Valuing arbitrage opportunities for LNG suppliers across the Atlantic

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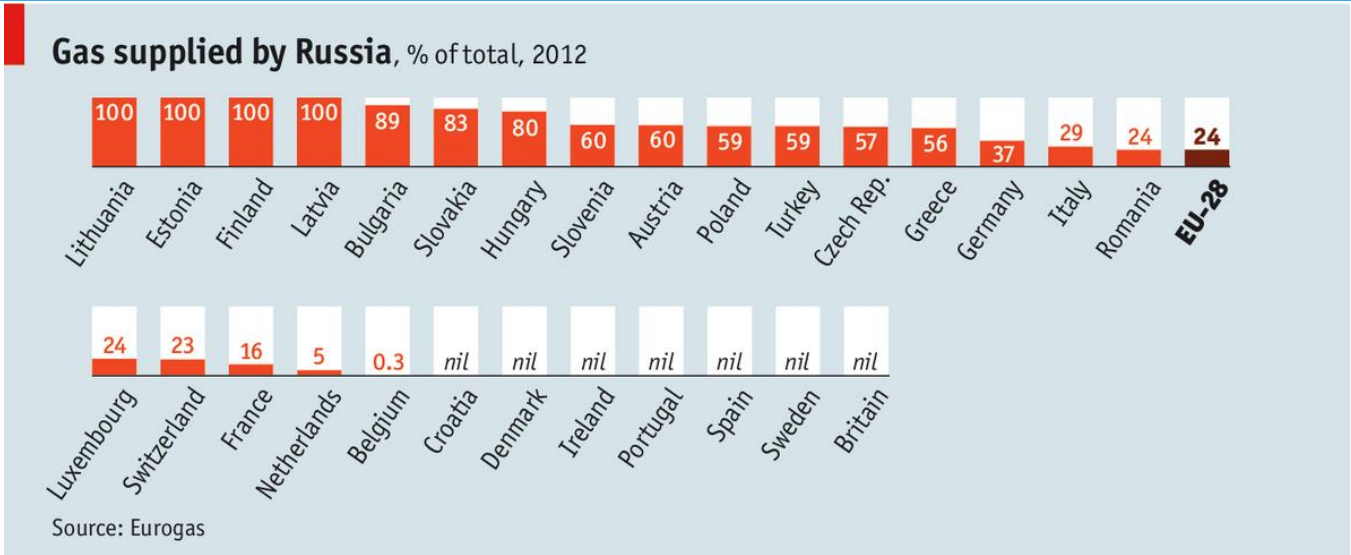
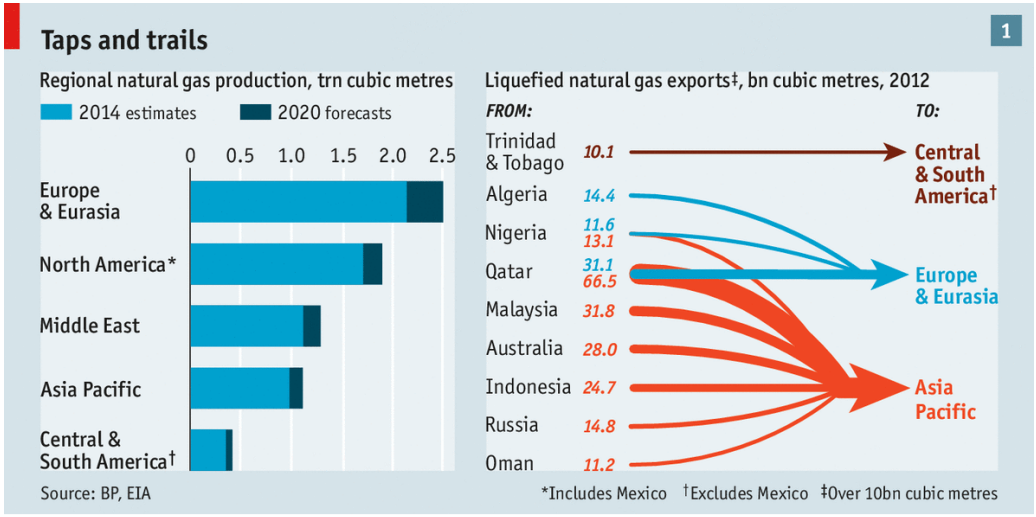

