

INDIAN STATISTICAL INSTITUTE  
First Semestral Examination: (2019-2020)

MS (Q.E.) II Year

Macroeconomics II

Date:

Maximum Marks 60

Duration 3 hours

**Use separate booklets for group A & B.**

**Group-A**

**Answer both questions.**

1. (a) Set up a New Keynesian model with Calvo-type price stickiness where labour is the only factor of production and the supply of labour is fixed at unity (no labour-leisure choice).  
(b) Show that in this model price dispersion reduces equilibrium output.  
(c) What would be the effect of a money supply shock in such a model?

[10+5+5=20]

2. (a) Set up a Real Business Cycle model with log utility, a single member infinitely lived household, no government and 100% depreciation of capital.  
(b) Show that the saving rate and the supply of labour are constant in equilibrium.  
(c) Can government intervention, smoothing out supply shocks, improve welfare in this model?

[4+4+2=10]

**Group-B**

**Answer all questions**

1. Show that with investments having convex adjustment cost, the capital stock exhibits smooth transitional dynamics even when the country is small in the international capital market facing a constant rate of interest.  
Show that if the production function and the investment adjustment cost function are both linear homogeneous then Tobin's marginal  $q$  would be equal to the average  $q$ .

[10+5=15]

2. Derive the steady state in the Blanchard-Yaari model and examine the effect of an increase in the probability of death per unit time on steady state capital accumulation.

Also demonstrate how Ricardian equivalence is rendered invalid in this model.

[10+5=15]

INDIAN STATISTICAL INSTITUTE

First Semestral Examination: (2019-2020) (Back paper)

MS (Q.E.) II Year

Macroeconomics II

Date 09/11/20

Maximum Marks: 100

Duration: 3 hours

**Use separate booklets for group A & B.**

**Answer both questions.**

1. Following the work of Kydland and Prescott show that the ability of the government to precommit its monetary policy is welfare enhancing. [25]
2. Set up a New Keynesian model with sticky prices. Argue that output response to a productivity shock is sluggish if prices are sticky as compared with the case where they are fully flexible. [25]

**Group-B**

**Answer all questions**

1. In the Blanchard-Yaari model with cohort *dependent* wage, what would be the effect of a sharper decline in wage with respect to age on the steady state capital accumulation?  
Consider the same model, but now with zero population growth, cohort *independent* wages and open to international asset market with a constant rate of interest. Show that the aggregate savings in this model is negatively related to the level of assets?

[20+5=25]

2. In an infinite horizon model, work out the dynamics of per capita asset for a small open economy, facing a constant rate of interest in the world capital market. In this context discuss the problems associated with either a very low or a very high rate of interest.

[25]

Indian Statistical Institute  
Semestral Examination: (2019 – 2020)  
M.S.(QE) – II year  
Econometric Applications I

Date: 25.11.2019

Maximum Marks – 100

Duration: 3 hours

**The question carries 110 marks. The maximum you can score is 100.**

Answer any *four* questions from 1-5.

1. (a) Suppose some income is transferred from a poor person to a non-poor person, other things remaining the same. What is expected to happen to a poverty measure? [State the axiom(s) you use]. Examine the 'head count ratio' and 'income gap ratio' measures in light of these axiom(s).
- (b) In the context of measurement of poverty, state the axioms (i) Replication invariance, (ii) Subgroup consistency and (iii) Decomposability.
- (c) Consider the income profile  $x_1 \leq x_2 \dots \leq x_n$  and the poverty measure  $P = \frac{1}{n} \sum_{i=1}^q (1 - \frac{x_i}{z})^\alpha$ , where  $q$ : number of poor;  $z$ : poverty line; and  $\alpha = 0, 1, 2$ .

Examine the index in light of the axioms in (c) for the three different values of  $\alpha$ .

[6 + 6 + 13 = 25]

2. (a) Define 'income elasticity of demand'. How are the commodities classified based on this elasticity? Sketch the Engel curves corresponding to these classifications. Justify your answer.
- (b) If tax is proportional to the value of a consumer item, then show that taxing a luxury item is progressive.
- (c) Discuss the problems of 'identification' and 'least squares bias', that are likely to arise in estimation of demand functions from time series data.

