Section 01.a	Section 01.a	Section 01.a
Simple Interest Formula	Write i_t and d_t in terms of the accumulation function, $a(t)$	Compound Interest 1) Give $a(t)$ in terms of i 2) Give $a(t)$ in terms of d 3) Give $a(t)$ in terms of δ
Section 01.a	Section 01.a	Section 01.a
Identities 1) Give i in terms of d 2) Give d in terms of i	Identities 1) Give v in terms of i 2) Give v in terms of d	Nominal Rates 1) Give $a(t)$ in terms of $i^{(m)}$ 2) Give $a(t)$ in terms of $d^{(m)}$
Section 01.b – d	Section 01.e	Section 01.g
Force of Interest: 1) Define FoI in terms of $a(t)$ 2) Give $a(t)$ in terms of δ_t	Constant Force of Interest 1) Give δ in terms of i 2) Give $a(t)$ in terms of δ	Variable FoI Trap Given $a(t)$, find AV of 1 invested at time t_1 and accumulated to t_2
Section 01.g	Section 02.b	Section 03.a
Variable FoI Trap Given $a(t)$, find PV at time t_1 of a payment of 1 at time t_2	Method of Equated Time	Geometric Series Sum the following: $a + ar + ar^2 + ... + ar^{n-1}$
Section 03.b	Section 03.b	Section 03.b
Annuity Immediate 1) Give formula for $a_{\overline{n}\mid i}$ 2) Give formula for $s_{\overline{n}\mid i}$	Annuity Due 1) Give formula for $\ddot{a}_{\overline{n}\mid i}$ 2) Give formula for $\ddot{s}_{\overline{n}\mid i}$	Annuity Identities 1) Give $\ddot{a}_{\overline{n}\mid i}$ in terms of $a_{\overline{n}\mid i}$ 2) Give $\ddot{s}_{\overline{n}\mid i}$ in terms of $s_{\overline{n}\mid i}$

$a(t)=(1+i)^t$ $a(t)=(1-d)^{-t}$ $a(t)=e^{\delta t}$	$i_t=\dfrac{a(t)-a(t-1)}{a(t-1)}$ $d_t=\dfrac{a(t)-a(t-1)}{a(t)}$	$a(t)=1+it$
$a(t)=(1+i)^t=\left(1+\dfrac{i^{(m)}}{m}\right)^{mt}$ $a(t)=(1-d)^{-t}=\left(1-\dfrac{d^{(m)}}{m}\right)^{-mt}$	$v=\dfrac{1}{1+i}$ $v=1-d$	$i=\dfrac{d}{1-d}$ $d=\dfrac{i}{1+i}$
$a(t_1 \text{ to } t_2)=e^{\int_{t_1}^{t_2}\delta_r dr}=\dfrac{a(t_2)}{a(t_1)}$	$\delta=\ln(1+i)$ $a(t)=e^{\delta t}$	$\delta_t=\dfrac{a'(t)}{a(t)}$ $a(t)=e^{\int_0^t \delta_r dr}$
$\dfrac{a(1-r^n)}{1-r}$ $=\dfrac{\text{First Term}-\text{First Ommitted Term}}{1-\text{Common Ratio}}$	$\bar{t}=\dfrac{P_1t_1+P_2t_2+...+P_nt_n}{P_1+P_2+...+P_n}$	$\dfrac{1}{a(t_1 \text{ to } t_2)}=e^{-\int_{t_1}^{t_2}\delta_r dr}=\dfrac{a(t_1)}{a(t_2)}$
$\ddot{a}_{\overline{n}\rvert i}=(1+i)a_{\overline{n}\rvert i}$ $\ddot{s}_{\overline{n}\rvert i}=(1+i)s_{\overline{n}\rvert i}$	$\ddot{a}_{\overline{n}\rvert i}=\dfrac{1-v^n}{d}$ $\ddot{s}_{\overline{n}\rvert i}=\dfrac{(1+i)^n-1}{d}$	$a_{\overline{n}\rvert i}=\dfrac{1-v^n}{i}$ $s_{\overline{n}\rvert i}=\dfrac{(1+i)^n-1}{i}$

