

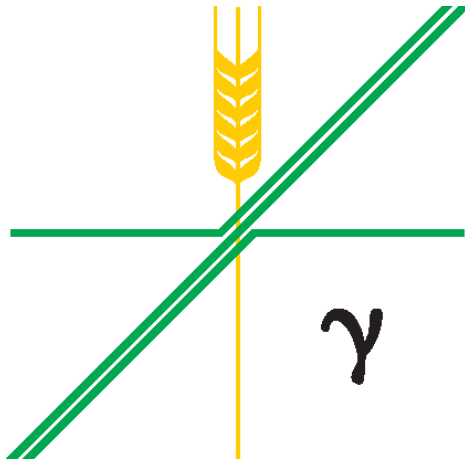


energyriskevents.com/europe 7-10 October 2013, London

MANAGING RISK IN EUROPEAN ENERGY MARKETS

Energy Risk SUMMIT EUROPE
Energy Trading Stream: October 8th 2013

The Relationship between Oil and Gas in Europe – and its Future

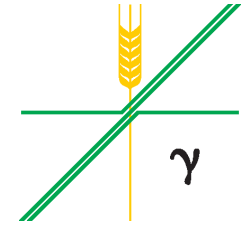


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Today's Goal:



To understand how this dynamic relationship can be modelled, priced andtraded

- The issue of oil versus gas pricing has been in the headlines for Europeans constantly for the past years.
- RWE recently won an arbitration against Gazprom on this very issue.
- The now significant volumes of LNG in the European market are potentially of great importance.

The Approach

- Analysing price levels and changes, forward curves and their implied volatility as well as implied correlation
- Understanding Fundamentals "like a trader"
- Understanding shifting benchmark composition
- Understanding marginal price setting mechanisms and marginal supply / demand curves

Use 'Best in Class' Risk Analytics

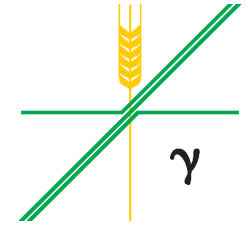
- The dataset: ICE Brent, NBP, ZEE, TTF, PEG, WBC (Baumgarten) in €/MWH
- Stationarity (ADF), Rolling Correlation (Eydeland), Cointegration (Engle Granger relationship), ECM framework ...
- Neural Networks offer significant predictive capability

The Results

- ...

EIA conversion factors: 1 barrel of crude = 1.69 MWH, 1 therm = 0.0293 MWH

Structure:



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II **The Big Picture**

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III **Oil, Gas and LNG**

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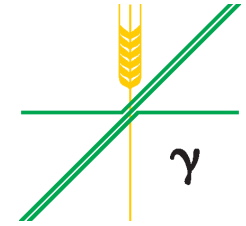
IV **Quant Analytics**

- European Gas hubs, recent developments, some numbers
- Crude Oil and Natural Gas in Europe: old and new facts
- Some statistical analysis
- Some recent applications

V **Summary of Results & Questions**

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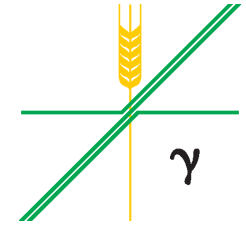
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What drives markets?



Making Money, or Not Losing Money or Managing Cashflows

- Banks – customers (producers, consumers, corporates...funding etc)
- Investors (10 types of funds)
- Hedgers & Traders

Investors

- Funds -

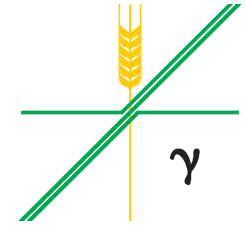
Research – generates market view and trade ideas

- Academic
- Practitioner
- Proprietary

Quantitative Analytics

- Measures risk
- Consolidates risk
- Predicts risk

What do all market players have in common?



Market Risk

- ...
- ...
- ...

Credit Risk

- ...
- ...
- ...

Legal Risk

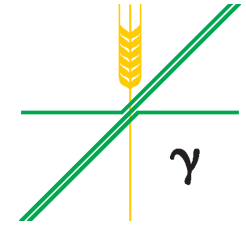
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Operational Risk

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- ...
- ...

Fundamental Analysis is ALL inclusive

Why do we care?



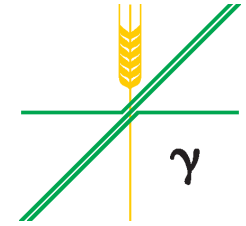
As an exciting market dynamic

- ❑ Money can be risked, made and lost
- ❑ It is a constant theme for investors, banks, utilities, pension funds with a capex of €35-70 bln per annum.
- ❑ It is complex and challenging to understand and model.

From a Banking perspective

- ❑ The emergence of a new asset class means that it has significant revenue generation potential and commodities have generated in excess of US\$5 billion of revenue annually since 2005.
- ❑ Global commodity AUM (assets under management) have grown from US\$ 10 bln in 2001 to US\$ 400 bln by 2011
- ❑ This coined the phrase “The Fourth Commodity Supercycle” (Global Commodity Paper #11, ML BoA, 2010). This is the time when real world GDP growth expanded by roughly 5% annualised, facilitating a surge in commodity demand in Emerging Markets – who accounted for a dramatically increased share of world GDP growth compared to any other time in history.
- ❑ Now we look at commodity markets “Post Supercycle”

We also care because...



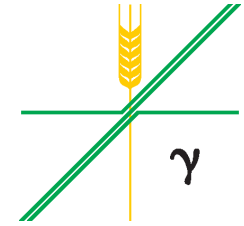
As the EU-27 we are driving towards a “unique gas market”

- We presume we are “there” in oil
- We have a GTM and ETM – Gas and Electricity Target Models
- It is all supposed to benefit the consumer and taxpayer....

The profound transformation of European Gas markets

- An ongoing process of deregulation which started in 1991
- Is proceeding at a different pace in almost every country, ENI is still 40% owned by the Italian government, for example.
- We had a series of Russia gas interruptions to the EU via Ukraine.
- Aims for a unique single market ???
- Has been dramatically affected by new technologies such as CCGT
- Has a dynamically shifting import composition
- It became a real world investment theme. By 2011 the IEA forecasts a “Global Golden Era of Gas”, The EU Third Package for Gas takes effect. The OIES publishes two substantial books which take data to all along with analysis – one on EU Gas Demand (Honore) and one on Global LNG Trading (Stern).
- We are aiming to comply with EU 2020 goals.

We have to be careful what we wish for..



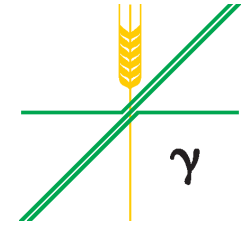
Already we must be planning for the 4th Gas Package

- ❑ Regulators and Politicians come and go, Utilities and Trading Companies persist (sort of).
- ❑ There are 10 large trading companies in the world .
- ❑ There are 7 large electricity companies – one generates almost 25% of EU total
- ❑ There are 10 large European gas companies (Russia sends 200bcmpa to Europe). Annual sales volumes and cumulative.

❑ ENI	95	95	
❑ E.On	80	175	
❑ GasTerra	78	253	
❑ GdF	60	313	
❑ RWE	35	348	
❑ Wintershall	34	383	
❑ Centrica	32	415	
❑ EdF	28	440	+12 Edison? A total of 40
❑ Gas Natural	25	465	
❑ Distrigas	18	483	

- ❑ UK & Germany consume 100, Italy 85, Holland 45, France 45, Spain 35, Turkey 20.
- ❑ The balance of advantage shifts between IOC's and NOC's over time

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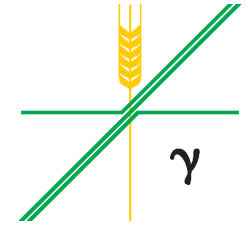
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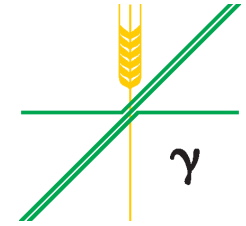
The Big Picture



The world of choices

- Global Economics
- Global Equity Strategy
- Global Demographics & Pensions
- Global Leveraged Finance Strategy
- HNWI's
- Latam Strategy
- EEMEA
- Asia
- Rates
- Securitised Products
- High Yield & Leveraged Loans

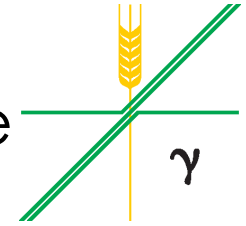
Commodities Advantage: China vs the rest



Can China's continued slowdown be countered by recovery elsewhere?

- ❑ Global growth remains weak in aggregate but it is becoming clear that the latest "slowdown scare" has come to an end and global industrial production growth is in the process of recovery, albeit at a relatively subdued pace. In normal circumstances this would be a clear positive for industrial commodity prices. However the current story is more mixed largely because China's growth is diverging substantially from that being achieved in the West.
- ❑ A recovery in the West should alleviate some of the downward pressure on the industrial commodity complex but the importance of China (for basic materials use in particular) suggests caution remains warranted. Paradoxically after months of worry about fragile developed world economies, China has become the main drag on activity important for demand .

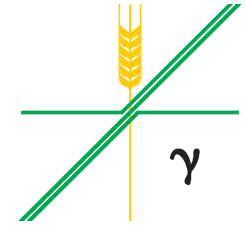
Commodities: Finding returns after the supercycle



Interesting questions

- How would you define your current level of commodity investment? (overweight, neutral, underweight, zero)
- What do you expect your level of commodity investment to be over the coming twelve months?
- What do you currently see as the largest challenge to investing in commodities? (correlation with other asset classes, negative roll yields, high volatility, regulatory changes, timing)
- Which investment approach do you think will see the greatest asset flow?
- Over the next twelve months which form of trading will offer the best opportunities to extract alpha from commodities? (relative value, cross asset class, fundamentally based directional trading, quantitative based directional trading, volatility)

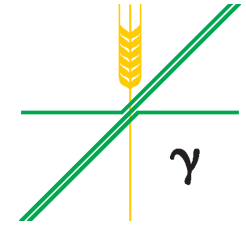
Commodities: “Regime change”



One bank's list

- Regime change
- Regime change analysis
- Trading recommendations
- Short-term price forecasts vs Forward Prices
- Long-term price forecasts vs Forward Prices
- Price forecasts: old vs new
- Quarterly energy, iron ore & steel forecasts
- Commodity portfolio allocation
- Economic outlook: Looking under the hood of recovery
- Anchor themes
- Oil
- US Natural Gas
- European Gas and LNG
- Thermal Coal
- Carbon
- European Power
- grains, oilseeds, livestock, steel and iron ore, aluminium, copper, zinc, lead, nickel, tin, gold, silver, platinum and palladium

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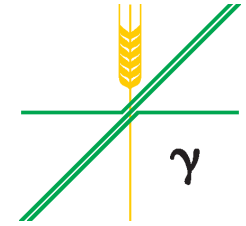
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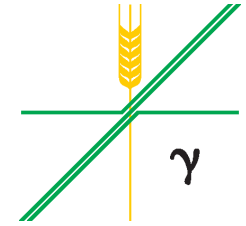
The oil dynamic – a global story



The market dynamic – as a Quant would say "its non-stationary"

- ❑ The price elasticities dominating markets from 2000-present are increasingly those of Emerging Markets – especially China
- ❑ There was a well-forecasted shift toward and increasingly OPEC-dominated supply base
- ❑ Supply side dynamics shifted dramatically as we moved away from a period of under-investment in infrastructure
- ❑ Supply side lags were, and continue to be, slower due to the changing complexity of the supply chains for US transportation fuels
- ❑ A new global petroleum S&D dynamic, with countries like Brazil achieving energy balance and Indonesia leaving OPEC as it began to consume all of its own production
- ❑ Data quality downgraded and became semi-public as we move across the bifurcated supply base –from IOC to NOC and OPEC
- ❑ A major shift in the US Dollar Index with all its attendant impacts on commodities around the world. This inverse relationship between commodity prices and the US\$ means that a rising oil price exerts downward pressure on the US\$ exchange rate given the US is a major oil importer. With an economy twice the size of China it ran a trade deficit in 2011 of US\$560 bln (US\$ 2.1 exports, US\$ 2.7 imports) and had net oil imports of US\$ 325 bln.

