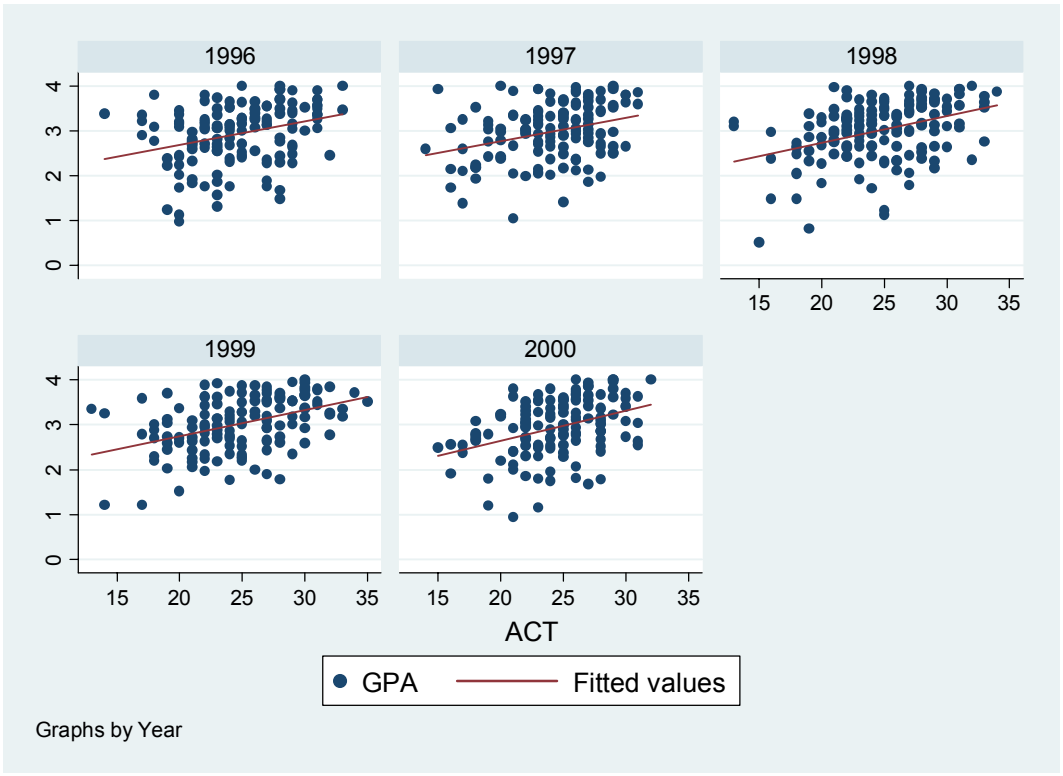
Creating Indicator Variables in Stata

Example from Appendix C4 includes
Y = GPA for 1st year, X_1 = ACT test score (taken before admission)
Categorical variable = "Year" = year of admission, from 1996 to 2000 (5 categories)

Here are separate plots of Y = GPA and X = ACT for each admission year:

```
. twoway (scatter GPA ACT) (lfit GPA ACT), by(Year)
```



To create four indicator variables:

```
. xi i.Year
i.Year            _IYear_1996-2000    (naturally coded; _IYear_1996 omitted)
```

To create indicator variables and run the regression analysis at the same time:

```
. xi: regress GPA ACT i.Year
i.Year            _IYear_1996-2000    (naturally coded; _IYear_1996 omitted)

      Source |       SS       df       MS              Number of obs =     705
-------------+------------------------------           F(  5,   699) =   22.12
       Model |  38.7250909     5  7.74501817            Prob > F      =  0.0000
    Residual |  244.723315   699  .350104886            R-squared     =  0.1366
-------------+------------------------------           Adj R-squared =  0.1304
       Total |  283.448406   704  .402625577            Root MSE      =   .5917

------------------------------------------------------------------------------
         GPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ACT |   .0579188   .0055663    10.41   0.000     .0469901    .0688475
 _IYear_1997 |   .0791562   .0717559     1.10   0.270    -.0617266     .220039
 _IYear_1998 |   .0822289   .0688475     1.19   0.233    -.0529438    .2174016
 _IYear_1999 |   .0887545   .0703506     1.26   0.208    -.0493693    .2268783
 _IYear_2000 |    .034314   .0708633     0.48   0.628    -.1048164    .1734444
       _cons |   1.498709   .1461276    10.26   0.000     1.211808    1.785611
```