Section 03.b	Section 03.b	Section 03.b
Annuity Relationships State the +1/-1 formulas.	Definition of Annuity Formulas 1) Write $s_{\overline{n}\vert i}$ in terms of $(1+i)$. 2) Write $\ddot{s}_{\overline{n}\vert i}$ in terms of $(1+i)$.	Definition of Annuity Formulas 1) Write $a_{\overline{n}\vert i}$ in terms of v. 2) Write $\ddot{a}_{\overline{n}\vert i}$ in terms of v.
Section 03.d	Section 03.f	Section 03.f
Deferred Annuities 1) Give ${}_{m}\vert a_{\overline{n}\vert i}$ in terms of $a_{\overline{n}\vert i}$ 2) Give ${}_{m}\vert a_{\overline{n}\vert i}$ using block pmts.	Infinite Geometric Series Sum the following: $a + ar + ar^2 + ar^3 + \ldots$	Perpetuities 1) Give the formula for $a_{\overline{\infty}\vert i}$ 2) Give two formulas for $\ddot{a}_{\overline{\infty}\vert i}$
Section 03.g	Section 04.b	Section 04.b
The $a_{\overline{2n}\vert} / a_{\overline{n}\vert}$ Trick 1) Simplify $a_{\overline{2n}\vert} / a_{\overline{n}\vert}$ 2) Simplify $a_{\overline{3n}\vert} / a_{\overline{n}\vert}$	Fission PV and AV of payments of *P* occurring at the end of every *n* years for *k n* years.	Fusion PV and AV of payments of *P* occurring at the end of each *m*-thly period, for *n* years.
Section 04.b	Section 04.b	Section 04.b
m-thly Annuities PV and AV of an *n*-year annuity paying $1/m$ at the end of each *m*-thly period.	*m*-thly Annuities PV and AV of an *n*-year annuity paying $1/m$ at the beginning of each *m*-thly period.	*m*-thly Perpetuities PV of a perpetuity paying $1/m$ at the end of each *m*-thly period.
Section 04.d	Section 04.e	Section 04.g
Continuous Annuities PV and AV of continuous payments of 1 per year for *n* years.	Double Dots Cancel State the "Double Dots Cancel" rule.	Annuities with varying interest Write $a_{\overline{n}\vert}$ and $s_{\overline{n}\vert}$ in terms of $a(t)$.

$a_{\overline{n}\rvert i} = v + v^2 + ... + v^n$ $\ddot{a}_{\overline{n}\rvert i} = 1 + v + v^2 + ... + v^n$	$s_{\overline{n}\rvert i} = 1 + (1+i) + ... + (1+i)^n$ $\ddot{s}_{\overline{n}\rvert i} = (1+i)+(1+i)^2+...+(1+i)^n$	$\ddot{s}_{\overline{n}\rvert i} = s_{\overline{n+1}\rvert i} - 1$ $\ddot{a}_{\overline{n}\rvert i} = a_{\overline{n-1}\rvert i} + 1$
$a_{\overline{\infty}\rvert i} = \frac{1}{i}$ $\ddot{a}_{\overline{\infty}\rvert i} = \frac{1}{d} = a_{\overline{\infty}\rvert i} + 1$	$\frac{a}{1 - r}$	${}_{m}\rvert a_{\overline{n}\rvert i} = v^m a_{\overline{n}\rvert i}$ ${}_{m}\rvert a_{\overline{n}\rvert i} = a_{\overline{m+n}\rvert i} - a_{\overline{n}\rvert i}$
$PV = \left(P\, s_{\overline{m}\rvert j}\right) a_{\overline{n}\rvert i}$ $AV = \left(P\, s_{\overline{m}\rvert j}\right) s_{\overline{n}\rvert i}$	$PV = \left(\frac{P}{s_{\overline{n}\rvert i}}\right) a_{\overline{kn}\rvert j}$ $AV = \left(\frac{P}{s_{\overline{n}\rvert i}}\right) s_{\overline{kn}\rvert j}$	$\frac{a_{\overline{2n}\rvert}}{a_{\overline{n}\rvert}} = 1 + v^n$ $\frac{a_{\overline{3n}\rvert}}{a_{\overline{n}\rvert}} = 1 + v^n + v^{2n}$
$a^{(m)}_{\overline{\infty}\rvert} = \frac{1}{i^{(m)}}$ $\ddot{a}^{(m)}_{\overline{\infty}\rvert} = \frac{1}{d^{(m)}} = a^{(m)}_{\overline{\infty}\rvert} + \frac{1}{m}$	$\ddot{a}^{(m)}_{\overline{n}\rvert} = \frac{1 - v^n}{d^{(m)}}$ $\ddot{s}^{(m)}_{\overline{n}\rvert} = \frac{(1+i)^n - 1}{d^{(m)}}$	$a^{(m)}_{\overline{n}\rvert} = \frac{1 - v^n}{i^{(m)}}$ $s^{(m)}_{\overline{n}\rvert} = \frac{(1+i)^n - 1}{i^{(m)}}$
$a_{\overline{n}\rvert} = \left(\frac{1}{a(1)} + \frac{1}{a(2)} + ... + \frac{1}{a(n)}\right)$ $s_{\overline{n}\rvert} = a(n)\left(\frac{1}{a(1)} + \frac{1}{a(2)} + ... + \frac{1}{a(n)}\right)$	$\frac{a_{\overline{n}\rvert}}{a_{\overline{p}\rvert}} = \frac{\ddot{a}_{\overline{n}\rvert}}{\ddot{a}_{\overline{p}\rvert}} = \frac{a^{(m)}_{\overline{n}\rvert}}{a^{(m)}_{\overline{p}\rvert}} = \frac{\ddot{a}^{(m)}_{\overline{n}\rvert}}{\ddot{a}^{(m)}_{\overline{p}\rvert}}$	$\bar{a}_{\overline{n}\rvert} = \int_0^n v^t\, dt = \frac{1 - v^n}{\delta}$ $\bar{s}_{\overline{n}\rvert} = (1+i)^n \bar{a}_{\overline{n}\rvert} = \frac{(1+i)^n - 1}{\delta}$