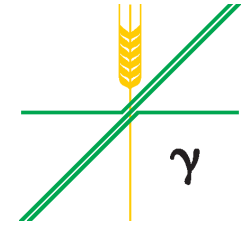
Oil – key points TODAY



The market dynamic –

- ❑ Of current concern geopolitically is Syria, Libya and Egypt, and while the risk premium has been considerable it has eased.
- ❑ In Syria a diplomatic solution for international inspectors to secure, monitor and eventually destroy the chemical weapons now looks more likely...
- ❑ In Libya, if the current severe disruptions affecting over 1 Mb/d of light sweet crude are not at least partially addressed in the next four-six weeks....
- ❑ The fundamental oil outlook is for a broadly balanced market...
- ❑ The starting point for fundamentals is more bullish. Crude stocks are very tight in Europe and Japan and gasoil stocks are very tight elsewhere...
- ❑ Despite the upside risks from geopolitics...
- ❑ The forecast for front month NYMEX WTI increased by US\$5.- in Q4 2013, as the mid continent reconnected with the USGC...
- ❑ Shale oil will not have an impact on global crude oil prices in the next five years because...

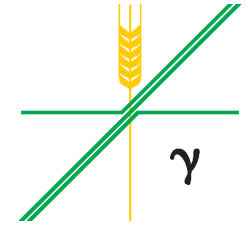
Oil – key points TODAY



In the US

- ❑ The increase in crude runs and build out of transportation infrastructure have led to significantly tighter price spreads for Brent-WTI than have been seen since 2010. As Bakken crude continues to be sent to the East and West Coast Refiners, the bottlenecks around Cushing will continue to clear. This is likely to lead to tighter WTI spreads against LLS through the rest of the year. As a buffer of transportation capacity emerges, the Midwestern Refiner will have to compete in order to keep crude in the region. This competition should, in turn, also keep the Brent-WTI spread narrow though 4Q13. US\$4.- /bbl?

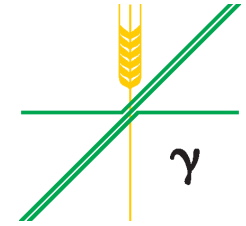
The gas dynamic – a European story



The unique market “we all want” – GTM and the 3rd Package

- ❑ Division of the EU into entry-exit (EE) zones; EE tariffication; Capacity Allocation (CAM) mechanisms i.e. auctions, with descriptors; Congestion Management Mechanisms.
- ❑ Each EE to be 20+ BCM (no national boundary assumption); have NG from 3 different sources; a churn rate of 6+; a residual supply index of more than 110% for 95% of days per annum. Only UK, France, Germany, Italy, Spain, Holland & Turkey are nationally of this size. In May 2012 the Dutch GTS connected to German Gasunie Deutschland (1 of the 6 Gaspool TSO's).
- ❑ Recognises that 50% of “required” investment will not take place without some sort of federal intervention and that investment is “40% constrained by permitting and 60% by a combination of access to finance and regulation”.
- ❑ Identifies that Generation investment needs vastly exceed infrastructure needs and estimates €70 bln of capex needs EACH AND EVERY YEAR to reach 2020 targets. We have never exceeded €35 bln in any one year (2008). For perspective a large EU-27 utility might have a market cap of €25-30 bln.
- ❑ Notes infrastructure is publicly owned and so returns are nationally regulated. Inter-country (cross-border) connections are financeable at the credit rating of the weaker country.

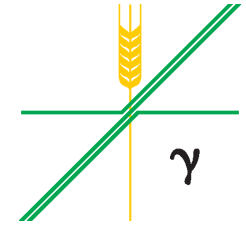
The gas dynamic – LNG



Asian LNG outlook remains strong

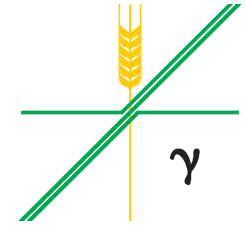
- ❑ We still expect strong global LNG demand growth driven by Asia, US LNG projects have contributed to heightened Asian price sensitivity, however we expect US volumes to be limited and the cost curve ex-USA remains challenged restricting downward pressure on LT contracts terms. On oil/gas forward curves we believe LNG buyers would be indifferent between US gas linked and oil linked contracts within five years.
- ❑ US LNG approvals gain pace, may result in FID delays on greenfield LNG projects. A further 70mtpa of unsanctioned global LNG capacity is likely required by 2020E and 180mtpa by 2025E. The US will likely supply 60mtpa by 2020E.
- ❑ China and India's LNG demand is supported by price reform; Thailand and Singapore are both significant new markets (c. 15mtpa by 2020E). China now has a significant LT contract book (45-50mtpa by 2016E), we expect India to be more active in securing LT contracts (eg. Mozambique)...
- ❑ Stocks with significant exposure to growing LNG volumes include KBR, CB&I, Technip, JGC, Anadarko, ENI, GALP, Novatek, Oil Search, Ophir – BG Group remains most exposed to the tight spot LNG market...
- ❑ In recent years Qatargas has signed 5 supply agreements that commence delivery in 2013, with buyers including Japanese utilities and Chinese and Malaysian energy companies. In total an additional 10mtpa will go to Asia...

Of the €220 bln the EU needs to invest by 2020



- ❑ €140 bln is for high voltage electricity transmission: Of which €70 bln onshore, €30 bln offshore, €40 bln for storage and €70 bln for smart grid apps.
- ❑ Three priority Gas projects
 - ❑ Southern Gas Corridor
 - ❑ North-South Gas Connectors (central to eastern europe)
 - ❑ North-South Gas Connectors (within western europe)
- ❑ Four priority Electricity projects
 - ❑ Northern Offshore Grid
 - ❑ Baltic Interconnector
 - ❑ Pyrenees Power Link
 - ❑ Power links in central and southern europe
- ❑ THIS IS BASED ON 2020 GAS DEMAND INCREASING BY 50 - 150 MTOE (million tonnes oil equivalent)
- ❑ €70 bln is for high pressure gas transmission, gas storage, LNG terminals and reverse flow infrastructure. THIS IS INCREMENTAL to Renewables which today received €35 bln in support subsidies in 2009; Of which Germany €11, €5 each Italy & Spain, €3 France, €2 each UK & Sweden – paid on actual generation and not installed capacity.
- ❑ Wind and Solar power have dramatically affected the role and importance of gas in Europe.

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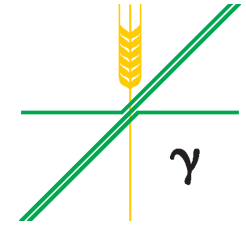
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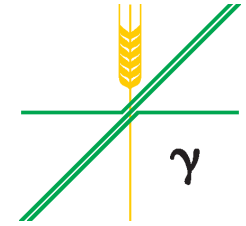
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European Gas Hubs (some numbers)



- In 1H2013 total volumes traded on all European gas hubs was 10,530 TWh, down 3.6% yoy. Of which:
 - UK NBP, -11%.
 - Dutch TTF, +27%.
 - German Gaspool, +23%.
 - NCG, +22%.
- NBP volumes were reduced as activity shifted to EU Mainland hubs and Intercontinental Exchange (ICE).
- Total volumes physically delivered on EU hubs 1H2013 +5% yoy.
 - Zeebrugge, +48%.
 - Gaspool, +14%.
 - NCG, +13%.

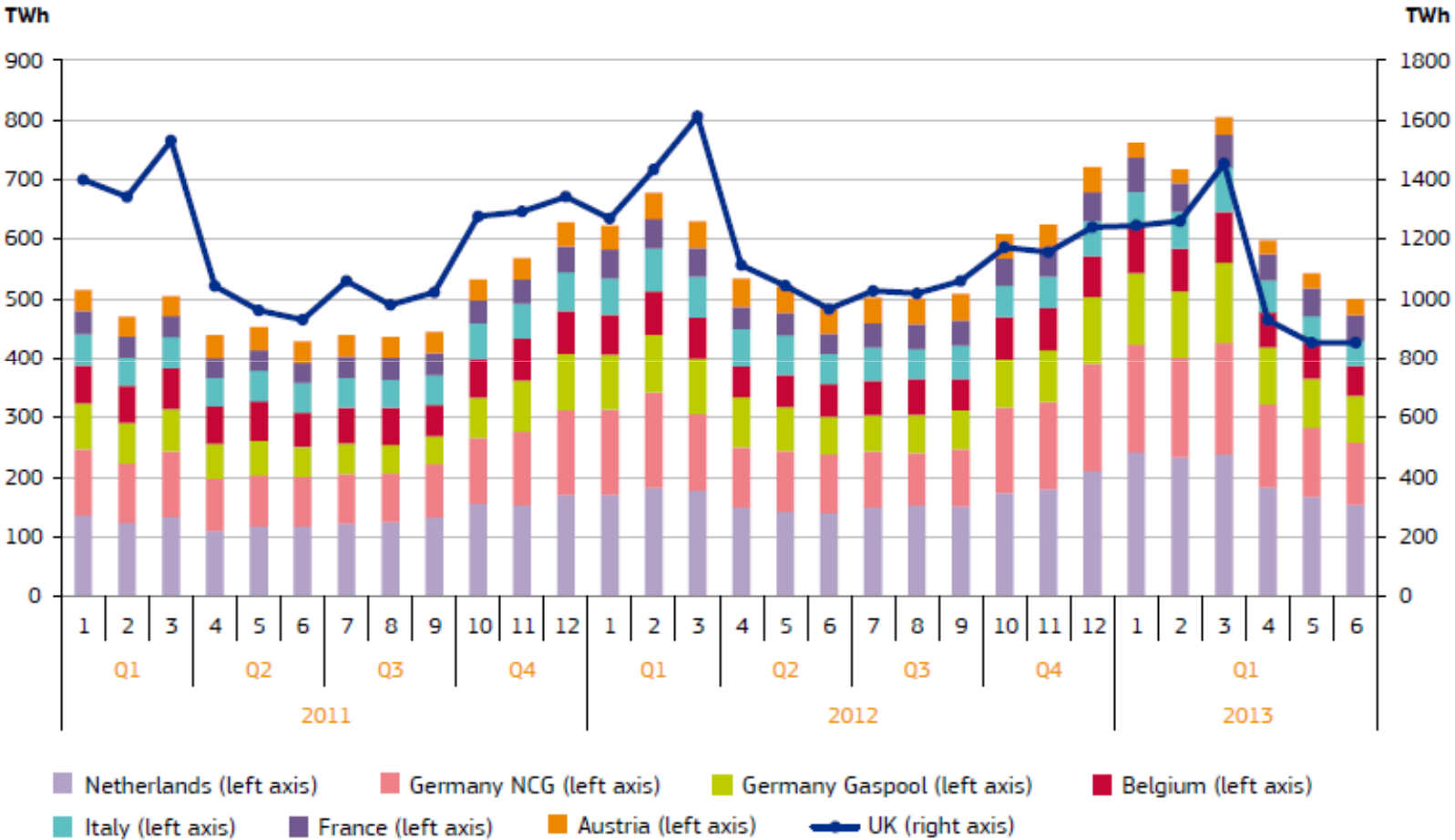
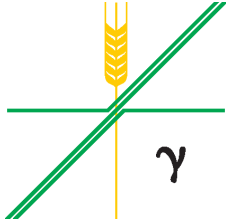
New European Gas Hubs