Gas supplied by Russia, % of total, 2012
100 Lithuania
100 Estonia
100 Finland
100 Latvia
89 Bulgaria
83 Slovakia
80 Hungary
60 Slovenia
60 Austria
59 Poland
59 Turkey
57 Czech Rep.
56 Greece
37 Germany
29 Italy
24 Romania
24 EU-28
24 Luxembourg
23 Switzerland
16 France
5 Netherlands
0.3 Belgium
nil Croatia
nil Denmark
nil Ireland
nil Portugal
nil Spain
nil Sweden
nil Britain
Source: Eurogas


Taps and trails
1
Regional natural gas production, trn cubic metres
2014 estimates
2020 forecasts
0 0.5 1.0 1.5 2.0 2.5
Europe & Eurasia
North America*
Middle East
Asia Pacific
Central & South America†
Source: BP, EIA
Liquefied natural gas exports‡, bn cubic metres, 2012
FROM:
TO:
Trinidad & Tobago 10.1
Algeria 14.4
Nigeria 11.6 13.1
Qatar 31.1 66.5
Malaysia 31.8
Australia 28.0
Indonesia 24.7
Russia 14.8
Oman 11.2
Central & South America†
Europe & Eurasia
Asia Pacific
*Includes Mexico †Excludes Mexico ‡Over 10bn cubic metres

Research question and motivation

- Research question
  - What is the potential to benefit from gas price differentials across the Atlantic with LNG shipments?
- Motivation
  - When prices of oil and gas markets decouple, this might give rise to arbitrage opportunities for Liquefied Natural Gas (LNG)
  - Diminishing oil price link could have an effect on gas pricing differentials across the Atlantic
  - Related literature:
    - Energy market cointegration: Dahl c.s.; Westgaard c.s.; Stern and Rogers; Neumann c.s.
    - Arbitrage: Yepes Rodriguez; Dehnavi and Yegorov; Neumann; Siliverstovs c.s.; Suenaga.

Methodology:

1 Investigate oil and gas markets

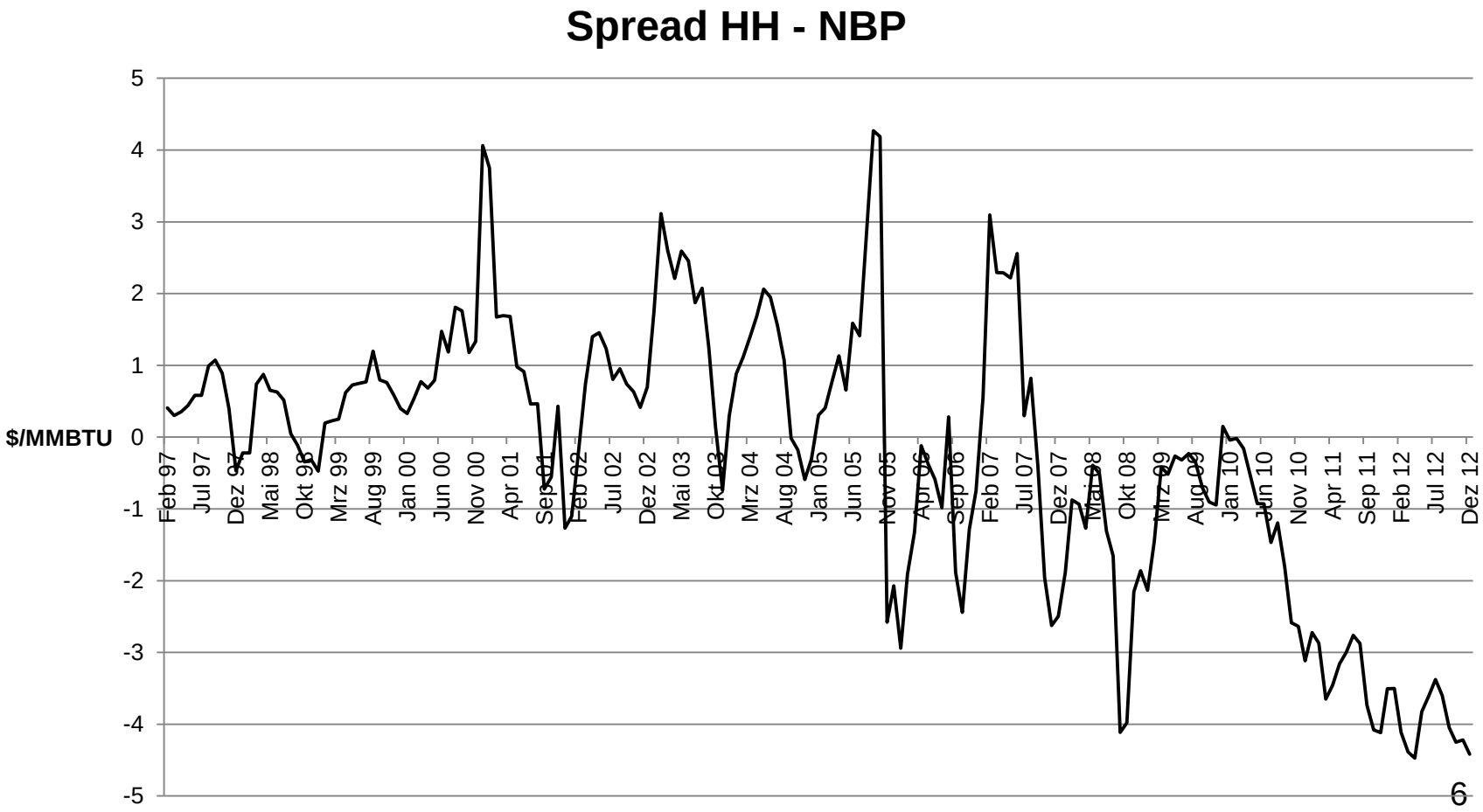
- Is natural gas price pegged to the oil price?
- Is there a global gas market?
- *Hence, preliminary cointegration analysis*

2 Investigate LNG arbitrage opportunities; three alternatives:

1. Constant over time (gas markets not cointegrated or gas prices do not react to LNG trade)
2. Increase (drop in costs for LNG shipping, handling, storage)
3. Decrease (when gas price spreads in the Atlantic become smaller)

- *Hence, investigate gas price differentials in relation to cost to be associated with LNG shipments.*