Section 04.h

Arithmetic Progression

P/Q formulas for AV and PV of an arithmetic annuity.

Section 04.h

Increasing Annuities

1) Give the formula for $(Ia)_{\overline{n|}}$.
2) Give the formula for $(Is)_{\overline{n|}}$.

Section 04.h

Decreasing Annuities

1) Give the formula for $(Da)_{\overline{n|}}$.
2) Give the formula for $(Ds)_{\overline{n|}}$.

Section 04.h

Increasing Perpetuities

Give the formula for $(Ia)_{\overline{\infty|}}$

Section 04.h

Increasing to Level Perpetuities

PV of a perpetuity imm. paying: 1, 2, …, n, n,n, n,...

Section 04.i

m-thly Increasing Annuities

1) Describe payments for $(Ia)^{(m)}_{\overline{n|}}$
2) Give formula for $(Ia)^{(m)}_{\overline{n|}}$

Section 04.i

m-thly Increasing Annuities

1) Describe payments for $(I^{(m)}a)^{(m)}_{\overline{n|}}$
2) Give formula for $(I^{(m)}a)^{(m)}_{\overline{n|}}$

Section 04.j

Geometric Annuities

PV of an n-year annuity immediate with payments starting at P and increasing by k% per year.

Section 04.k

Continuous Annuities

PV of an n-year annuity paying continuously at a rate of t, with a constant FoI, δ.

Section 04.k

Continuous Annuities

PV of an n-year annuity paying continuously at a rate of $f(t)$, with a constant FoI, δ.

Section 04.k

Continuous Annuities

Find PV of an n-year annuity paying continuously at a rate of $f(t)$, with a variable FoI, δ_t.

Section 04.l

Palindromic Annuity

PV of an annuity imm. paying: 1, 2, 3, …, $n-1$, n, $n-1$, …, 3, 2, 1

Section 05.a

Net Present Value

Define NPV.

Section 05.a

Internal Rate of Return

Define IRR.

Section 05.e

Find DWR for this example:

	$t=0$	$t=1/4$	$t=1/2$	$t=1$
Beg:	0	120	90	220
Trans	+ 100	− 40	+ 110	− 220
End:	100	80	200	0

