

Answer all questions in the space provided on the exam.

Total of 36 points (and worth 22.5% of final grade).

**Read each question carefully, so that you answer the question.**

**Short Answer (6 points each question)**

1. Sarah believes she faces health costs in the current year of either \$5,000 with probability 0.8 or \$20,000 with probability 0.2. She can purchase complete insurance for \$8,000.

(a)(i) Is this premium actuarially fair? **Explain your answer.**

(ii) Calculate the loading factor for this policy.

(b) Suppose an insurance company sells insurance to 100 people who face the same distribution of health costs as does Sarah. What interval will the average claim per individual insured person lie in with probability 0.95?

(c)(i) Sarah obtains a major medical and hospital policy that covers all costs, aside from a \$1,000 annual deductible and a 20% coinsurance rate. If Sarah actually incurs annual health charges of \$4,000, by how much will her health insurance company reimburse her?

(ii) Sarah is 26 years old, single, living in Yolo County in zip code 95616 with annual income of \$32,000. Is she eligible for government subsidy if she purchases the Blue Shield Bronze 60 PPO through Covered California? **Yes or No.**

2. Circle True or False to each of the following statements about the U.S. health market.

[One point each.]

- (a) **True** **False** U.S. infant mortality rates are lower than in most other wealthy countries.
- (b) **True** **False** Hospital care, physicians, and pharmaceutical drugs combined accounted for more than one-half of U.S. health expenditures in 2017.
- (c) **True** **False** Government paid for roughly one-quarter of 2017 US health expenditures.
- (d) **True** **False** It is possible to be simultaneously covered by Medicare and Medicaid.
- (e) **True** **False** U.S. health spending as a % of GDP has more than doubled since 1960.
- (f) **True** **False** Elderly were the age group most likely to lack health insurance in 2017.

**3.(a)(i)** Doctors have a stronger incentive to provide unnecessary services under which type of health insurance arrangement: **FFS** or **HMO**? An answer without explanation is fine.

**(ii)** Doctors are more likely to be paid a fixed amount per month per patient under which type of health insurance arrangement: **FFS** or **HMO**? An answer without explanation is fine.

**(b)** Suppose going from no insurance to insurance with an effective coinsurance rate of 50% leads to health expenditures changing from \$2,000 to \$3,000. Calculate the arc price elasticity of demand.

**(c)** Consider the American Affordable Care Act (“Obamacare”) introduced in 2014.

**(i)** Name one policy implemented to reduce the likelihood that mostly unhealthy individuals would be the ones that purchased insurance on the health insurance exchanges such as Covered California.

**(ii)** Name one policy implemented to reduce the number of uninsured other than (possibly subsidized) purchase of insurance through health insurance exchanges such as Covered California.

4. Ann's utility (U) depends on her income (x) in the following way.

x	0	10	20	30	40	50
U(x)	0	180	320	420	480	500

Her usual job has income of 50, but she believes there is a 20% chance she'll lose her job and have an income of zero. Thus she has income of 50 (and utility of 500) with probability 0.80 and income of 0 units (and utility of 0) with probability 0.20.

**(a)(i)** Is Ann risk-averse, risk-neutral, risk-prefer or is there not enough information to answer the question? **Explain your answer.**

**(ii)** Calculate Ann's expected utility.

**(b)(i)** Now suppose Ann can purchase insurance that fully replaces her income if she lost her job, while she keeps all her income if she keeps the job. So she is guaranteed income of 50 units in either state of the world. Calculate the actuarially fair premium for this insurance policy. (Hint: Define a random variable Y equal to the amount the insurance company pays to Ann).

**(ii)** Suppose Ann can purchase such insurance for 20 units. Will Ann be willing to purchase this insurance policy? Explain your answer. There is enough information given in this question to give an unambiguous yes or no answer.

**(c)** This part unrelated to parts (a) and (b).

On an appropriate diagram show the welfare loss due to moral hazard of moving from no health insurance to health insurance with 20% coinsurance.

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5. You are given the following Stata output for a sample who had either 25% coinsurance (variable `coins25=1`) or 0% coinsurance (variable `coins25=0`).

Variable `out_infl` measures annual outpatient spending in dollars.

```
. bysort coins25: sum out_infl
-> coins25 = 0
  Variable |      Obs      Mean   Std. Dev.   Min      Max
  out_infl |     412   1548.135   2632.784      0  28519.19
-> coins25 = 1
  Variable |      Obs      Mean   Std. Dev.   Min      Max
  out_infl |     251   1026.126   1729.041      0  16002.1

. reg out_infl coins25
-----+-----
Source |      SS          df           MS       Number of obs   =      663
-----+-----
Model |  42502278.1         1   42502278.1       F(1, 661)       =      7.81
Residual |  3.5963e+09       661   5440640.8       Prob > F        =     0.0053
-----+-----
Total |  3.6388e+09       662   5496625.15     R-squared       =     0.0117
                                           Adj R-squared   =     0.0102
                                           Root MSE      =     2332.5

-----+-----
out_infl |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
coins25 |  -522.0083   186.7654    -2.79   0.005   -888.7332   -155.2834
  _cons |  1548.135   114.9149   13.47   0.000   1322.492   1773.777
-----+-----
```

(i) Give a 95% confidence interval for mean spending in the 25% coinsurance plan.

(ii) Give the average difference in spending between the two plans.

(iii) Does a test at significance level 5 percent reject the null hypothesis that mean spending is the same in the two plans? **Explain your answer.**

(iv) Suppose we give the command `regress out_infl if coins25==0`.

Given the above output, what number do you expect the estimated coefficient to equal?

(v) Suppose we define an additional variable `coins0` which equals 1 if 0% coinsurance and equals 0 otherwise. We give the command `regress out_infl coins0 coins25, noconstant`. Given the above output, is it possible to know the resulting estimated coefficient of `coins0`? If so, give the estimated value.

(vi) Suppose we give the command `hist out_infl`.

Would the result suggest that outpatient spending is normally distributed? **Explain.**

**Multiple Choice (1 point each) Note: You should spend 15-20 % of time on these!**

1. Major changes in health insurance in the United States include
  - a. extensive employer-provided private insurance by the 1920's
  - b. extensive public insurance for the elderly and the poor introduced in the 1960's
  - c. both a. and b.
  - d. neither a. nor b.
  
2. Studies revealed that
  - a. HMO's on balance provide a lower quality of care than traditional FFS insurance
  - b. HMO's on balance provide similar quality of care to traditional FFS insurance
  - c. HMO's on balance provide a higher quality of care than traditional FFS insurance
  
3. A high deductible health insurance plan is
  - a. most attractive to healthy people
  - b. most attractive to high-income people
  - c. neither a. nor b.
  - d. both a. and b.
  
4. The raw data from the RAND health insurance experiment in Table 2 of the RAND study presented in class established very clearly that
  - a. lower coinsurance leads to higher outpatient spending (statistically significant at 5%)
  - b. lower coinsurance leads to higher inpatient spending (statistically significant at 5%)
  - c. both a. and b.
  - d. neither a. nor b.
  
5. Managed competition may not work as well in practice as in theory as
  - a. Different health plans aim to provide the insured with the same network of doctors
  - b. People rarely switch to health plans with a lower premium
  - c. neither a. nor b.
  - d. both a. and b.
  
6. The percentage of people in the U.S. currently without health insurance is roughly
  - a. 0 percent
  - b. 10 percent
  - c. 20 percent
  - d. 30 percent or more.