

1. (50 points) Using IRS form 5500 data on pension plan investments, I created two measures of the share of pension fund assets invested in the employer's own stock. The first ("**any stock**") is a dummy variable indicating whether the pension holds any company stock in the pension plan. The second measure ("**stock share**") is the percentage of assets invested in company stock. Stock share equals zero for about 52 percent of the sample. The control variables in the regressions include (1) beta: the beta coefficient reflecting the relationship between the stock's returns and returns on the market portfolio; (2) the standard deviation of daily returns on the company's stock; (3) the percentage of the company's workers that are female; and (4) the % of the company's workers that have no college education.

Four regressions were estimated with the same set of explanatory variables included. The first two regressions had "any stock" as the dependent variable using OLS and Probit. The second two regressions had "stock share" as the dependent variable using OLS and Tobit.

Regression type		OLS		PROBIT		OLS		TOBIT	
Dependent variable		Any stock		Any stock		Stock Share		Stock share	
	Sample mean	coeffic	t-statistic	coeffic	t-statistic	coeffic	t-statistic	coeffic	t-statistic
beta	0.91	-0.04	-8.71	-0.11	-8.68	-0.03	-9.4	-0.07	-9.99
standard deviation of daily returns	0.03	-3.29	-19.96	-9.17	-19.67	-2.27	-20.41	-5.64	-22.34
% female	0.40	0.10	5.11	0.26	5.26	0.09	7.02	0.18	7.11
% with no college	0.44	-0.27	-10.57	-0.68	-10.53	-0.18	-10.57	-0.39	-11.42
Intercept	1.00	0.69	40.23	0.50	11.20	0.35	30.84	0.28	12.38
Standard error of residual						0.11		0.58	

- Use the OLS and Probit models to predict the probability that the "average" pension plan (i.e. the plan with characteristics equal to the sample mean) invests in some company stock. Give a brief description of how you calculated your estimates.
- Use the OLS and Probit models to provide an estimate of the effect of a one unit increase in beta on the probability that the average pension plan holds some company stock. Give a brief description of how you calculated your estimates.
- Is it appropriate to compare the size of the OLS and probit coefficients for the "any stock" equations? Explain.
- Based on the OLS model for "stock share", predict the share of assets invested in company stock for the pension plan with average characteristics. Provide a brief description of your calculation.
- Repeat (d) using the Tobit model. Provide a brief description of your calculation.
- Use the Tobit model to compute each of the following (provide a brief description of the calculation in each case):
 - the probability that the average plan will invest more than zero in company stock.
 - the marginal effect of a one unit increase in the stock's beta on the observed holding of company stock for the average plan.
 - the probability that the average plan will invest between 25 and 75 percent of assets in company stock.
- Some pension researchers have found evidence that men and women exhibit degrees of risk aversion in making their investment decisions. Given that beta and the standard deviation of stock returns reflect the "risk" of a stock, explain how you could test this hypothesis. Also, if there is a difference in behavior, how could you determine

whether women are more or less risk averse than men. (Note: It is important to recognize that the female variable in this study is continuous -- not a dummy -- because it represents the percentage of employees that are female.

2. (50 points) Starting with data from the Health and Retirement Study on workers who were over age 51 in 1992 and working full-time, their labor force behavior was recorded every two years between 1992 and 1998. For each person who was working full-time in a given survey, data from the subsequent survey was used to record whether they made a transition from full-time work to (i) full-time work; (ii) part-time work; (iii) retirement. These transitions are recorded respectively as **FTFT**, **FTPT**, **FTRET**. A multinomial logit model was used to estimate how various characteristics affected the probability of each transition. The coefficients for FTFT are normalized to zero.