$(Da)_{\overline{n}\rvert} = \dfrac{n - a_{\overline{n}\rvert}}{i}$ $(Ds)_{\overline{n}\rvert} = \dfrac{n(1+i)^n - s_{\overline{n}\rvert}}{i}$	$(Ia)_{\overline{n}\rvert} = \dfrac{\ddot{a}_{\overline{n}\rvert} - n v^n}{i}$ $(Is)_{\overline{n}\rvert} = \dfrac{\ddot{s}_{\overline{n}\rvert} - n}{i}$	$A = P a_{\overline{n}\rvert} + Q \dfrac{a_{\overline{n}\rvert} - n v^n}{i}$ $S = P s_{\overline{n}\rvert} + Q \dfrac{s_{\overline{n}\rvert} - n}{i}$
PV of *m*-thly payments starting at $1/m$, and increasing by $1/m$ each year. $(Ia)^{(m)}_{\overline{n}\rvert} = \dfrac{\ddot{a}_{\overline{n}\rvert} - n v^n}{i^{(m)}}$	$PV = \dfrac{\ddot{a}_{\overline{n}\rvert}}{i}$	$(Ia)_{\overline{\infty}\rvert} = \dfrac{1}{i d} = \dfrac{1}{i} + \dfrac{1}{i^2}$
$(\bar{I}\,\bar{a})_{\overline{n}\rvert} = \int_0^n t v^t \, dt = \dfrac{\bar{a}_{\overline{n}\rvert} - n v^n}{\delta}$	$PV = \dfrac{P}{1+k} a_{\overline{n}\rvert i'}$ where $i' = \dfrac{i-k}{1+k}$	PV of *m*-thly payments starting at $1/m^2$, and increasing by $1/m^2$ each *m*-thly period. $(I^{(m)} a)^{(m)}_{\overline{n}\rvert} = \dfrac{\ddot{a}^{(m)}_{\overline{n}\rvert} - n v^n}{i^{(m)}}$
$PV = a_{\overline{n}\rvert i} \cdot \ddot{a}_{\overline{n}\rvert i}$	$\int_0^n \dfrac{f(t)}{a(t)} dt$	$\int_0^n f(t) v^t \, dt$
$\text{DWR} = \dfrac{-100 + 40 - 110 + 220}{100(1) - 40(3/4) + 110(1/2)}$ $= 0.4 = 40\%$	The rate at which the PV of cash inflows is equal to PV of cash outflows.	Sum the PV of cash inflows and cash outflows, calculated using the "interest preference rate".

Section 05.e

Find DWR for this example:

	$t=0$	$t=1/4$	$t=1/2$	$t=1$
Beg:	0	120	90	220
Trans	+ 100	− 40	+ 110	− 220
End:	100	80	200	0

Section 06.a

Amortization

1) Find B_t prospectively.
2) Find B_t retrospectively.

Section 06.a

Amortization

1) Give formulas for I_t .
2) Give formulas for P_t .

Section 06.b

Sinking Funds

1) Give formula for SFD.
2) Give formula for total payment under SF method.

Section 07.b

Bond Pricing

State the relationship between the coupon rate and the special coupon rate.

Section 07.b

Bond Pricing

Give the basic bond pricing formula.

Section 07.b

Bond Pricing

State the premium/discount bond pricing formula.

Section 07.c

Premium and Discount

Explain the relationships between *P* and *C* and *g* and *i* for a bond purchased at a premium.

Section 07.c

Premium and Discount

Explain the relationships between *P* and *C* and *g* and *i* for a bond purchased at a discount.

Section 07.c

Premium and Discount

For bonds sold at a premium, does the book value increase or decrease over time?

Section 07.c

Premium and Discount

For bonds sold at a discount, does the book value increase or decrease over time?

Section 07.c

Premium and Discount

Give formula for Write-Down of Premium

Section 07.c

Premium and Discount

Give formula for Write-Up of Discount

$I_t = R\left[1 - v^{n-t+1}\right] = i\,B_{t-1}$ $P_t = R\,v^{n-t+1} = R - I_t$	$B_t = R\,a_{\overline{n-t\rvert}}$ $B_t = L(1+i)^t - R\,s_{\overline{t\rvert}}$	$\text{TWR} = \frac{120}{100}\frac{90}{80}\frac{220}{200} - 1$ $= 0.485 = 48.5\%$
		$SFD = \frac{L}{s_{\overline{n\rvert}j}}$ $R_t = L\,i + \frac{L}{s_{\overline{n\rvert}j}}$ (i is rate on loan, j is SF rate)
$P = C + (F\,r - C\,i)\,a_{\overline{n\rvert}i}$	$P = F\,r\,a_{\overline{n\rvert}i} + C\,v^n$	$C\,g = F\,r$
Premium: Book value decreases over time. This process is called "Write-Down" of premium.	Discount: $P < C$ $g < i$	Premium: $P > C$ $g > i$
$P_t = (C\,i - F\,r)\,v^{n-t+1}$	$P_t = (F\,r - C\,i)\,v^{n-t+1}$	Discount: Book value increases over time. This process is called "Write-Up" of discount.

