This is the formula sheet that will be provided in the midterm and final exam.

* The present value of a growing annuity with first payment equal to C, discount rate k, growth rate g and maturity N:

PV(GA) =

* Minimum-variance portfolio of two risky assets D and E, weight in D:
* Tangency portfolio of N risky assets, where is the NxN variance-covariance matrix of the returns, is an N-vector of expected excess returns and is an N-vector of ones.
* Variance of a portfolio of N assets:

== + , or

in matrix notation , where is an N-vector of weights and and NxN variance-covariance matrix.

* A forward rate is an interest rate quoted today for a future period T to T+K

where is the T-period spot interest rate.

* A first-order approximation to the percentage change in a bond price (P) for a percentage change in the bond’s yield to maturity (YTM) can be written as:

where duration .

* A second-order approximation to the percentage change in a bond price (P) for a percentage change in the bond’s yield to maturity (YTM) can be written as:

where Convexity = .

* Black-Scholes European call option price on a stock that pays a continuous dividend yield q up to expiration of the option:

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with , where S0 current stock price, K strike price, σ annual volatility, T the number of years to expiration, r the continuously compounded risk-free rate. Also, recall the following cumulative probabilities for standard normal variables: P(z≤-2.33)=1%; P(z≤-1.96)=2.5%; P(z≤-1.65)=5%; P(z≤-1.28)=10%; and, P(z≤-0.67)=25%.

* To replicate the payoffs of any derivative (C) in a binomial pricing model (where the value of the underlying asset can go up (u) or down (d)), use the following definitions:

Δ=(Cu-Cd)/(Su-Sd) and B=(Cd- ΔSd)/(1+r),

to find the position in the underlying asset and the risk-free bond, respectively.