ARE212: Section 03

Dan Hammer

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The idea behind this section is to study the behavior of the centered and uncentered R^2 as cofactors are incrementally included in the regression. First, we must create a random matrix, where each variable is drawn from a standard uniform distribution. All elements are independent and identically distributed, so we can create a very long, random vector and reshape it into a rectangular matrix. For convenience and practice writing functions in `R`, we show a general function that accepts the dimensions (n rows and k columns) of the matrix. The function generates a long vector of length $n \cdot k$ and then reshapes it into an $n \times k$ matrix.

```
random.mat <- function(n, k) {
  v <- runif(n*k)
  matrix(v, nrow=n, ncol=k)
}
```

The function bound to `random.mat()` behaves as we would expect:

```
random.mat(3,2)
```

```
          [,1]      [,2]
[1,] 0.3893909 0.7055891
[2,] 0.3528445 0.1080787
[3,] 0.7856757 0.2772204
```

Another useful function for this section will be to create a square demeaning matrix $\mathbf{A}$ of dimension n. The following function just wraps a few algebraic maneuvers, so that subsequent code is easier to read.

```
demean.mat <- function(n) {
  ones <- rep(1, n)
  diag(n) - (1/n) * ones %*% t(ones)
}
```

As is described in the notes, pre- or post-multiplying a matrix $\mathbf{B}$ by $\mathbf{A}$ will result in a matrix of deviations from column means of $\mathbf{B}$. We may as well check that this is true.