now, the "bet" is not about the bond's yield. Note that

$\left\{\begin{matrix}\text{corp}\\ \text{yld}\end{matrix}\right\} = \left\{\begin{matrix}\text{GOC}\\ \text{yld}\end{matrix}\right\} + \left\{\begin{matrix}\text{credit}\\ \text{spread}\end{matrix}\right\}$

The original credit spread (at issue) = .06. corp $y_0 = GOC_0 + .06$.

At t=5, the call price is determined by $y_5 = GOC_5 + .06$. So, if $GOC_5 << GOC_0$ (so, the bond in part a) would get called), now call price is calculated from $y_5 = GOC_5 + .06$. So, a low GOC_5 ⇒ low y_5 ⇒ high call price ∴ can't be called at 100.

But, if the t=5 credit spread is < .06, the economic value of the bond will be > call price → call! Bet is on credit spread.

2

Question 2 (15 marks)

Table 1 shows today's strip rates, hat r(t), and discount factors, d(t), and cumulative discount factors, going out to a maturity of 10 years.

Part a). Consistent with the strip rates (no arbitrage), a 3-year maturity, 15% coupon bond has a yield of 2.34%. (i) What is the yield on a zero-coupon, 3-year bond? (ii) From the strip rates, what is the par yield of a 3-year maturity bond?

3 yr zero-coup bond $\hat{r}(3) = y = .0250$ (i)

par $y = .0247$ ← par $y = 2\left[\frac{1-.9282}{5.82192}\right]$

3 yr 15% - coup bond $y = .0234$

par $y = 2\left(\frac{.0718}{5.82192}\right)$

$= .0247$ (ii)

Part b). Explain the relative ranking, by yield, of the three 3-year maturity bonds, that differ only by their coupon rates.

A very { high coup bond had the lowest yield = .0234
low (0) coup " " " highest " = .0250 }

The par yield was <u>between</u> the high and low coupon bond yields.

- A high coup bond sells at a pre<u>mium</u> to $100
- A low " " sells " " <u>disc</u>ount to $100
- The par yield is the yield on a hypothetical coupon bond selling at <u>exactly</u> $100.

The high coupon bond has the lowest yield, because yield = weighted average of all $\hat{r}(t)$ $t \leq$ bond maturity, and the strip curve is up<u>ward</u> sloping: all $\hat{r}(t) < \hat{r}(T)$ for $t \leq T$.

Question 2 continued

Part c). Consistent with the strip rates (no arbitrage), a 10-year maturity, 15% coupon bond has a yield of 8.19%. (i) What is the yield on a zero-coupon, 10-year bond? (ii) From the strip rates, what is the par yield of a ~~X~~ 10-Year year maturity bond? (iii) Comparing parts a) and b), how does the "coupon effect" change with the maturity of the bond?

10-yr zero-coup bond $\hat{r}(10) = y = .0990$ (i)

10-yr par yld $y = .0861$ * (ii)

10-yr 15%-coup bond $y = .0819$

$$* \text{ par } y = 2\left[\frac{1-.38050}{14.38413}\right] = .0861$$

iii) The "coupon effect" is how different are yields on equivalent-maturity bonds with different coupons:

3 yr : $.0250 - .0234 = .0016$ difference $\left\{ \begin{array}{l} \text{Low coup} \\ -\text{Hi coup} \end{array} \right.$

10 yr : $.0990 - .0819 = .0171$

The longer the maturity, the bigger the difference between $\hat{r}(T)$ and lower, earlier $\hat{r}(t)$. So, a bigger coupon effect.

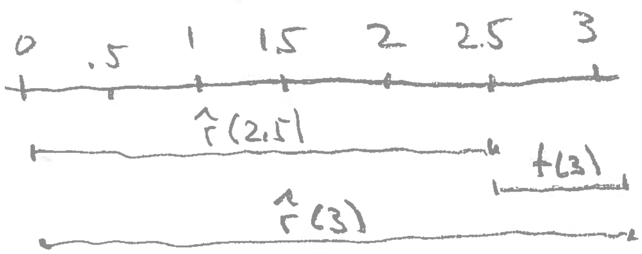
Question 3 (15 marks). Table 2 shows strip rates and discount factors for two different scenarios on the slope of the strip curve.

Part a). Scenario #2 has a downward sloping strip rate curve. Are there any arbitrage opportunities along that curve because the slope is downward? Why or why not?

