

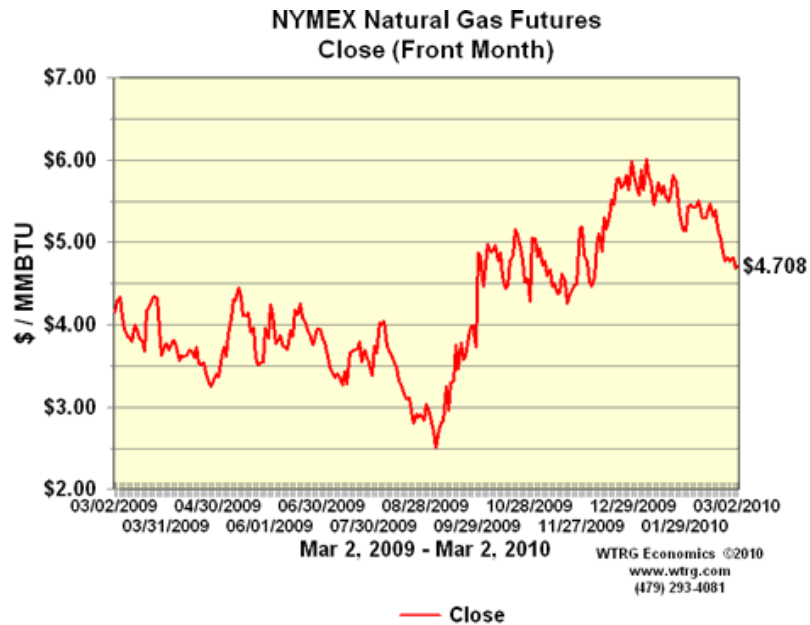
# BS2243 – Lecture 5

## Bertrand and other competition

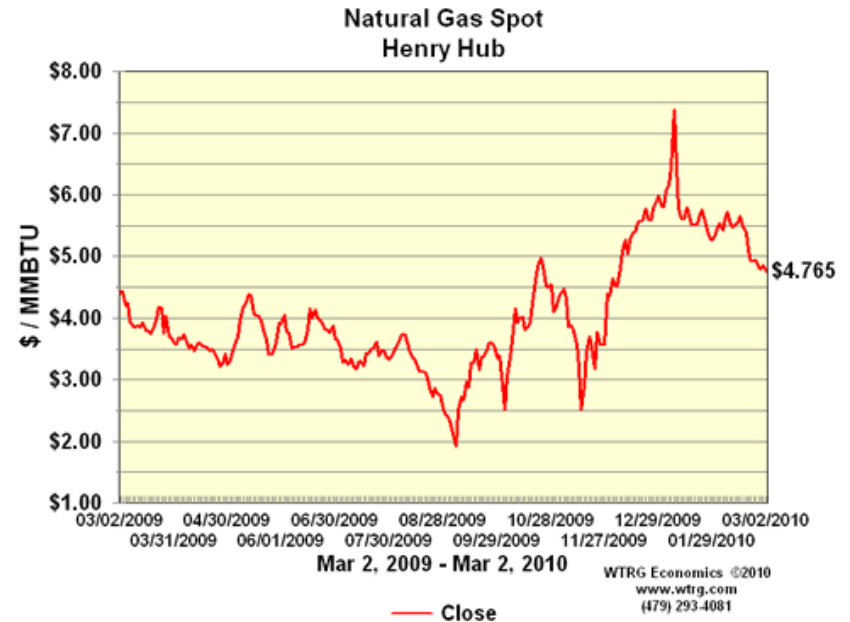
Spring 2012

(Dr. Sumon Bhaumik)

