**Advanced Data Analysis MTH 9797 & STA 9797**

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**Homework #1**

Due: Thurs, Nov 9 by 12 midnight

Submit via Blackboard

**1.1: Linear Regression**

Calculate first order conditions (FOC) For the following linear regression model:

Hint

* Set up the equation to minimize the regression error term
* Compute the first order conditions
  + The variables include all b’s, b0, b1, b2
* Compute reduced form with all constants on the RHS
* Represent reduced form in matrix notation

**1.2: Linear Regression**

Calculate first order conditions (FOC) For the following linear regression model:

Subject to,

Hint:

* Set up the equation to minimize the regression error term, including the constraint
* Set up the Lagrange Equation which includes the Lagrange multiplier
* Calculate the derivative for each variable and set equal to zero
  + The variables include all b’s, b0, b1, b2, b3, and the Lagrange Multiplier λ
* Find the reduced form of the equation by bringing all constants to the RHS
* Represent reduced FOC in matrix notation

**1.3: Linear Regression**

Calculate first order conditions (FOC) For the following linear regression model:

Subject to:

Hint:

* Set up the equation to minimize the regression error term, including the constraint
* Set up the Lagrange Equation which includes the Lagrange multiplier
* Calculate the derivative for each variable and set equal to zero
  + The variables include all b’s, b0, b1, b2, and two Lagrange Multipliers ,
* Find the reduced form of the equation by bringing all constants to the RHS
* Represent reduced FOC in matrix notation

**1.4: Lecture 1 – Important Class Items**

What is the key take-away from the first lecture?

Hint:

* Recall the data issues that we have when estimating a covariance matrix.
* Why do we need to use a factor model to compute a covariance matrix for risk modeling.