There are no arbitrage opportunities due to the downward-sloping $\hat{r}(t)$ curve because $d(t)$ is always getting smaller as t gets bigger: all the implicit forward rates, $f(t)$ are > 0.

Part b). (i) For forward rate f(3), when does the forward contract mature and when does the underlying 6-month TBill mature? (ii) Calculate the forward rate, f(3), in each scenario.

(i) For $f(3)$:



The forward contract matures at date $t=2.5$, and delivers a 6-mo TBill, that matures at $t=3$.

So, combining $\hat{r}(2.5)$ and $f(3)$ is equivalent to using just $\hat{r}(3)$ to make a 3-year riskless investment.

(ii) Scen #1: $f(3) = 2\left[\frac{d(2.5)}{d(3)} - 1\right] = 2\left[\frac{.92370}{.88536} - 1\right] = .0866.$

Scen #2: $f(3) = 2\left[\frac{.92370}{.91997} - 1\right] = .0081.$

Question 3 continued

Part c). Explain the reasoning for why the f(3) in Scenario #1 is so different from the f(3) in Scenario #2.

As show in the graph with part b), f(3) has to "make up" for the difference between d(2.5) and d(3), ie, between $\hat{r}(2.5)$ and $\hat{r}(3)$.

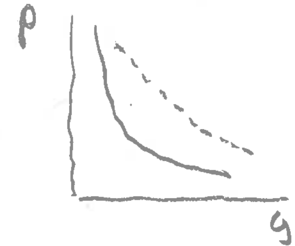
In Scen #1, a 2.5-year strip earns 3.2%, while a 3-year strip earns a lot more at 4.1%. So, buying a 2.5-year strip is earning less over 2.5 years than the 3-year strip, and so f(3) must do very well to make up the lower yield over the first 2.5 years.

In Scen #2, The 3-year strip earns less (2.8%) than the 2.5-year strip (3.2%), but it lasts 6 months longer. To make the 2 - $\hat{r}(2.5)$ plus f(3) versus $\hat{r}(3)$ alone equal only requires a slightly positive f(3) [because d(2.5) is quite close to d(3)], so f(3) = .0081, barely > 0.

Question 4 (10 marks).

Part a). What is "convexity" in a bond? What characteristics make one bond more convex than another?

Convexity is how curved a bond's price-yield curve is: the more curved towards the origin → the more convex is the bond.



2 characteristics make a bond more convex:

- longer maturity
- lower coupon

Part b). Explain how convexity is used as a bet on volatility of interest rates.

Convexity in a bond provides { upward potential (when $y\downarrow$) / downside protection (when $y\uparrow$) }

If the current yield $= y_0$, and we think, in 6 months, yield will be y_1, the value of convexity depends on the change $y_1 - y_0$. If $y_1 - y_0 = dy$

(i) small: small $dy \Rightarrow$ small $dP = P_1 - P_0$, regardless of convexity

(ii) large: large $dy \Rightarrow$ big dP { upside potential / downside protection }

Thus, the value of convexity depend on:

If big dy is expected: convexity is valuable
If small dy " " : " is not valuable.

If my estimate of rate volatility (dy) differs from the market, my valuation of convexity differs from how the market is pricing volatility.

EG, I buy convex bonds if my dy estimate >> market's dy estimate.

7

Question 5 (20 marks).

Table 3 shows some pricing and risk data for three different bonds. The data in the table includes the dollar duration, -dP/dy.

Part a). (i) Calculate the modified duration and PVBP for each of the bonds. (ii) Define PVBP.

Mod Dur = $\left(\frac{1}{P}\right)\left(-\frac{dP}{dy}\right)$ PVBP = $\left(-\frac{dP}{dy}\right)(.0001)$

		3yr	10yr	20yr
(i)	Mod Dur	2.970	7.073	19.512
	PVBP	.0280	.1054	.0727

(ii) PVBP is \$loss on \$100 FV bond at dy = +.0001.

Part b). Why is the dollar duration, -dP/dy, so much bigger for the 10-year 10% coupon bond than the other two bonds?

Dollar duration is the dollar change in value for a large, 100% yield increase. If the bond has a high coupon, with high cash flows and a high price, that dollar price will vary more, in \$, than a lower coupon bond at a lower price.

