Statistical Analysis of Commodities Futures Prices

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Natural Gas Futures Prices

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Purpose

- Examine patterns of the trading price of natural gas futures
  - Analyze Outliers
  - Seasonality of Trading Prices
  - Variance of Prices
  - Correlation of Prices on Stocks

Background of Natural Gas

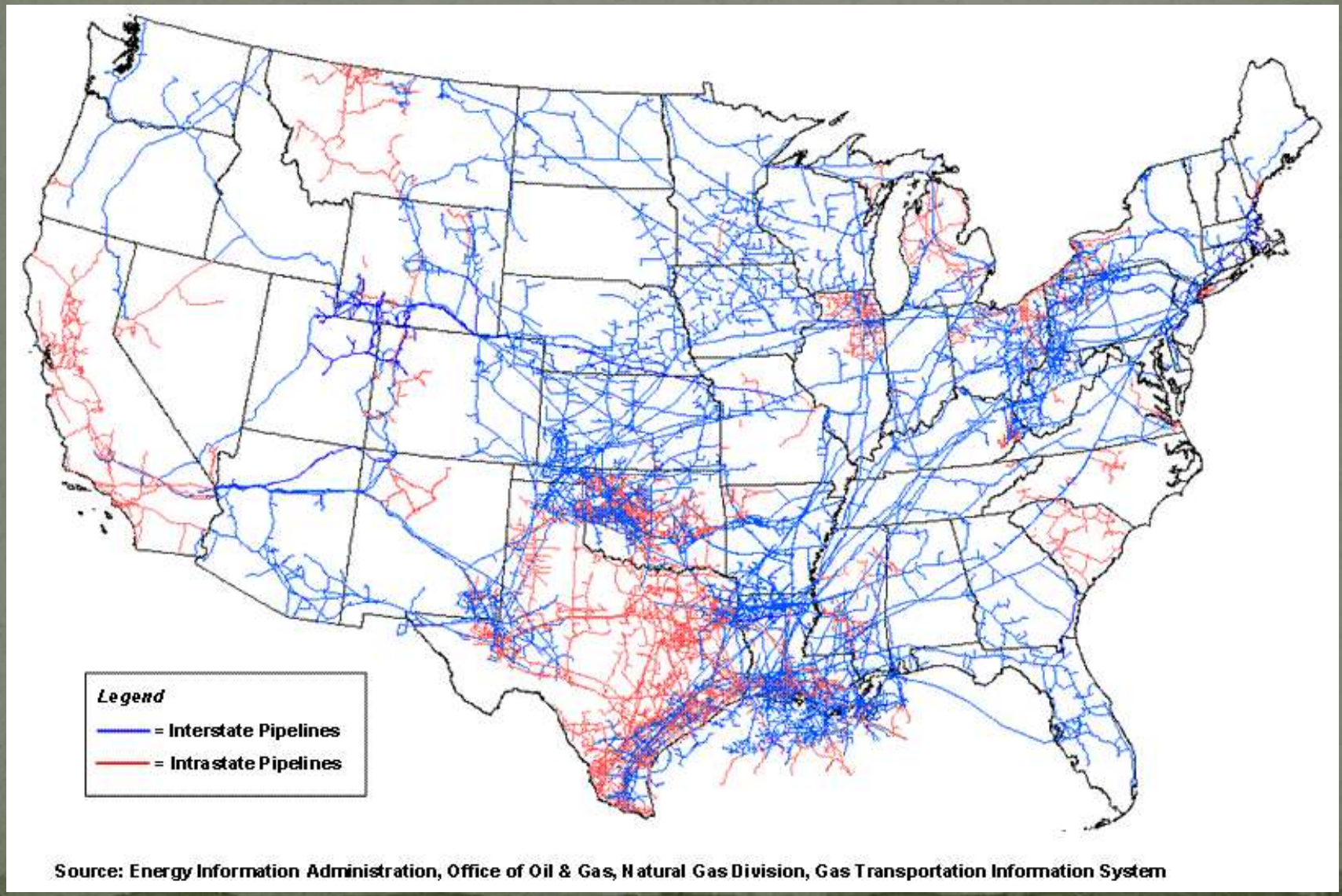
- Primarily used as a source for heating and electrical generation
- Increasing in demand
  - Transportation

http://blog.kir.com/archives/oil%20and%20gas%20well%20at%20sunset3.jpg

Natural Gas Futures

- Traded on New York Mercantile Exchange (NYMEX)
- Million British thermal units (mmBTU)
  - Contracts in blocks of 10,000 mmBTU
- Henry Hub
  - Pricing point for natural gas futures

