CEEPR Workshop
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New Developments in Oil Futures Markets

John E. Parsons

Center for Energy and Environmental Policy Research

Front Month, NYMEX-WTI, 1986-2006

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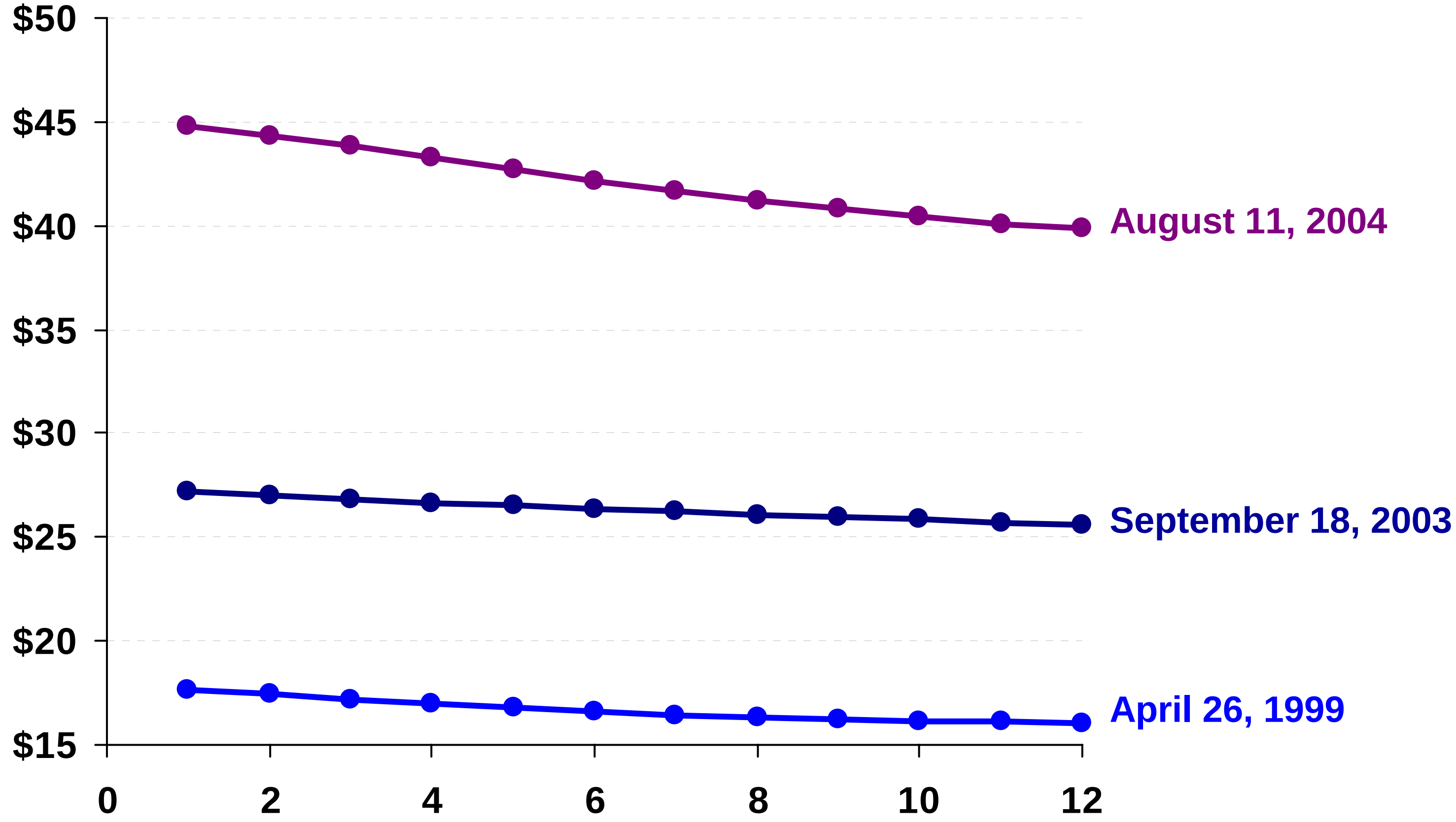
Historically, Oil Futures are “Backwardated”