This bigger \$ volatility in the high coupon, 10-year bond shows up as a bigger PVBP than the higher-duration, 20-year strip. (PVBP is also in \$\$).

B

Question 5 continued

Part c). Form a portfolio of the 3-year maturity bond and the 20-year maturity bond with portfolio weights chosen so that the portfolio modified duration is the same as the modified duration of the 10-year maturity bond (calculated in part a).) What are the portfolio weights?

X = weight on 20-yr

1-X = " " 3-yr

$7.073 = (1-x)2.970 + X\,19.512$

$4.103 = X\,16.542$

$X = .248$

$1-X = .752$

Part d). Compare the convexity of the portfolio in part c) with the convexity of the 10-year bond. Explain the difference.

$\text{port. } C = \overset{7.740}{.752(10.293)} + \overset{96.781}{.248(390.244)}$

$= 104.521$

portfolio C = 104.521 > 10-year bond C = 63.982.

Duration basically is proportional to a bond's maturity. However, convexity increases with t^2 - so as t increases, convexity goes up much faster than duration.

So, the portfolio duration equals the 10-year bond duration, but the portfolio convexity is much greater than the 10-year convexity because of the use of the 20-year bond (with big C) in the portfolio

Question 6 (10 marks)

Part a). (i) What is a "green bond'? (ii) How will investors that buy the TD Bank green bond issue discussed in class know that it is actually a green bond?

(i) Green bond is one whose proceeds will be used to "support environmental mandates" like preserving, protecting or remediating air, water and soil quality, or mitigating climate change.

(ii) TD promises it's green bond holders to show them the new projects TD is funding with the proceeds of the green bond issue. Is self-reporting credible?

Part b). In the two articles discussed in the presentation "Rates," we characterized the global economic situation. (i) Briefly describe this situation and what the European Central Bank (ECB) and Bank of China (BoC) are doing about that. (ii) What is a "currency war" and how might that show up here?

(i) The Chinese economy is slowing down markedly. The drop in demand from the Chinese for commodities has lowered commodity prices. The Euro zone economy is struggling and inflation is very low, or negative (deflation).

ECB: continue buying ABSs, MBSs, and keep borrowing rates low.

PBoC: cut their lending rate (and cut their deposit rate) to encourage new borrowing and investment

(ii) FX war: by dramatically cutting interest rates in China, fewer investors will invest there, so the Yuan will drop against other currencies. This makes Chinese exports cheaper compared to exports from Japan, Singapore, etc. To avoid losing export business, Japan and other countries may cut their rates to get their currencies to depreciate: Currency war!

10

Formula Page

$PV(i,n) = 1/(1+i)^n$
$PVA(i,n) =$
$(1 - PV(i,n))/i$

True Yield (Canada): $Y_T = \frac{(F-P)}{P} * \frac{365}{t}$
Bank Discount (US): $Y_D = \frac{(F-P)}{F} * \frac{360}{t}$
Accrued Interest: $AI = (1-w) * (^C/_2)$
where w = fraction of coupon period remaining
Gross Price = Invoice Price – AI

Par Yield: $y_t = 2 * [\frac{1-d(t)}{\sum_{s=1}^{2t} d(\frac{s}{2})}]$
Forward Rate: $f_t = 2 * \left[\frac{d(t-.5)}{d(t)} - 1\right]$
Dollar Duration:

$$\frac{dP}{dy} = -(1+\frac{y}{2})^{-1} * [(\sum_{s=1}^{2T-1} \left(\frac{S}{2}\right) * \left(\frac{C}{2}\right) * (1+\frac{y}{2})^{-s}) + TF(1+\frac{y}{2})^{-2T}]$$

Modified Duration:

$$D = (1+\frac{y}{2})^{-1} * [(\sum_{s=1}^{2T-1} \left(\frac{S}{2}\right) * w_{\frac{s}{2}}) + Tw_T] = -\frac{1}{P} * \frac{dP}{dy}$$

Where $w_{s/2} = \frac{\left(\frac{C}{2}\right) * (1+\frac{y}{2})^{-s}}{P}$
and $w_T = \frac{F * (1+\frac{y}{2})^{-2T}}{P}$

PVBP = -(dP/dy)*(.0001)