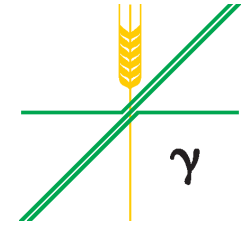
- Traded volumes on the Polish Power Exchange (PolPX) (launched in December 2012) hub have increased with 142 deals in the first quarter of 2013 and volumes reached 156 MWh in March 2013.
- First OTC transaction on PolPX delivered to the virtual point on 28 May.
- The Hungarian Gas Exchange was launched in January 2013, but initially had only two members as Hungary's regulations prevented overseas firms from trading on the exchange. This changed by June 2013 when the country's energy regulator granted limited trading licenses to three foreign trading companies.

Traded Volumes on European Gas Hubs

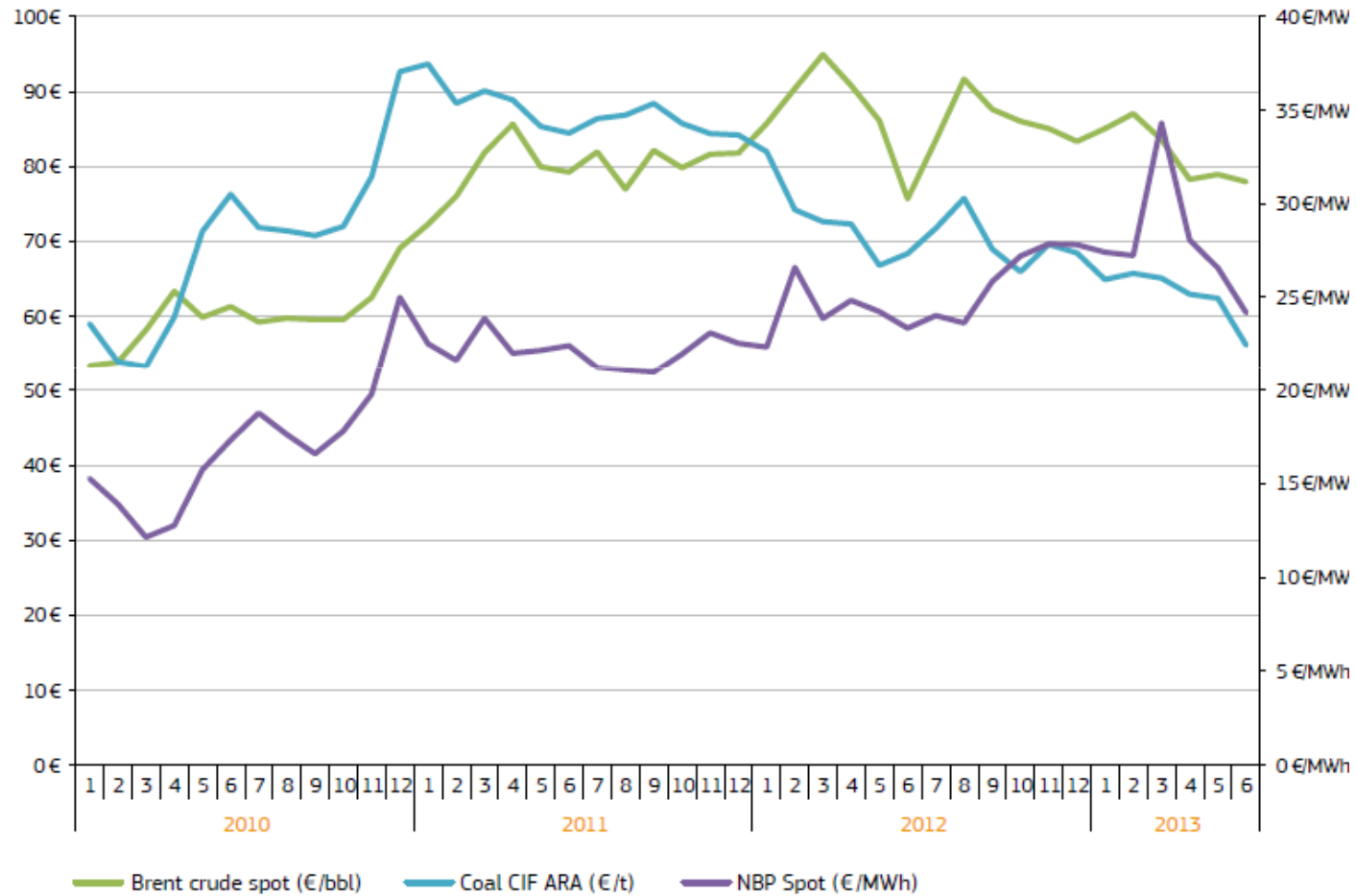
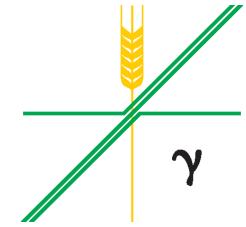
UK right axis – all the others on the left



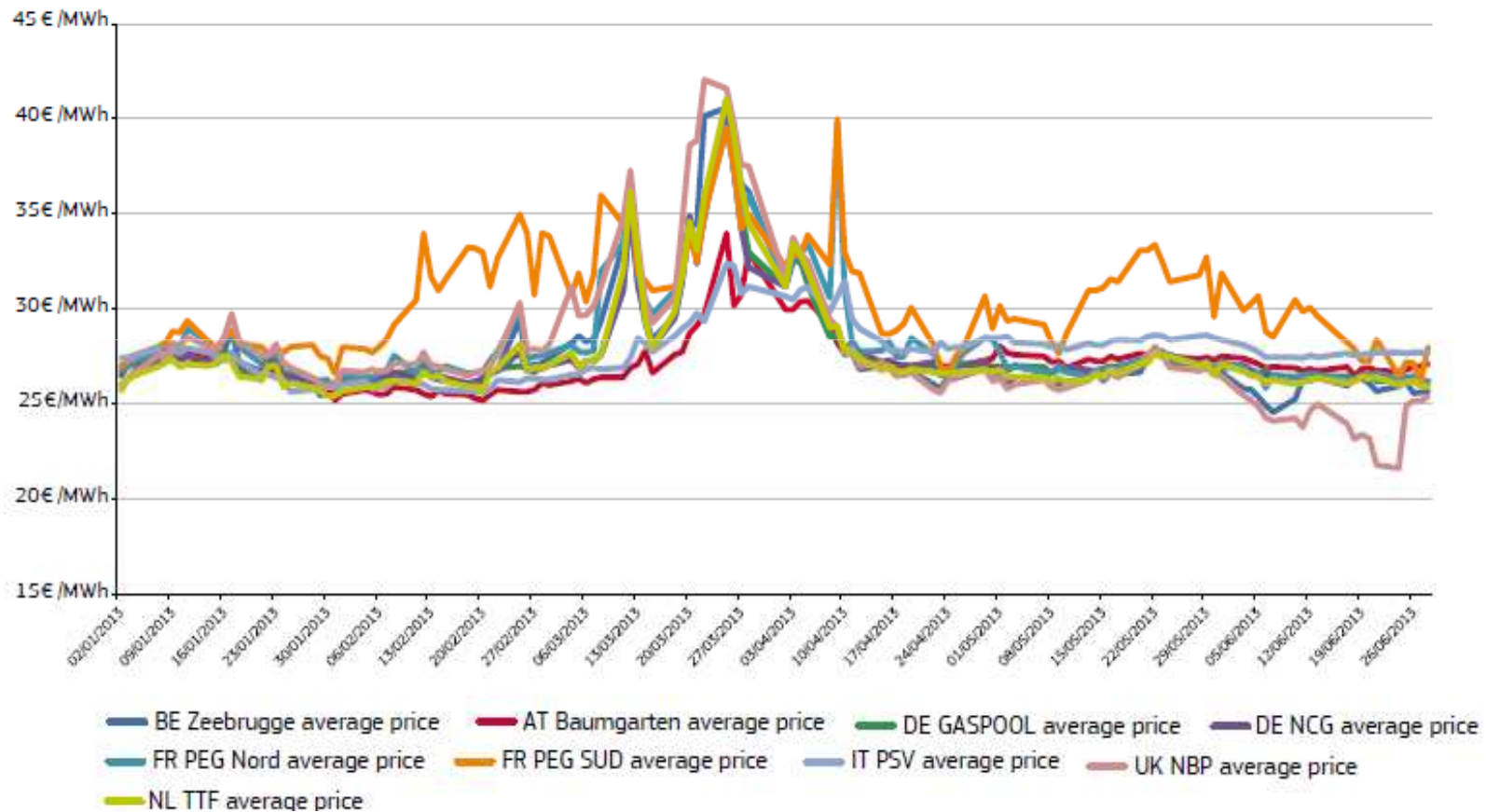
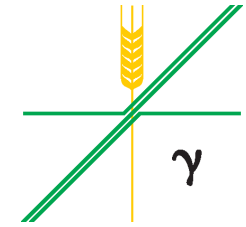
Comparison of wholesale gas prices



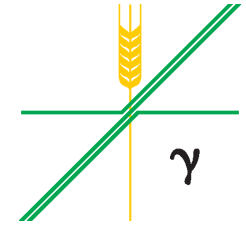
Spot prices of energy commodities in Europe



