

Valuing the LNG Arbitrage Option

Mark Hayes

Ph.D. Candidate

Program on Energy and Sustainable Development

Stanford University

<http://pesd.stanford.edu/>

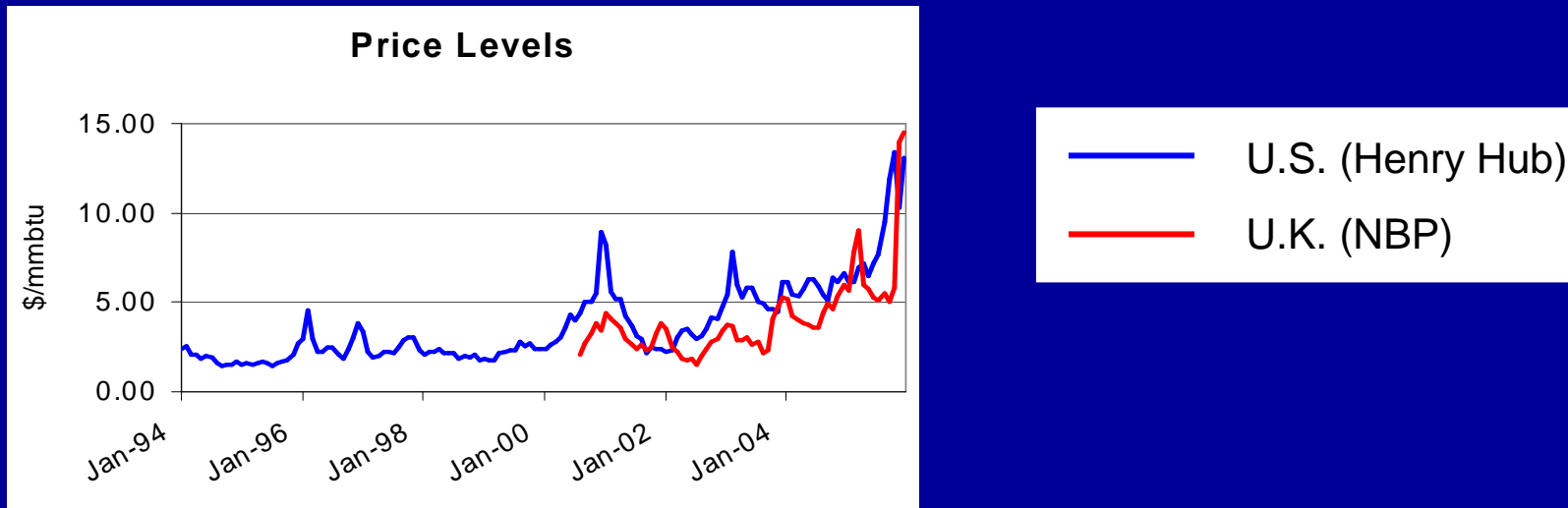
Overview

- Non-correlated demand and price deviations in regional markets create arbitrage opportunities
- But... exercising the option requires tanker capacity and access to regasification capacity in the arbitrage market
- How does the value of the arbitrage option compare to the cost?
 - Construct model to simulate future price developments and physical cargo diversion
 - Focus here on Atlantic Basin circa 2015

Model Structure

- Use hypothetical Egypt to U.K. LNG project
 - 5 mtpa liquefaction facility with ships and full regasification capacity reserved in U.K.
 - Divert cargoes to U.S. when netback price favorable
- Key assumptions
 - Diverted volumes are price takers in both markets
 - Ships are available for charter (138,000 m³ @ \$52K per day)
 - Simulate correlated prices in both markets according to mean-reverting model
- Value the option of reserving “excess” regasification capacity in the U.S.