[10+5+10=25]

3. (a) Define the Specific Concentration Curve (SCC) for a particular commodity. What does the point (0.4,0.3) on a SCC signify? Explain.
- (b) Discuss the properties of SCC and derive its relationship with the Lorenz Curve (LC). When does the SCC reduce to LC? Give justification for your answer.

- (c) Assuming that income follows a Lognormal distribution and the Engel curve of an item is of constant elasticity form, describe alternative methods of estimating the Engel elasticity using the SCC.

[5 + 14 + 6 = 25]

4. (a) Explain the main difference between a ‘censored distribution’ and a ‘truncated Distribution’.

(b) Write down the Tobit model to incorporate zero consumption with full specification of the distribution of the error term. Why are the assumptions underlying the standard linear regression model not tenable in such a case?

- (c) Given the dynamic model for ‘clothing’

$$q(t) = \alpha + \beta s(t) + \gamma x(t)$$

where  $q(t)$  : rate of demand at time  $t$ ,

$x(t)$  : income during the same time, and

$s(t)$  : inventory of ‘clothing’ at time  $t$ ,

and assuming that the stock is used up at a constant depreciation rate  $\delta$ , find the short and long term derivatives of consumption with respect to income.

[3 + 12 + 10 = 25]

5. (a) Explain the ‘deterministic’ and ‘stochastic’ production frontiers assuming a log-linear relationship between inputs and output. State clearly the assumptions you make.

(b) Define the input and output oriented measures of ‘technical efficiency’ due to Debreu-Farrell (D-F) and Koopmans.

(c) “D-F technical efficiency is necessary, but not sufficient for Koopmans’ technical efficiency” – explain this diagrammatically for both input and output oriented measures.

(d) Describe the Modified Least Squares (MOLS) method of estimating technical efficiency from cross section data using a deterministic production frontier and a Half Normal distribution of efficiency ( $u$ ).

$$[u \sim \text{HalfNormal}(0, \sigma_u^2) \Rightarrow f(u) = \frac{2}{\sigma_u \sqrt{2\pi}} \exp(-u^2 / 2\sigma_u^2)]$$

[5+6+8+6 = 25]

6. Practical Assignment

[10]

INDIAN STATISTICAL INSTITUTE  
SEMESTRAL EXAMINATION, 2019-2020

M.S.(Q.E.) II year  
Theory of Finance I

Back Paper

Date: 10.1.2020

Maximum Marks: 100

Time: 3 hours

*Note: Clearly explain the symbols you use and state all the assumptions you need for any derivation. Answer Parts A and B in separate answer scripts.*

A

1. (a). Define a covered call, and derive its payoff and profit functions. Analyze the role of a covered call as a hedging instrument.

(b). Clearly explain the usefulness of exotic options by giving examples.

(10+4)

2. Demonstrate Ito's Lemma rigorously. Hence or otherwise determine the price of a forward contract.

(10+10)

3. Do you agree or disagree with the statement that in a one-step binomial model existence of a risk neutral probability is equivalent to non-arbitrage? In either case justify your answer.(12)

4. Define first order stochastic dominance relation and explain it graphically. Derive its expected utility equivalence condition. (4+10)

5. Suppose of two investors the former is more risk averse than the latter in the Arrow-Pratt absolute sense. Show that in order to avoid investment in an even prospect the maximum amount that the former would be willing to pay is higher than that for the latter. Interpret the result. (10)

6. Suppose that a person's optimal portfolio consists of positive fractions of a risk-free prospect and a risky prospect. If his absolute risk aversion measure is decreasing in initial wealth, how does the amount invested in the risky prospect change? Prove or disprove your claim. (10)

## B

1. Show how a European option can be valued using stock price simulation. (10)
2. Let  $A_1$  and  $A_2$  be two assets with rates of returns  $R_1$  and  $R_2$  respectively. Let  $E[R_i] = \mu_i$ ,  $Var(R_i) = \sigma_i^2$ , for  $i = 1, 2$  and  $Cov(R_1, R_2) = \sigma_{1,2}$ . Assume that both  $\mu_1 = \mu_2$  and  $\sigma_{1,2} = \sigma_1 \cdot \sigma_2$  do not simultaneously hold. Find the portfolio of  $A_1$  and  $A_2$  which has the minimum possible variance. (10)



