

Practice Midterm Exam

Multiple Choice (3 points per question)

1. What are the necessary conditions for mortgage-backed securities to exist?
 - a. perfect capital markets
 - b. complete spanning of assets
 - c. value additivity must hold
 - d. all of the above
 - e. none of the above

2. In comparison to mortgage pass-through securities, mortgage backed bonds should be priced:
 - a. to provide lower yields than MPTs because of lower prepayment risks
 - b. to provide higher yields than MPTs because of higher prepayment risks
 - c. to provide the same yield as MPTs because of equivalent amounts of prepayment risk
 - d. none of the above

3. Which of the following statements are true?
 - I. If the mortgage backed security is to be used as a hedge or to enhance portfolio yield, negative convexity may be acceptable.
 - II. There is not one call but a bundle of calls embedded in the mortgage backed security
 - a. Only I is true
 - b. Only II is true
 - c. Both I and II are true
 - d. Neither I nor II are true

4. Which of the following statements generally holds with respect to CMOs?
 - a. discount-priced CMO bond coupons with high-WAC collateral benefit from slower prepayments
 - b. premium-priced CMO bond coupons with low-WAC collateral benefit from slower prepayments
 - c. discount-priced CMO bond coupons with low-WAC collateral are the most volatile structure and will be priced to a relatively narrow yield spread
 - d. premium-priced CMO bond coupons with high-WAC collateral are the most stable structure and will be priced to a relatively wide yield spread.

5. A TAC bond has all of the following characteristics except
- there is just one PSA speed at which the TAC schedule is satisfied
 - if a bond has both a PAC and a TAC class in addition to support bonds, the TAC receives any principal remaining after the PAC requirements are met
 - a TAC bond can act as a support bond for a PAC
 - all of the above are characteristics of a TAC
6. The new Goldman Sachs prepayment model discussed in Fabozzi differs from the Goldman Sachs prepayment model developed by Richard and Roll which was discussed in class in that the new model includes
- prepayments due to mortgage assumptions
 - partial prepayments of mortgages
 - prepayments due to refinancing
 - all of the above
 - only a and b
 - only a and c
 - only b and c
7. The vast majority of regularly traded mortgage pass-throughs are issued and/or guaranteed by Ginnie Mae (GNMA), Freddie Mac (FHLMC), or Fannie Mae (FNMA). Which of the following are true about these agencies?
- The guarantee of all 3 agencies carries the full faith and credit of the U.S. government
 - The risk premium for pass-throughs guaranteed by all 3 agencies is identical
- Only I is true
 - Only II is true
 - Both I and II are true
 - Neither I nor II are true

8. Based on the information provided below, which tranche is fairly well protected if there is a slow down in prepayments and realizes most of the benefits of a speedup of prepayments?

Exhibit 6. OAS Analysis of FNMA 89-97 Classes A, B, C, and Z (As of 4/27/90)

Base Case (assumes 12% interest-rate volatility)

	OAS (in basis points)	Option Cost (in basis points)
Collateral Class	70	45
A	23	29
B	46	41
C	59	36
Z	74	50

Prepayments at 80% and 120% of Prepayment Model (assumes 12% interest-rate volatility)

Collateral Class	New OAS (in basis points)		Change in Price per \$100 par (holding OAS constant)	
	80%	120%	80%	120%
Collateral Class	70	71	\$0.00	\$0.04
A	8	40	-0.43	0.48
B	31	65	-0.86	1.10
C	53	73	-0.41	0.95
Z	72	93	-0.28	2.70

Interest-Rate Volatility of 8% and 16%

- Tranche A
- Tranche B
- Tranche C
- Tranche Z

9. You are given the following information on matching effective duration with stripped mortgage backed securities (SMBS). Which combination of the market value of the IO and the market value of the Ginnie Mae (GNMA) pass-through should show little price sensitivity to small changes in interest rates e.g. a good hedge?

Exhibit 10. Matching Effective Duration with SMBSs

Portfolio 1*: GNMA 7 and FNMA Trust 215 IO

IO Market Value (\$mm)	0	10	20	30	41	60	80	100
GNMA 8 Market Value (\$mm)	100	90	80	70	59	40	20	0
Effective Duration of Portfolio	7.0	5.3	3.6	1.9	0.0	-3.2	-6.6	-10.0

Portfolio 2*: FNMA 8 Servicing Portfolio and FNMA Trust 215 PO

PO Market Value (\$mm)	0	10	20	40	50	65	80	100
Servicing portfolio Market Value (\$mm)	100	90	80	60	50	35	20	0
Effective Duration of Portfolio	-28.6	-24.2	-19.8	-11.0	-6.7	-0.1	6.5	15.3

*Total market value of portfolio is \$100 mm.

Note: The servicing portfolio of FNMA 8% pass-through collateral receives a gross coupon of 75 basis points.

- | | <u>IO Market Value</u> | <u>PT Market Value</u> |
|----|------------------------|------------------------|
| a. | \$ 10 mm | \$ 90 mm |
| b. | \$ 41 mm | \$ 59 mm |
| c. | \$ 60 mm | \$ 40 mm |
| d. | \$ 80 mm | \$ 20 mm |

Short Essay:: (20 points) Please limit your answer to no more than half a page.