Taylor's Series: $\frac{dP}{P} = -D * (dy) + \frac{1}{2} * C * (dy)^2$

COMM 474-201 January 2015 Midterm One Tables

Table 1 For Question 2

Strip Rates, Discount Factors and Cumulative Discount Factors

Maturity	% hat r(t)	d(t)	sum d(t)
0.5	0.5	0.99751	0.99751
1	0.7	0.99304	1.99054
1.5	1.3	0.98075	2.97129
2	1.6	0.96863	3.93992
2.5	1.9	0.95382	4.89375
3	2.5	0.92817	5.82192
3.5	3.5	0.88564	6.70757
4	4.2	0.84683	7.55439
4.5	5.1	0.79722	8.35161
5	6.5	0.72627	9.07789
5.5	7	0.68495	9.76283
6	7.3	0.65038	10.41321
6.5	7.5	0.61966	11.03287
7	8	0.57748	11.61035
7.5	8.3	0.54339	12.15374
8	8.6	0.50986	12.66360
8.5	8.9	0.47704	13.14064
9	9.1	0.44892	13.58956
9.5	9.5	0.41407	14.00363
10	9.9	0.38050	14.38413

Table 2 For Question 3

Strip Rates and Discount Factors

----- Scenario #1 --------			------ Scenario #2 -------		
Maturity	% hat r(t)	d(t)	Maturity	% hat r(t)	d(t)
0.5	1.0	0.99502	0.5	5.0	0.97561
1	1.5	0.98517	1	4.8	0.95367
1.5	2.0	0.97059	1.5	4.1	0.94094
2	2.6	0.94965	2	3.9	0.92566
2.5	3.2	0.92370	2.5	3.2	0.92370
3	4.1	0.88536	3	2.8	0.91997
3.5	4.9	0.84414	3.5	2.5	0.91672
4	5.8	0.79557	4	2.3	0.91258

Table 3 for Question 5

Bond Data

Maturity	3-year	10-year	20-year
Coupon	0%	10%	0%
Yield	0.02	0.04	0.05
Price	94.205	149.054	37.243
- dP/dy	279.815	1054.265	726.694
Convexity	10.293	63.982	390.244

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There are 6 questions worth 80 points, over 12 pages (including formula and tables pages). You have 80 minutes to complete the exam.

Note: Calculate interest rates to 4 decimals (e.g., .0264), calculate bond prices to three decimals (e.g., $104.578) and calculate discount factors to 5 decimals (e.g., .98934).

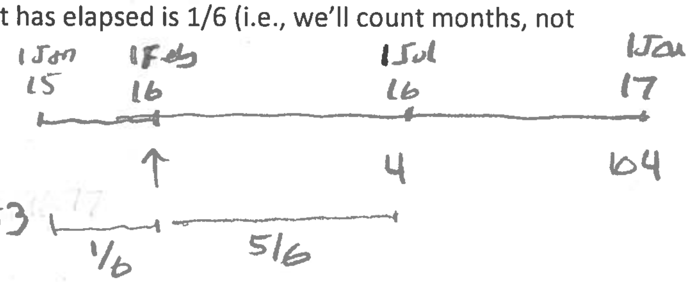
16 19 = 35

20 + 17 = 37

Question 1 (15 Marks)

with a maturity of 1 Jan 17.

Today is 1 Feb 2016. You see a GOC 8% coupon bond has a yield (bond-equivalent) of .0100 (1%). Assume the fraction of the current coupon period that has elapsed is 1/6 (i.e., we'll count months, not days, in the coupon period).



Part a). Calculate the invoice price of the bond.

$$IP = \frac{4}{(1.005)^{5/6}} + \frac{104}{(1.005)^{11/6}} = 3.983 + 103.053$$

$$= 107.038$$

Part b) Calculate the Accrued Interest on the bond.

$$AI = \left(\tfrac{1}{6}\right)4 = .667$$

Part c) Calculate the Gross Price of the bond. Why must we decompose Invoice Price in to GP and AI?

$$GP = 107.038 - .667$$

$$= 106.371$$

For tax purposes. When a bond is bought at $IP_0 = GP_0 + AI_0$ & sold at $IP_1 = GP_1 + AI_1$, one pays capital gains tax on $GP_1 - GP_0$ and the higher interest income tax on (int rec'd) + $AI_1 - AI_0$.

This tax amount is bigger than capital gains on $IP_1 - IP_0$.

Question 2 (15 marks)

Table 1 shows today's strip rates, hat r(t), and discount factors, d(t), and also shows the strip rates and discount factors that will apply one year from today, and we also have a 1-year investment horizon.

