



# **GAS PRICING: INTRODUCTORY CONCEPTS AND VOCABULARY**



## Lack of Theoretical Literature Relevant to Natural Gas Pricing

- Most price theorists writing prior to gas becoming a widely used source of energy
- Most energy pricing work ignores gas because of lack of data
- Equity and “social justice” usually ignored in favour of efficiency arguments
- Most useful contribution is Coase’s transaction cost theory which considers long term contracts a determining factor of markets
- Hotelling’s theory of inter-temporal optimisation of resource development, requires definition of “depletion of a finite resource”
- Gas pricing as a product of “discriminating (bilateral) monopoly” behaviour



# Analytical Problems of Gas Price Research

- | **UNITS** – currencies and volume/heat units: \$/MMbtu; \$/mcm; Euro/MWh; UK pence/therm
- | **Concepts:** is the discussion about price formation or price level?
- | **Location:** wellhead border, wholesale (hub), retail
- | **Domestic prices:** level is one issue, collection is another
- | **Lack of transparency:** confidentiality – guaranteed by contract – for all contracts outside North America
- | **Vocabulary and definitions** eg “subsidies”

**This is why there is so little public/academic literature on gas pricing!**



# Analytical Problems of Gas Price

## Categorisation: the issue of “regions”

- | North America: US, Canada, Mexico (Caribbean?)
- | Europe: Great Britain, North West, Central, South (Spain, Italy, Balkans)
- | CIS: Russia, Western CIS, Central Asia
- | Asia: “established markets” (Japan, Korea, Taiwan), “new markets” (China, India, SE Asia)
- | Middle East/North Africa: exporters and importers
- | South East Asia: exporters and importers
- | Others – marginal in global gas trade thus far: Latin America, Sub-Saharan Africa, Pakistan

**All gas literature refers to geographical regions, but this does not hold up analytically**

# IGU Categories of Price Formation 1



- **Oil price escalation (OPE):** price linked, usually through a base price and an escalation clause, to competing fuels, typically crude oil, gas oil and/or fuel oil. In some cases coal prices can be used as can electricity prices.
- **Gas-on-gas competition (GOG):** the price is determined by the interplay of supply and demand – gas-on-gas competition – and is traded over a variety of different periods (daily, monthly, annually or longer). Trading takes place at physical hubs (eg Henry Hub in the US) or notional hubs (eg NBP in the UK). If there are longer term contracts these will use gas price indices to determine the price. Spot LNG is also included in this category and also bilateral agreements where there are multiple buyers and sellers.
- **Bilateral monopoly (BIM):** The price is determined by bilateral discussions and agreements between a large seller and a large buyer, with the price being fixed for a period of time – typically this would be one year. There may be a written contract in place but often the arrangement is at the government or state-owned company level. There will be a dominant buyer and seller.
- **Netback from final product (NET):** The price received by the gas supplier is a function of the price received by the buyer for the final product the buyer produces. This may occur where the gas is used as a feedstock in chemical plants, such as ammonia or methanol, and the major variable cost in producing the product.



## IGU Categories of Price Formation 2

- **Regulation - cost of service (RCS):** The price is determined, or approved, by a regulatory authority, or possibly a Ministry, but the level is set to cover the “cost of service”, including the recovery of investment and a reasonable rate of return.
- **Regulation - social and political (RSP):** The price is set, on an irregular basis, probably by a Ministry, on a political/social basis, in response to the need to cover increasing costs, or possibly as a revenue raising exercise.
- **Regulation below cost (RBC):** The price is knowingly set below the average cost of producing and transporting the gas often as a form of state subsidy to its population.
- **No Price (NP):** The gas produced is either flared, or provided free to the population and industry, possibly as a feedstock for chemical and fertiliser plants. The gas produced may be associated with oil and/or liquids and treated as a by-product.

Source: IGU, Wholesale Gas Price Survey – 2017 Edition, p.13.