Average day ahead price on European hubs (2013)



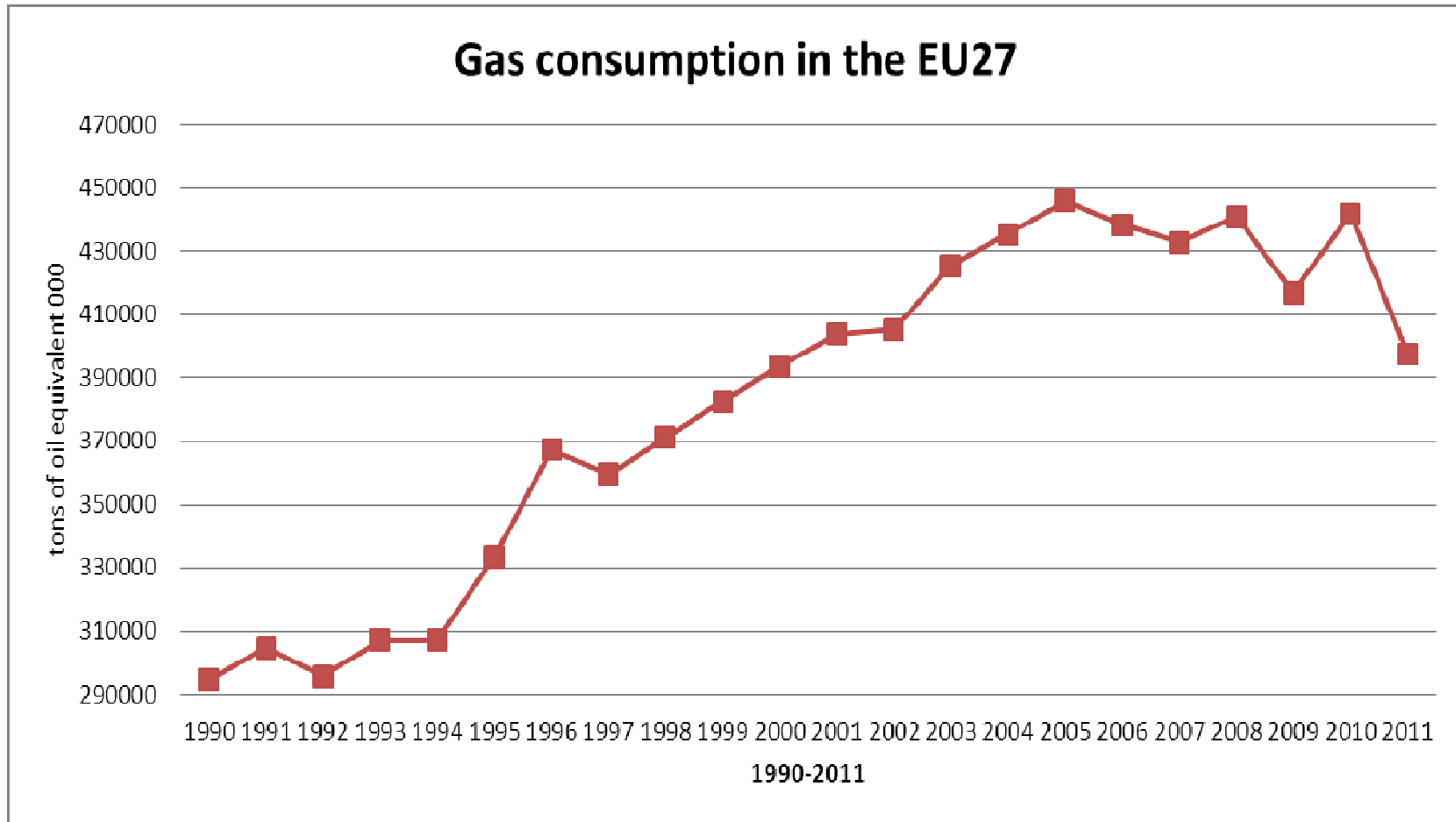
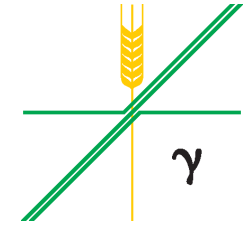
Statistical features of daily gas prices in European hubs (launch-2013)



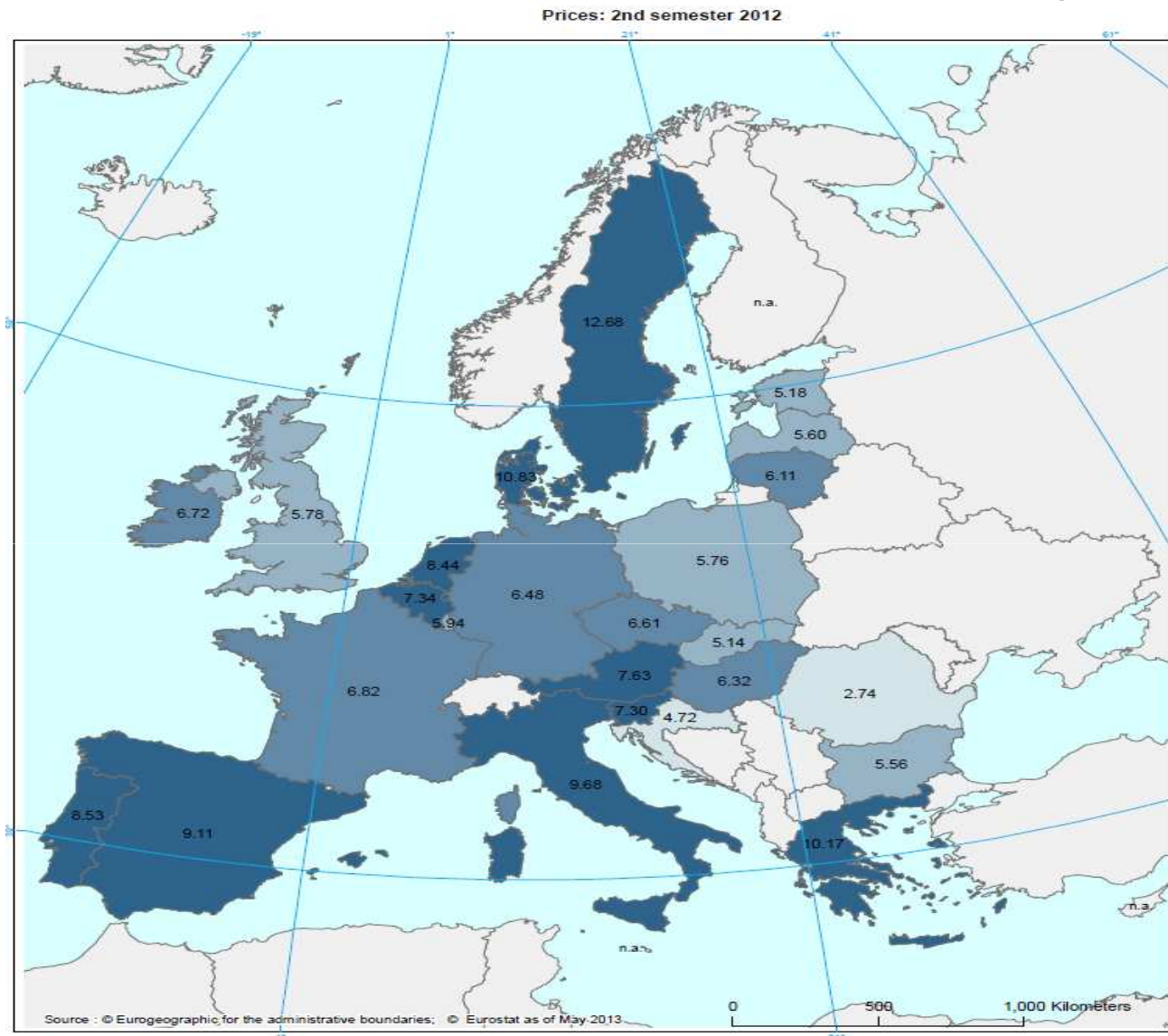
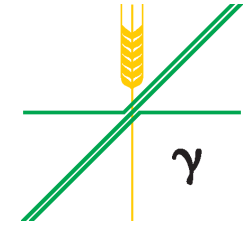
Main Statistical Features of daily gas prices In Europe by hubs

	NBP	Zeebrugge	TTF	CEGH	NCG	PNGM
Min	4.42	7.47	7.95	21.80	8.03	7.99
Max	57.85	36.59	35.30	28.49	31.95	29.03
Mean	15.30	21.62	21.56	25.94	21.78	21.56
Standard Deviation	8.18	6.00	5.80	1.50	5.51	5.68
Kurtosis	0.51	-0.36	-0.42	-0.17	-0.48	-0.45
Skewness	0.75	-0.72	-0.74	-0.94	1.23	-0.91
N. observation	4229	1200	1537	687	1528	1073

European gas Consumption (1990-2013)



Retail prices for households in Member states (2012)