Benchmarking the Model: *Historical Prices and Volatility*



1994 to 1999

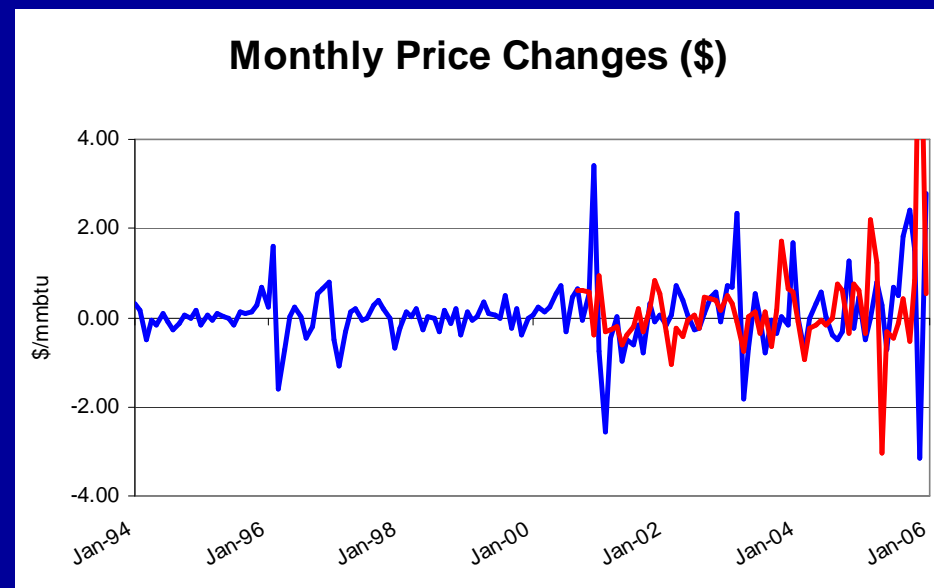
HH monthly volatility (σ) = \$0.4

2000-2005

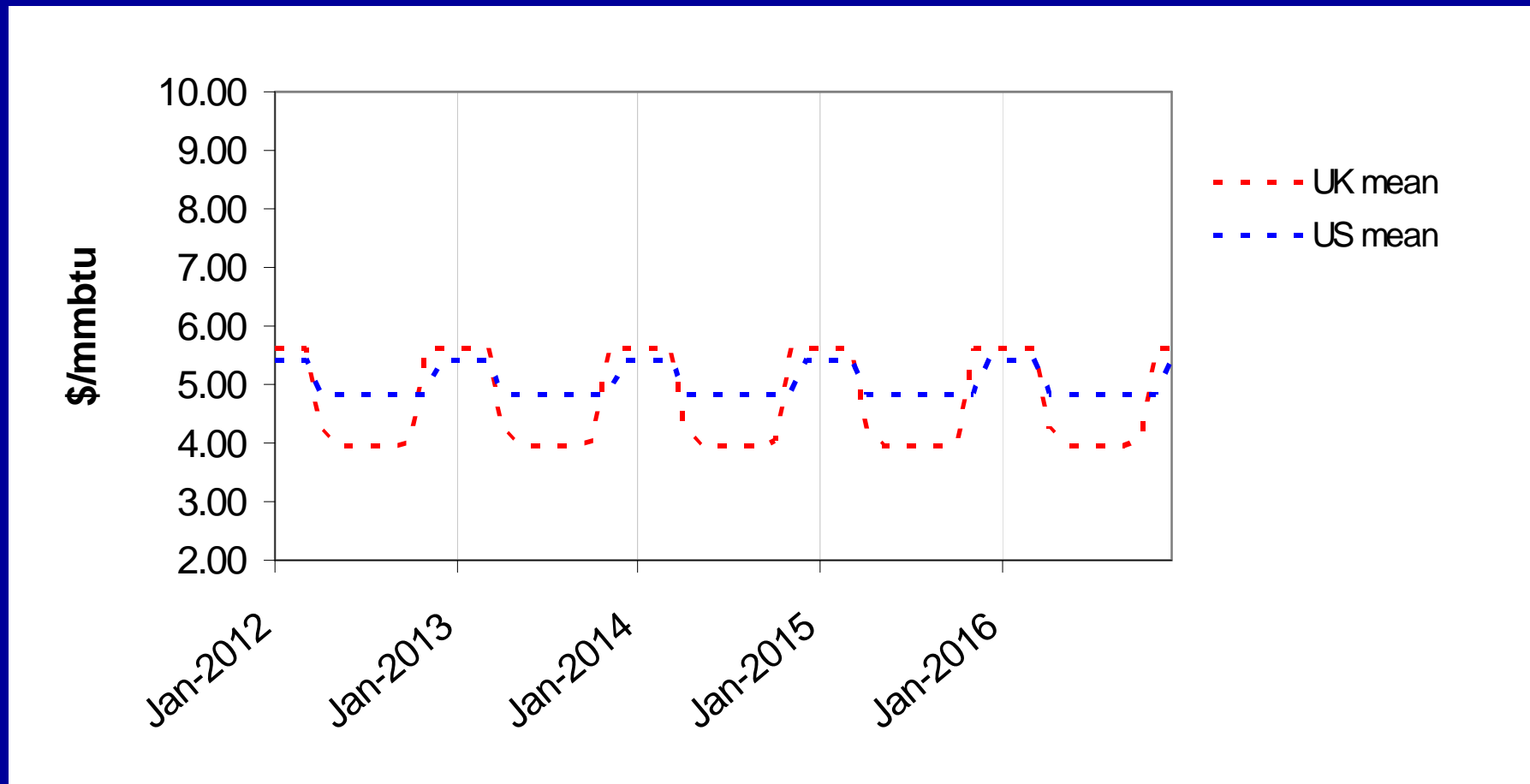
HH monthly volatility (σ) = \$0.8