# Price stickiness - observation



Source: <http://www.wtrg.com/daily/ngfclose.gif>

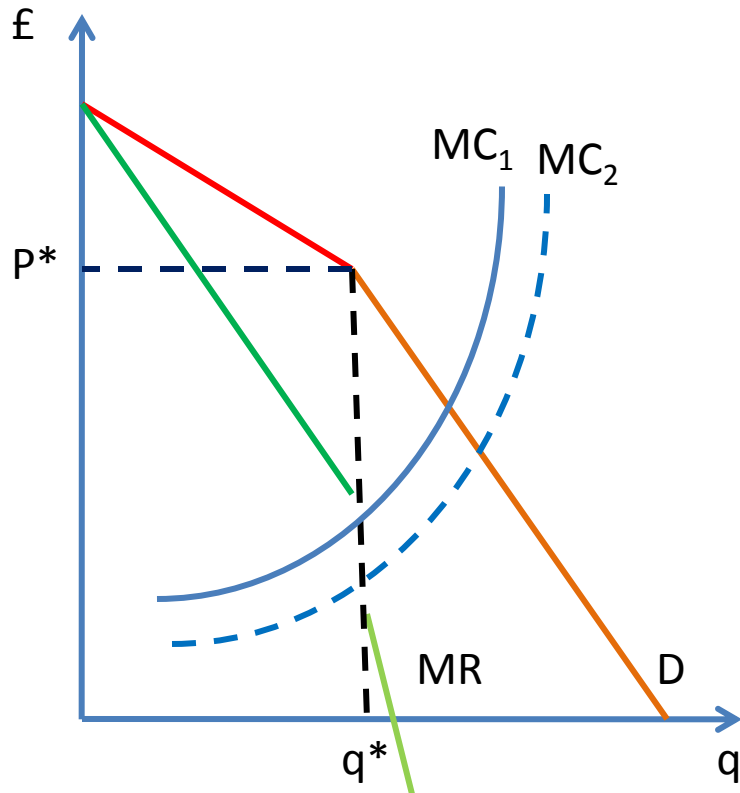


Source: <http://www.wtrg.com/daily/oilandgasspot.html#Natural>

## Observation:

Both spot and futures prices of natural gas fluctuate a lot, but the retail price that households pay is much more stable.

# Price stickiness - explanation

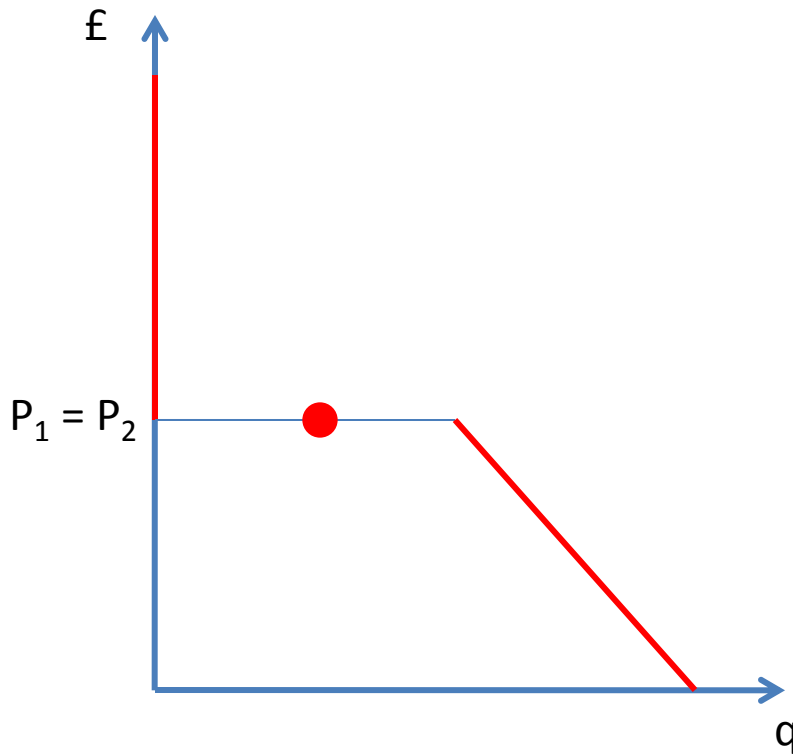


- Oligopolist produces  $q^*$  and sells at price  $P^*$
- If it raises its price, no one will follow, but if it reduces its price the competitors will follow
- Demand curve is kinked and MR curve is discontinuous at  $q^*$
- Same price and quantity for different MC curves