INDIAN STATISTICAL INSTITUTE  
SEMESTRAL EXAMINATION, 2019-2020

M.S.(Q.E.) II year  
Theory of Finance I  
Back Paper

Date: Maximum Marks: 100 Time: 3 hours

*Note: Clearly explain the symbols you use and state all the assumptions you need for any derivation. Answer Parts A and B in separate answer scripts.*

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INDIAN STATISTICAL INSTITUTE  
First Semestral Examination: (2019-2020)

MS (Q.E.) II Year

International Economics I

Date: 22/11/19

Maximum Marks 60

Duration 3 hours

**Use separate booklets for group A & B**

**Group-A**

**Answer all questions**

1. Discuss a possible price magnification result in the context of a 2x3 Viner-Jones type of specific factors model of trade. Completely derive the welfare gains from trade in such a model. [20]
2. Consider the CES production function:  $X = (a_x l_x^{\rho_x} + b_x k_x^{\rho_x})^{1/\rho_x}$ ,  $\rho_x \in (0,1)$ ,  $a_x, b_x > 0$  and consider a 2x2 HOS model with the said production structure (of course the other commodity, say Y, will have a similar production structure with different parameters). Will (or under what conditions will) Stolper-Samuelson and Rybczynski theorems hold in such a setting? [10]

**Group-B**

**Answer all questions**

1. Explain the mechanics through which capital inflow in Dei's model necessarily leads to welfare improvement. How is this result strikingly different from the Brecher, Diaz-Alejandro result, where the import competing capital intensive sector is tariff protected and the country is small. [15]
2. Show how in Krugman (1981) distributional conflict is related both to difference in factor endowment ratios and economies of scale. [15]

INDIAN STATISTICAL INSTITUTE

First Semestral Examination: (2019-2020) (Back paper)

MS (Q.E.) II Year

International Economics I

Date 10/01/20

Maximum Marks: 100

Duration: 3 hours

Use separate booklets for group A & B

Group-A

Answer all questions

1. Discuss the continuum-Ricardo model of trade by Dornbusch, Fischer and Samuelson.

[15]

2. Illustrate a model of trade with exchange rates and purchasing power parities and establish a relationship between these two variables.

[20]

3. Discuss the Viner-Jones specific factor model of trade.

[15]

Group-B

Answer all questions

1. Show that in a three-agent setting, a transfer paradox might occur even when the equilibrium is Walras stable. In this context discuss the role of substitution effects in ensuring normal results.

[25]

3. Show how in Krugman (1981) pattern of trade (intra/inter- industry) is related both to difference in factor endowment ratios and economies of scale.

[25]

**INDIAN STATISTICAL INSTITUTE**  
 203, B.T. ROAD, KOLKATA – 700108  
 M.S. (Q.E.) II Year (2019 – 2020)  
 Semester II Examination  
 Econometric Methods II

Date: 29.11.2019

Maximum Marks: 100

Time: 3 hours

[Answer any FIVE questions. Marks allotted to each question are given within parentheses.]

1. (a) Explain what is meant by volatility in the context of financial time series. Do you think that GARCH process is appropriate to capture volatility? Justify your answer.
- (b) Obtain the unconditional variance of a GARCH (2, 2), process, and then discuss under what parametric condition(s) infinite variance is a possibility for this process. Also, explain clearly the implication of the condition(s) on the nature of underlying volatility.

$$(\overline{5+5} + \overline{5+5} = 20)$$

2. (a) Explain how the risk behavior of investors influences the expected rate of return in ARCH – M model.
- (b) Show that for an ARCH-M model specified as

$$y_t = \partial h_t + \varepsilon_t, \varepsilon_t | \Psi_{t-1} \sim N(0, h_t)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2, \quad \alpha_0 > 0 \text{ and } \alpha_1 \geq 0$$

where  $\Psi_{t-1}$  is the information set at time  $t - 1$ ,

$$V(y_t) = \frac{\alpha_0}{1 - \alpha_1} + \frac{2(\partial \alpha_0 \alpha_1)^2}{(1 - \alpha_1)^2 (1 - 3\alpha_1^2)}$$

$$\text{Corr}(y_t, y_{t-1}) = (2\alpha_1^3 \partial^2 \alpha_0) / \{2\alpha_1^2 \partial^2 \alpha_0 + (1 - \alpha_1)(1 - 3\alpha_1^2)\}.$$