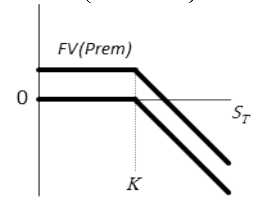
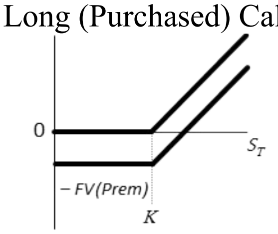
Section 07.d	Section 07.d	Section 07.f
Price Between Coupons Give the Full Price (also called the Dirty Price).	Price Between Coupons Give the Market Price (also called the Clean Price).	Callable Bonds For a bond selling at a premium, is an earlier redemption date better or worse?
Section 07.f	Section 08.b	Section 08.b
Callable Bonds For a bond selling at a discount, is an earlier redemption date better or worse?	Preferred Stock Give the price of a preferred stock paying coupons of Fr.	Common Stock Give the theoretical price of a common stock with expected dividend of D and growth rate k.
Section 09.a	Section 09.b	Section 09.b
Inflation Given an effective rate of i, and an inflation rate of r, find the real rate of interest, i'.	Spot Rates and Forward Rates Given spot rates $s_1, s_2, \cdots$, find a formula for the forward rate f_n.	Spot Rates and Forward Rates Given forward rates $f_1, f_2, \cdots$, find a formula for the spot rate s_n.
Section 09.d	Section 09.d	Section 09.e
Duration and Convexity Give the formula for Macaulay Duration.	Duration and Convexity Give the Macaulay Duration for a zero coupon bond.	Duration and Convexity Give the derivative definition for Macaulay Duration.
Section 09.f	Section 09.f	Section 09.g
Duration and Convexity Give the derivative definition for Modified Duration.	Duration and Convexity State the relationship between $ModD$ and $MacD$.	Duration and Convexity Assume a portfolio contains n investments, each with present value PV_i and duration $ModD_i$. Find the duration of the portfolio.

For a bond selling at a premium, an earlier redemption date is worse.	$B_{t+k} - k\,F\,r = B_t(1+i)^k - k\,F\,r$	$B_{t+k} = B_t(1+i)^k$
$P = \dfrac{D}{i-k}$	$P = \dfrac{F\,r}{i}$	For a bond selling at a discount, an earlier redemption date is better.
$(1+s_n)^n = (1+f_0)\cdot(1+f_1)\cdot\ldots\cdot(1+f_{n-1})$	$1+f_n = \dfrac{(1+s_{n+1})^{n+1}}{(1+s_n)^n}$	$i' = \dfrac{i-r}{1+r}$
$MacD = -\dfrac{P'(\delta)}{P(\delta)}$	$MacD = n$ for a zero coupon bond	$MacD = \dfrac{\sum(t\cdot v^t\cdot CF_t)}{\sum(v^t\cdot CF_t)}$
$ModD = \dfrac{\sum(PV_i\cdot ModD_i)}{\sum PV_i}$	$ModD = v\cdot MacD$	$ModD = -\dfrac{P'(i)}{P(i)}$

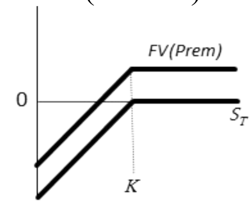
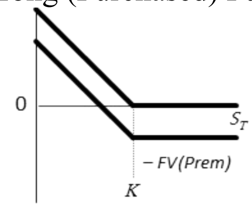
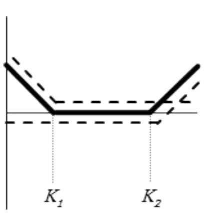
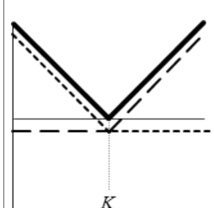
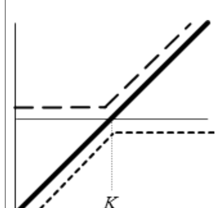
Section 09.i	Section 09.i	Section 09.i
Duration and Convexity Give the derivative definition for Convexity.	Duration and Convexity Give the formula for Convexity.	Duration and Convexity Give the Taylor Polynomial approximation for ΔP, given Δi.
Section 09.j	Section 09.k	Section 09.j
Immunization State the criteria for Redington Immunization. What is the effect of Redington Immunization?	Immunization State the criteria for Full Immunization. What is the effect of Full Immunization?	Immunization State the criteria for Duration Matching.
Section 10	Section 10	Section 10
Buying and Selling Assets As an individual buying an asset, do you pay the ask price, or the bid price?	Buying and Selling Assets As an individual selling an asset, do you receive the ask price, or the bid price?	Buying and Selling Assets Which is larger: The ask price, or the bid price?
Section 10	Section 10	Section 10
Buying and Selling Assets Does a broker buying an asset pay the ask price or the bid price?	Buying and Selling Assets Does a broker selling an asset receive the ask price or the bid price?	Derivatives State four reasons for using derivatives.
Section 10	Section 10	Section 10
Long vs Short Positions If you have a long position in an asset, do you benefit from an increase or decrease in the price of that asset?	Long vs Short Positions If you have a short position in an asset, do you benefit from an increase or decrease in the price of that asset?	Short-Selling Describe the basic process of a short-sale, ignoring haircuts and dividends.