# Bertrand price competition

- Observation
  - Even in an oligopolistic market where firms have market power, price-cost margin is low
  - Example: airline industry
- Setting
  - Two firms, with identical costs ( $MC = AC = 70$ )
  - Homogeneous product
  - Demand is stable
  - Consumers know the prices of all sellers

# Bertrand price competition – demand



- Market demand curve

$$P = 1000 - Q$$

$$\text{i.e., } Q = 1000 - P$$

- Demand curve for Firm 1

$$\left\{ \begin{array}{ll} q_1 = 0, & \text{if } P_1 > P_2 \\ q_1 = 0.5(1000 - P), & \text{if } P_1 = P_2 = P \\ q_1 = 1000 - P_1, & \text{if } P_1 < P_2 \end{array} \right.$$

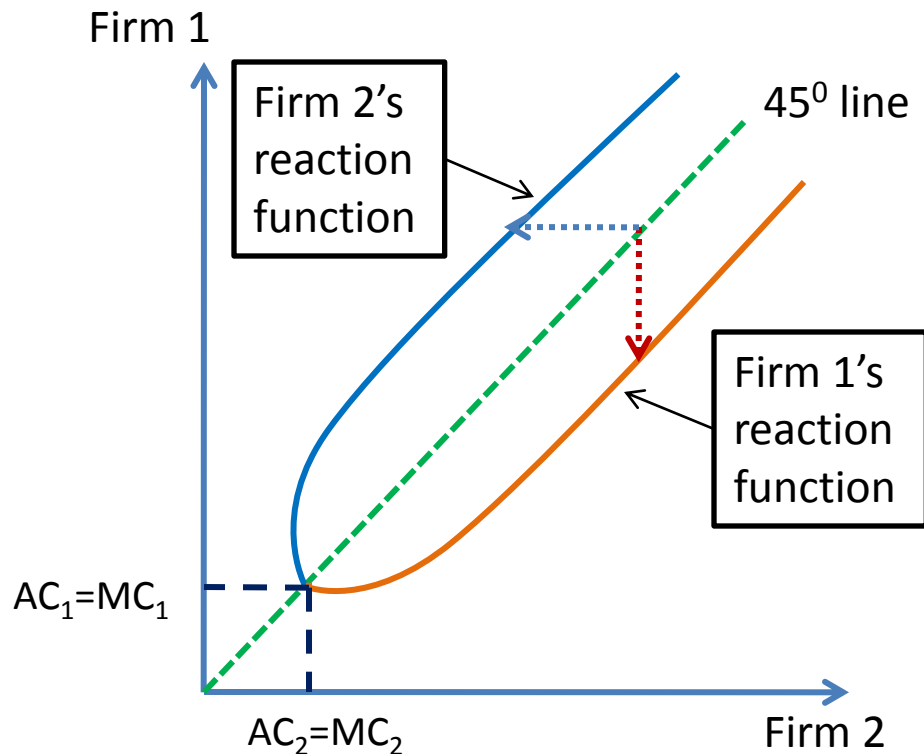
# Bertrand price competition – strategy I

- Both firms charge £400 at the moment
  - Quantity demanded = 600, and each firm sells 300
  - Total revenue of Firm 1 =  $300 \times 400 = 120,000$
- Firm 1 changes price to £399
  - Quantity demanded = 601; Firm 1 sells all of it
  - Total revenue of Firm 1 =  $601 \times 399 = 239,799$
- Marginal revenue of Firm 1
$$\Delta TR / \Delta q = (239,799 - 120,000) / (601 - 300) = 398 > MC (= 70)$$
- It makes sense for Firm 1 to reduce price from £400 to £399

# Bertrand price competition – strategy II

- Firm 1 reduces price further to £398
  - Quantity demanded = 602; Firm 1 sells all of it
  - Total revenue of Firm 1 =  $602 \times 398 = 239,596$
- Marginal revenue of Firm 1
$$\Delta TR/\Delta q = (239,536 - 239,799)/(602 - 601) = -203 < MC (= 70)$$
- *So long as Firm 2 does not change its price*, it does not make sense for Firm 1 to reduce its price further from £399 to £398

