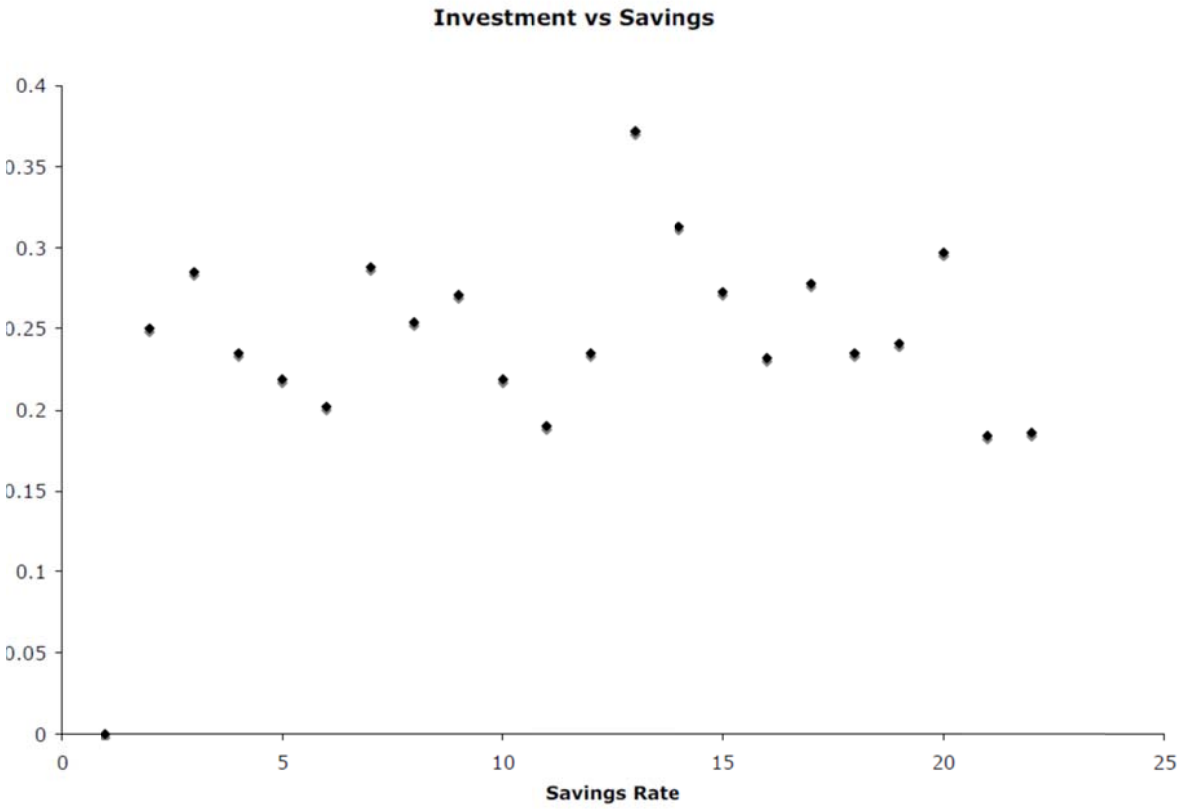
HW 4 answers

6.15
(a)



(*b*) Based on the scatterplot, there doesn't seem to be a very strong relationship between Savings and Investment. It actually seems like the same general level of investment occurs regardless of how much is being saved in each country. Therefore, neither the linear or log-linear models are likely to fit very well, although the existence of the observation in the lower lefthand corner of the plot may change these results.

(c) The regression results are as follows:

$$\begin{aligned} Invrate &= 0.0435 + 0.8468 Savrate \\ se &= (0.0176) \quad (0.0693) \\ t &= (2.4685) \quad (12.222) \\ r^2 &= 0.8872 \end{aligned}$$

