

# Liquefying a Market: The Transition of LNG to a Traded Commodity

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# A Tale of Two Equilibria

- From the inception of the industry 54 years ago, LNG has been sold largely through long-term contracts, which in turn have been used to secure financing for capital-intensive liquefaction facilities
- Market has been moving to shorter-term contracts, and the spot market has been growing
- Virtuous circles driven by the coordination-game nature of contracting and exogenous shocks likely to make the LNG market resemble the oil market



# Contract Duration: A Red Herring

- Contract durations are falling. Estimates are that in 2017 most new contracts were for 2-5 years
- However, traders (e.g., Vitol, Trafigura) are signing long term contracts (e.g., 15 years w/ Cheniere)
- But not all contracts are created equal: the contracts with Cheniere are indexed to Henry Hub NG not Brent crude
- Increasing liquidity of other benchmarks (e.g., JKM) may also drive a shift away from Brent indexing
- Contracts with traders/portfolio players different than those with final consumers



# Co-evolution of Trading and Contract Structure

- Co-evolution of structure of LNG contracts, short-term dealing, and paper markets
- Greater liquidity in short-term markets facilitates indexing long-term contract prices to gas/LNG prices
- More short-term trading, indexing contracts to gas/LNG and activity by trading firms contributes to development of paper hedging markets



# Theoretical Foundations

- Transactions Cost Economics (TCE, cf. Williamson) demonstrates that contracts, including long-term contracts, are governance mechanisms designed to curb opportunism (“holdup”) by parties to a transaction
- Opportunism problems most likely to arise with very specialized (“specific”) assets and small-numbers bargaining conditions



# TCE and LNG

- The conditions identified by TCE have been present in LNG since the inception of the market in the mid-1960s
- Liquefaction facilities in particular are very specialized, long-lived, and capital intensive
- Consumers of LNG historically tended to be very large
- Not surprisingly, long-term contracts have been the rule in LNG



# A Self-Perpetuating Equilibrium

- Further, the lumpy nature of LNG investments means that additions to capacity tend to occur only at intervals
- Existing LTCs have locked in many buyers and sellers
- Therefore, suppliers and consumers of new capacity face small-numbers bargaining which they address with LTC
- Self-perpetuating LTC equilibrium



# LTC Begets LTC

- This LTC begets LTC equilibrium is characteristic of a coordination game
- “Temporal specificity”
- See Pirrong (1993) for development of the theory and application to the ocean shipping industry
- In that article I show that even for assets that are less specific than liquefaction facilities, temporal specificity/coordination issues can lead to a self-perpetuating LTC equilibrium



# Disadvantages of LTCs

- Lack of flexibility to respond to S&D shocks
- Potential misalignment of interests of parties due to supply and demand changes that result in differences between prices set in contract and value of good to buyer or cost of production
- This misalignment problem can be mitigated by price indexing, but due to lack of a reliable spot price (because everything is traded LTC) indexes are problematic