# Bertrand price competition - outcome



- Given any common price, each firm's best strategy would be cutting price by £1
- These strategies are defined by the reaction functions
- Once the market price is equal to  $AC = MC$  ( $AC_1 = AC_2 = MC_1 = MC_2$ ), no further price cuts are possible



# Bertrand outcome - role of information

## Apple Ipod Classic 160 GB

6. Generation - Storage Capacity: 160 GB - Screen Size: 2.5 " - MP3 Playback - MPEG4 Playback - Weight: 162 g - Storage Medium: Hard Disc Drive - Width: 61.8 mm

Vendor	Price
e-bay	£169.99
PIXmania.com	£173.00
LASKYS	£179.73
ebuyer.com	£181.38
comet	£193.00

- Why does price vary significantly across vendors?
- Bounded rationality on the part of both buyers and sellers
- Non price factors like trust and transactions cost

Source: <http://www.smartshopping.co.uk>

Query at 13:08 on 04-02-2010

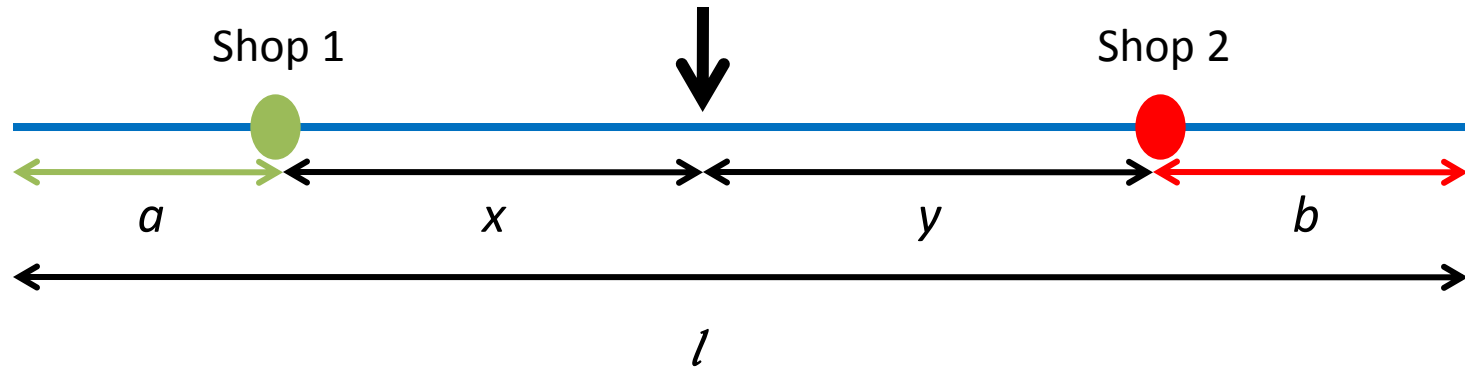
# Thinking assessment – Bertrand model

- If you are asked to explain the model, what must you include in the answer?
  - Assumptions
  - What is the basis for competition (price)?
  - How might a firm benefit if it undercuts its competitor (demand curve)?
  - Is undercutting the competitor necessarily the best strategy for a firm (reaction functions)?
  - What is the equilibrium?
- What would a discussion require in addition?
  - Why are the assumptions important?
  - Examples that can help make a point
- What is the difference between an “ok” answer and a “good” answer?
  - Maintaining the sequence of the arguments
  - Making use of the relevant diagrams and explaining them in the text

# Spatial competition

- Observation
  - Along a motorway, gas stations are clustered, i.e., located right next to each other at regular intervals
  - In high streets, a wide range of retail outlets like banks, pharmacies and fast food shops are located right next to each other
- Question
  - Does it make strategic sense to locate an outlet right next to its competitors?