# Wholesale and Retail Prices

- **‘WHOLESALE PRICE LEVELS ... need to be treated with caution ... [as] they can cover different points in the gas chain – wellhead price, border price, hub price, city gate price – so the comparison of price levels is not always a like for like comparison’ IGU (2017, p.59).**
- **RETAIL PRICE LEVELS: prices that customer classes pay to their supplier; should include additional transportation charges; may include additional taxes/environmental charges**



# Three Basic Types of Wholesale Pricing

## Fixed/regulated/cost-based prices:

- ▮ Price set by government or regulatory authority
- ▮ May be: below cost (subsidised), strongly politically influenced

## Oil-related prices based on:

- ▮ Crude oil prices (Asian LNG importers)
- ▮ Oil product prices (traditional Continental Europe)

## Market prices based on spot and futures trading:

- ▮ Usually at market hubs and exchanges (North America, UK, Continental Europe in the 2010s)

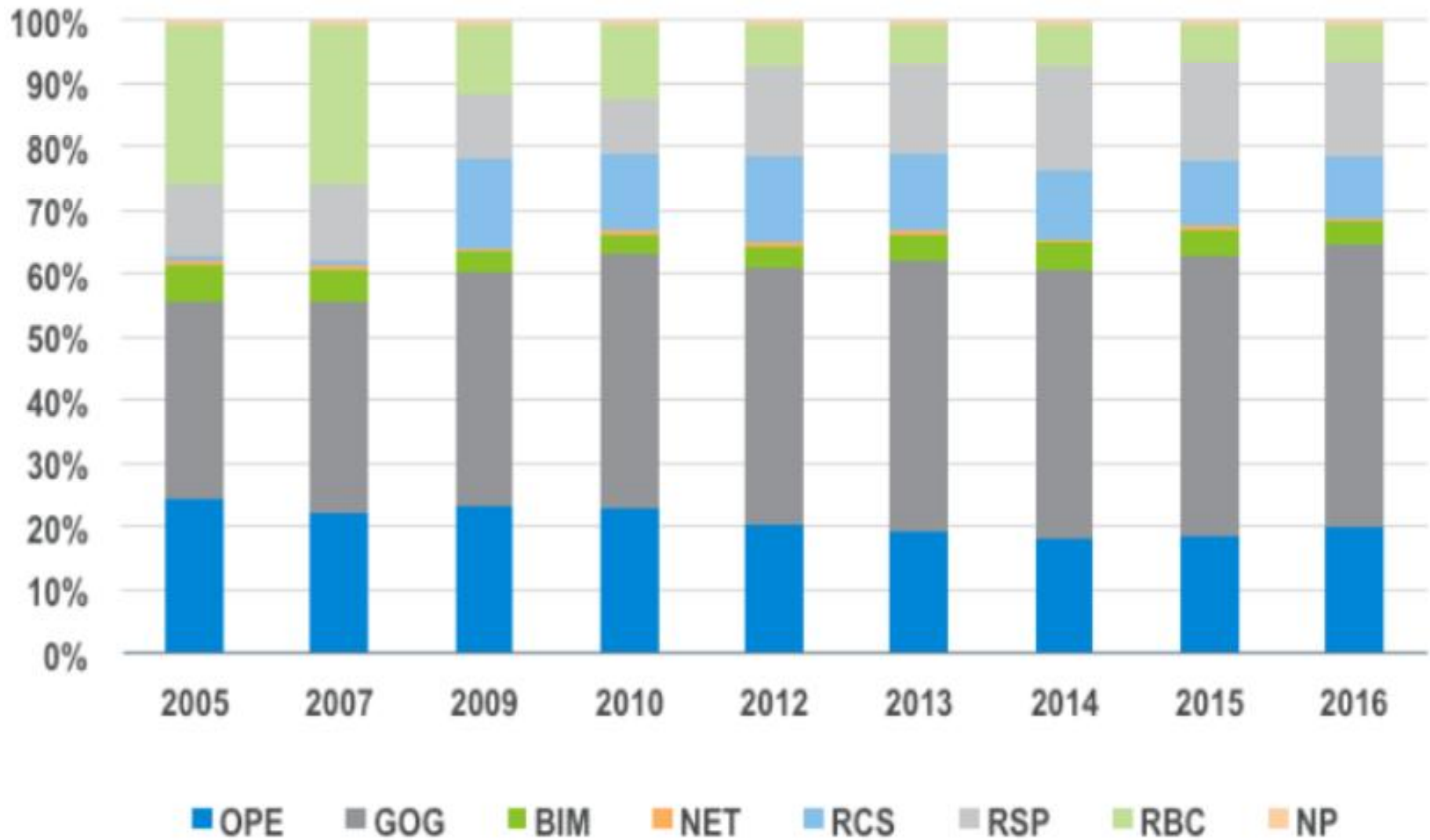
**These wholesale prices will generally influence the retail/enduser price in the country where the gas is sold**