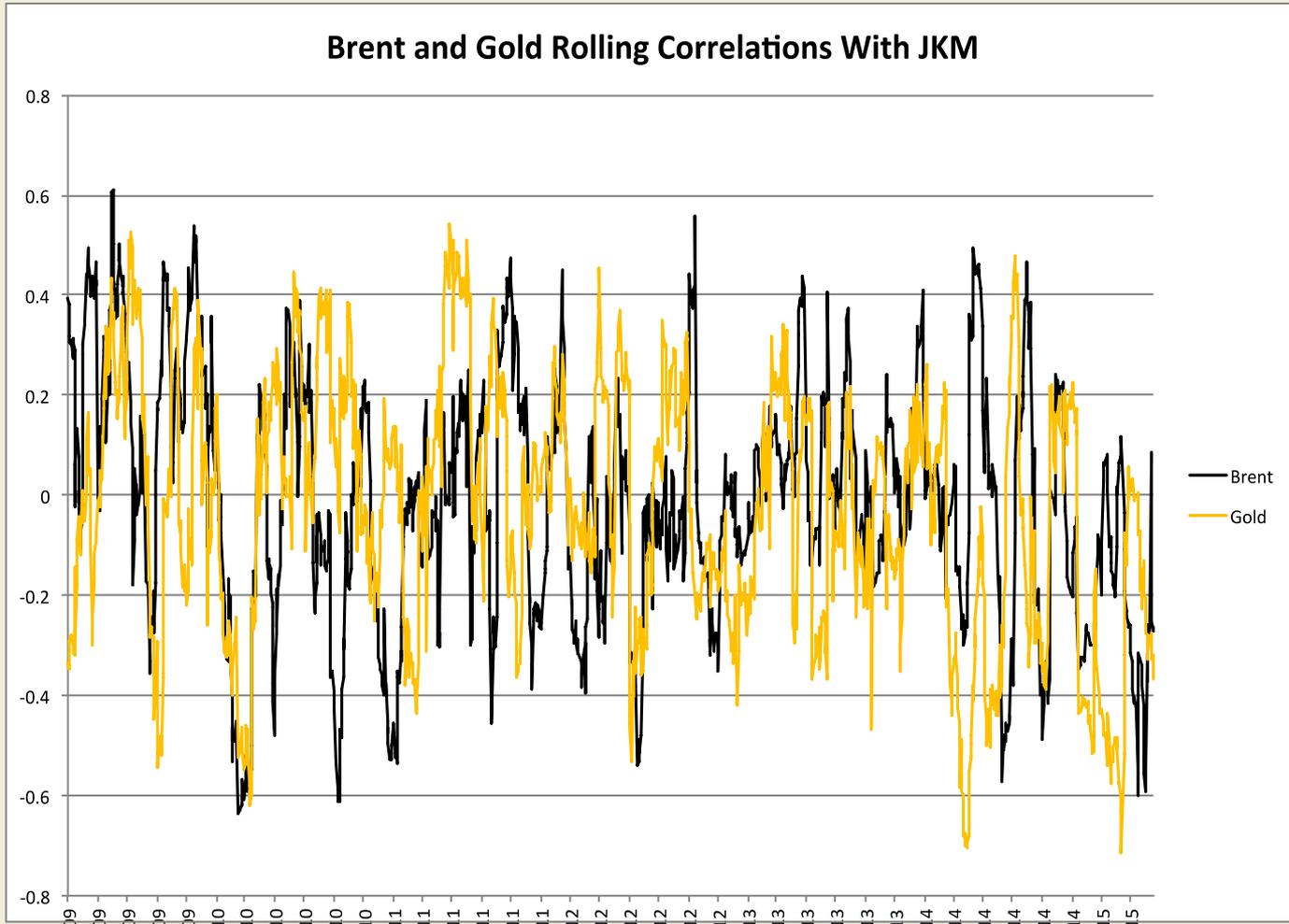


# A Barbarous Relic

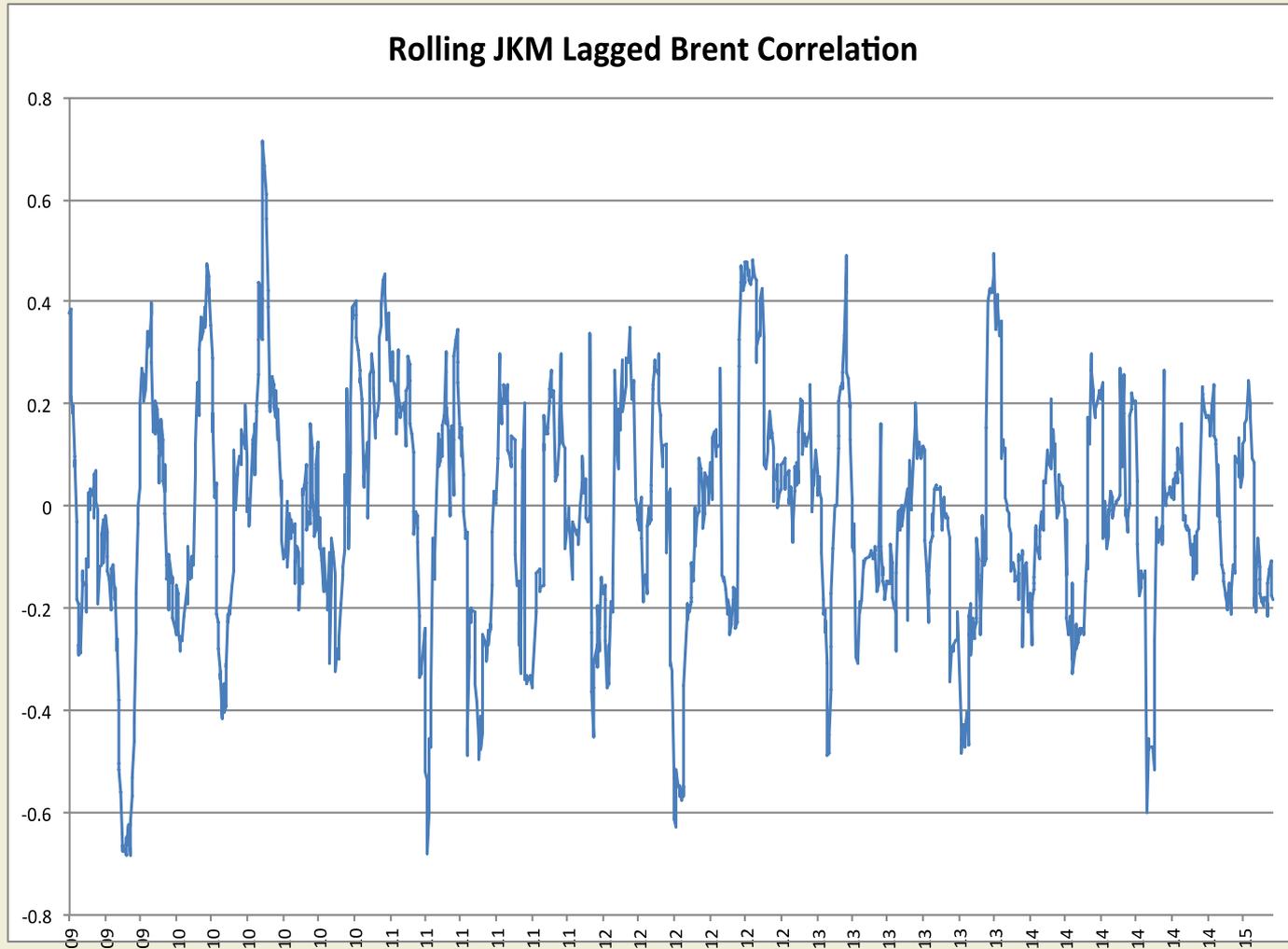
- Keynes called the gold standard “a barbarous relic”
- Oil linkage in LNG pricing is similarly barbarous
- Oil-linked prices (especially with lagging) do not reflect supply and demand fundamentals, and result in severe misalignments between contract prices and values, which leads to disputes and misallocations