Natural Gas Pipelines



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System

Importance of Study

- Understand natural gas futures prices and how they are influenced
- Determine if there is an investment strategy

Research Objectives

- Determine trends and statistical properties of the natural gas prices
  - Seasonality
  - Time Series Properties

Methods

- Used historical natural gas futures prices from the Energy Information Administration (EIA)
  - Contracts 1 through 4
- Converted data collected from EIA
- Analysis
  - Looked for outliers on graphs
  - Looked at seasonality
  - Compared Natural Gas prices with WMB

Results - Example

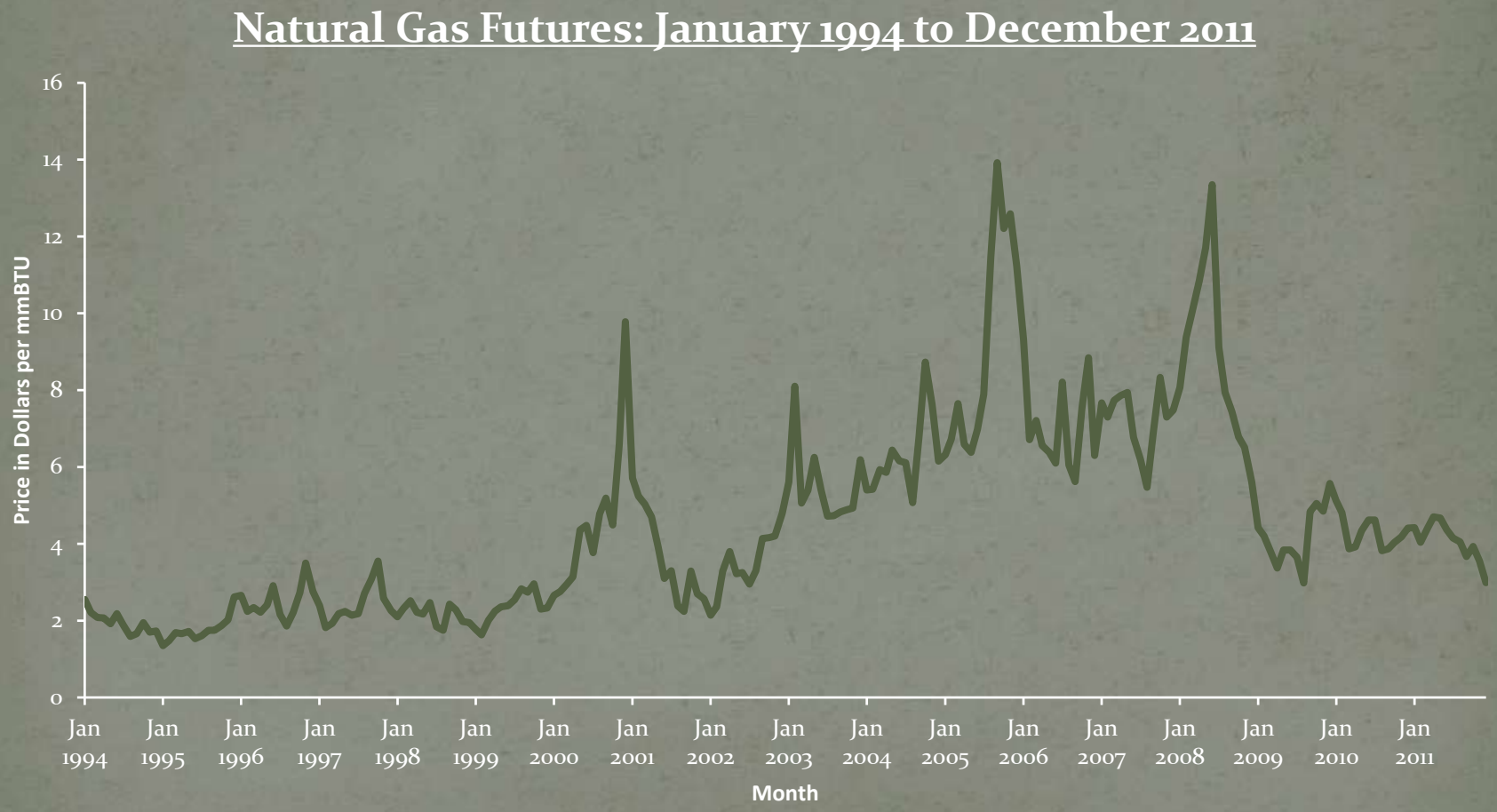
- Price on Friday, April 13:

NYMEX: $1.981 per mmBTU

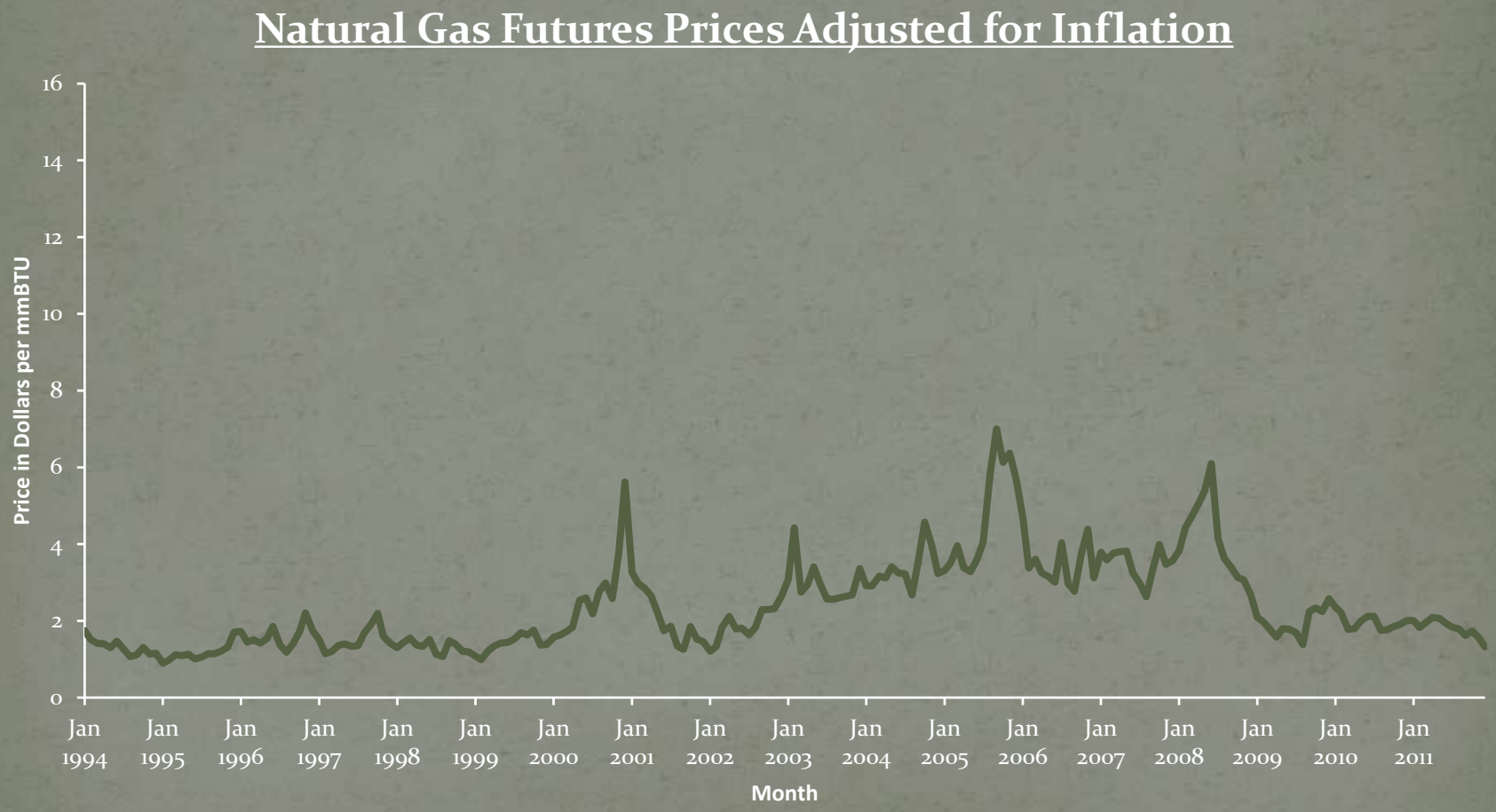
Price per Contract:

$1.981 x 10,000 = $19,810

Results – Outliers



Results – Outliers (cont)

