

EE 376 Assignment 1

1) From the retail price of fuel type k given in (1)

$$P_k = 1.07(P_{Rk} + (1.1)t_k + OF_k + CF_k + M_k) \quad (1)$$

where P_k is the retail price of fuel type k
 P_{Rk} is the ex-refinery price of fuel type k
 t_k is the initial excise tax. Note that 1.1 in front of t_k combines the excise tax and municipal tax as it is always 10% of the excise tax rate
 OF_k is the tax rate charged by the Oil Fund
 CF_k is the tax rate charged by the Energy Conservation Fund
 M_k is the Marketing Margin
The Value added tax (VAT) at 7% is applied on the ex-refinery price and the taxes and marketing margin

Let the carbon tax rate be t_c . The new excise tax rate is based on the carbon conversion factor c_k . Hence, the new excise tax rate is defined as $c_k t_c$. If we replace the initial excise tax rate with the new rate, the retail price of fuel type k can be written as

$$P_{tk} = 1.07(P_{Rk} + (1.1)c_k t_c + OF_k + CF_k + M_k) \quad (2)$$

From equation (1) and (2) proof that P_{tk} can be rewritten as

$$P_{tk} = P_k + (1.07)(1.1)(c_k t_c - t_k) \quad (3)$$

2) Use the Excel file “Carbon Tax” to simulate the impact of carbon tax that can mitigate carbon emission by 10% on fuel prices and tax revenue.

Column B to Column J are the estimated BAU quantity demanded of each fuel from year 2013-2040. They are Gasoline 95 (Q95), Gasoline 91 (Q91) Gasohol E10 (QE10), E20 (QE20), E85 (QE85), Diesel (QD), LPG (QL) NGV (QN) . Column L to Column T are respective initial prices.

- Calculate the BAU fuel prices with the existing excise tax rates in with appropriate formulae in Column L to Column T.
- Calculate BAU carbon emissions of each fuel and total BAU emissions for year. 2013 - 2040 using the carbon conversion factors given in cells V2 to AD2. Show the calculation with appropriate formulae in Column V to Column AE.
- Calculate new fuel prices with carbon taxes that replace the old excise taxes using the formular in equation (3). You may assume a carbon tax rate t_c at 10 Baht. Show the calculation with appropriate formulae in Column AG to Column AO.
- Calculate new quantity demanded of each fuel that are the result of the carbon tax. Show the calculation with appropriate formulae in Column AQ to Column AY.
- From d) calculate the result carbon emissions of each fuel and total emissions for year 2013 – 2040. Show the calculation with appropriate formulae in Column BA to Column BJ.

- f) Use “Goal seek...” function in Excel to adjust you carbon tax rate until the total carbon emissions during 2013-2020, 2021-2030, and 2031-2040 decrease from the BAU levels by 10%.
[See this as an example: <https://www.excel-easy.com/examples/goal-seek.html>]