NBP monthly volatility (σ) = \$0.7

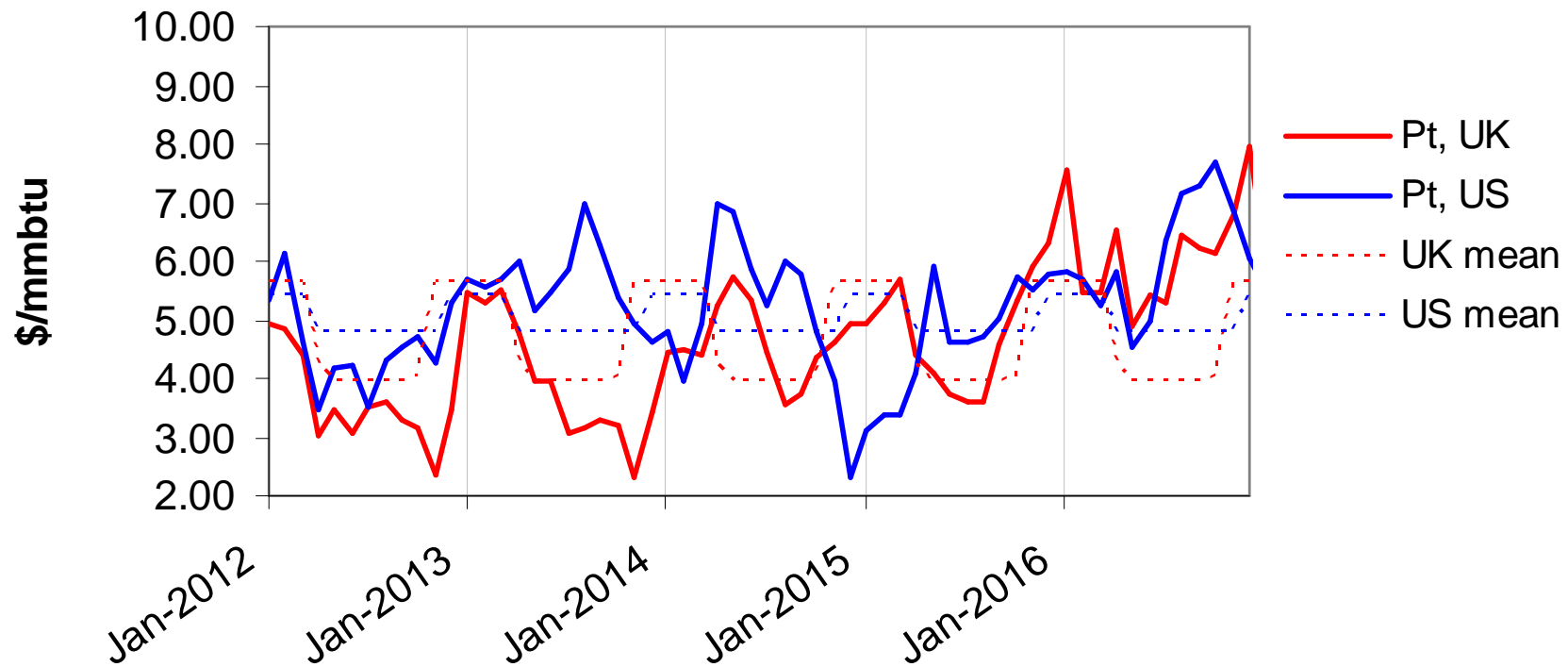
...BUT, ONLY 12% CORRELATED



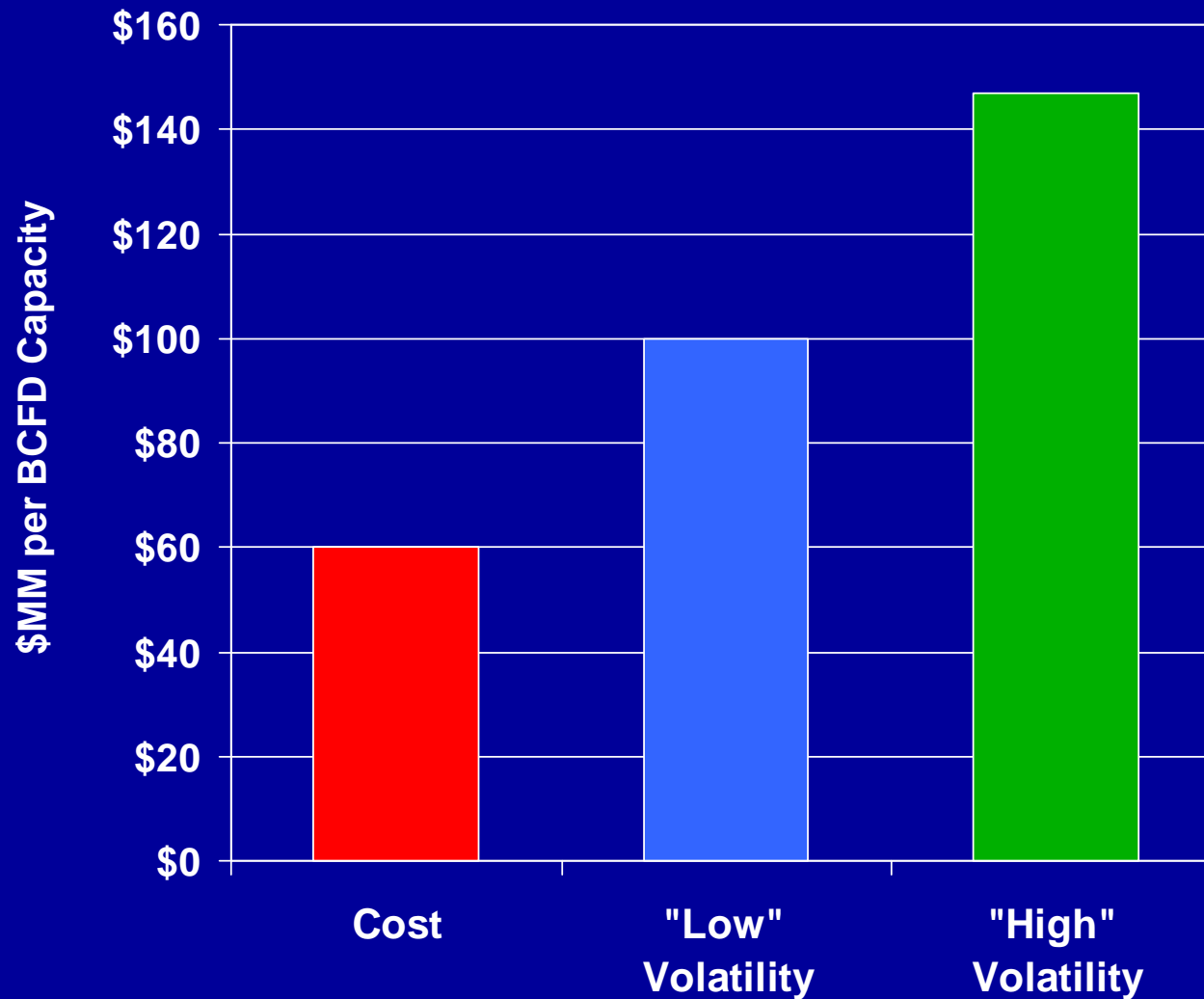
U.S. & U.K. Expected Price Levels



U.S. & U.K. Price Simulations "High" Volatility Case



Expected Annual Value of Holding U.S. Regasification Capacity