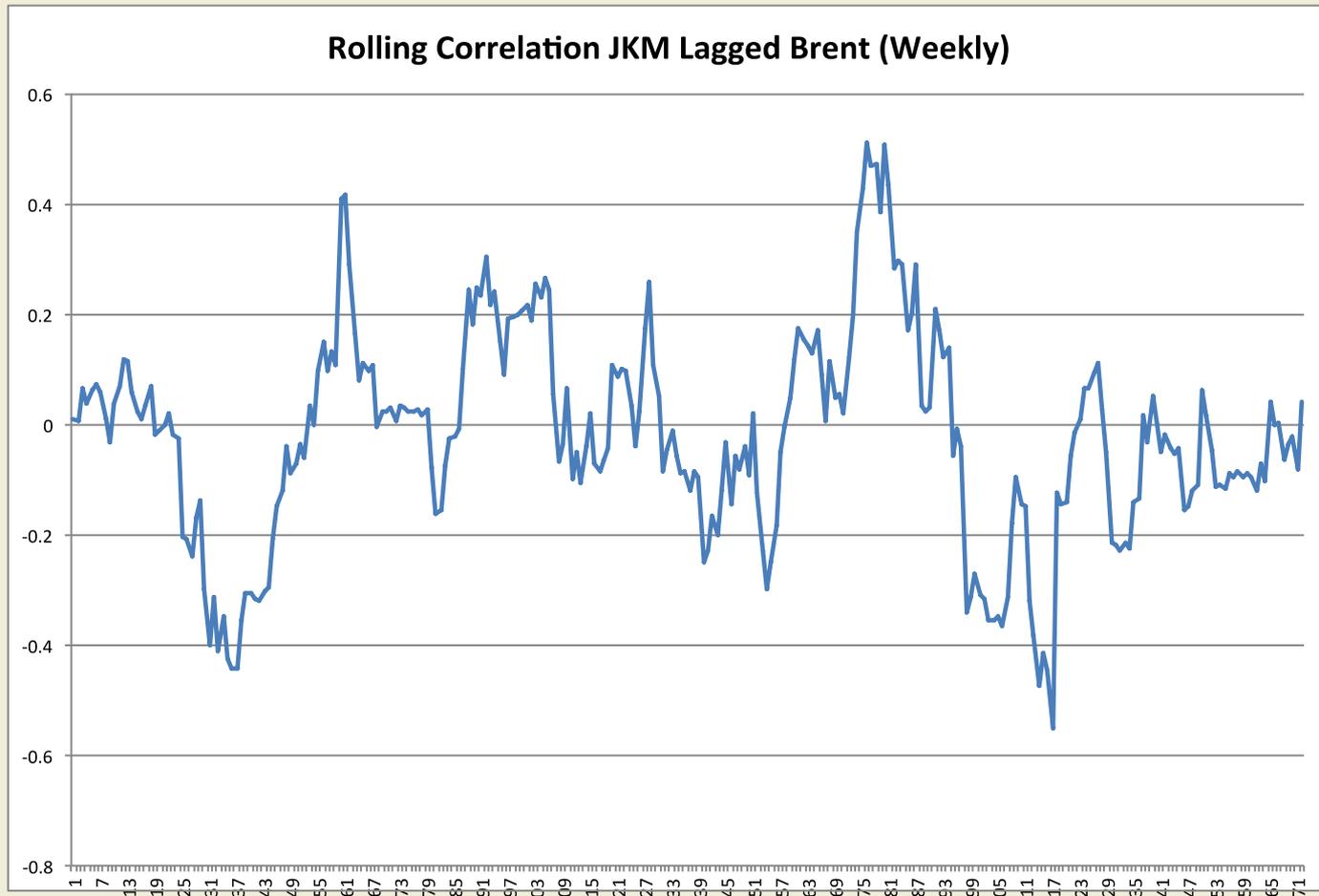
# The Disconnect Between Oil and LNG I



# The Disconnect Between Oil and LNG II



# The Disconnect Between Oil and LNG III



# The Disconnect Between Oil and LNG IV

- Correlation b/t JKM & Brent (contemporaneous): .05
- Correlation b/t JKM & Gold (contemporaneous): -.03
- Gold standard wouldn't be much worse!
- Lagged weekly correlation JKM/Brent same as Bluto Blutarski's GPA: zero point zero
- Brent & JKM are cointegrated, indicating a long-run relationship, but excursions away from long-run relationship last months: oil-based price is almost never "just right"

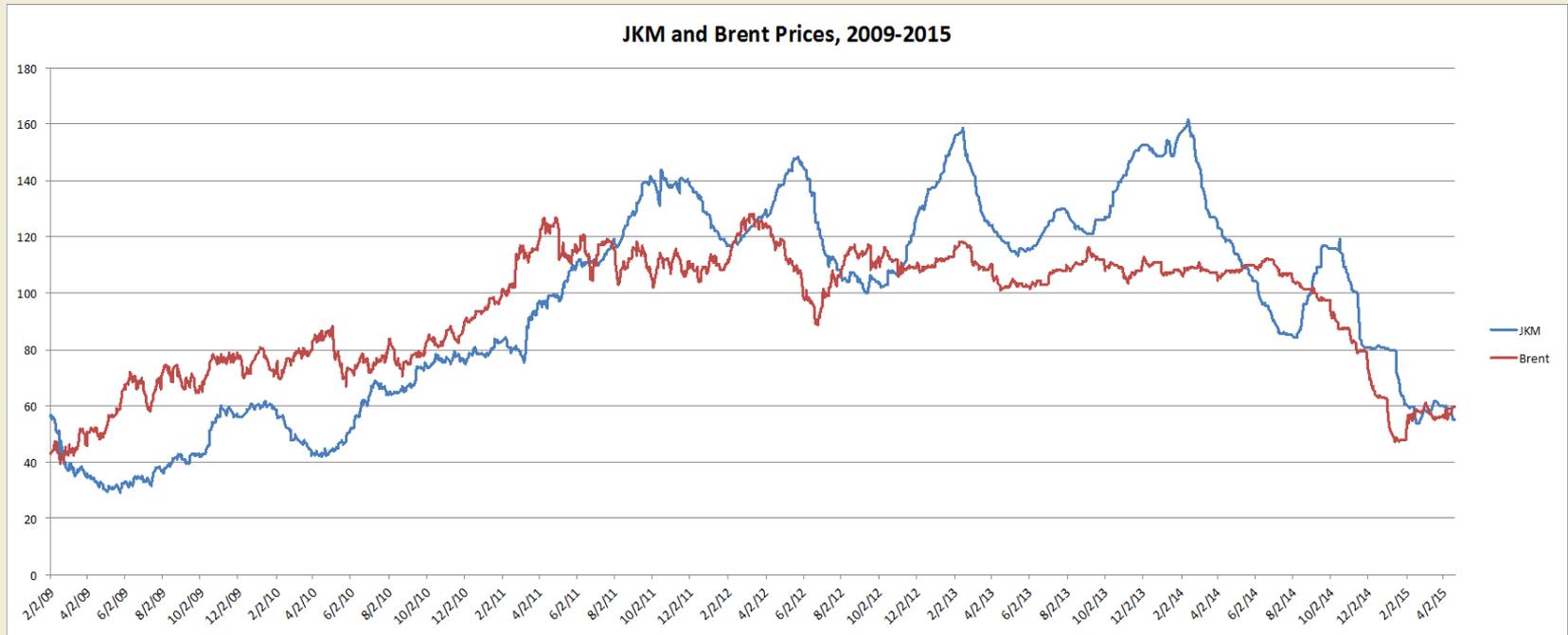


# Disconnect Between Oil and Gas

- Reader (2018) demonstrates that correlations between oil and gas values (e.g., TTF, NBP, HH) are low
- Oil prices not cointegrated with gas values as measured by TTF, NBP, HH
- Cointegration of oil and JKM likely an artifact of the legacy of indexing LNG to Brent