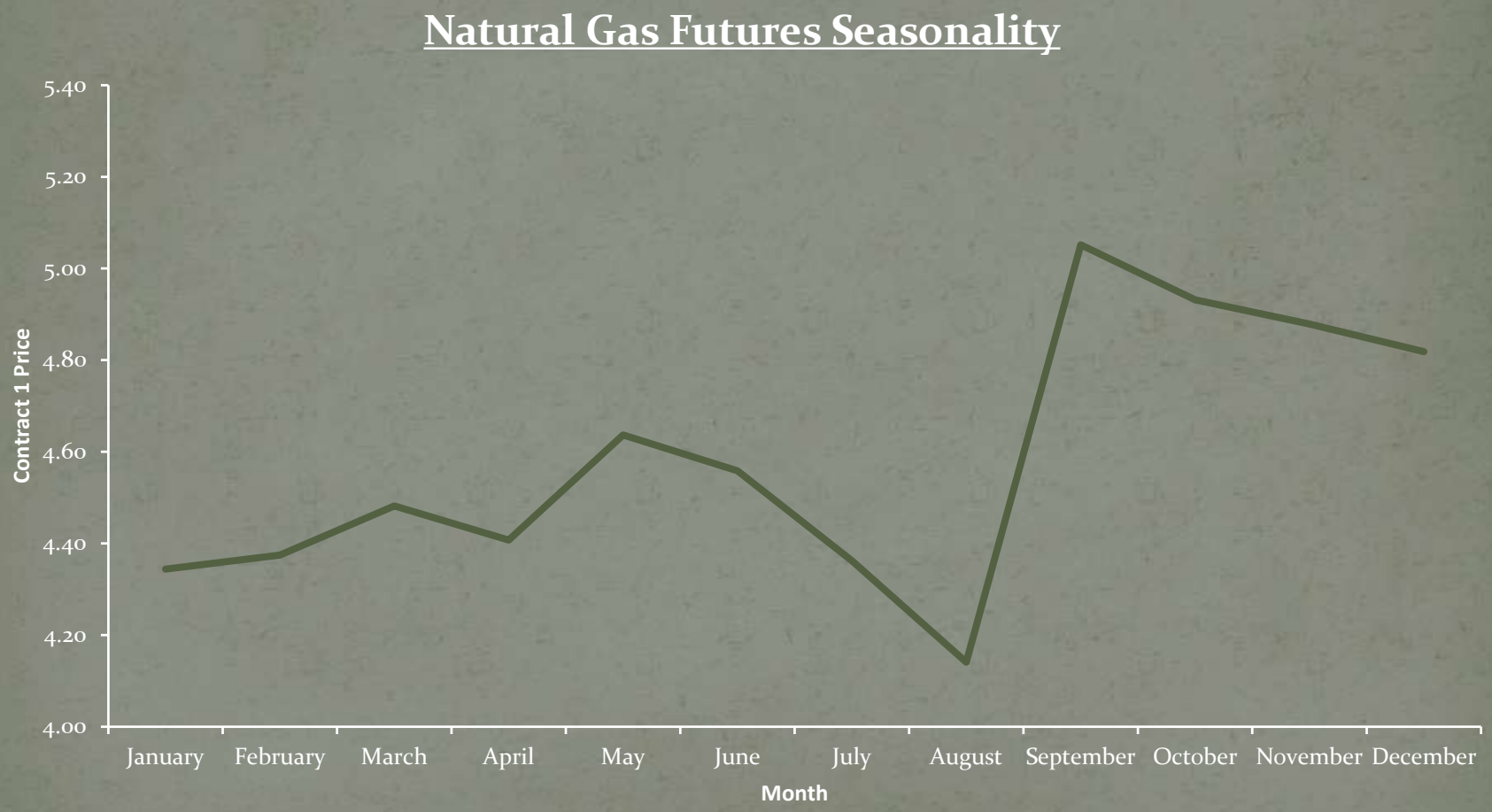


Results – Seasonality

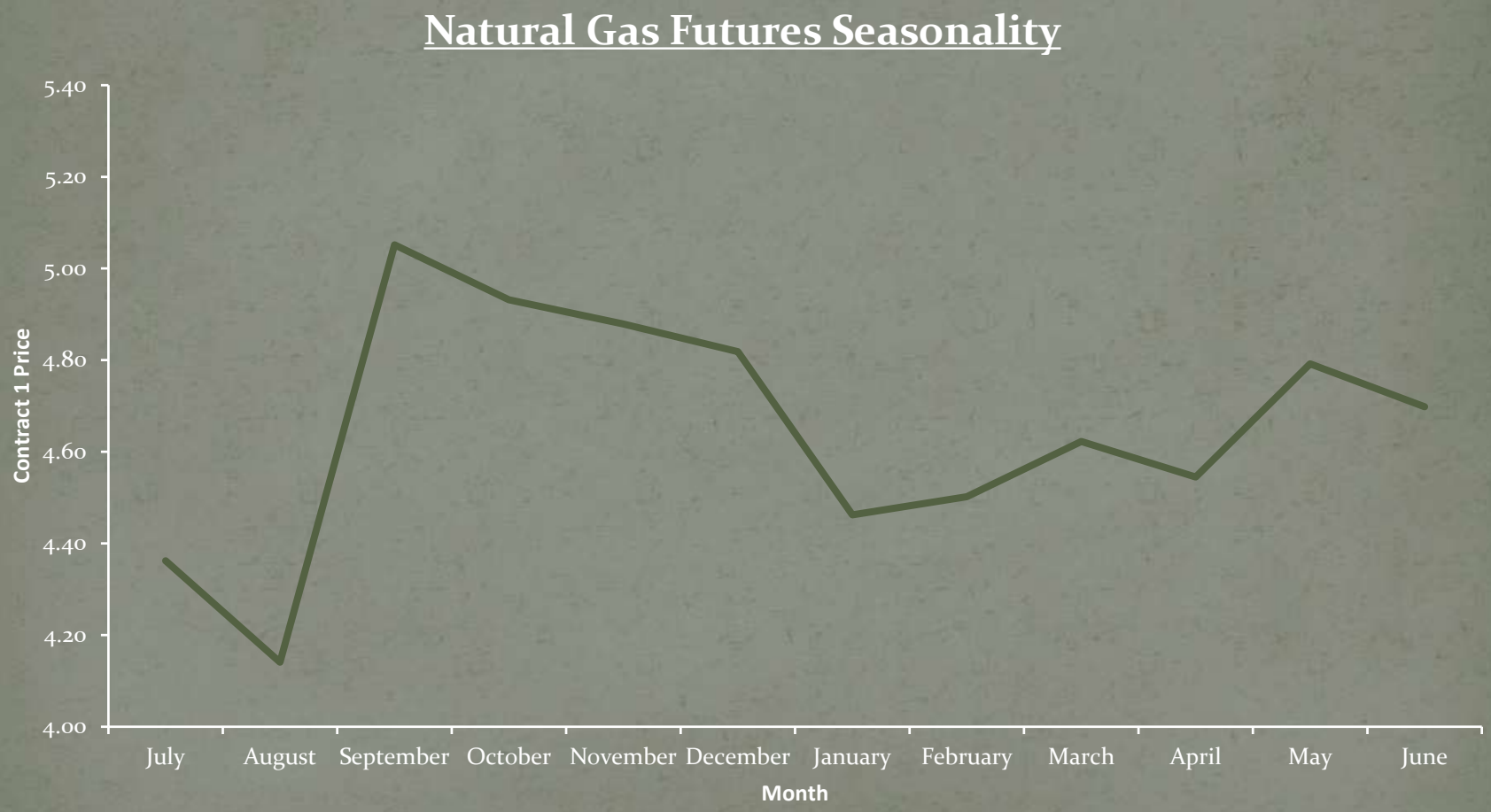
Price in Dollars per mmBTU

Month	High Price	Average Price	Low Price
January	**9.32 (2006)**	**4.43**	**1.35 (1995)**
February	9.37 (2008)	4.37	1.48 (1995)
March	10.10 (2008)	4.42	1.69 (1995)
April	10.84 (2008)	4.41	1.66 (1995)
May	11.70 (2008)	4.57	1.72 (1995)
June	13.35 (2008)	4.56	1.53 (1995)
July	9.12 (2008)	4.27	1.61 (1995)
August	11.47 (2005)	4.14	1.59 (1994)
September	13.92 (2005)	4.63	1.66 (1994)
October	12.21 (2005)	4.93	1.87 (1995)
November	12.59 (2005)	4.89	1.70 (1994)
December	11.23 (2005)	4.82	1.73 (1994)

Results – Seasonality (cont)



Results – Seasonality (cont)



Results – Comparison to Stocks

- Natural Gas was compared to Williams (WMB)
  - No statistically significant correlation
  - No correlation to energy sector either

Results – Summary

- Outliers of Data Set
  - Four outliers for natural gas
- Seasonality
  - Change between August and September
- Correlation
  - Not significantly correlated to stocks

Conclusion/Discussion

- Price jump in seasonality
  - If a person has excess storage capacity, why not buy in August and sell in September?
- Based on this analysis, outside events cause commodity prices to spike
  - Hurricanes Katrina and Rita
  - Recession

Further Research

- Analyze weather influence on futures prices
- Look at the influence of hurricane season on natural gas
- Influence of storage costs on pricing of natural gas
- Further analysis with stocks

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Questions