$\Delta P \approx P(i)\cdot\left[-(\Delta i)ModD + \frac{1}{2}(\Delta i)^2(Conv)\right]$	$Conv = \frac{\sum\left[t(t+1)v^{t+2}CF_t\right]}{\sum\left(v^t\cdot CF_t\right)}$	$Conv = -\frac{P''(i)}{P(i)}$
$PV_A = PV_L$ $ModD_A = ModD_L$	$PV_A = PV_L$ $ModD_A = ModD_L$ Each liability falls between two assets. Full Immunization protects against all changes in *i*.	$PV_A = PV_L$ $ModD_A = ModD_L$ $Conv_A > Conv_L$ Redington Immunization protects against small changes in *i*.
The ask price is larger than the bid price.	Individuals sell at the bid price.	Individuals buy at the ask price.
1. Risk management - hedging 2. Speculation - investment vehicle 3. Reducing transaction costs 4. Regulatory arbitrage	Brokers sell at the ask price.	Brokers buy at the bid price.
Short Selling: 1. Borrow a share of the stock, and sell it immediately. 2. Close the short at a later date by purchasing a share of the stock and returning it to the original lender.	Short positions benefit from a decrease in the price of the underlying asset.	Long positions benefit from an increase in the price of the underlying asset.

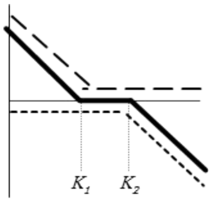
Section 10	Section 10	Section 10
Short-Selling What is a haircut (also called margin)?	Short-Selling What is the maximum loss that can be incurred as a result of a short-sell?	Short-Selling List three reasons for short-selling.
Section 11	Section 11	Section 11
Forward Contracts State the payoff of a long forward contract.	Forward Contracts State the payoff of a short forward contract.	Forward Contracts What is the relationship between payoff and profit for a forward contract?
Section 12	Section 12	Section 12
Call Options Describe a call option.	Call Options Give formulas for payoff and profit for a long call and a short call.	Call Options What positions do the sides of a call option hold with respect to the underlying asset?
Section 12	Section 12	
Call Options Sketch graphs of payoff and profit for a long call.	Call Options Sketch graphs of payoff and profit for a short call.	
Section 13	Section 13	Section 13
Put Options Describe a put option.	Put Options Give formulas for payoff and profit for a long put and a short put.	Put Options What positions do the sides of a put option hold with respect to the underlying asset?

1. To speculate that the price of the asset will decline. 2. To borrow money for financing purposes. 3. To hedge the risk of owning an asset or a derivative on the asset.	The potential loss on a short-sale is unlimited.	A haircut (or margin) is collateral given to the lender by the short-seller.
Since the only transactions take place at time T, payoff and profit are the same for a forward contract.	Payoff for short forward = $F - S_T$	Payoff for long forward = $S_T - F$
A long (or purchased) call is long with respect to the underlying asset. A short (or written) call is short with respect to the underlying asset.	**Long Call** • $PO = \max\left[0,\ S_T - K\right]$ • Profit = PO – FV(Prem) **Long Call** • $PO = -\max\left[0,\ S_T - K\right]$ • Profit = PO + FV(Prem)	The purchaser of a call option has the right (but not the obligation) to buy for K on the exercise date. The writer of a call option has an obligation to sell for K if the call is exercised.
	Short (Written) Call  	Long (Purchased) Call 
A long (or purchased) put is short with respect to the underlying asset. A short (or written) put is long with respect to the underlying asset.	**Long Put** • $PO = \max\left[0,\ K - S_T\right]$ • Profit = PO – FV(Prem) **Long Put** • $PO = -\max\left[0,\ K - S_T\right]$ • Profit = PO + FV(Prem)	The purchaser of a put option has the right (but not the obligation) to sell for K on the exercise date. The writer of a put option has an obligation to buy for K if the put is exercised.