# Spatial competition – Hotelling I



- Two shops: Shop 1 charges price  $P_1$  and Shop 2 charges price  $P_2$
- At each point on the road, there is a customer
- A customer has to incur a cost ( $c$  per mile) to travel to either shop
  - Customers in region “a” will only go to Shop 1, while customers in region “b” will only go to Shop 2
  - There is a point between Shop 1 and Shop 2 where a customer is exactly indifferent between going to Shop 1 and Shop 2
  - Unlike in a Bertrand framework, it is possible to be in price competition and still charge a higher price than the competitor

# Spatial competition – Hotelling II

- What do we know?

$$\begin{cases} l = a + x + y + b \\ P_1 + cx = P_2 + cy \end{cases}$$

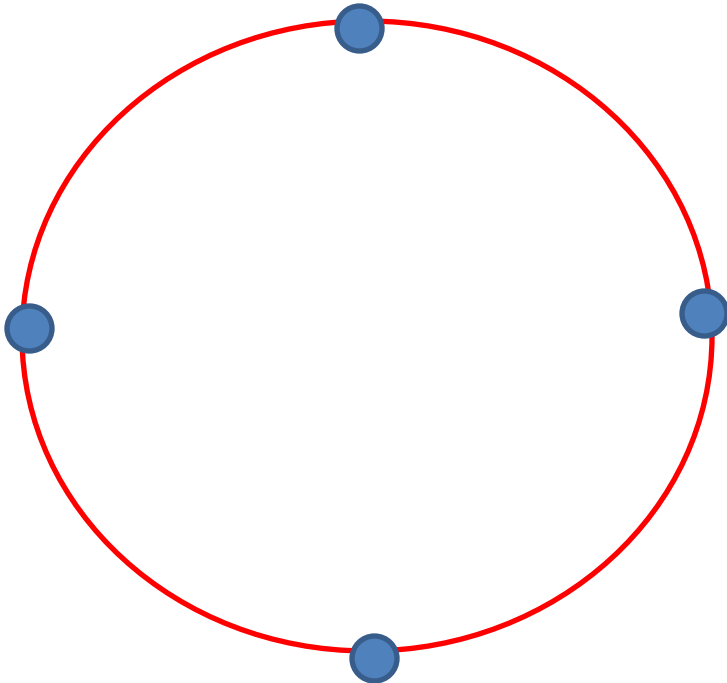
- What does each firm do?
  - Each firm chooses a price that maximises its profits
- What can we demonstrate?
  - Shop 1's profit increases if  $a$  increases, and Shop 2's profit increases if  $b$  increases
- Each firm will move towards the centre, and will eventually be located next to each other

# Spatial competition – Salop I

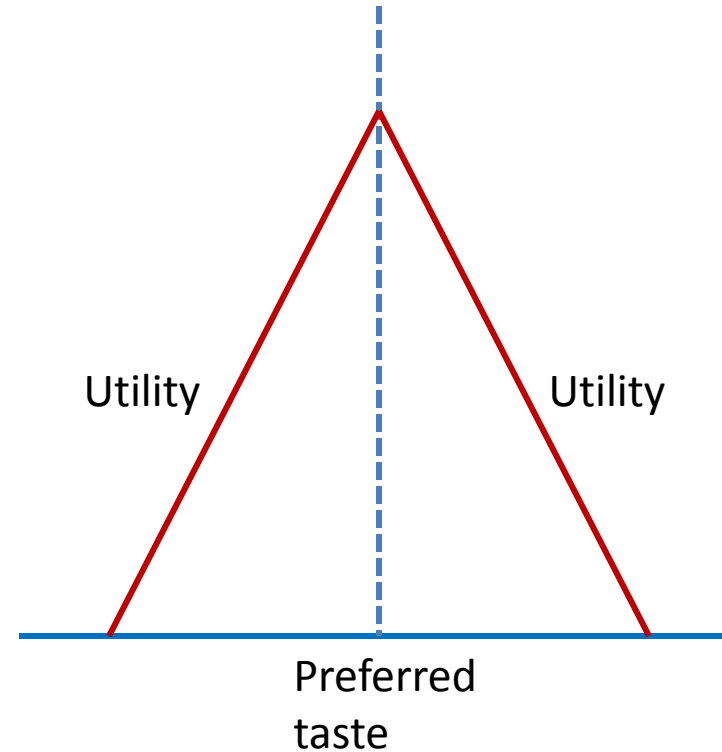
- Setting
  - There are  $n$  firms located around a circle, equidistant from each other
  - They all sell a comparable product (ice cream), but there is another product in the market that could be used as a substitute (chocolate cake)
- Consumers
  - Each consumer maximises utility, and has a preference for a certain variety of the product (flavour of ice cream)
  - Utility is maximised when a consumer gets exactly what she wants, at a given price
  - If the value for money (from ice cream consumption) falls below the utility from consuming the substitute product (i.e., chocolate cake), she opts for the substitute