Part a). Calculate the effective annual return (EAR) and bond-equivalent return (BER), if today we buy a 1.5-year strip and sell it after one year (at the end of our investment horizon.

Buy 1.5-yr strip $P_0 = \$97.059$

$P_1 = 99.010$

$$1 + EAR = \frac{99.010}{97.059} = 1.0201$$

$$BER = 2\left[(1.0201)^{1/2} - 1\right] = .0200$$

Part b). Instead of the strategy in part a), suppose today we buy a 6% coupon, 1-year GOC and assume we will observe, 6 months from now, the 6-month strip rate, hat r(.5) equal to .015 (1.5%). Calculate the effective annual return (EAR) and bond-equivalent return (BER) from this strategy.

$$P_0 = 3(.99502) + 103(.98517)$$
$$= 2.98506 + 101.47251$$
$$= 104.458$$

0	.5	1
	3	103

$3 \xrightarrow[1.0075]{} 3.0225$

$P_1 = 103$

$$1 + EAR = \frac{103 + 3.0225}{104.458} = \frac{106.0225}{104.458} = 1.01498$$

$$BER = 2\left[(1.01498)^{1/2} - 1\right] = .0149$$

Question 2 continued

Part c). Describe, for each strategy above, its exposure to both of: (i) interest rate risk and (ii) reinvestment risk.

STRAT a): Buy a 1.5-year strip.

* interest rate risk is <u>present</u>: we will value the bond at $t=1$ but it doesn't mature until $t=1.5$. And, at $t=0$, we don't know what $\hat{r}(.5)$ will be at $t=1$. This is interest rate risk.

* Reinvestment risk is <u>absent</u>: there are no cash flows between $t=0$ and $t=1$ (ie, the investment horizon)

STRAT b): Buy 1-year, 6% coupon.

* interest rate risk is <u>absent</u>: at $t=1$ we receive 103 no matter what interest rates are at that time.

* reinvestment risk is <u>present</u>: we receive \$3 at $t=.5$, which we will re-invest at whatever $\hat{r}(.5)$ is at $t=.5$, and we don't know that now.

Question 3 (10 marks). Use the strip rates in Table 1 that apply today for this question.

Part a) Determine the prices today of (i) a 1.5-year strip and (ii) a 1.5-year 20% coupon bond.

(i) $P_0 = \$97.059$

(ii) $P_0 = 10(.99502) + 10(.98517) + 110(.97059)$

$= 9.9502 + 9.8517 + 106.7649$

$= 126.567$

Part b) Which bond in part a) will have a higher yield? Why?

The yield on a coupon bond is a geometric average of all the strip rates from $\hat{r}(.5)$ to the $\hat{r}$ on the coupon bond's maturity date. Here, the strip curve is upward-sloping $\hat{r}(.5) < \hat{r}(1) < \hat{r}(1.5)$. So, bonds with higher coupons put less weight on the largest $\hat{r}(1.5)$, and more weight on the smaller $\hat{r}(.5)$ and $\hat{r}(1)$, lowering the yield.

So, the zero-coupon, strip 1.5-year bond will have a higher yield ($= \hat{r}(1.5)$) than the 20% 1.5-year bond.

Question 4 (15 marks).

Table 2 contains, for three GOC bonds (the maturities and coupon rates are provided in the table), their yields, their prices, P, their dollar durations, -dP/dy, and their convexities, C.

Part a). For all three bonds, calculate, from the data given, the bonds' (i) modified durations and (ii) PVBPs. (iii) What do these risk parameters mean, intuitively, and why is the 10-year bond PVBP so similar to the 30-year bond PVBP despite the huge duration differences?

	(i)	(ii)
	$MD = -\frac{1}{P}\frac{dP}{dy}$	$PVBP = -(dP/dy)(.0001)$
5-yr	$\frac{600.582}{147.357} = 4.076$ yrs	$600.582(.0001) = .0606$
10-yr	$\frac{985.366}{125.753} = 7.836$ yrs	$985.366(.0001) = .0985$
30-yr	$\frac{896.418}{30.478} = 29.412$ yrs	$896.418(.0001) = .0896$

(iii) MD = % loss on a bond if its yield increases by 1%.

PVBP = The \$ Loss on a bond if its yield increases by .0001 = 1 basis point = 1/100th of a percent.