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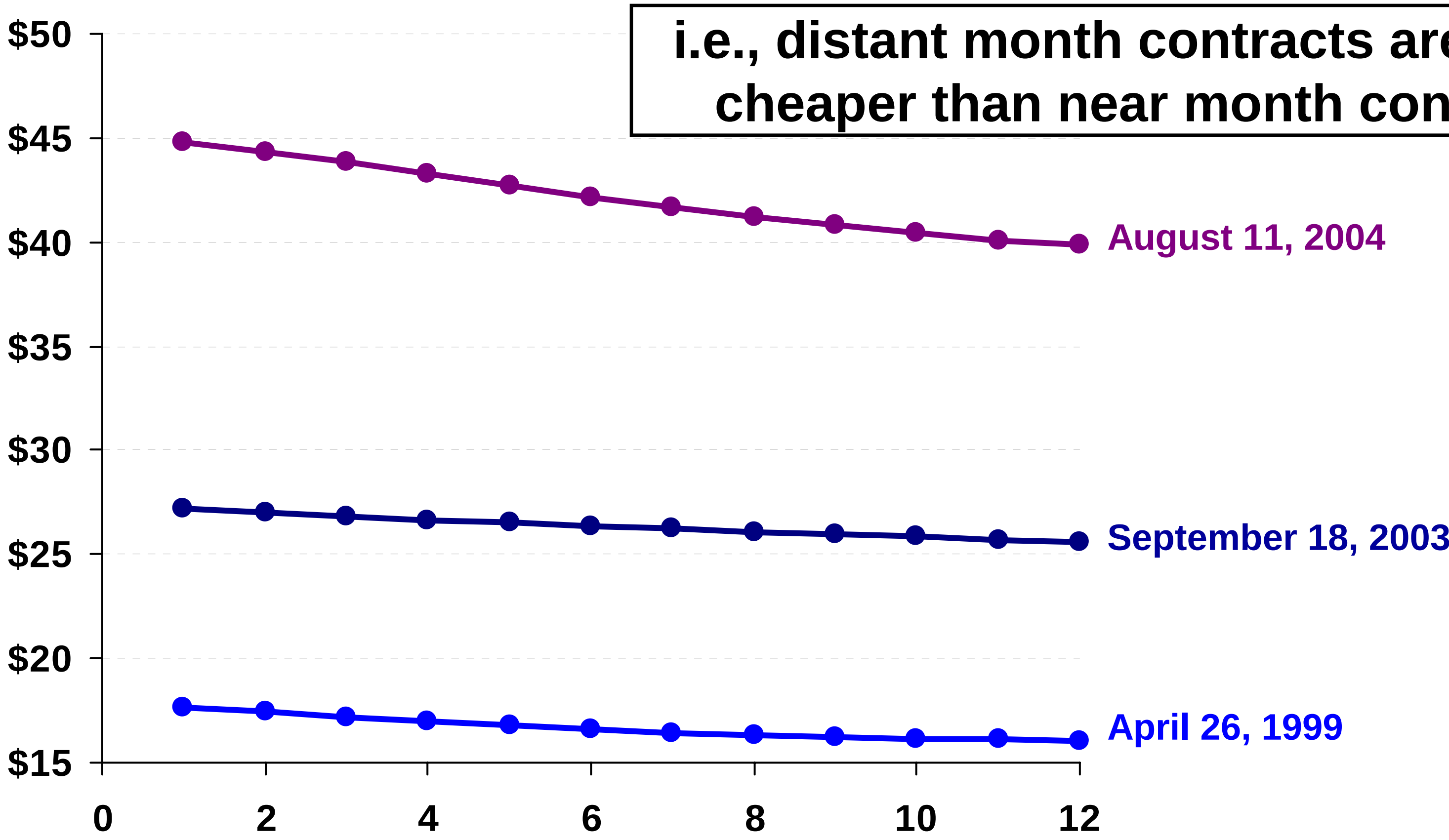
Historically, Oil Futures are “Backwardated”