Also discuss the implication of the special case where  $\alpha_1 = 1$ .

$$(4 + \overline{13+3} = 20)$$

3. (a) Consider a two-variable VAR model. Derive conditions under which this VAR model (i) is stationary, and (ii) refers to cointegration.
- (b) Discuss what is meant by impulse response functions. In this context, also discuss the Choleski factorisation.

$$(10 + 10 = 20)$$

4. (a) Explain what you mean by cointegration. In case of relationship involving three time series variables, is cointegration unique? Justify your answer.
- (b) Is it possible that cointegration does not exist? Give justifications for your answer.
- (c) Discuss how you would test for the presence of cointegration in a system of equations with  $K (>2)$  variables.

$$(\overline{5 + 5 + 4 + 6 = 20})$$

5. (a) Discuss how VECM is related to cointegration. Also discuss, with justifications, what is (are) the essential difference(s) between VECM and cointegration in terms of their reference to different horizons of time.
- (b) Explain what is Granger causality involving stationary variables. Discuss the relationship between Granger causality and cointegration.

$$(\overline{5 + 5 + 4 + 6 = 20})$$

6. Consider the following panel data model.

$$y_{it} = \delta_i + x'_{it}\beta + \theta Z_i + \varepsilon_{it}, i = 1, 2 \dots N; t = 1, 2, \dots T,$$

where  $\varepsilon_{it}$  satisfies all the classical linear regression model assumptions, and  $x_{it}$  ( $k \times 1$ )'s are time-individual varying regressors.

Let  $x_t = (x_{1t}, x_{2t}, \dots, x_{Nt})'$ .  $\delta_i$  is time invariant and an unobserved variable.

Assume that  $E[\varepsilon_{it}|x_t, \delta_i, Z_i] = 0$ ,  $E[\delta_i|x_t] \neq 0$ , and  $\sigma_\varepsilon^2 = \text{Var}(\varepsilon_{it})$ . Further,  $Z_i$  ( $1 \times 1$ ) is a time invariant observed variable, and  $x_{it}$  and  $Z_i$  are correlated.

- (a) Provide a consistent estimator of  $\theta$  assuming  $E[\delta_i|Z_i] = 0$ , and prove its consistency.
- (b) Also find a consistent estimator of  $\theta$  assuming  $E[\delta_i|Z_i] \neq 0$ . Prove its consistency as well.

$$(8+12=20)$$

INDIAN STATISTICAL INSTITUTE

First Semestral Examination: (2019-2020)

MS(QE) II

Individual and Collective Choice

Date: 27. 11. 2019      Maximum Marks: 100      Duration: 3 hrs.

Note: Answer all questions.

- (1) Consider the social aggregation problem, where  $A = \{x, y\}$  is the set of alternatives,  $|A| = 2$ ,  $N$  is the finite set of agents and  $|N| \geq 2$ .
  - (a) Suppose that the social welfare function satisfies symmetry and neutrality and the number of agents preferring  $x$  over  $y$  is the same as the number of agents preferring  $y$  over  $x$ . Then show that the social welfare function necessarily prescribes indifference between  $x$  and  $y$ .
  - (b) Define non-triviality and positive responsiveness of a social welfare function.
  - (c) Can you find a social welfare function that satisfies non-triviality and positive responsiveness but fails to satisfy Pareto? Justify your answer.
  - (d) Find a non-dictatorial social welfare function  $F$  that satisfies Pareto, neutrality and non-triviality but fails to satisfy symmetry and positive responsiveness. (10+4+8+8=30)
- (2) State and prove Arrow's impossibility theorem using the notion of extremely pivotal agent. (5+25=30)
- (3) Consider the pure public goods problem. Show that an outcome efficient mechanism is dominant strategy incentive compatible if and only if it is from the class of VCG mechanisms. Give all the relevant definitions. (25)
- (4) State the Cubical Array Lemma for the pure public goods problem by giving all the relevant definitions. Using this lemma show that there is no balanced VCG mechanism for the pure public goods problem. (7+8=15)