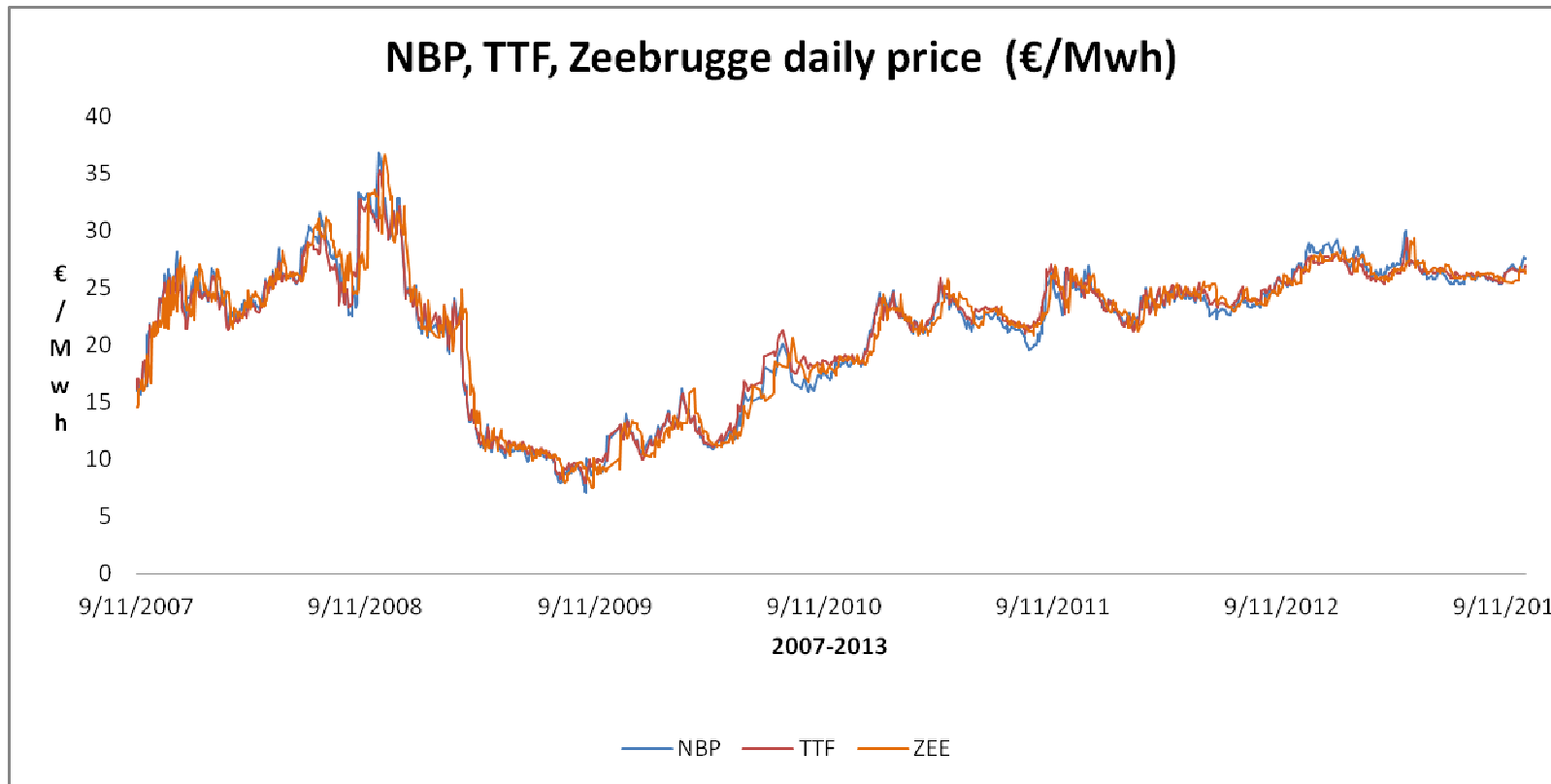
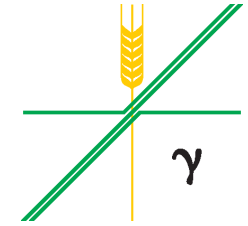


Prices per kWh (c€)

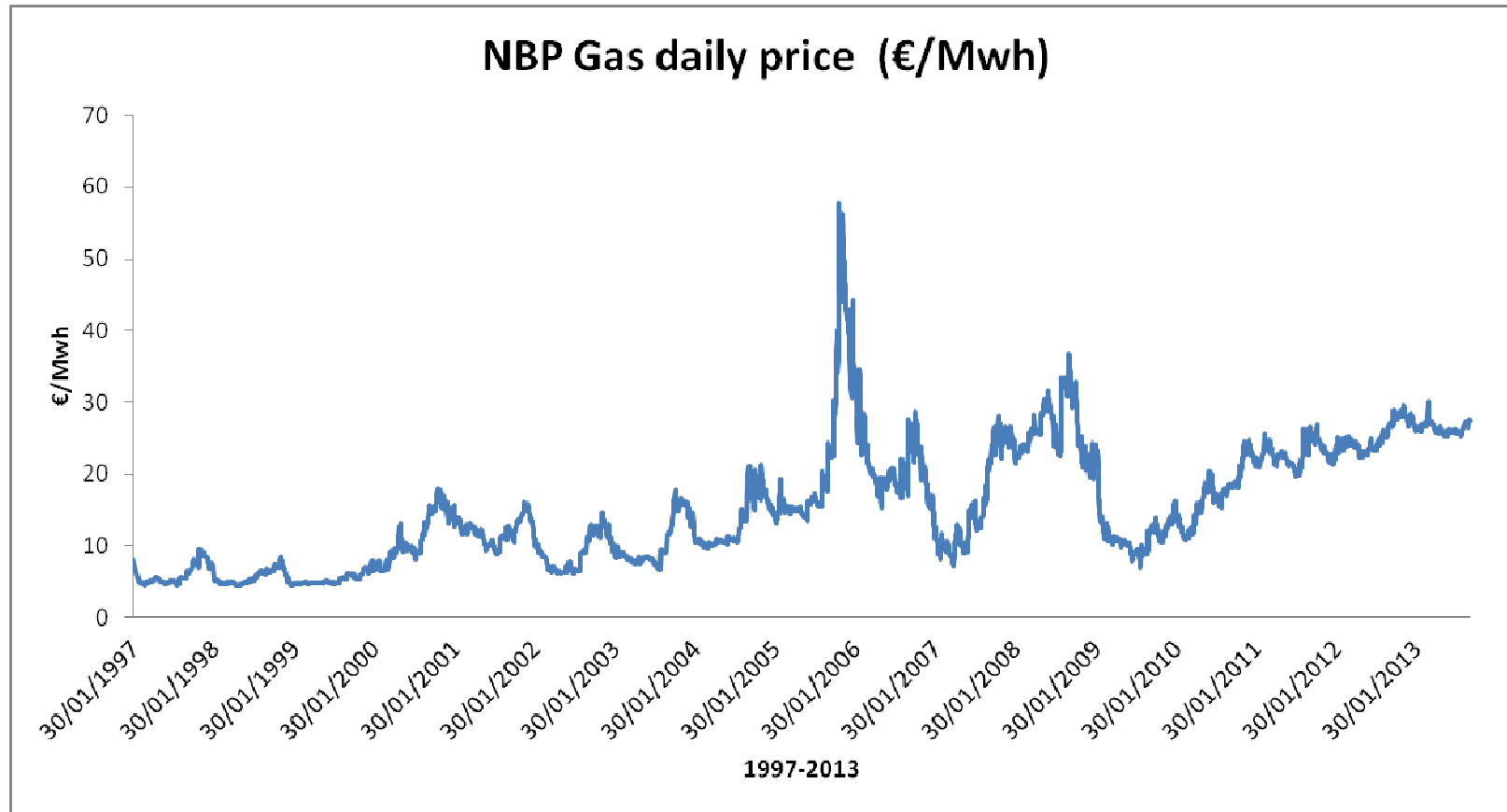
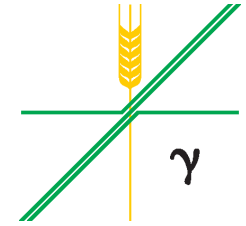
- no data
- < 5.01
- 5.01 - 6.00
- 6.01 - 7.00
- > 7.00

Band D2: 5.56 MWh < Consumption < 55.6 MWh

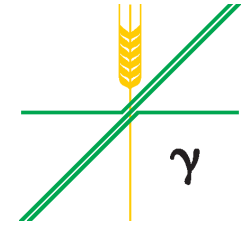
Price dynamics, European Hubs



NBP: historic dynamic

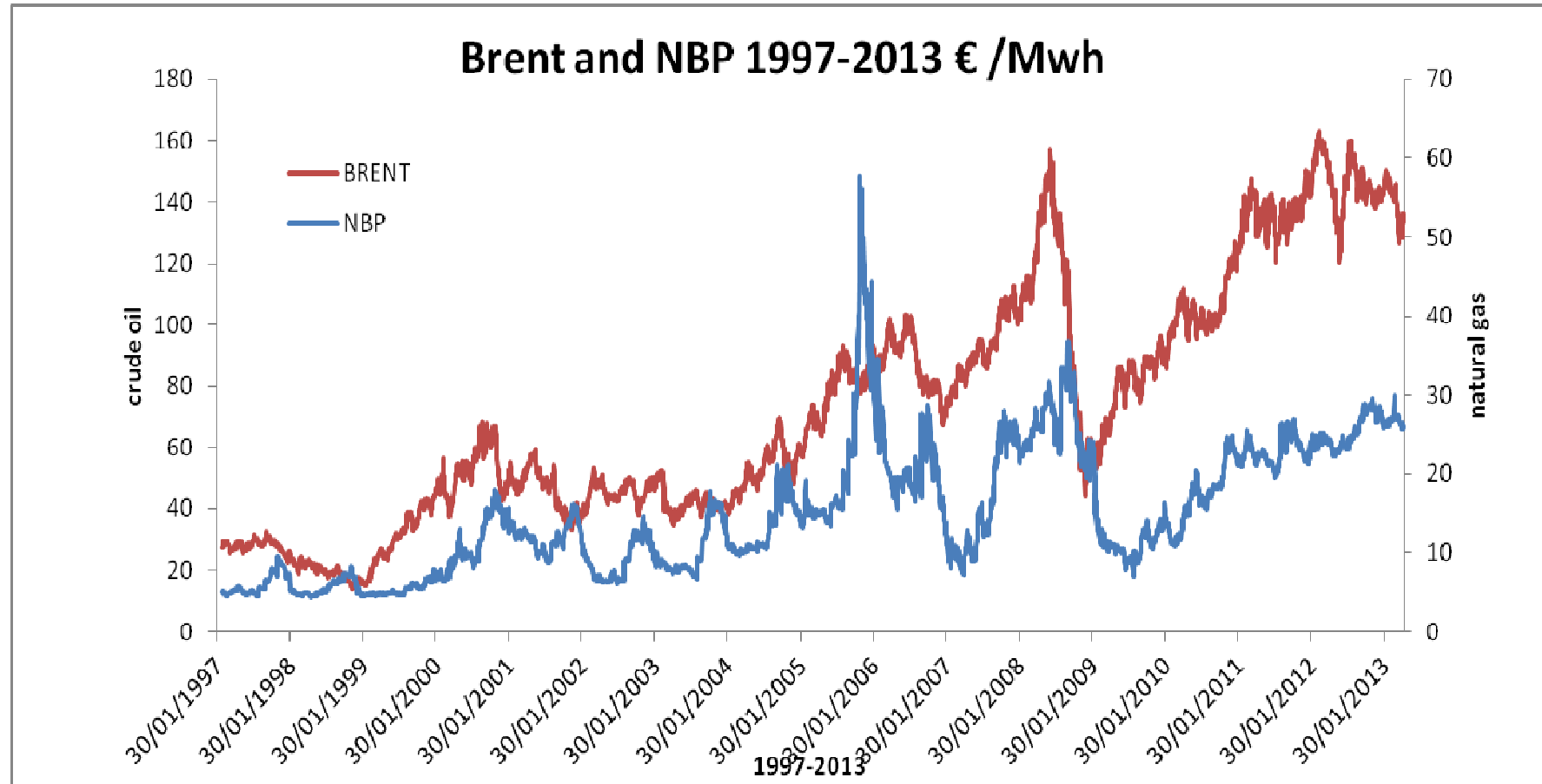
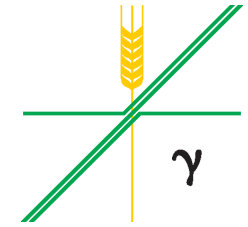