i.e., distant month contracts are cheaper than near month contracts



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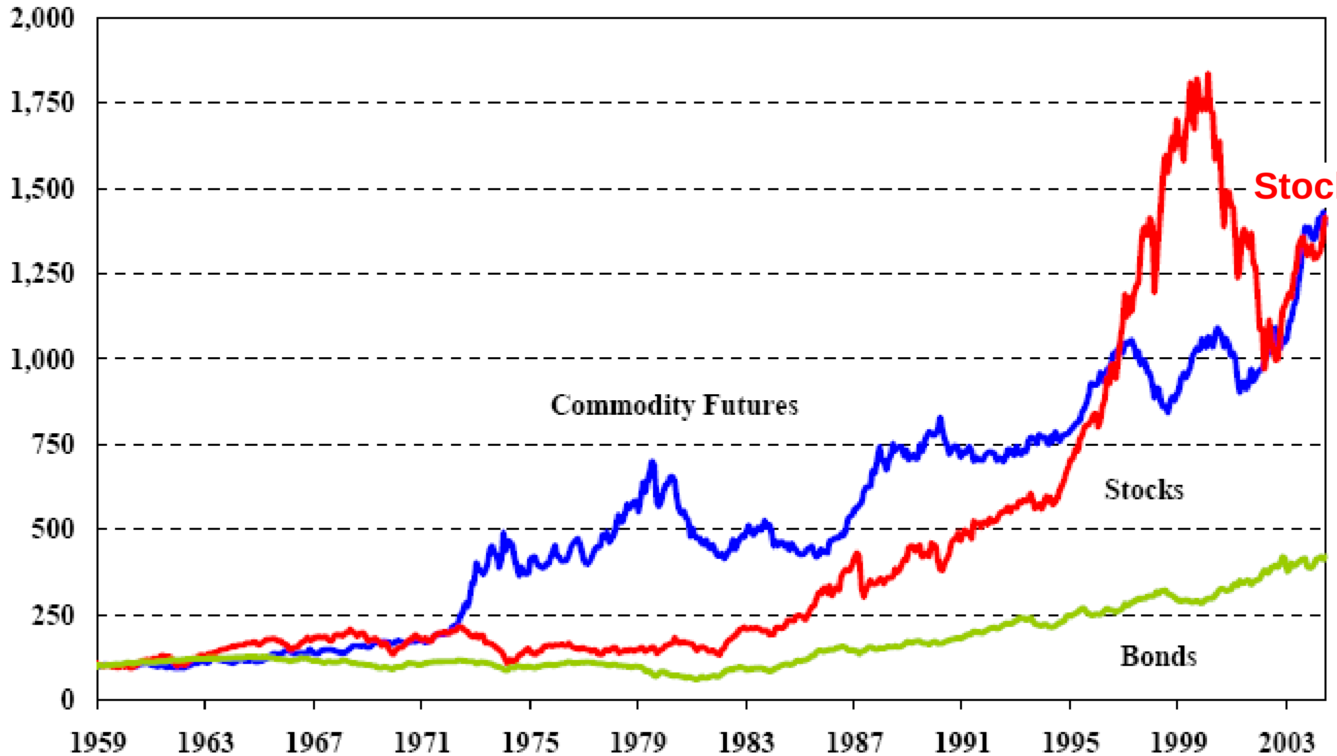
Backwardation, Inventory & Convenience Yield

- **if you can manage it, it's cheaper to purchase supplies ahead of time in the futures market and organize operations to use them "just in time"**
- **holding stocks pays a cost above and beyond the simple storage cost**
  - **Buying at the high spot price, contracting the future sale at the low, distant futures price, and holding the commodity to close out the transaction…**
  - **Buying high, selling low, *<u>and</u>* paying the storage cost**
- **holders of inventories must be earning a "return" somehow to compensate – we infer a high convenience yield to the inventories**

Backwardation is the Source of Commodity Portfolio Performance Returns

Figure 3

Stocks, Bonds, and Commodity Futures
Inflation Adjusted Performance 1959/7-2004/12



Stocks 5.65% avg. risk prem.

Comm. 5.23% avg. risk prem.

from ***Facts and Fantasies about Commodity Futures*** **by Gary Gorton and K. Geert Rouwenhorst, 2005**