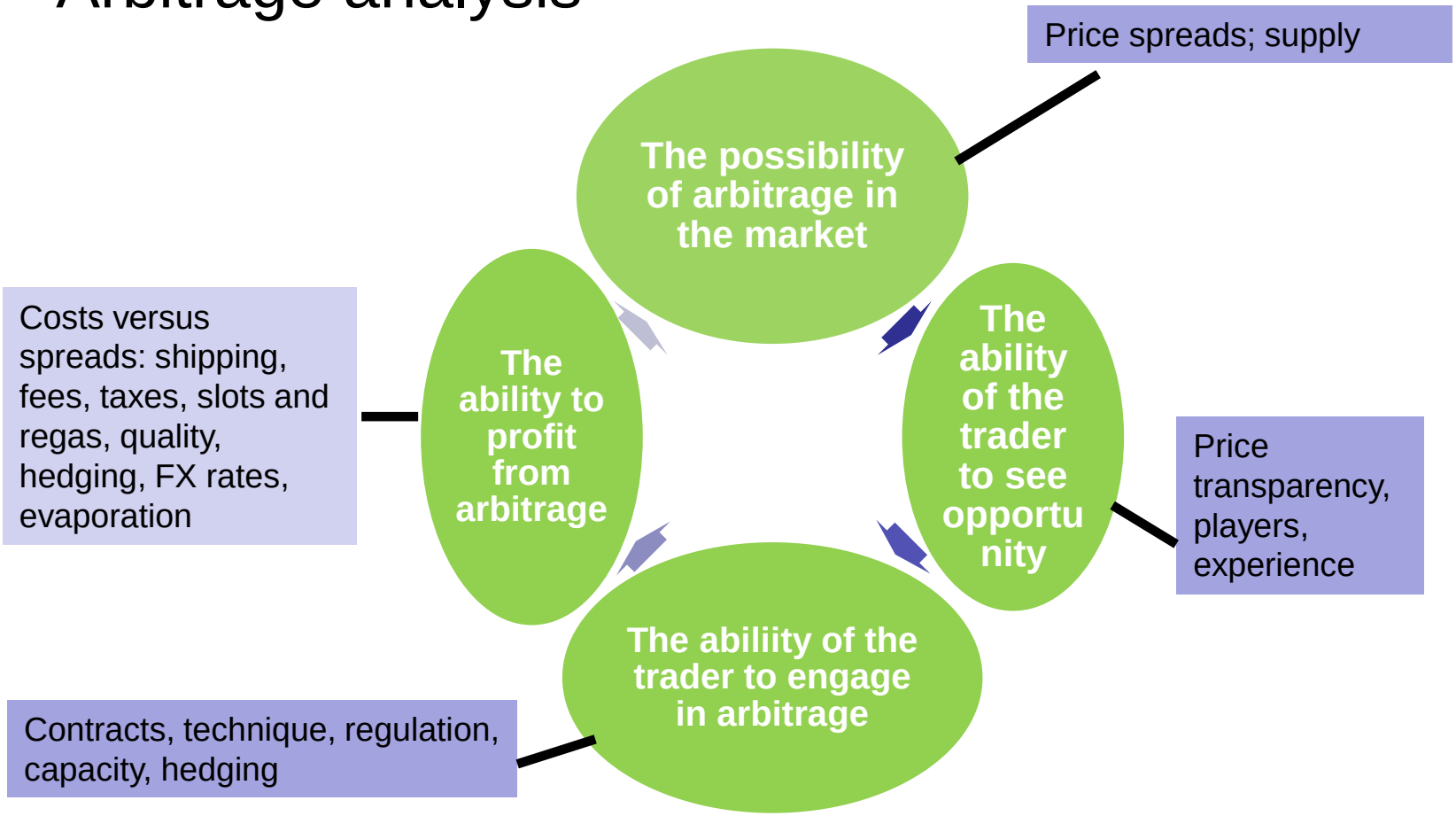
Data:


Spread HH - NBP
$/MMBTU
5
4
3
2
1
0
-1
-2
-3
-4
-5
Feb 97
Jul 97
Dez 97
Mai 98
Okt 98
Mrz 99
Aug 99
Jan 00
Jun 00
Nov 00
Apr 01
Sep 01
Feb 02
Jul 02
Dez 02
Mai 03
Okt 03
Mrz 04
Aug 04
Jan 05
Jun 05
Nov 05
Apr 06
Sep 06
Feb 07
Jul 07
Dez 07
Mai 08
Okt 08
Mrz 09
Aug 09
Jan 10
Jun 10
Nov 10
Apr 11
Sep 11
Feb 12
Jul 12
Dez 12

Methodology: cointegration analysis

1. Henry Hub & WTI
2. HH & Brent
3. NBP & WTI
4. NBP & Brent
5. LNGUS & WTI
6. LNGUS & Brent
7. NBP & HH
8. NBP & LNGUS
9. HH & LNGUS