Crude Oil & Gas: A much debated story

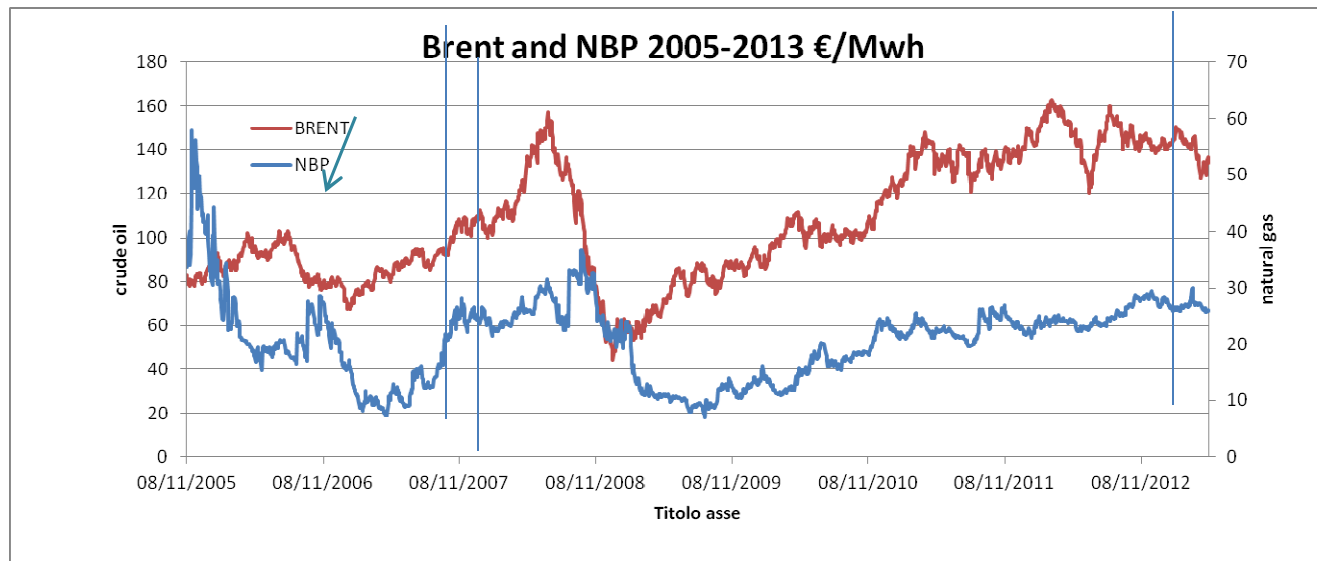
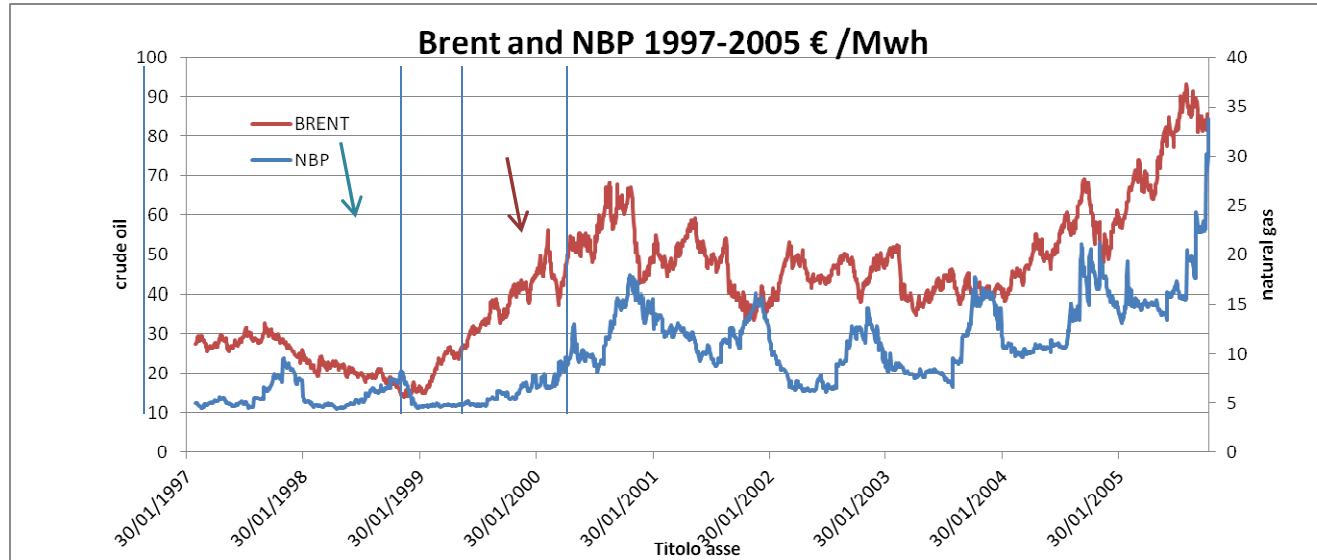
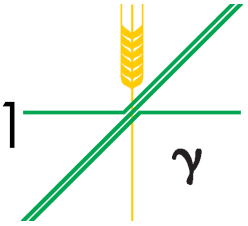


- Gjølberg and Johnsen (1998): (1992-1998) analysed co-movements between the prices of crude oil and major refined products. Found a high degree of integration and a long run equilibrium.
- Panagiotidis and Rutledge (2006): (1996-2003) investigated whether oil and gas decoupled. The existence of a cointegrating relationship prior to the inauguration of the Interconnector indicates that despite the highly-liberalized nature of the UK gas market, oil and gas prices were moving together in the long-run.
- Bachemeir and Griffin (2006): (1998-2005) found that crude oil around the world trades in a highly integrated way and that oil and natural gas are cointegrated in the long run and exhibit strong evidence of market integration.
- **From a Dynamic Commodity Trading perspective there is no a priori expectation of a sustaining relationship between Natural Gas and Oil.**

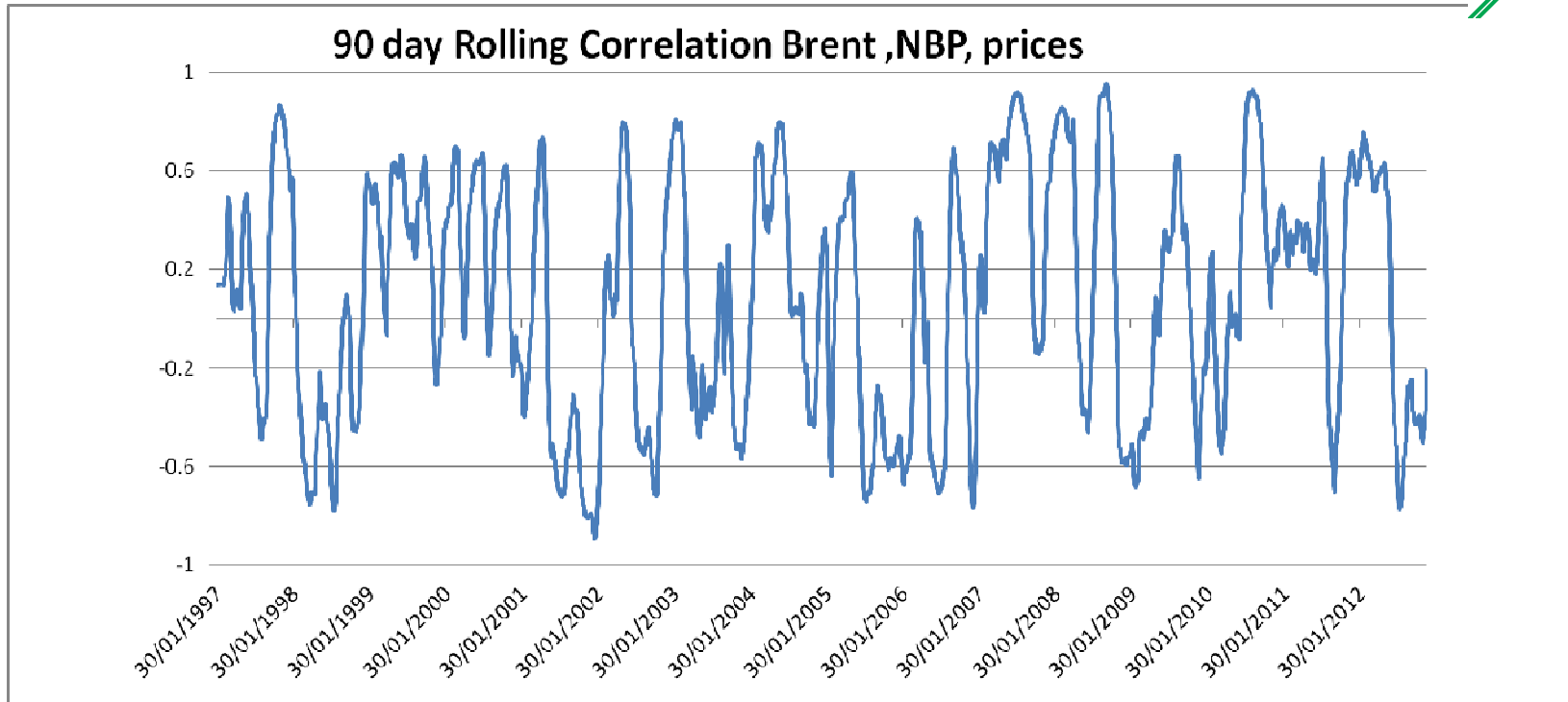
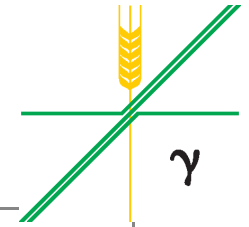
Have Crude Oil & Gas decoupled?