In the book Liar's Poker, discuss what John Meriwether's strategy was for investing in mortgage-backed securities. More specifically, did Meriwether's strategy involve betting on whether interest rates were headed up or down? If so, please elaborate on this strategy and if not, what strategy did Meriwether use?

Mathematical Question: (25 points per question; 50 points total)

1. **Graduated Payment Mortgage:** Mr. Kamakawiwoole is applying for a \$100,000 GPM loan for 30 years at an interest rate of 8%. Payments would be designed so as to graduate at the rate of 7.5% for 3 years beginning with payments in the second year. What would monthly payments be for Mr. Kamakawiwoole in each of the first 5 years of the loan?

Loan Amount 100,000
Interest Rate 0.08
Term 30
Gradation Rate 0.075

Round all computations to 6 decimals

Payment Pd	Graduated Pymt Factor	MPVIFA	MPVIF	PV
MP1	_____	11.495782	1.000000	_____
MP2	_____	11.495782	0.923361	_____
MP3	_____	11.495782	0.852596	_____
MP4-30	_____	132.576786	0.787255	_____
			Total	_____

MP1 _____
MP2 _____
MP3 _____
MP4-30 _____

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2. Planned Amortization Class (PAC): Following is yearly data assuming a 325% PSA for the first 6 years on a mortgage pass-through from which a PAC and a support bond are constructed.

Orig. Loan Bal.	400000	Class PAC	Par 243800	Coupon .085
WAC	.090	Support	<u>156200</u>	.085
Service Fee	.005		400000	
MPT Rate	.085			
Contract Term	360			
WAM	357			
MPT Rate PSA	.075 325			

Yr	Year	Proj. DS(t)	Proj. SP(t)	Proj. I(t)	Proj. PR(t)	Proj. S(t)	SP+P R Pymts	Proj. CF(t)	Proj. End BAL(t)	Principa l Repaid
0	Beg. Bal	400,000								
1	375,996	37832	2736	35096	24697	1950	27433	60579	372,567	27,433
2	323,294	34148	2700	31448	51945	1747	54645	84346	317,922	82,078
3	259,092	28357	2451	25906	61209	1439	63660	88126	254,262	145,738
4	206,630	22833	2159	20674	49341	1149	51500	71025	202,762	197,238
5	164,630	18380	1901	16480	39327	916	41228	56792	161,534	238,466
6	131,024	14796	1674	13123	31313	729	32987	45380	128,548	271,452

If the bands associated with the PAC tranche are at 125% PSA and 250% PSA, what is the PAC sinking fund schedule, the PAC principal, and the principal on the support bond for the first 6 years?

Year	125%PSA SP+PR Pymts	250%PSA SP+PR Pymts	PAC Sinking Fund (Princ.)	PAC Principal	Support Principal
0					
1	12248	21728	_____	_____	_____
2	23685	43329	_____	_____	_____
3	29941	52247	_____	_____	_____
4	27957	44657	_____	_____	_____
5	25894	37800	_____	_____	_____
6	23986	31983	_____	_____	_____

Solution Key to Practice Final Exam

Multiple Choice (points)

1. e
2. a
3. c
4. b
5. d
6. e
7. d
8. d
9. b

Short Essay:: (points)

Answer: Meriwether's strategy was not betting on the direction of interest rate movements but rather on setting up hedge strategies, in particular interest rate arbitrage, to capture the spread in yield between different securities affected by interest rates. Usually, the spread relationships are stable but can become quite skewed when interest rate volatility is high (there are large swings in the interest rate) which in turn creates bargains. Meriwether's computer generated "relative-value" trading strategy determines exactly how cheap those bargains are based on historical price data. This in turn allows him to more accurately play the spread between various securities.

Mathematical Question: (points)

1. Graduated Payment Mortgage:

Answer

Loan Amount	100,000				
Interest Rate	0.08				
Term	30				
Gradation Rate	0.075				
			Round all computations to 6 decimals		
		Graduated			
Payment Period	Payment	Pymt Factor	MPVIFA	MPVIF	PV
MP1	MP1*1.0	1.000000	11.495782	1.000000	11.495782
MP2	MP1*1.075	1.075000	11.495782	0.923361	11.410864
MP3	MP2*1.075	1.155625	11.495782	0.852596	11.326578
MP4-30	MP3*1.075	1.242297	132.576786	0.787255	<u>129.660684</u>
				Total	163.893908
MP1	610.15	= 100,000*163.893908			
MP2	655.91	= 617.53*1.075			
MP3	705.11	= 660.76*1.075			
MP4-30	757.99	= 707.01*1.075			

2. Planned Amortization Class (PAC):

Answer

Year	Year 125%PSA SP+PR Pymts	Year 250%PSA SP+PR Pymts	PAC Sinking Fund (Princ.)	Year PAC Principal	Year Support Principal
0					
1	12248	21728	12248	12,248	15,185
2	23685	43329	23685	23,685	30,960
3	29941	52247	29941	29,941	33,719
4	27957	44657	27957	27,957	23,543
5	25894	37800	25894	25,894	15,334
6	23986	31983	23986	23,986	9,000