# Global Consumption of Gas by Price Mechanism 2005-16



Source: IGU





## Global Wholesale Price Data 2016

- | **65% of global gas consumption is sold on either gas/gas competition GOG (ie market prices) or oil-related prices (OPE) but outside the OECD, the shares are much lower**
- | **Regulated pricing:**
  - | **>80% of gas sold in Africa and more than 90% in Middle East either below cost (ie absolute subsidy) or at `social' prices**
  - | **>66% of gas sold in CIS countries, >40% of gas sold in Latin America; 25% of gas sold in Asia subject to regulation of some sort**

**These are domestic wholesale prices reported by the countries themselves (more on non-OECD regions in the second part of the presentation)**



## International Gas Pricing Formation in 2016 (%)

	TOTAL IMPORTS	PIPELINE IMPORTS	LNG IMPORTS
OPE	49%	35%	76%
GOG	46%	57%	24%
BIM	5%	8%	-
TOTAL	100%	100%	100%

OPE = oil price related; GOG = spot/hub price related BIM = bilateral monopoly pricing

**International gas prices are 38-69% oil-linked,  
and 31-52% spot/hub-based**

Source: IGU



# Evolution of Gas Prices in North America, Europe and Pacific LNG Importing Countries

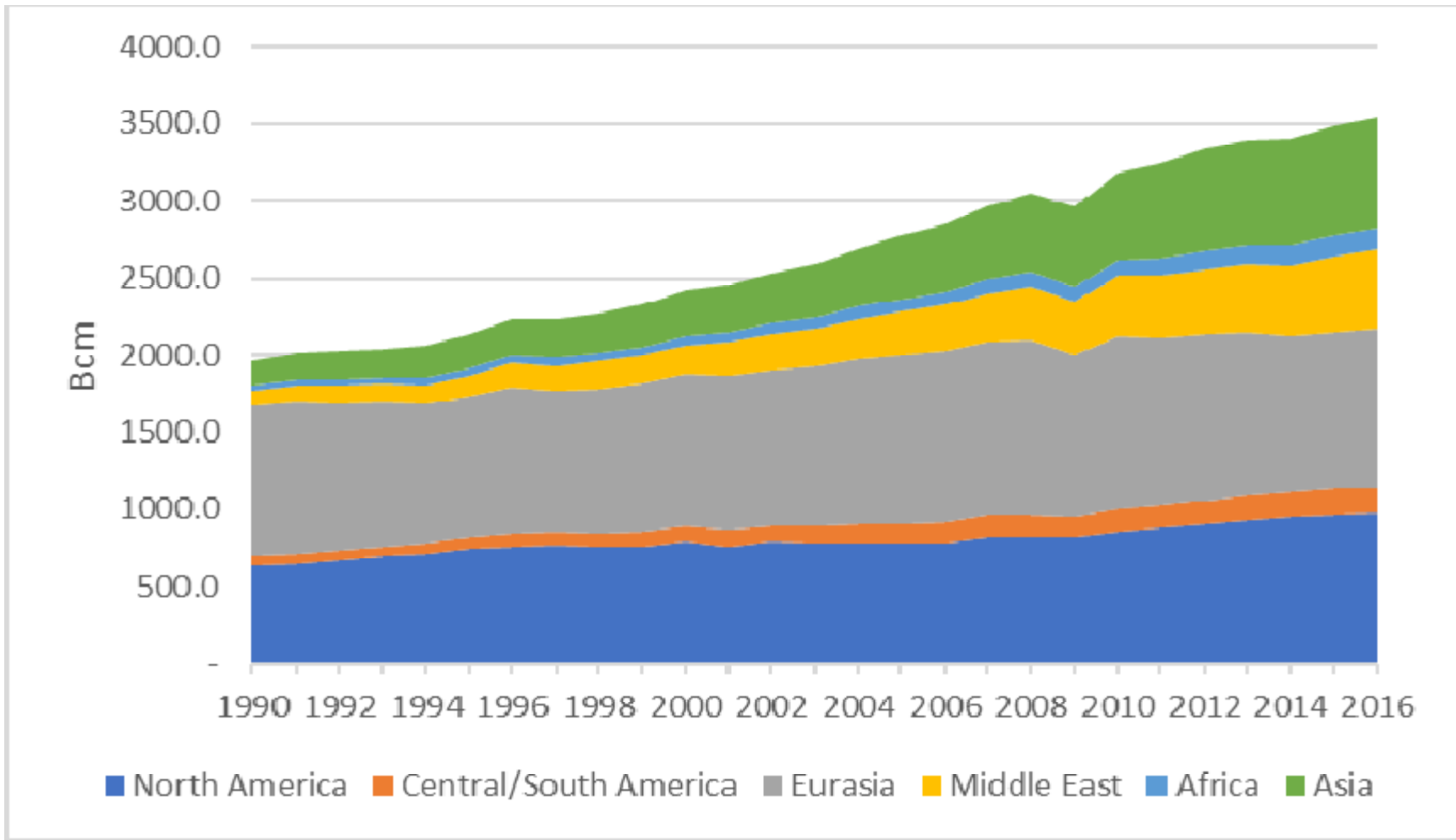