# Spatial competition – Salop II

- Firms

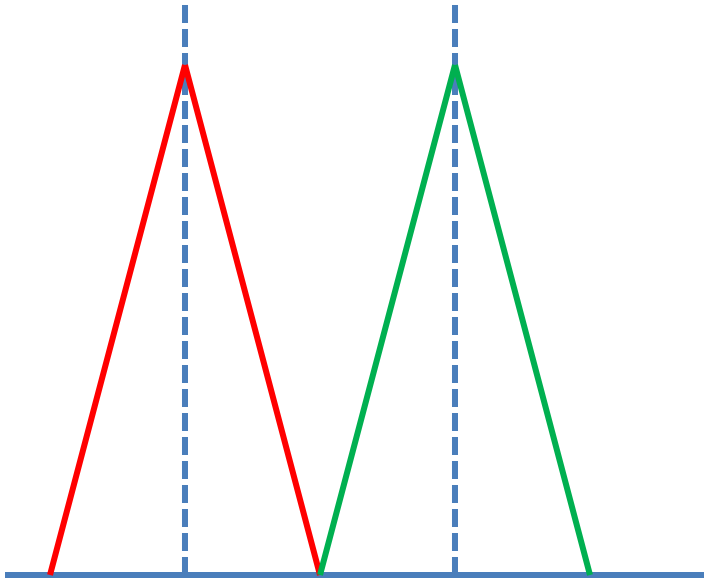


- Consumers

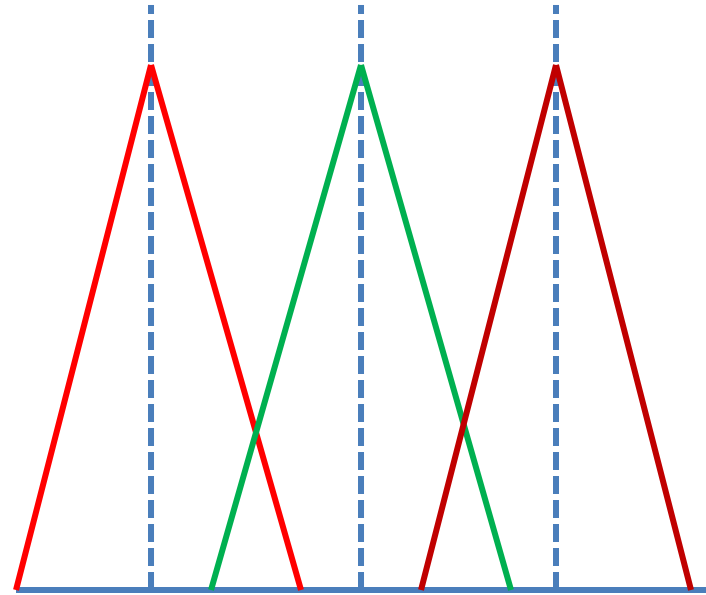


# Spatial competition – Salop III

- Few firms / High price



- Many firms / Low price





# Spatial competition – Salop IV

- Equilibrium
  - All firms charge the same price
  - There is no entry or exit
  - The firms are equidistant from each other
- Strategy
  - Product proliferation