Section 13	Section 13	
Put Options Sketch graphs of payoff and profit for a long put.	Put Options Sketch graphs of payoff and profit for a short put.	
Sections 12 and 13	Section 14	Section 15
Option Styles Describe the difference between American-style options and European-style options.	Option Moneyness Describe the following terms: 1. In-the-money 2. At-the-money 3. Out-of-the-money	Hedging Strategies 1. Describe the assets used to create a protective put. 2. In terms of profit, a protective put is the same as what option?
Section 15	Section 15	Section 15
Hedging Strategies 1. Describe the assets used to create a covered call. 2. In terms of profit, a covered call is the same as what option?	Hedging Strategies 1. Describe the assets used to create a covered put. 2. In terms of profit, a covered put is the same as what option?	Hedging Strategies 1. Describe the assets used to create a protective call. 2. In terms of profit, a protective call is the same as what option?
Section 16	Section 16	Section 16
Put-Call Parity State the general formula for Put-Call Parity	Put-Call Parity State the Put-Call Parity formula for a non-dividend paying stock.	Arbitrage Define arbitrage.
Section 16	Section 16	Section 16
Combining Options 1. Sketch the graph of the payoff of a synthetic forward. 2. Describe the options used to construct a synthetic forward.	Combining Options 1. Sketch the graph of the payoff of a straddle. 2. Describe the options used to construct a straddle.	Combining Options 1. Sketch the graph of the payoff of a $K_1 - K_2$ strangle. 2. Describe the options used to construct a $K_1 - K_2$ strangle.

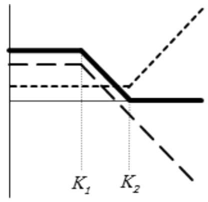
	Short (Written) Put  	Long (Purchased) Put 
1. Protective Put = Long Asset + Long Put 2. In terms of profit: Long Asset + Long Put = Long Call	1. **In-the-money**: Positive payoff if the option is exercised now. 2. **At-the-money**: Spot price is currently equal to strike price. 3. **Out-of-the-money**: Negative PO if the option is exercised now.	European-style options may only be exercised on the exercise date. American-style options may be exercised at any time prior to the exercise date.
1. Covered Call = Long Asset + Short Call 2. In terms of profit: Long Asset + Short Call = Short Put	1. Covered Put = Short Asset + Short Put 2. In terms of profit: Short Asset + Short Put = Short Call	1. Protective Call = Short Asset + Long Call 2. In terms of profit: Short Asset + Long Call = Long Put
A transaction which generates a positive cash flow with no net investment or risk.	$Call - Put = S_0 - PV(K)$	$Call - Put = PV(F_{0,T}) - PV(K)$ $Call - Put = F^P_{0,T} - PV(K)$
 K_1 - Strike Long Put K_2 - Strike Long Call	 K - Strike Long Call K - Strike Long Put	 K - Strike Long Call K - Strike Short Put

Section 16	Section 16	Section 16
Combining Options 1. Sketch the graph of the payoff of a K_1-K_2 collar. 2. Describe the options used to construct a K_1-K_2 collar.	Combining Options 1. Sketch the graph of the payoff of a K_1-K_2 bear spread. 2. Describe the options used to build a K_1-K_2 bear spread.	Combining Options 1. Sketch the graph of the payoff of a K_1-K_2 bull spread. 2. Describe the options used to build a K_1-K_2 bull spread.
Section 16	Section 16	Section 16
Combining Options 1. Sketch the graph of the PO of a $K_1-K_2-K_3$ asymm butterfly. 2. Describe the options used in a $K_1-K_2-K_3$ asymm butterfly.	Combining Options 1. Sketch the graph of the PO of a $K_1-K_2-K_3$ symm butterfly. 2. Describe the options used in a $K_1-K_2-K_3$ symm butterfly.	Combining Options 1. Sketch the graph of the payoff of a K_1-K_2 box spread. 2. Describe the options used to build a K_1-K_2 box spread.
Section 17	Section 17	Section 16
Hedging List six potential reasons to hedge.	Hedging List four potential reasons not to hedge.	Combining Options 1. Sketch the graph of the payoff of a ratio spread. 2. Describe the options used to construct a ratio spread.
Section 18	Section 18	Section 18
Cash-and-Carry 1. Describe a cash-and-carry strategy. 2. What is the purpose of a cash-and-carry strategy?	Reverse Cash-and-Carry 1. Describe a reverse cash-and-carry strategy. 2. What is the purpose of a reverse cash-and-carry strategy?	Futures Contracts List four ways in which a futures contract differs from a forward contract.
Section 19	Section 19	Section 19
Commodity Swaps Describe a commodity swap.	Commodity Swaps Describe a market value of a commodity swap.	Interest Rate Swaps Consider a three year period with spot rates s_1, s_2, and s_3. Provide a formula that could be used to find the fixed swap rate R.