The 30-yr bond has by far the highest % loss when yield increases (MD), but, it has about the same PVBP as the 10-year bond.

This is because the 30-year bond has a much smaller price, so a PVBP of \$.0896 is actually a big percentage of P = \$30.478.

6

Question 4 continued

Part b) Consider a portfolio of 2 bonds: a weighting of .8516 on the 5-year bond and a weighting of .1484 on the 30-year bond. Calculate the modified duration and convexity of this portfolio.

$MD_p = .8516(4.076) + .1484(29.412) = 3.4711 + 4.365 = 7.836$ yrs

$C_p = .8516(20.627) + .1484(879.469) = 17.566 + 130.513 = 148.080$ yrs^2

Part c) Compare the modified duration and convexity of the 10-year bond with the modified duration and convexity of the portfolio in part b). How are they similar and how are they different? What causes the difference?

$MD_{10yr} = MD_p$: the 10-year bond and the portfolio have the <u>same</u> DURATIONS

$C_{10} = 74.410$ the portfolio convexity is <u>twice</u> as big as the 10-yr bond
$C_p = 148.080$

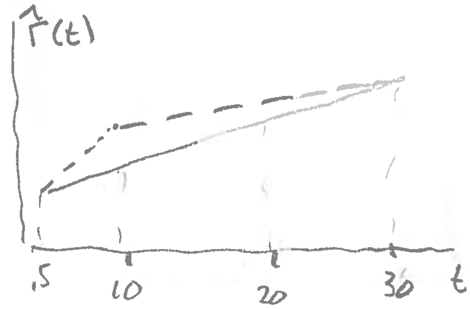
The portfolio weights were chosen to give $MD_p = MD_{10}$. The $C_p >> C_{10yr}$ because convexity increases with t <u>squared</u> (not linearly), so C_{30} is <u>much</u> bigger than C_5 or C_{10}, pulling C_p up at an increasing rate.

Question 5 (10 marks).

A 25-year GOC with a 4% coupon has the following key rate durations (KRDs): KRD(.5) = .482, KRD(10) = 6.527 and KRD(30) = 9.862 for a total (modified duration) of 16.872 years.

Part a). Suppose the yield curve shifts by d hat r(.5) = d hat r(30) = 0 and d hat r(10) = +.0100. That is, the .5-year strip rate and 30-year strip rate don't move, but the 10-year strip rate goes up by 1%. How is the strip ~~yield~~ curve shape changing? What is the expected return on the bond due to the curve change?

The strip curve is shifting up by 1% at $t=10$ and the $\hat{r}(t)$ around $t=10$, between $t=.5$ and $t=30$ will shift up by less and less as one moves away from $t=10$.

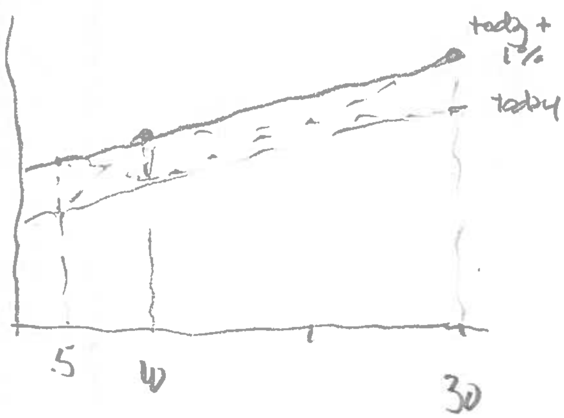


$$E(r) = -[.482(0) + 6.527(.01) + 9.862(0)] = -.06527$$

The 25-yr GOC bond would lose 6.527% of its value.

Part b). Why is the sum of the three KRDs for a bond it's modified duration?

If you shift all 3 key rates, $\hat{r}(.5)$, $\hat{r}(10)$ and $\hat{r}(30)$, up by 1% at the same time, that is equivalent to moving the entire strip curve up by 1%. The expected return is



$$E(r) = -[KRD(.5)(.01) + KRD(10)(.01) + KRD(30)(.01)]$$
$$= -[KRD(.5) + KRD(10) + KRD(30)](.01)$$
$$= -D\,dy \quad \text{where } D = \sum_s KRD(s) = \text{modified duration}$$

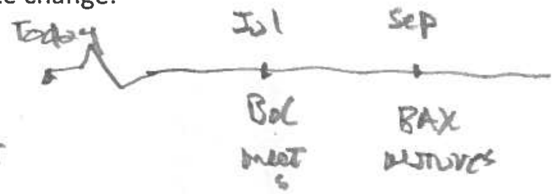
and $dy = .01$

8

~~Question 5 continued~~

Question 6 (15 marks) We discussed articles on BAX futures ("Pill"), what happened recently in the high-yield bond market ("Trash") and the rating change for the Province of Alberta ("Alberta").