**POSSIBLE HYPOTHESES ARE THAT PRICES MOVE:**

- from fixed/regulated/cost-based prices to..oil-related prices to..market prices based on spot and futures trading
- from regional to international (global?) levels

**We return to these hypotheses at the end of the presentation but first...  
what is the importance of these regions?**



# Regional Gas Consumption 1990 - 2016



Source: BP Statistical Review 2017



# Global Gas Demand and Trade 2016

BCM

	DEMAND	TRADE (Imports)		
		PIPELINE	LNG	TOTAL
North America	968	143	9	151
Europe	488	416	56	472
Asia/Pacific	723	66	242	308
Russia/CIS	542	61	-	61
Central/South America	172	17	16	33
Middle East	512	27	14	41
Africa	138	9	10	19
<b>TOTAL</b>	<b>3543</b>	<b>738</b>	<b>347</b>	<b>1085</b>

Source: BP Statistical Review of World Energy 2017

**North America, Europe and Asia/Pacific account for 86% of global gas imports; Europe accounts for 44% of pipeline gas and Asia/Pacific for 70% of global LNG imports**



# **MARKETS, EXCHANGES, HUBS, FUTURES: SOME DEFINITIONS/EXPLANATIONS**



## What is a Commodity Market?

- | A Market is a place where you can always sell and always buy
- | The only question is – at what price?
- | If you can always buy and always sell a commodity in a market, then you can always buy and always sell derivatives.