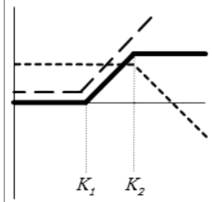


K_1 - Strike Long Put

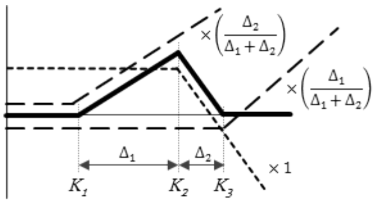
K_2 - Strike Short Call



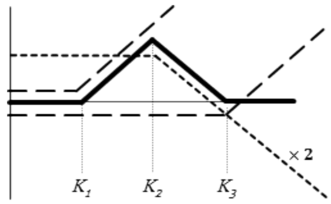
K_1 - Strike Short Call
K_2 - Strike Long Call
or
K_1 - Strike Short Put
K_2 - Strike Long Put
(PO shifted down)



K_1 - Strike Long Call
K_2 - Strike Short Call
or
K_1 - Strike Long Put
K_2 - Strike Short Put
(PO shifted down)

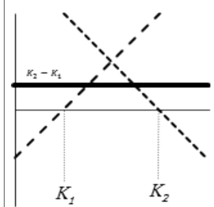


K_1 - Strike Long Call ($\times \lambda_1$) $\lambda_1 = \Delta_2/(\Delta_1 + \Delta_2)$
K_2 - Strike Short Call ($\times$ 1)
K_3 - Strike Long Call ($\times \lambda_2$) $\lambda_2 = \Delta_1/(\Delta_1 + \Delta_2)$



K_1 - Strike Long Call
K_2 - Strike Short Call ($\times$ 2)
K_3 - Strike Long Call

K_2 - Straddle (Short)
K_1 - K_3 - Strangle (Long)

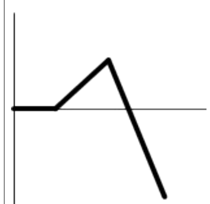


K_1 - Long Syn Fwd

K_2 – Short Syn Fwd

Reasons not to hedge:
1. Involves transaction costs
2. Potentially costly expertise
3. Monitoring and control capabilities
4. Financial reporting, accounting, and tax considerations

Reasons to hedge:
1. Decrease taxes
2. Reduce chance of bankruptcy
3. Financing – Alternative to borrowing
4. Increase debt capacity
5. Risk aversion
6. Manage non-financial risks



K - Strike Long Call

K - Strike Short Put

Futures Contracts

1. Traded on an exchange
2. Relatively standardized
3. More liquid than forwards
4. Marked-to-market and settled daily

Reverse Cash-and-Carry

1. Long forward + Shot asset
2. Arbitrage strategy to take advantage of a forward price that is too low.

Cash-and-Carry

1. Short forward + Long asset
2. Arbitrage strategy to take advantage of a forward price that is too high.

$$1 = \frac{R}{1+s_1} + \frac{R}{(1+s_2)^2} + \frac{1+R}{(1+s_3)^3}$$

Market value of swap contract is 0 when contract is entered into. Lending/borrowing will occur with the first payment. After that point, the swap will generally have a nonzero market value.

A commodity swap involves the exchange of a variable sequence of payments with a sequence of level payments.

Section 18	Section 18	Section 18
Forward Prices Give the forward price of a stock that pays no dividends.	Forward Prices Give the forward price of a stock paying discrete dividends.	Forward Prices Give the forward price of a stock paying continuous dividends.
Section 18	Section 18	Section 18
Prepaid Forward Prices Give the prepaid forward price of a stock that pays no dividends.	Prepaid Forward Prices Give the prepaid forward price of a stock paying discrete dividends.	Prepaid Forward Prices Give the prepaid forward price of a stock paying continuous dividends.
Section 18		
Forward Prices State the relationship between the forward and prepaid forward prices of an asset.		

$F_{0,T} = S_0 e^{(r-\delta)T}$	$F_{0,T} = S_0 e^{rT} - \mathrm{AV}(\mathrm{Divs})$	$F_{0,T} = S_0 e^{rT}$
$F_{0,T}^{P} = S_0 e^{-\delta T}$	$F_{0,T}^{P} = S_0 - \mathrm{PV}(\mathrm{Divs})$	$F_{0,T}^{P} = S_0$
		$F_{0,T}^{P} = PV(F_{0,T}) = F_{0,T} e^{-rT}$ $F_{0,T} = AV(F_{0,T}^{P}) = F_{0,T}^{P} e^{rT}$