Crude Oil & Gas in Europe: 1997-2005 & 2005-2013 (A tale of two different markets)

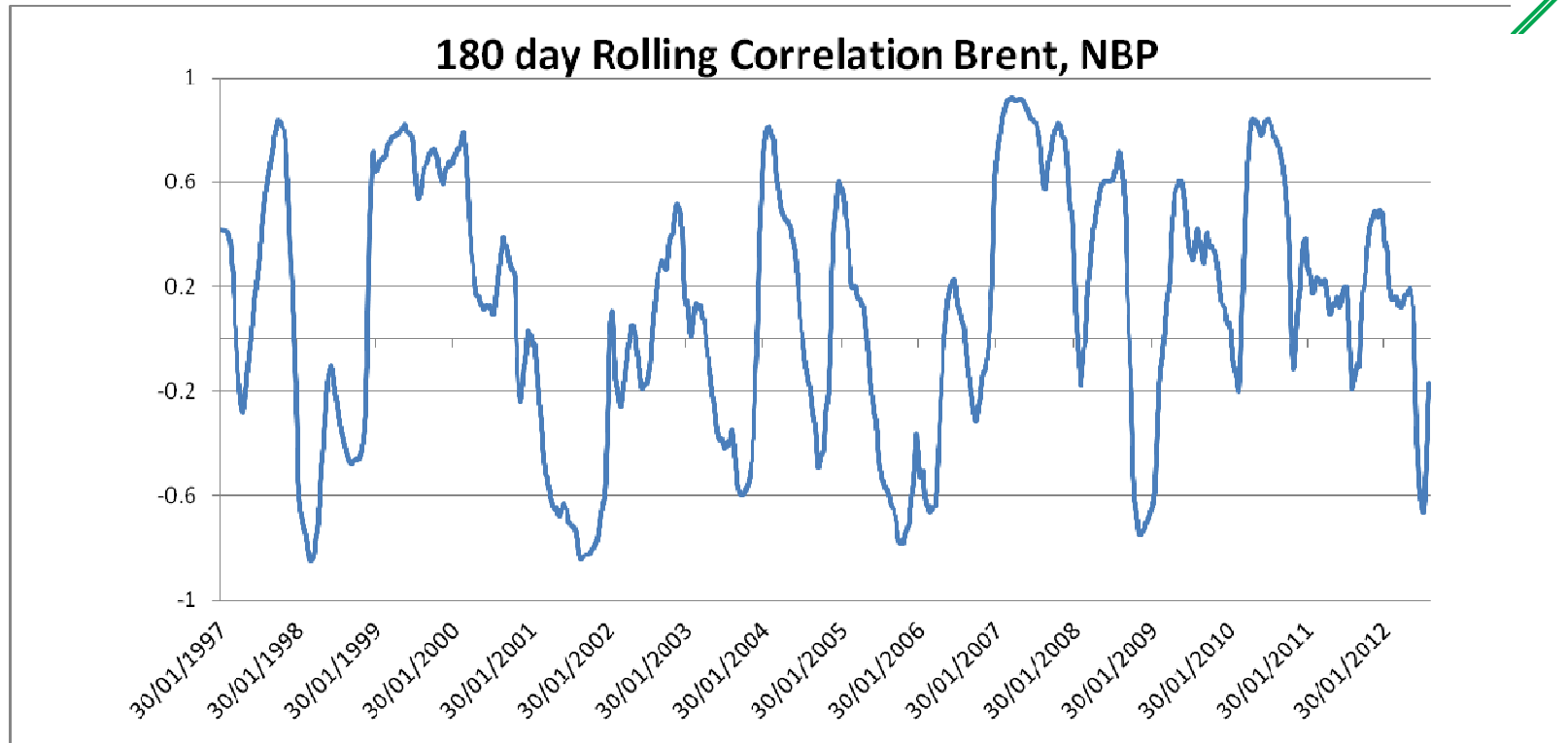
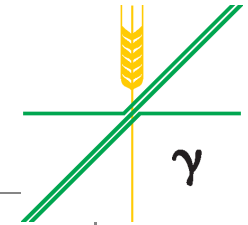


Brent, NBP Correlation



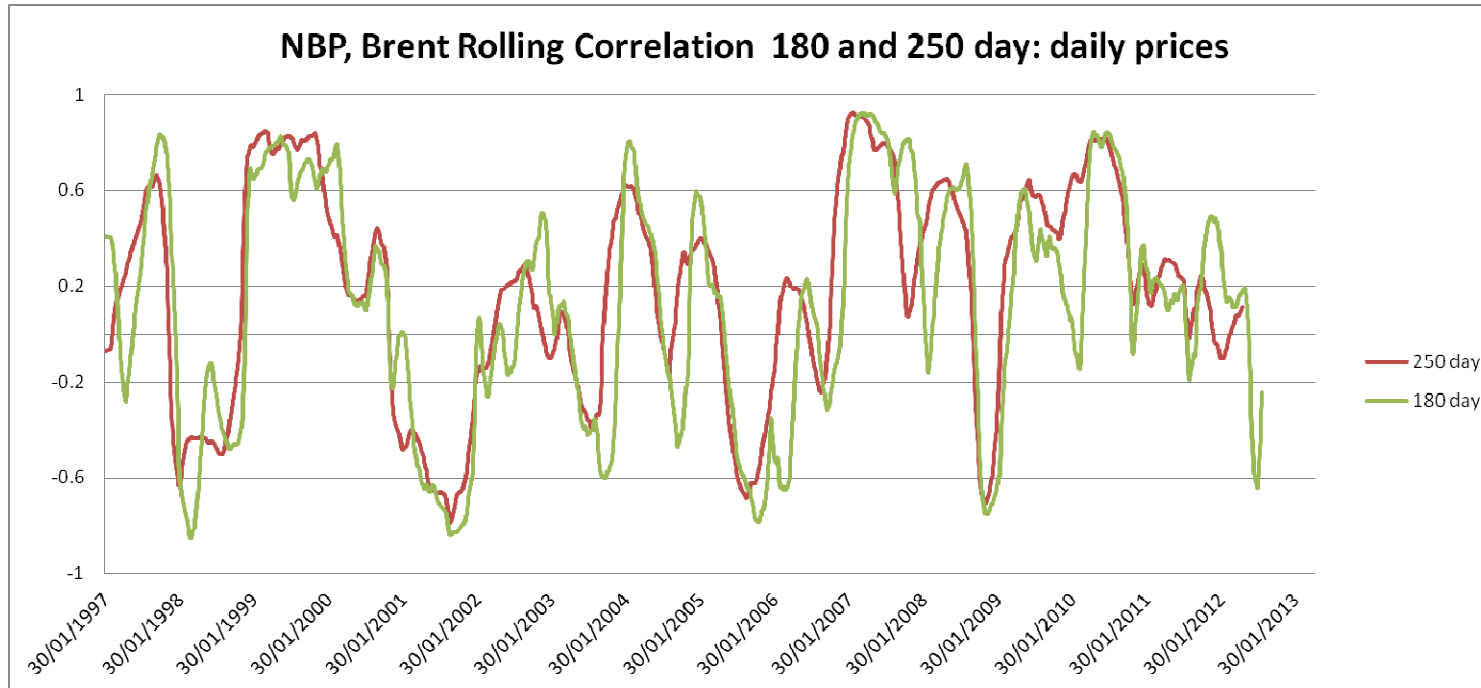
	Rolling correlation	unconditional
Average corr.	0.08	0.78
σ	0.48	
min	-0.85	
max	+0.92	

Brent, NBP Correlation



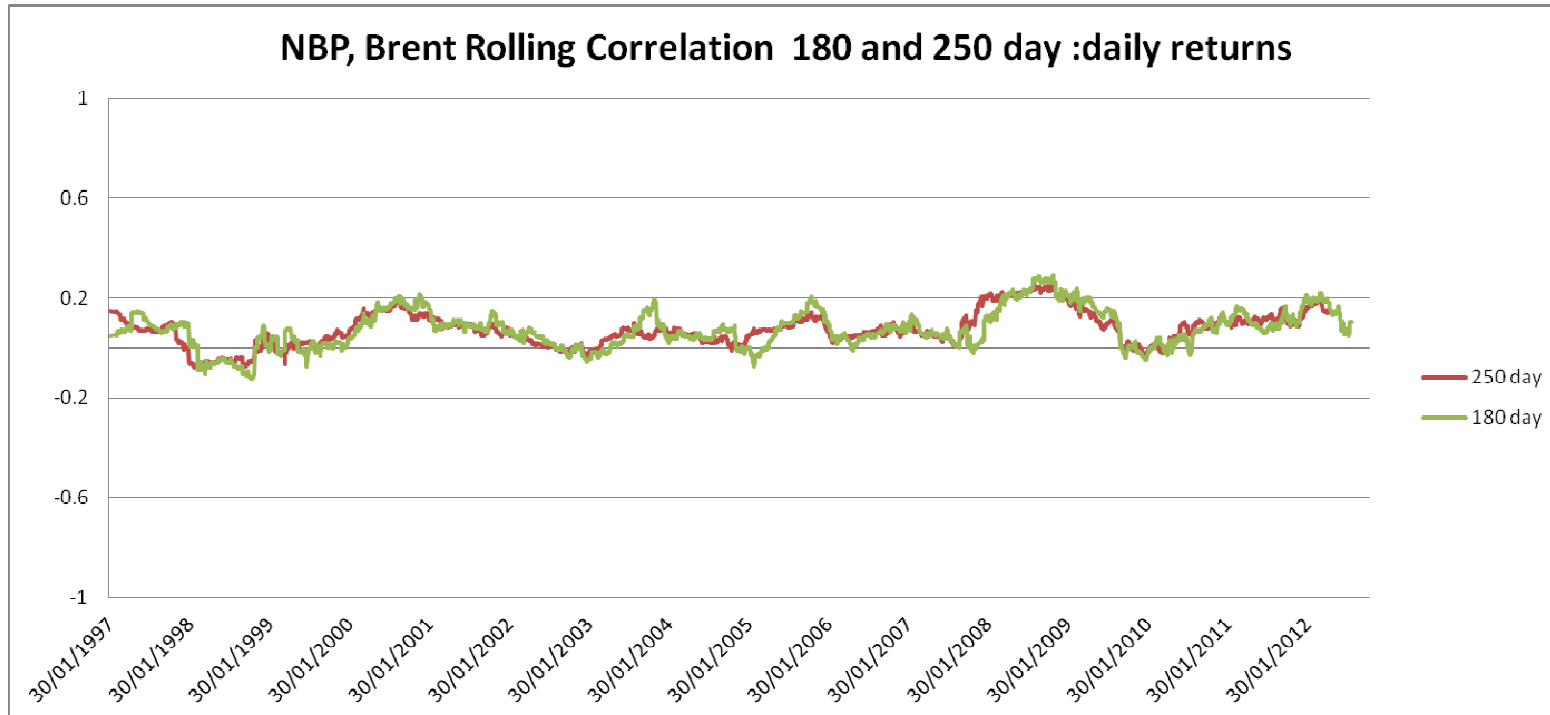
	Rolling correlation	unconditional
Average corr.	0.11	0.78
σ	0.48	
min	-0.89	
max	+0.92	

Rolling Correlation: Prices



NBP, Brent Rolling Correlation: daily prices				
	90 day	120 day	180 day	250 day
Total	0.783			
Average	0.082	0.085	0.114	0.179
St dev	0.488	0.500	0.484	0.446
Min	-0.894	-0.870	-0.851	-0.787
Max	0.954	0.925	0.923	0.924

Rolling Correlation: Returns



NBP, Brent Rolling Correlation: daily returns

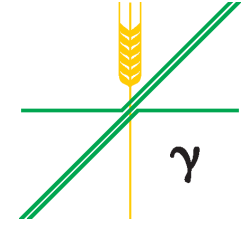
	90 day	120 day	180 day	250 day
Total	0.079			
Average	0.078	0.076	0.075	0.074
St dev	0.106	0.090	0.077	0.068
Min	-0.221	-0.149	-0.125	-0.078
Max	0.367	0.344	0.293	0.266

Rolling Correlation: Returns Another story?