Part a) From "Pill," describe how the September 16 BAX futures price contains information about the market's beliefs about a July Bank of Canada overnight rate change.



The Sept BAX is the 1st futures contract on a 3-month BA that matures after the BoC decides what to do with the overnight rate. If it raises the rate, investors will want a higher yield on the BA they buy when the BAX matures in Sep. So, the futures yield will be higher (price will be lower). Vice-versa if the investors expect a cut.

So, the futures yield (price) observed today conveys information about investor's expectations for the BoC's action in July.

Question 6 continued

Part b) From "Trash," what factors caused high-yield bonds' credit spreads to dramatically widen (get bigger). Explain three of the four reasons discussed in class.

1. The high-yield (HY) index is dominated by energy bonds. Oil price drops raise credit spreads.
2. The Fed is considering another rate hike. This won't affect credit spreads, but makes all bond yields increase.
3. A HY mutual fund stopped accepting redemptions because it was having difficulty even selling its HY bond holdings.
4. Carl Icahn said the "HY meltdown is just beginning."

Part c) From "Alberta," what was the primary factor that caused S&P to change its rating of the Province of Alberta from AAA to AA+?

The ratings score snapshot shows "weak budgetary performance" which means the next two years will see bigger-than-expected deficits brought on by oil-price ravaged economic performance.

But S&P sees excellent liquidity and positive GDP growth in 2017, with the debt burden remaining moderate.

Formula Page

$PV(i,n) = 1/(1+i)^n$
$PVA(i,n) =$
$(1 - PV(i,n))/i$

True Yield (Canada): $Y_T = \frac{(F-P)}{P} * \frac{365}{t}$
Bank Discount (US): $Y_D = \frac{(F-P)}{F} * \frac{360}{t}$
Accrued Interest: $AI = (1-w) * \left({}^{C}/_{2}\right)$
where w = fraction of coupon period remaining
Gross Price = Invoice Price – AI

Par Yield: $y_t = 2 * \left[\frac{1-d(t)}{\sum_{s=1}^{2t} d\left(\frac{s}{2}\right)}\right]$
Forward Rate: $f_t = 2 * \left[\frac{d(t-.5)}{d(t)} - 1\right]$
Dollar Duration:

$$\frac{dP}{dy} = -(1+\frac{y}{2})^{-1} * [(\sum_{s=1}^{2T-1} \left(\frac{s}{2}\right) * \left(\frac{c}{2}\right) * (1+\frac{y}{2})^{-s}) + TF(1+\frac{y}{2})^{-2T}]$$

Modified Duration:

$$D = (1+\frac{y}{2})^{-1} * [(\sum_{s=1}^{2T-1} \left(\frac{s}{2}\right) * w_{\frac{s}{2}}) + Tw_T] = -\frac{1}{P} * \frac{dP}{dy}$$

Where $w_{s/2} = \frac{\left(\frac{c}{2}\right) * (1+\frac{y}{2})^{-s}}{P}$
and $w_T = \frac{F * (1+\frac{y}{2})^{-2T}}{P}$

PVBP = -(dP/dy)*(.0001)

Taylor's Series: $\frac{dP}{P} = -D * (dy) + \frac{1}{2} * C * (dy)^2$

COMM 474-201,202 Jan-Apr 2016 Midterm One Tables

Table 1 for Questions 2 and 3

---- Today -----			--- In One Year ---		
t	hat r(t)	d(t)	t	hat r(t)	d(t)
0.5	0.010	0.99502	0.5	0.020	0.99010
1	0.015	0.98517	1	0.025	0.97546
1.5	0.020	0.97059	1.5	0.025	0.96342

Table 2 for Question 4

GOCs:	ytm=	P=	-dP/dy=	Convex=
5-yr, 12%	0.02	147.357	600.582	20.627
10-yr, 6%	0.03	125.753	985.366	74.410
30-yr, 0%	0.04	30.478	896.418	879.469