# No Goldilocks Moment



# What Does He Have in Common with the JKM-CB Correlation?



# Why Oil Linkage?



# Why the Oil Linkage?

- Seriously now . . . Once upon a time there were justifications: LNG & oil closer substitutes in use, no real viable alternative
- Now, however, these justifications don't hold: very different demand drivers (not substitutes) and supply drivers
- Technological change (e.g., use of LNG as a transport fuel) could lead to closer linkage, but correlations still likely to be quite low
- Cost of misaligned prices grows with size of the market



# Breaking the Equilibrium

- “Division of labor limited by the extent of the market”:  
growth of LNG is increasing number of buyers & sellers,  
which mitigates the small numbers bargaining problems
- Expiration of old contracts
- Shocks that have created short-term needs for LNG  
(Fukushima, Egypt gas production decline, Amazonian  
drought)
- Regulatory intervention that undermines destination  
clauses



# Breaking the Equilibrium: Optionality is More Valuable

- The increase in the number of potential buyers and sellers subject to idiosyncratic supply and especially demand shocks creates option value that is difficult to exploit using traditional contracts
- Number of buyer-seller combinations rises exponentially with number of sources/sinks: options increase nonlinearly with size of the market
- Substantial value to optimizing flows—sometimes in mid-voyage—in response to short-run demand and supply shocks



# A Virtuous Cycle

- The foregoing developments have led to growing spot/short-term trading of LNG
- This has increased liquidity of short-term market
- Liquidity creates liquidity (network effect/coordination game)
- Existence of a liquid traded market reduces potential for holdup/opportunism by increasing outside options for buyers and sellers
- Less LTC, more short-term sales, which enhances liquidity further



# Nearing a Tipping Point?

- The nature of liquidity means that markets can be “tippy” and shift from a LTC equilibrium to a traded-market equilibrium in a relatively short period of time
- Benefits of LTC contracts decline relative to benefits of selling/buying LNG on a shorter-term basis, and this decline is self-reinforcing



# Capital Intensity Does Not Necessarily Lead to LTC

- Other industries show that the existence of sufficiently liquid short term markets allow investment in very specific, capital intensive assets
- Oil refining
- Petrochemicals
- Iron ore (a relatively recent development)
- Liquid traded markets allow buyers to get security of supply and sellers to get security of demand *via* these traded markets



# Have Your Cake, and Eat It

- LTC can still provide benefits in terms of securing financing
- Development of traded markets can allow development of contracts that are more accurately indexed to gas value
- Replace Brent indexing with gas price indexing
- Henry Hub, JKM . . . Or something new



# How NA Can Expedite Tipping to A New Pricing Mechanism

- Emerging North American supply likely to be the source of the marginal ton for major consuming regions, notably Asia
- Values are determined at the margin, implying that NA prices will be the major component of values in major consumption regions
- North America has a liquid & transparent physical market
- It also has a very vibrant and relatively long-dated paper market that facilitates buyer hedging
- Basis risks obviously material, but experience in US NG market shows that these can be addressed (basis contracts)



# Before Our Very Eyes

- The recent Trafigura and Vitol contracts with Cheniere provide a great illustration
- These are long term (15 year deals) but indexed to HH
- Just as they do with offtake agreements in oil and metals, traders will secure long-term flows *via* contract, then traded them on a shorter-term basis
- Portfolio players



# Fearless Forecast

- Once US LNG comes onto the market in quantity, tipping of a large fraction of the market to a North American pricing benchmark will occur rapidly
- Global basis markets will develop around a pricing hub
- Hedging interest will become more balanced, squeezing out some speculators
- The barbarous relic will be consigned to the ash heap of history



# Other Indications of the Virtuous Cycle

- Paper volumes in JKM are increasing rapidly
- Cleared JKM swaps increasing at a rate of 175 pct/year from 2014-2017
- 300 pct growth in 2017
- In 1H2018, monthly year-on-year growth in volume on the order of 400-500 pct
- Characteristic of a liquidity spiral