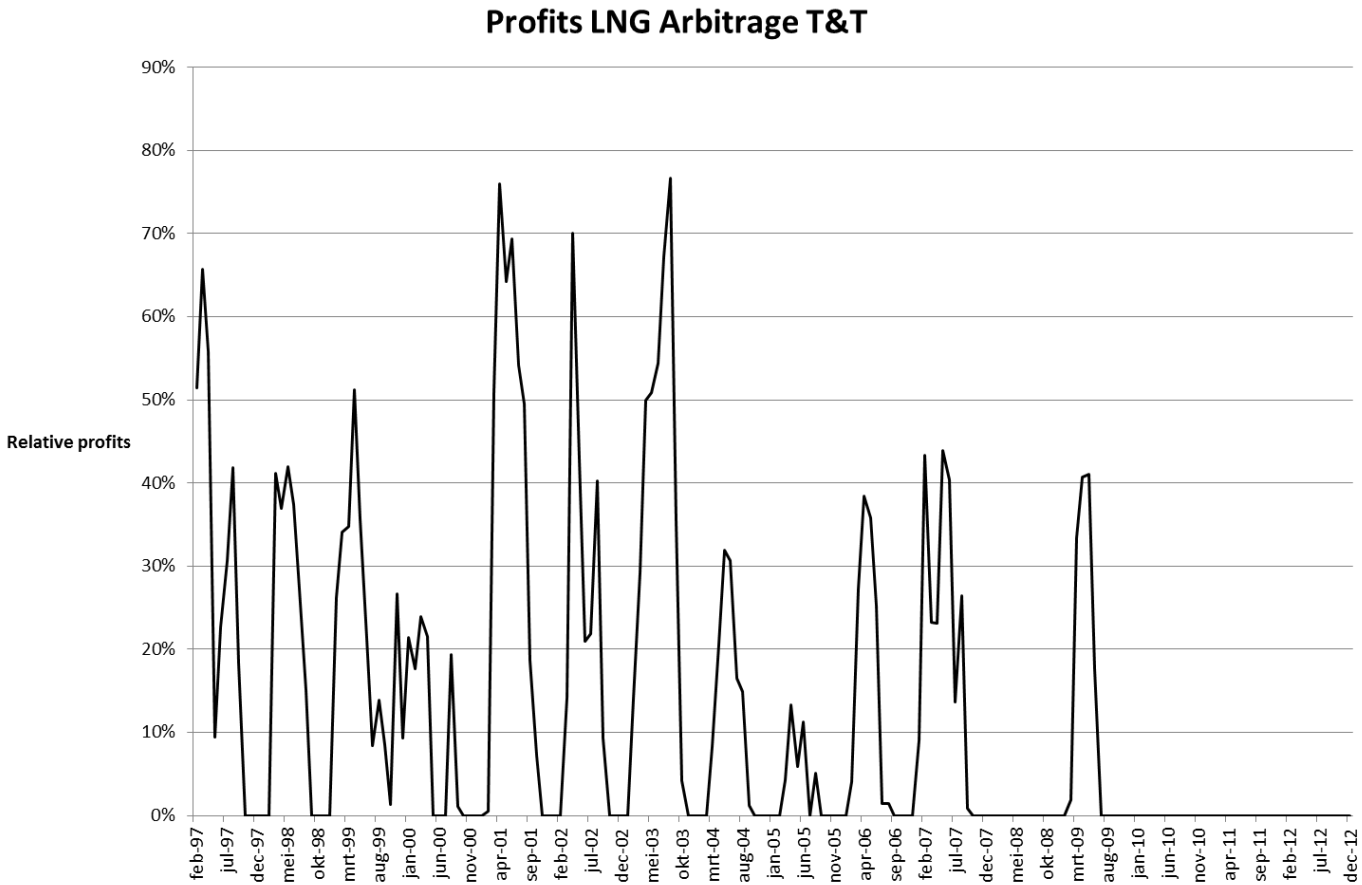
Arbitrage analysis



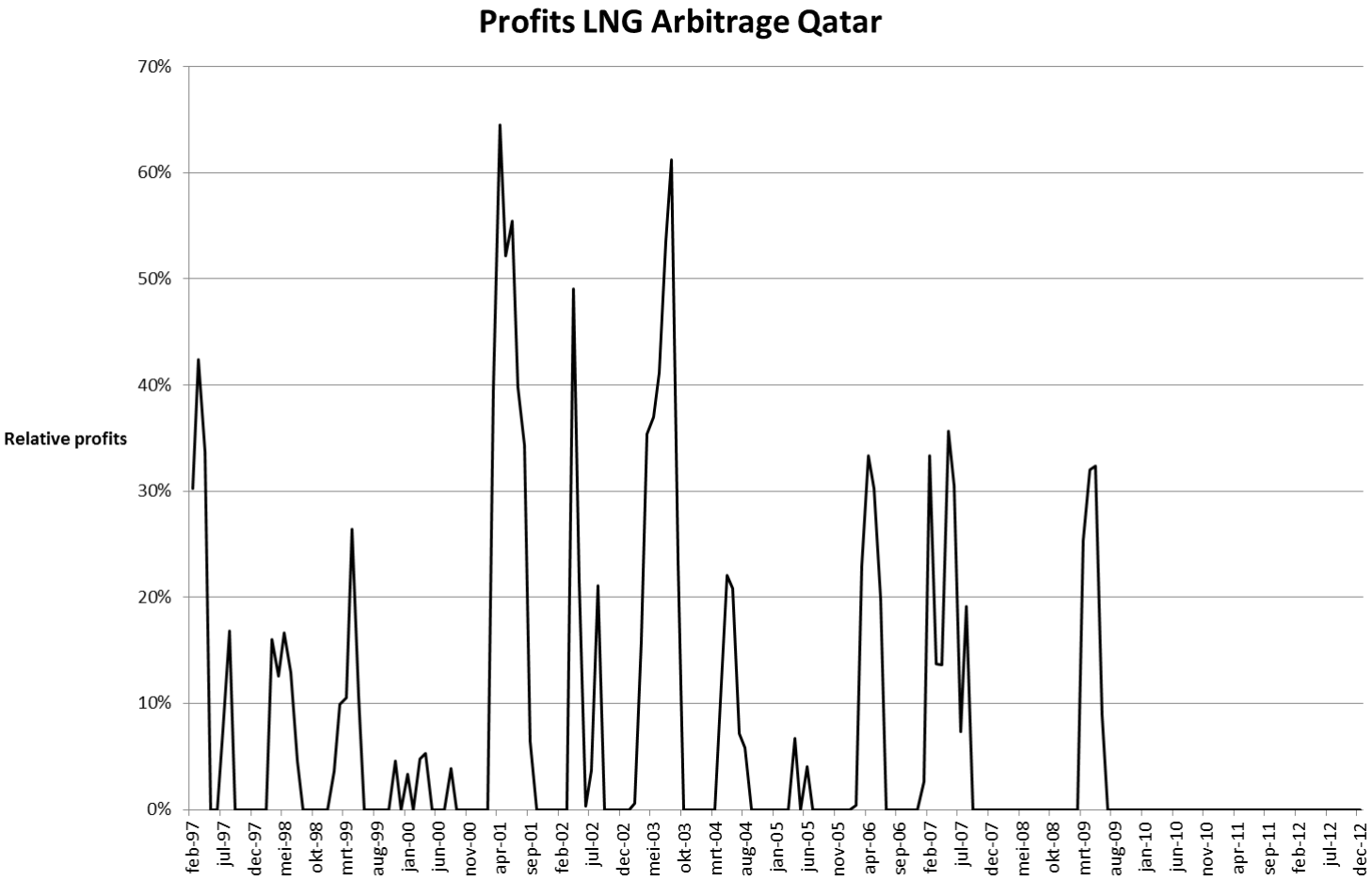
Cointegration analysis

- All series have unit roots in levels and are stationary in first differences.
- Structural breaks (Bai and Perron): for most series in first half of 2009.
- We observe:
  - Cointegration relationships change over time
  - E.g. NBP and HH are not cointegrated after 2007 (are so during 1997-2007)

