Lab 10

1. A researcher classifies a sample of 124 sixth grade children into four equal-sized groups according to the time they spend watching television. Group 1 is comprised of the 31 children who watch TV the least, group 2 is the "medium-low" viewing group, group 3 is the "medium-high" viewing group, and group 4 has the most TV viewing. Assume that these four groups form an interval measure when considered on a continuum from the group with least to the group with most TV viewing. The researcher's dependent variable is IQ (a measure of intelligence, for which high scores indicate high intelligence).

In Lab 9 the researcher was quoted as reporting a negative linear association between IQ and TV viewing. A colleague recommends that the researcher investigate whether "this tendency for higher levels of TV viewing to lead to lower IQs" is stronger in single-parent families than in two-parent families.

a. What two regression equations would you compare in answering the colleague's question? (Be sure to specify how your independent variables are coded.)

b. How would the researcher test whether her colleague was right? (I.e., what TWO pieces of statistical evidence would she need?)

WARNING: Do NOT test for any effects. Only explain what test(s) you would use and how you would interpret them.

2. Whereas scholars have already spent decades doing research on death anxiety, only recently has a group of researchers—under leadership of the eminent child psychologist, Dr. Spock—undertaken research to investigate a not entirely unrelated phenomenon, "birth anxiety" (common among soon-to-be fathers and mothers). In a recent article, Spock describes his study as utilizing "a balanced stratified sample of soon-to-be-mothers: 10 mothers who are in the first month of pregnancy, 10 who are in the second month of pregnancy, . . . . , and 10 mothers who are in the ninth month of pregnancy. The resulting nine strata yield a total sample size of 90. Anxiety scores (on a scale from 0 = no anxiety to 100 = extreme anxiety) were calculated for women in each of the nine resultant groups." In his analysis Spock claims to find evidence supporting two theories of birth anxiety:

Theory A: Expecting parents' anxiety tends to decrease during the 9 months of pregnancy as "they get used to the idea" of having their first child.
Theory B: Expecting parents' anxiety is initially high (due to phase 1 of the well-known "I can't believe it" syndrome), gradually shifts to a lower level during the middle months, and returns to a high level (due to phase 2 of the well-known "I can't believe it" syndrome).

Spock concludes, "Soon-to-be-mothers' anxiety scores were 55 on average. If we assume a 28-day month, there was a tenth of an anxiety point decrease for each additional day of the mother's pregnancy. The regression equation also shows an independent tendency for mothers in the fifth month of pregnancy to have anxiety scores that are 30 points lower than the overall mean. This tendency is opposed by a gradual pattern of increasing anxiety among mothers in the direction of both the first and ninth (i.e., last) months of pregnancy. Thus the data provide support for both Theory A and Theory B of birth anxiety."

a. Write down the regression equation that Dr. Spock estimated. (Be sure to include in the equation the estimated unstandardized regression coefficients mentioned in the above quotation from his article.)

b. Show specifically how Spock coded his independent variable(s). (i.e., indicate for each independent variable, what numerical value was assigned to each of the nine groups.)

3. Those who invest in the stock market are often glibly classified as "Bulls" (those who earn money by buying undervalued stocks), "Bears" (those who earn money by selling overvalued stocks), and "Pigs" (those who lose money by buying expensive stocks [after stock prices or corporate earnings have gone up] or by selling cheap stocks [after prices or earnings have dropped]). Pigs tend to "buy high" when they wrongly assume that increasing prices or earnings will continue to increase, and they "sell low" when they wrongly assume that declining prices or earnings will continue to decline. Wise investors avoid placement in the "Pig category" by making investment decisions based on corporations' Price/Earnings Ratios (P/ERs). A company's P/ER is computed by dividing its stock price by its total earnings. If a company's P/ER is small, its earnings are large relative to its price, prompting Bulls to invest in its stock. If a company's P/ER is large, its earnings are small relative to its price, prompting Bears to divest themselves of its stock. A mature stock market is one in which a large proportion of stock purchases are wise investments (e.g., investments based on corporate indicators such as the P/ER). Stock prices in immature stock markets are much more volatile than they are in mature stock markets, because buying and selling becomes epidemic as declining
prices are not counteracted by value-hunting Bulls, and as rising prices are not tempered by cautious Bears.

An investment firm has asked you to evaluate the maturity of the stock market managed by a stock exchange in Thailand. To make this evaluation you assemble data on a random sample of 57 corporations from among all corporations in the exchange. These data are on the following four variables:

SALES The number of the corporation's stocks sold to investors during the last 6 months minus the number of the corporation's stocks bought from investors during that period, as a proportion of all the corporation's stocks (i.e., when SALES is positive, the company's stock is being invested in; when SALES is negative, it is being divested of) Note that the Thai stock exchange is peculiar in that companies buy and sell their own stocks directly to investors.

PRICE The price (in dollars) of a single share of a corporation's stock at the beginning of the 6 month period for which SALES was calculated.

1/EARN The reciprocal of the corporation's annual earnings (in dollars per year) of a single share of a corporation's stock at the beginning of the 6 month period for which SALES was calculated.

PRICE/EARN The corporation's Price/Earnings Ratio (in years), calculated by multiplying PRICE and 1/EARN in a way that ensures that PRICE/EARN has zero correlations with PRICE and 1/EARN (Note: PRICE/EARN is the number of years that it would take to earn [at current annual earnings] a stock's current price.)

You may assume that the appropriate variance stabilizing transformation has been performed on the dependent variable. Correlations among these variables are . . .

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a. As noted above, PRICE/EARN was "calculated by multiplying PRICE and 1/EARN in a way that ensures that PRICE/EARN has zero correlations with PRICE and 1/EARN." Explain how the variable, PRICE/EARN, could be constructed such that it has zero collinearity with PRICE or 1/EARN. (It is only necessary here that you sketch out a strategy for constructing PRICE/EARN, not that you give a precise formula.)

b. In your analysis you use SPSS to regress SALES on PRICE, 1/EARN, and PRICE/EARN. Part of the output from this regression is . . .

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------------------ Variables in the Equation ------------------
Variable          B        SE B       Beta
PRICE           .007206     .002609  .345869
1/EARN        -6.723647    3.130358  -.268946
PRICE/EARN      .125000     .032773    .400000
(Constant)      .646569     .125009
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Using the .05 level of significance, test whether in the Thai stock exchange a significantly large proportion of the variation in SALES is explained by investors' wise (i.e., not unwise, not 'piglike', etc.) investments. (Note that this is a test of whether or not the exchange is more "mature" than one would expect if no investments were wisely made.) Be sure to show your work and explain your answer!