NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF COMMERCE

DEPARTMENT OF FINANCE: MSc Fiscal Studies

Revenue Forecasting, Mobilisation and Modelling (CFS 5202)

APRIL 2014 EXAMINATION

Time : 3 hours

INSTRUCTIONS:

Candidates should attempt **ALL QUESTIONS.**

Formulae Tables are attached at the end of the question paper.

QUESTION 1 **[15]**

Consider the table below giving GDP and Income Tax data for Country W in years 2012 and 2013. All the values of GDP and income taxes are expressed in current dollars.

(a) Calculate buoyancy. [5]

(b) If the national income in Country W grew by 5.5% and the elasticity was 0.79,

(i) What was the effect of NO changes in the tax system? [5]

(ii) What was the effect of changes in the tax system? [5]

Figure 1: Country W data

Year	2012	2013
GDP	5000	6200
Income Tax	500	680
GDP Deflator	1.4	2.4

QUESTION 2 **[10]**

Assume the following data series for tax revenues and discretionary changes for a given country during period 1 to 5:

T1 = 200; T2 = 240; T3 = 270; T4 = 250; T5 = 220

D2 = 20; D3 = 10; D4 = 30; D5 = 0.

(a) Calculate the discretionary change coefficients: $\frac{T5}{T5-D5}$; $\frac{T4}{T4-D4}$; $\frac{T3}{T3-D3}$; $\frac{T2}{T2-D2}$. [4]

(b) Calculate the adjusted tax revenues: AT5; AT4; AT3; AT2; AT1. [5]

(c) What can you conclude from the results in (b)? [1]

QUESTION 3 **[30]**

Suppose that the initial price of a box of cigarettes is \$0.80 per liter and the quantity sold and bought is 2000 boxes. Assume that $\varepsilon = 1.5$ and $\eta = 1.0$ and consider a tax rate of 5c per box. Show all the necessary steps.

(i) Calculate and interpret ΔP^s. [3]

(ii) Calculate and interpret ΔP^d. [3]

(iii) Calculate and interpret ΔQ^s. [3]

(iv) Now, using the exact formula, estimate Revenue. [6]

(v) Calculate and interpret the excess burden in this case. [6]

(vi) What would be the revenue if an ad valorem tax rate of 5% is imposed? Show all the necessary steps. [9]

QUESTION 4 **[25]**

Imports of chicken in Zimbabwe are valued at about USD 260 000, and the local industry produces USD 240 000 worth of chicken. Suppose that the price elasticity of demand for chicken is 1.5, and the local supply elasticity is 0.8.

(a) What is the elasticity of demand η^m? [6]

(b) By showing all the working, calculate how much revenue can the government raise if a tariff of 20% is introduced? [10]

(c) Assume the government is analyzing the revenue impact of an increase in the tariff rate from 20% to 25%. Estimate the change in revenue in this case, showing all your working.[9]

QUESTION 5 **[20]**

Revenue collected from an ad valorem tariff t on imports is given by

$$R = tP_{\text{cif}} \times e_0 Q_0$$

where e is the exchange rate.

In this case, the change in revenue can be expressed as

$$\Delta R = tP_{\text{cif}} \left(e_0 \Delta Q_0 + Q_0 \Delta e_0 \right)$$

Since the change in quantity imported is equal to

$$\Delta Q = \frac{\eta \Delta P Q_0}{P_0}$$

where $P_0 = P_{\text{cif}} e_0 (1 + t)$.

(a) Find an expression for $\frac{\Delta P}{P_0}$. [2]

(b) Deduce a formula for ΔR. [3]

(c) Hence, deduce a formula for $\frac{\Delta R}{R}$. [3]

(d) What is the effect on revenue collection if a particular currency is devaluated from 10 to 20 per US dollar. Assume a price elasticity of demand of -1.2. [6]

(e) If export duties are imposed on goods, the total amount of export duties can be derived in the same manner as for import tariffs using the formula

$$R = tP_{\text{fob}} Q_0^e + t^2 P_{\text{fob}} Q_0^e \epsilon^e$$

(i) Find an expression for the rate of change of revenue with respect to changes in tariff. [4]

(ii) What can you conclude from the above expression? [2]

END OF EXAMINATION PAPER

Formulae Sheet

$$\begin{aligned}
SS_{\text{tot}} &= \sum_i (y_i - \bar{y})^2 && (1)\\
SS_{\text{reg}} &= \sum_i (f_i - \bar{y})^2 && (2)\\
SS_{\text{err}} &= \sum_i (y_i - f_i)^2 && (3)\\
R^2 &\equiv 1 - \frac{SS_{\text{err}}}{SS_{\text{tot}}}. && (4)\\
E_{TY} &= \frac{\%\Delta T}{\%\Delta Y} && (5)\\
\Delta P^s &= \left[\frac{\eta}{\varepsilon - \eta}\right] \times T && (6)\\
\Delta P^d &= \left[\frac{\varepsilon}{\varepsilon - \eta}\right] \times T && (7)\\
R &= T \times Q_1 &&\\
&= T \times Q_0 \times \left[1 + \frac{T}{P_0} \times \frac{\epsilon\eta}{\epsilon - \eta}\right] && (8)\\
P^d &= (1 + t) \times P^s && (9)\\
\Delta P^d - \Delta P^s &= t \times P^s = t(P_0 + \Delta P^s) && (10)\\
\Delta P^s &= \frac{\eta}{\varepsilon - \eta(1+t)} \times t \times P_0 && (11)\\
\Delta P^d &= \frac{\varepsilon}{\varepsilon - \eta(1+t)} \times t \times P_0 && (12)\\
TR &= t \times P_1^s \times Q_1 &&\\
&= t \times (P_0 + \Delta P^s) \times (Q_0 + \Delta Q^s) && (13)\\
&\cong tP_0Q_0 + t^2 P_0 Q_0 \frac{\eta(1+\varepsilon)}{\varepsilon - \eta(1+t)} &&\\
\Delta Q^s &= \varepsilon \times \Delta P^s \frac{Q_0}{P_0} && (14)\\
R &= tP_{cif}Q_1^m && (15)\\
R &= tP_{cif}(Q_0^m + \Delta Q^m) && (16)\\
\eta^m &= \eta(Q_0^d/Q_0^m) - \epsilon(Q_0^s/Q_0^m) && (17)\\
R &= tP_{cif}Q_0^m + t^2 P_{cif} Q_0^m \eta && (18)
\end{aligned}$$

$$R = tP_{cif}Q_0^m + t^2 P_{cif} Q_0^m \eta^m \quad (19)$$

$$\begin{aligned} R &= tP_{\text{fob}}Q_1^e \\ &= tP_{\text{fob}}Q_0^e + t^2 P_{\text{fob}} Q_0^e \epsilon^e \quad (20) \end{aligned}$$

$$\text{EB} = -\frac{T^2 Q_0}{2P_0}\frac{\varepsilon\eta}{\varepsilon - \eta} \quad (21)$$

$$\text{EB} = -\frac{t^2 P_0 Q_0}{2}\frac{\varepsilon\eta}{\varepsilon - \eta(1+t)} \quad (22)$$