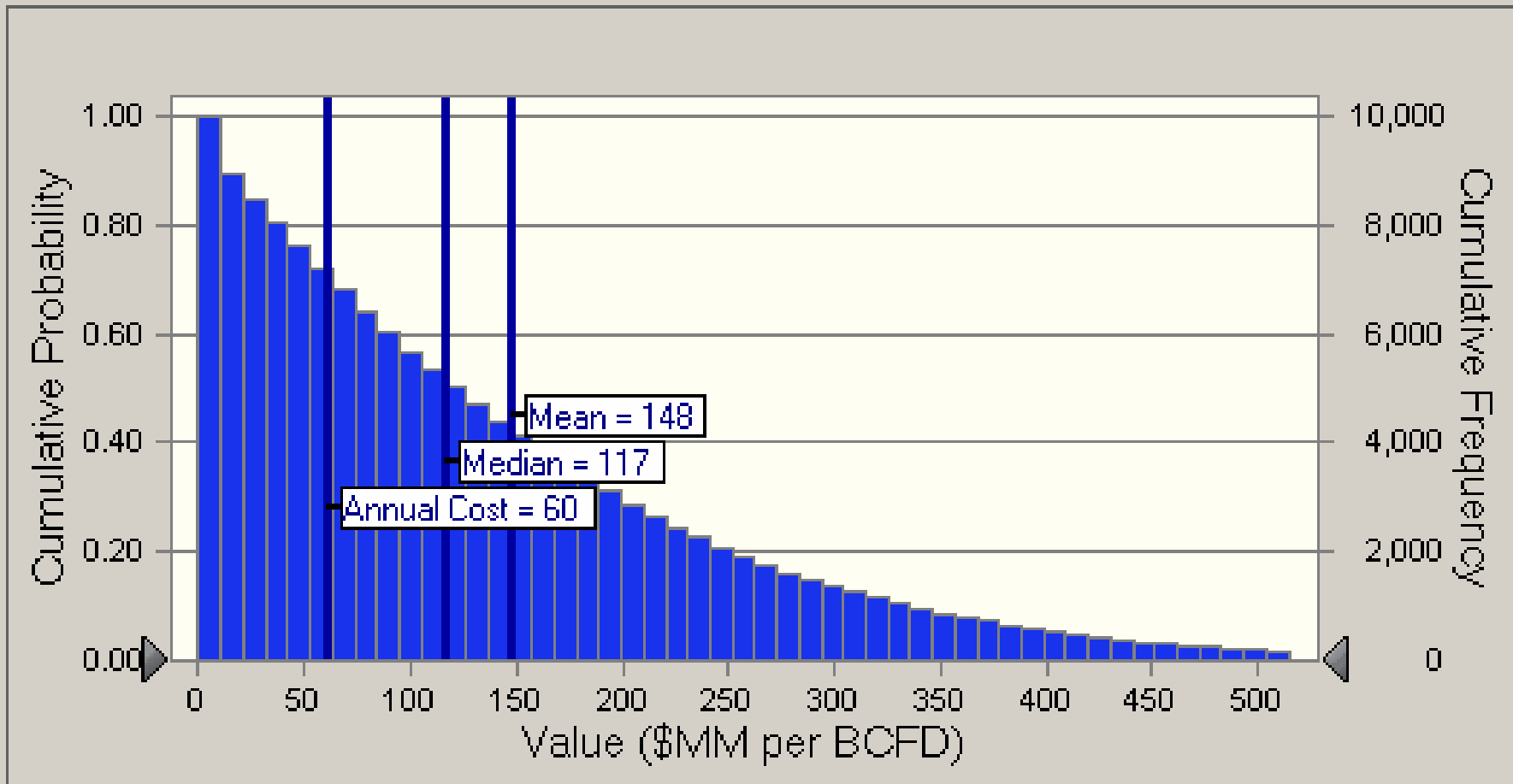


Distribution of Returns - "High" Volatility Case

10,000 Trials

Reverse Cumulative Frequency View

9,838 Displayed



Conclusions

- Non-correlated price movements create incentive for investment in “excess” capacity in tankers and regasification
- Valuation is sensitive to beliefs about future market price behavior
- “Spikey” nature of arbitrage returns creates potential communication challenges with both shareholders *and* regulators