	FTPT		FTRET	
	coefficient	t-statistic	coefficient	t-statistic
covered by only a DB plan	-0.47	-4.42	0.45	6.00
covered by only a DC plan	-0.41	-3.63	-0.18	-2.00
covered by both a DB and DC plan	-0.47	-1.90	0.35	2.13
Age dummies (under 55 omitted)				
55-60	0.36	3.22	0.38	4.34
61-62	1.12	8.21	1.76	17.97
63-65	1.47	8.76	1.93	15.96
65 and over	1.40	2.51	1.86	4.69
Education dummies (<12 years omitted)				
12 years	-0.02	-0.18	-0.25	-2.92
13-15 years	0.05	0.35	-0.29	-2.84
16 years or more	0.12	0.84	-0.33	-3.15
Male	-0.38	-4.18	-0.17	-2.55
Intercept	-2.52	-17.87	-2.22	-20.32

a. Compute the probability that a female with 12 years of education who is age 58 and has no pension plan coverage will:

- i. continue in full-time employment
- ii. switch to part-time work
- iii. retire.

Give a brief explanation of how you calculated your answers.

b. Federal regulations prohibit (or penalize) workers from withdrawing funds from their pension plan prior to retirement. Some policy makers have pointed out that this may make workers more likely to switch directly from full-time work to retirement and reduce the chance that they "phase" into retirement with a spell of part-time work intervening.

- i. Based on the information provided above, how does coverage by **only a DB** plan affect the chance that the worker in (a) makes each of the three possible transitions? Provide a numerical answer and provide a brief description of how you derived your answer.
- ii. Does your answer to (i) suggest that DB coverage does or does not "impede" phased retirement? Explain.

c. Suppose that you believe that the three types of pension coverage have different effects on the retirement behavior of men and women. How can you test the hypothesis that the effects are the same. Explain the models you would estimate, how you would construct the appropriate test statistic, the distribution of the test statistic (including degrees of freedom) and the conditions under which you would reject the null.

d. I was interested in the quantifying the differences in retirement behavior of men and women. To pursue this, I estimated the following commands in Stata.

```
mlogit transn $xvars3 if male==1;;  
predict p1a p2a p3a;  
mlogit transn $xvars3 if male==0;;  
predict p1b p2b p3b;
```

transn is the dependent variable indicating whether the transtion is FTFT, FTPT, or FTRET. \$xvars3 is just short-hand for the list of all the control variables (with the exception of the male dummy) that were included in the earlier logit model.

Here are the mean values of the predictions for the male and female sample.

	Male=1	Male =0
p1a	0.82	0.81
p1b	0.78	0.79
p2a	0.05	0.06
p2b	0.08	0.07
p3a	0.13	0.13
p3b	0.14	0.14

Keep in mind that p1 is for FTFT, p2 is for FTPT, and p3 is for FTRET. The a and b indicate which logit model was used to make the predictions.

- e. Using the information provided above, provide numeric answers to the following questions.
- If women "behaved" like men in making their retirement decisions, how would their transition rates change? Explain.
 - If women "behaved" like women but had the characteristics of men, how would their transition rates change?
- f. Another concern with pension policy is that it may cause workers to unnecessarily switch employers as they approach retirement in order that they can begin drawing retirement benefits. Consequently, pension coverage may not only affect whether a worker makes a transition from full-time to part-time work, but could affect the chance that she simultaneously switches employer. To allow for this possibility, I broke the 3 earlier transitions into: (1) FTFT-SAME; (2) FTFT-SWITCH; (3) FTPT-SAME; (4) FTPT-SWITCH; and (5) FTRET. The same/switch designator indicates whether the person stayed with the same employer or switched employers.

How can you test whether this new 5-transition specification of the model is "preferred" to the original specification with only 3 transtions? Explain. Provide details on how to calculate the relevant test statistic, its distribution, and the conditions under which the original 3-transition model would be rejected in favor of the 5-transition model.

- g. Suppose that "wealth" increases the chance that a worker makes a transition into retirement, but reduces the chance of continuing in full-time work or making a transition to part-time work. Since wealth is not included in the regression, how could this bias the estimated effects of the pension variables in the 3-transition model? Provide an intuitive explanation for the bias.