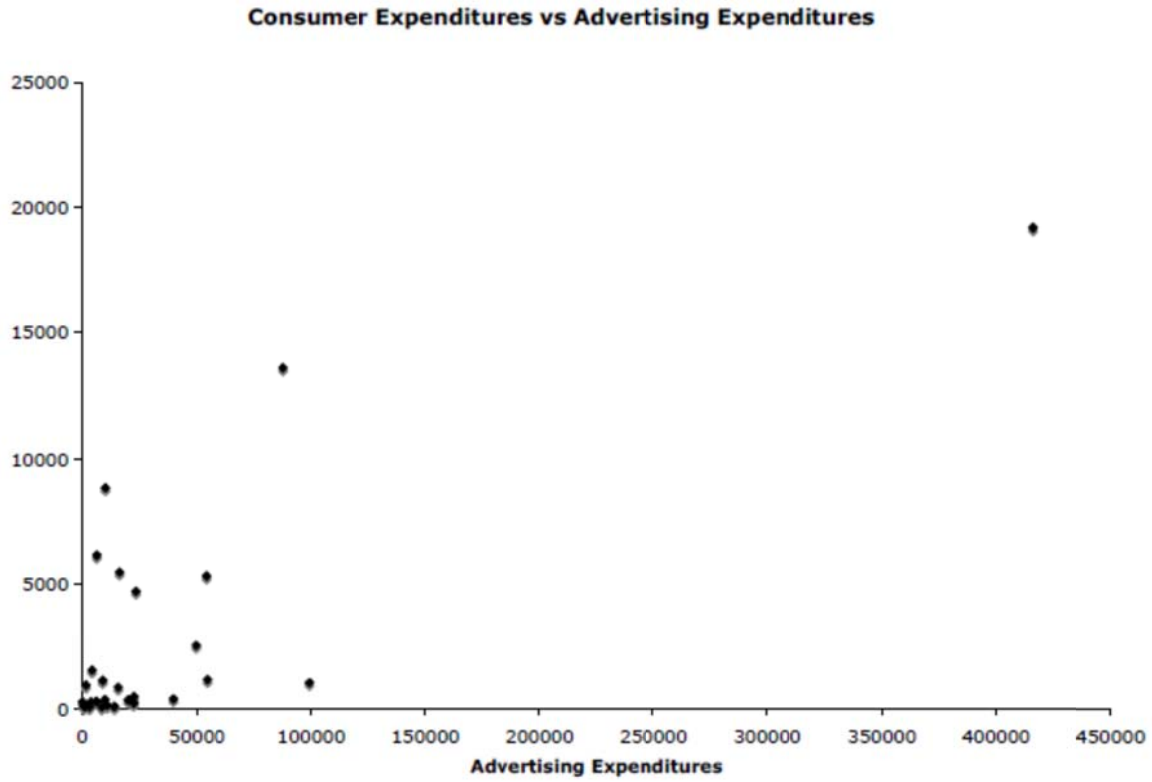
$$\begin{aligned} Invrate &= -0.02159 + 0.8288 lnSavrate \\ se &= (0.0986) \quad (0.0699) \\ t &= (-2.1901) \quad (11.865) \\ r^2 &= 0.8811 \end{aligned}$$

(d) In the linear model, the slope coefficient can be interpreted as: If the savings rate increases by 0.1 (relative to GDP), the increase in investment expenditure (relative to GDP) will be about 0.0847, on average. Therefore, investment rates increase less than savings rates. For the log-linear model, a one percent increase in the Savings Rate generally corresponds to a 0.829 percent increase in the rate of Investment.

(e) The intercept in the linear model suggests that, when the savings rate is 0 (no savings), a country's investment rate still exists, although it is small. This doesn't have much practical significance, though, since we don't see countries with 0 savings. The intercept in the log-linear model is negative, indicating that a 0% increase in savings should correspond to a drop in the percent of investment.

6.19

(a)



(b) Although the relationship between the two variables seems to be positive, it is not clear which particular curve will fit the data. In the following table we give regression results based on a few models.

Model	Intercept	Slope	r^2
Linear	1057.361	0.0446	0.5938
	(1.774)	(6.283)	
Lin-log	-12585.01	1626.643	0.3140
	(-2.872)	(3.516)	
Reciprocal	3077.256	-1642108	0.0461
	(3.344)	(-1.143)	
Log-linear	0.9864	0.6038	0.3294
	(0.628)	(3.642)	
Log-lin	6.262	0.00001	0.2510
	(21.354)	(3.008)	
Log-recip	6.852	-797.845	0.0829
	(20.951)	(-1.563)	

Note: figures in the parentheses are the estimated t values. In each regression the regressand is total expenditure and the regressor is advertising expenditure.

(c) Assessing the ratio of the variables, it seems there are few usually high values. The average ratio is 0.0342, with a standard deviation of 0.0396. There are high values of 0.0946, 0.1051, 0.0972, 0.1512, and 0.0924. These could definitely affect the regression results.

7.18 (a)

$$\hat{Y}_i = 19.443 + 0.018X_{2i} - 0.284X_{3i} + 1.343X_{4i} + 6.332X_{5i}$$
$$se = (3.406)\ (0.006)\quad (0.457)\quad (0.259)\quad (3.024)$$
$$R^2 = 0.978;\ \bar{R}^2 = 0.972;\ \text{modified } R^2 = 0.734$$

7.21 (a)

$$\widehat{\ln} M_2 = 1.2394 + 0.5243 \ln RGDP - 0.0255 \ln Tbrate$$
$$se = (0.6244)\ (0.1445)\qquad (0.0513)\quad R^2 = 0.7292$$

The regression results using the long-term (30 year bond) rate are as follows:

$$\widehat{\ln} M_{2t} = 1.4145 + 0.4946 \ln RGDP_t - 0.0516 \ln LTRATE_t$$
$$se = (1.3174)\ (0.2686)\qquad (0.1501)\quad R^2 = 0.7270$$

The income elasticities (0.5243 or 0.4946) and the interest rate elasticities (-0.0255 or -0.0516) are not vastly different.

8.23 (a) Refer to the regression results given in exercise 7.18. A priori, all slope coefficients are expected to be positive, which is the case, except for the variable US military sales. The R^2 value is quite high. Overall, the model looks satisfactory.

(b) We can use the R^2 version of the ANOVA table given in Table 8.5 of the text

Source of variation	SS	df	MSS
Due to regression	$0.978(\sum y_i^2)$	4	$\frac{0.978\sum y_i^2}{4}$
Due to residuals	$0.022(\sum y_i^2)$	15	$\frac{(0.022)\sum y_i^2}{15}$

Under the usual null hypothesis, the F ratio is:

$$F = \frac{0.978/4}{0.022/15} = 166.33$$

This F value is obviously highly significant, leading to the rejection of the null hypothesis that all slope coefficients are simultaneously equal to zero. In other words, the four variables collectively have a significant impact on defense outlay.