**Pricing in liberalised and competitive markets:  
financial as well as energy regulation**





# Markets and Exchanges

**These play a vital role in the liberalisation process**

- ▮ Allow for price discovery
- ▮ Enable risk management

**Physical markets**

- ▮ Over-the-counter: OTC

**Financial markets**

- ▮ Futures contracts

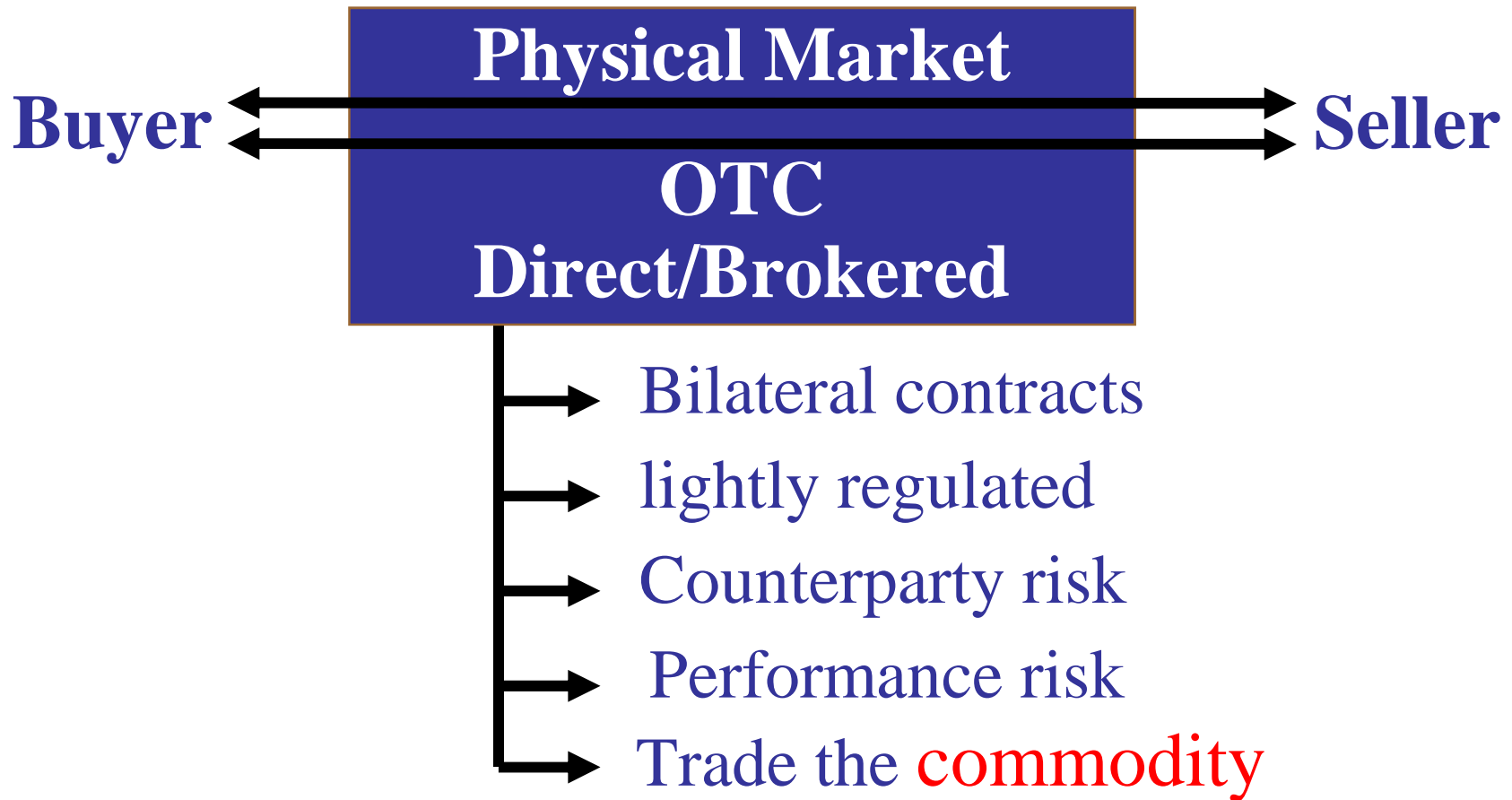
**Exchanges: both prompt and forwards**

- ▮ NYMEX, ICE, EEX, POWERNEXT

**Pricing in liberalised and competitive markets:  
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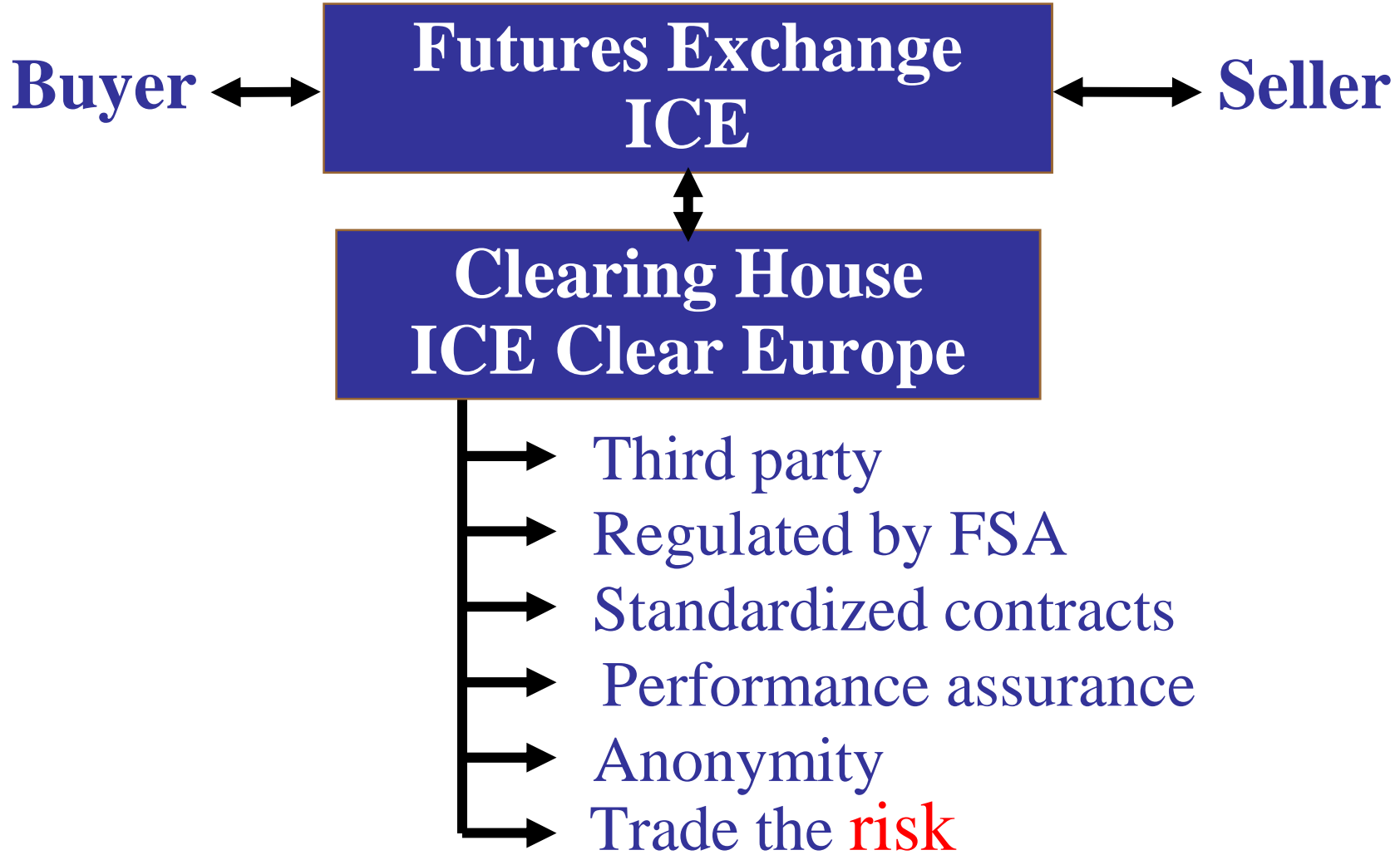


# Physical Market





# Financial Market





# What is an Exchange?



A Place/Forum Where:

securities or commodities are bought, sold or traded  
in an open but **regulated** environment



# What is a Futures Market/Contract?

- | **Regulated** market where contracts are traded on 'Exchanges' and financially guaranteed
- | **Standardised** 'paper' contracts:
  - | Quantity (clip size) & quality (product specification)
  - | Defined trading periods and expiry dates
  - | Help concentrate **liquidity**
  - | Often 'Benchmark' contracts
- | High 'gearing' through margin process:
  - | 'deposit' to trade often only ~10% of contract value
- | Price **transparency** throughout traded curve
- | Ability to 'sell short' as well as 'buy long'
- | **Anonymous** trading:
  - | Allows 'big' and 'small' participants to trade together

**Futures provide the ability to separate price from supply**



## Physical and Virtual Hubs

- **A physical hub: where pipelines carrying substantial quantities of gas cross (each other or a border) usually include storage**
- **A virtual hub: a location inside a country/trading region which is deemed to be where (all) gas is bought and sold**
- **Characteristics of hubs (physical and virtual):**
  - **Have high liquidity, high volume (depth), often high price volatility**
  - **Create price discovery – a national/regional benchmark**
  - **Are a true market place, reflective of supply/demand**
  - **Are not just a physical transfer point but also attracting ‘speculative’ trading**

**A hub is not just a place where pipelines cross, it is a marketplace and trading location; gas hub/LNG hub(?)**