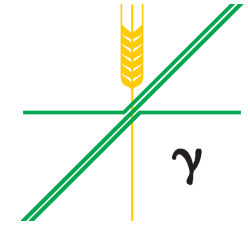
NBP, Brent Rolling Correlation 180 and 250 day :daily returns



Using Neural Networks to predict energy prices



-
- Advances in Decision Sciences, Volume 2012, Article ID 289810, 26 pages. doi:10.1155/2012/289810
 - **Research Article: Forecasting Energy Commodity Prices Using Neural Networks**
 - **Massimo Panella,¹ Francesco Barcellona,² and Rita L. D'Ecclesia²**
 - *1 - Department of Information Engineering, Electronics and Telecommunications (DIET), Sapienza University of Rome, Via Eudossiana 18, 00184 Rome, Italy*
 - *2 - Department of Social Science (DISS), Sapienza University of Rome, P.le Aldo Moro 5, 00185 Rome, Italy*



ESCP Europe Business School:

Visiting Professor in Dynamic Commodity Trading

Director, Research Centre for Energy Management (www.rcem.eu)

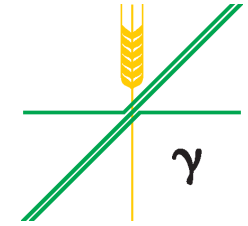
Managing Director, ESCP Trading Room (thetradingroom@rcem.eu)

Professional background:

David Stack is Managing Director of Agrimax, a consulting firm. This sole proprietorship has a client base that spans the major global commodities across Traders, Processors, Manufacturers, Producers, Consumers, and Investors of all asset classes. With the ability to understand global trading of physical commodities, as well as financial derivatives and financial markets, it is perhaps unique. David has been involved the business for more than 30 years, 22 years in Commodities trading, risk management and derivatives, 12 years building and marketing risk management solutions businesses, 5 years Blue-chip Energy Trading company experience and 3 years at a "Wall Street" Bank managing the Agriculture portfolio (Louis Dreyfus, BP, Enron, Louis Dreyfus, Bunge, Barclays)

David is a builder of teams, trading and risk management systems used by many traders and several large trading companies, today.

<http://www.rcem.eu/experts/associates/stack.aspx>



ESCP Europe Business School:

Visiting Professor in Dynamic Commodity Trading

Director, Research Centre for Energy Management (www.rcem.eu)

Managing Director, ESCP Trading Room (thetradingroom@rcem.eu)

Professional background:

Rita D'Ecclesia is Partner for Quantitative Analytics at Agrimax.

Professor at Sapienza University of Rome and University of London.

Director of the PhD program in Economics and Finance at "Sapienza".

Chair of the Euro Working Group for Commodities and Financial Modelling (EWGCFM)

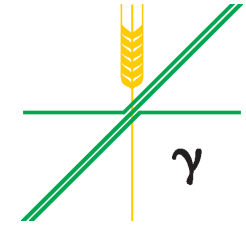
www.ewgfm.eu

President of the International Summer School (ISS) for Risk Measurement and Control.

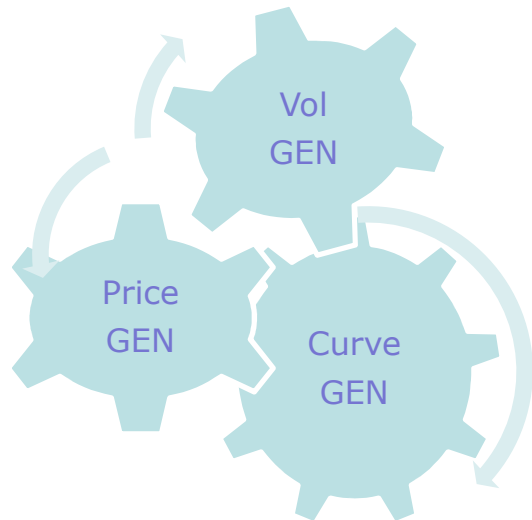
Research areas related to risk management, optimization techniques and modelling commodity markets.

<http://www.rcem.eu/experts/associates/decclesia.aspx>

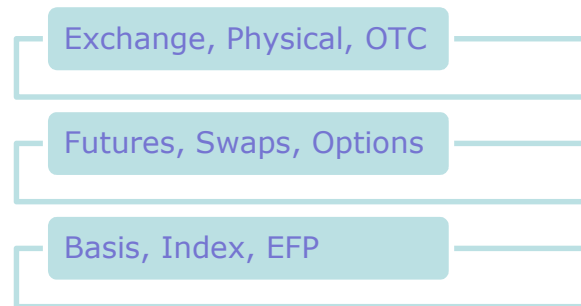
ACTS – riskGRID™ the GUI feed...



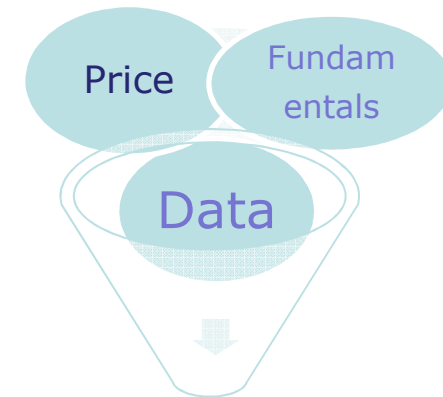
Generators



Transaction types

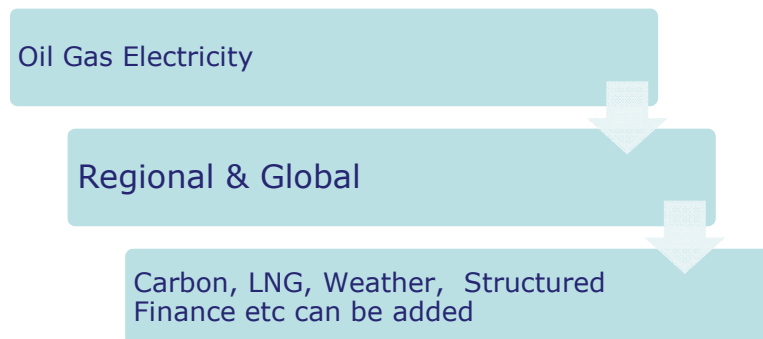


Database

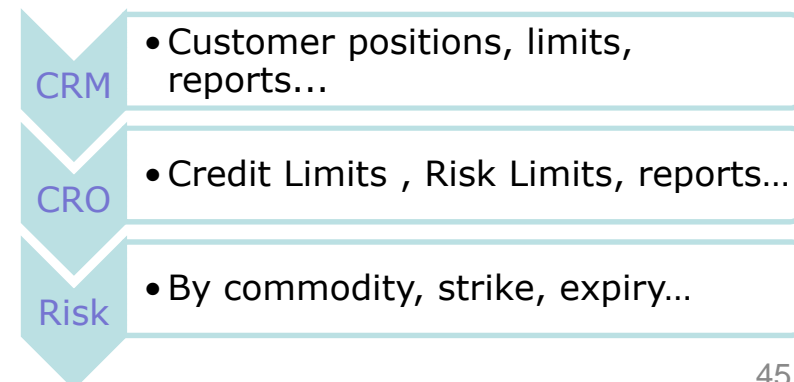


riskGRID™ Architecture

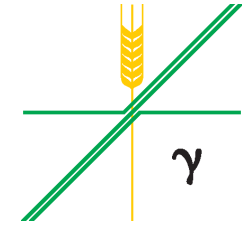
Commodities



Biz Mgmt, Compliance & Controls

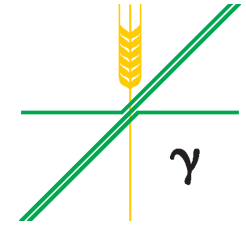


riskGRID™ - the front end of ESCP ACTS

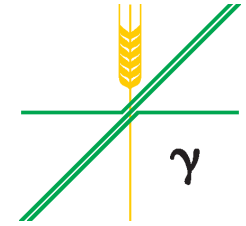


Account:		All	1	+/- day	0	30-Mar-12	Prices	riskGRID					AS OF:		March 30, 2012					
Commodity	last	Δ	+/-	IVol%	+/-	TDelta	TGamma	\$Theta	\$Vega	\$Rho	\$P&L YTD	\$P&L TDY	Futs	Swaps	TDelta	1d Δ	IV%	1w Δ	IV%	
WTI (CL)																				
Apr-12	103.02	(4.50)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
May-12	103.54	(4.41)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Jun-12	104.03	(4.22)	0.00	20.00%	0.00	(0)	(2)	139	(92)	25	(1,503)	\$ 200	100	300	400	0	0.01%	0.01%		
Jul-12	104.40	(3.90)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Aug-12	104.66	(3.55)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Sep-12	104.86	(3.23)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Oct-12	105.05	(2.92)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Nov-12	105.23	(2.63)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
Dec-12	105.33	(2.35)	0.00	20.00%	0.00	0	0	0	0	0	0	\$ -	0	0	0	0	0.01%	0.01%		
						(0)	(1.6)	\$ 139	\$ (92)		\$ (1,503)	\$ 200	100	300	400					
HEAT (HO)																				
Apr-12	316.84	(3.75)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
May-12	317.01	(3.49)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Jun-12	317.94	(2.50)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Jul-12	318.91	(2.11)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Aug-12	319.81	(1.78)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Sep-12	320.53	(1.55)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Oct-12	321.07	(1.51)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Nov-12	321.48	(1.65)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Dec-12	321.76	(1.74)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
						0	0.0	\$ -	\$ -		\$ -	\$ -	0	0	0					
RBOB (RB)																				
Apr-12	338.99	13.27	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
May-12	330.81	5.74	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Jun-12	324.93	2.69	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Jul-12	319.47	1.00	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Aug-12	313.91	(0.15)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Sep-12	308.24	(0.84)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Oct-12	292.10	(1.41)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Nov-12	287.40	(1.38)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
Dec-12	284.94	(0.85)	0.00	20.00%	0.00	0	0.0	\$ -	\$ -	0	\$ -	\$ -	0	0	0	0	0.01%	0.01%		
						0	0.0	\$ -	\$ -		\$ -	\$ -	0	0	0					

Combining the light and dark



Structure:



I Statement of the Problem – Every Problem is an Opportunity

- The issue of oil versus gas pricing has been in the headlines for Europeans constantly for the past years.
- RWE recently won an arbitration against Gazprom on this very issue.
- The now significant volumes of LNG in the European market are potentially of great importance.

II The Big Picture

- Analysing price levels and changes, forward curves and their implied volatility as well as correlation
- Understanding Fundamentals “like a trader”
- Understanding shifting benchmark composition

III Oil, Gas and LNG

- The dataset: ICE Brent, NBP, ZEE, TTF, PEG, WBC (Baumgarten) in €/MWH
- Stationarity (ADF), Rolling Correlation (Eydeland), Cointegration (Engle Granger relationship), ECM framework ...
- Neural Networks offer significant predictive capability

IV Quant Analytics

- European Gas hubs, recent developments, some numbers
- Crude Oil and Natural Gas in Europe: old and new facts
- Some statistical analysis
- Some recent applications

V Summary of Results & Questions

- ...