To test whether the year of admission is needed in the equation – this tests all years together:
Method 1: List all four of the indicator variables by name:

```
. testparm _IYear_1997  _IYear_1998 _IYear_1999 _IYear_2000

 ( 1)  _IYear_1997 = 0
 ( 2)  _IYear_1998 = 0
 ( 3)  _IYear_1999 = 0
 ( 4)  _IYear_2000 = 0

       F(  4,   699) =    0.60
            Prob > F =    0.6648
```

Method 2: Use shorthand code that includes them all:

```
. testparm _IYear*

 ( 1)  _IYear_1997 = 0
 ( 2)  _IYear_1998 = 0
 ( 3)  _IYear_1999 = 0
 ( 4)  _IYear_2000 = 0

       F(  4,   699) =    0.60
            Prob > F =    0.6648
```

To create separate intercepts and slopes in the regression:

```
. xi: regress GPA ACT i.Year*ACT
i.Year            _IYear_1996-2000    (naturally coded; _IYear_1996 omitted)
i.Year*ACT        _IYeaXACT_#         (coded as above)

      Source |       SS       df       MS              Number of obs =     705
-------------+------------------------------           F(  9,   695) =   12.33
       Model |  39.0234908     9  4.33594343           Prob > F      =  0.0000
    Residual |  244.424915   695  .351690526           R-squared     =  0.1377
-------------+------------------------------           Adj R-squared =  0.1265
       Total |  283.448406   704  .402625577           Root MSE      =  .59304

------------------------------------------------------------------------------
         GPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ACT |   .0522815   .0128546     4.07   0.000     .0270431    .0775199
 _IYear_1997 |   .0821589   .4622083     0.18   0.859    -.8253331    .9896509
 _IYear_1998 |  -.1078284   .4254001    -0.25   0.800    -.9430518     .727395
 _IYear_1999 |  -.0590787   .4311573    -0.14   0.891    -.9056057    .7874483
 _IYear_2000 |  -.3325866   .4748162    -0.70   0.484    -1.264833    .5996595
         ACT |  (dropped)
_IYeaXA~1997 |  -.0002628   .0187286    -0.01   0.989    -.0370342    .0365085
_IYeaXA~1998 |   .0077131   .0170561     0.45   0.651    -.0257745    .0412008
_IYeaXA~1999 |   .0059855   .0171826     0.35   0.728    -.0277506    .0397216
_IYeaXA~2000 |   .0149111   .0190717     0.78   0.435    -.0225339    .0523561
       _cons |   1.637894   .3212589     5.10   0.000      1.00714    2.268649
------------------------------------------------------------------------------
```

To test whether the interaction terms (separate slopes) are needed:

```
. testparm _IYeaXACT*

 ( 1)  _IYeaXACT_1997 = 0
 ( 2)  _IYeaXACT_1998 = 0
 ( 3)  _IYeaXACT_1999 = 0
 ( 4)  _IYeaXACT_2000 = 0

       F(  4,   695) =    0.21
            Prob > F =    0.9317
```

To test whether year is needed at all – separate intercepts and/or slopes:

```
. testparm _IYear* _IYeaXACT*

 ( 1)  _IYear_1997 = 0
 ( 2)  _IYear_1998 = 0
 ( 3)  _IYear_1999 = 0
 ( 4)  _IYear_2000 = 0
 ( 5)  _IYeaXACT_1997 = 0
 ( 6)  _IYeaXACT_1998 = 0
 ( 7)  _IYeaXACT_1999 = 0
 ( 8)  _IYeaXACT_2000 = 0

       F(  8,   695) =    0.40
            Prob > F =    0.9189
```

It looks like it does not help to take year of admission into account. Here is the regression without it; compare Adj R-squared and Root MSE for this fit with the ones that included year:

```
. regress GPA ACT

      Source |       SS       df       MS              Number of obs =     705
-------------+------------------------------           F(  1,   703) =  108.47
       Model |  37.8888841     1  37.8888841           Prob > F      =  0.0000
    Residual |  245.559522   703  .349302308           R-squared     =  0.1337
-------------+------------------------------           Adj R-squared =  0.1324
       Total |  283.448406   704  .402625577           Root MSE      =  .59102

------------------------------------------------------------------------------
         GPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ACT |   .0578005   .0055498    10.41   0.000     .0469044    .0686966
       _cons |   1.558702   .1380167    11.29   0.000     1.287728    1.829676
------------------------------------------------------------------------------
```