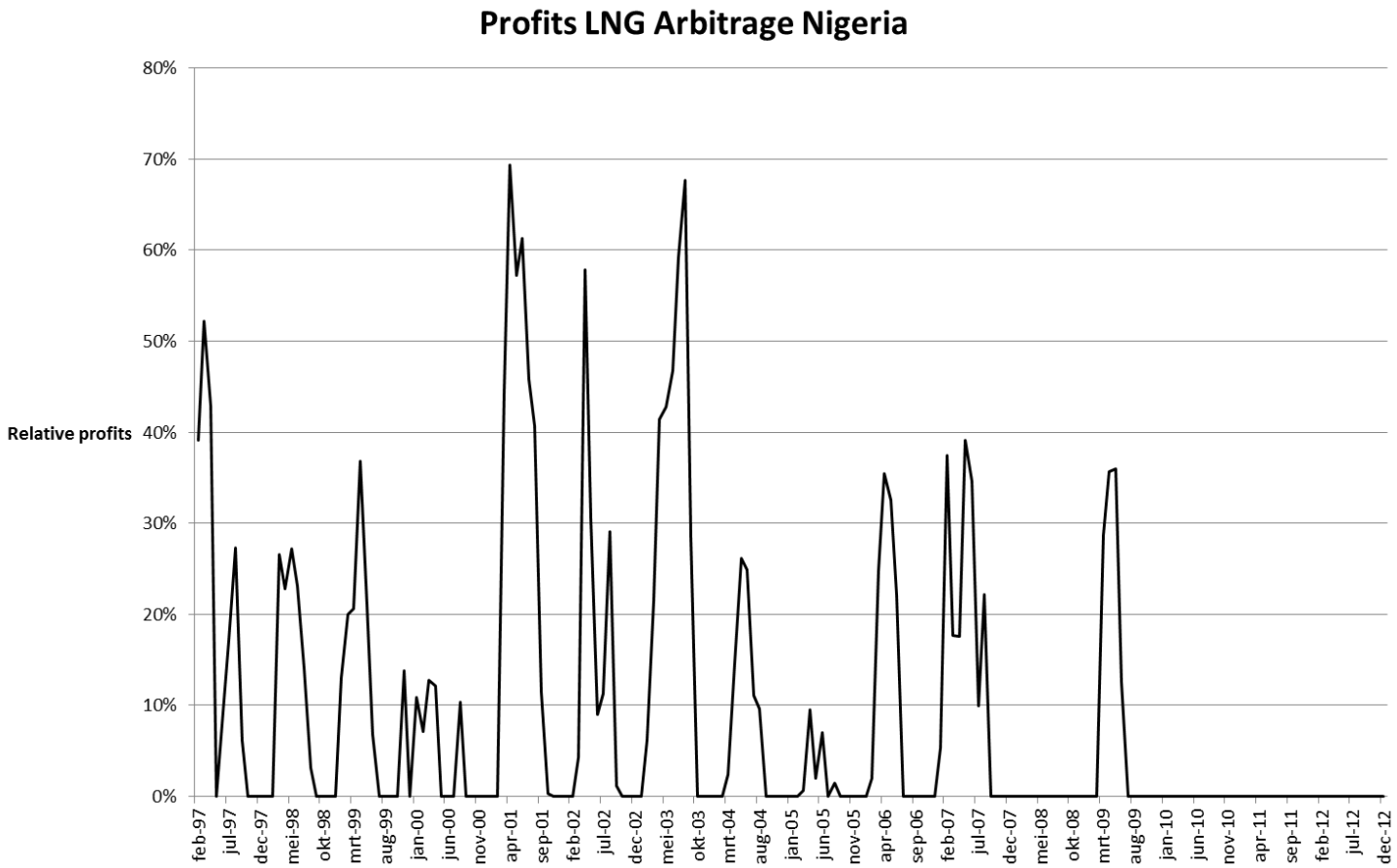
Arbitrage analysis



Arbitrage analysis



Arbitrage analysis



Conclusion

- No stable cointegration relationship oil-gas-LNG
- No signs of a global gas market yet
- Increasingly less arbitrage opportunities for LNG arbitrage in the Atlantic
- Results from US gas prices

Thank you

Comments, questions, ideas?

Nederlands

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English

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