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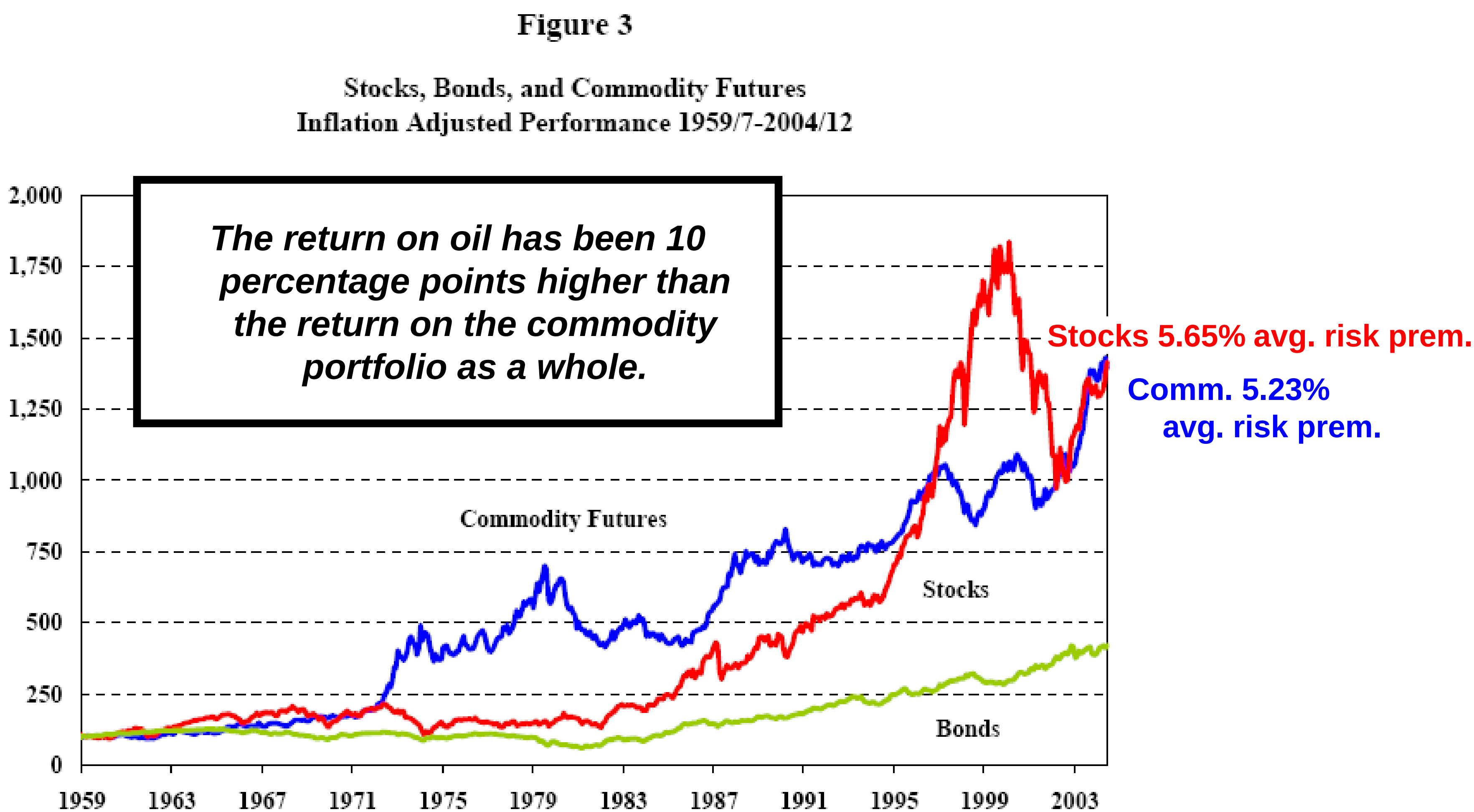

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The Creation of Commodity Funds

- **Goldman Sachs created its GSCI in 1991**
  - Collateralized futures: buy 2nd maturity out and roll when it is the prompt month before delivery dates
  - A diversified commodity index
  - But energy commodities dominate…approx 70% of capitalization
  - Within energy crude is 44%, natural gas 9%

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- Popularity developed in 2003-2004
- $40 billion invested, 90% from pension funds
- These now represent nearly 50% of open interest in oil futures

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Are the Speculators Responsible for the Rise in Oil Prices?

- a view surprisingly reinforced by BP's CEO, Lord Browne:
  - The Times of London, April '06: Lord Browne blamed [the increase of the crude oil price] on nervousness in the financial markets over the conflict in Iraq and a big increase in activity by speculative financial investors in oil. He said: "The scale of this [financial investment] has risen significantly, it has got much larger. We don't know whether it makes things more volatile. It is the case that the price of oil has gone up while nothing has changed physically."

Influence Exists

September 29, 2006

"Goldman Sachs, which runs the largest commodity index, the G.S.C.I., said in early August that it was reducing the index's weighting in gasoline futures significantly. "They started unwinding their positions, and those other longs also rushed to the door at the same time," said Lawrence J. Goldstein, president of the Petroleum Industry Research Foundation. Wholesale prices for New York Harbor unleaded gasoline, the major gasoline contract traded on the New York Mercantile Exchange, dropped 18 cents a gallon on Aug. 10, to $1.9889 a gallon, a decline of more than 8 percent, and they have dropped further since then."

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The New York Times

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BUT

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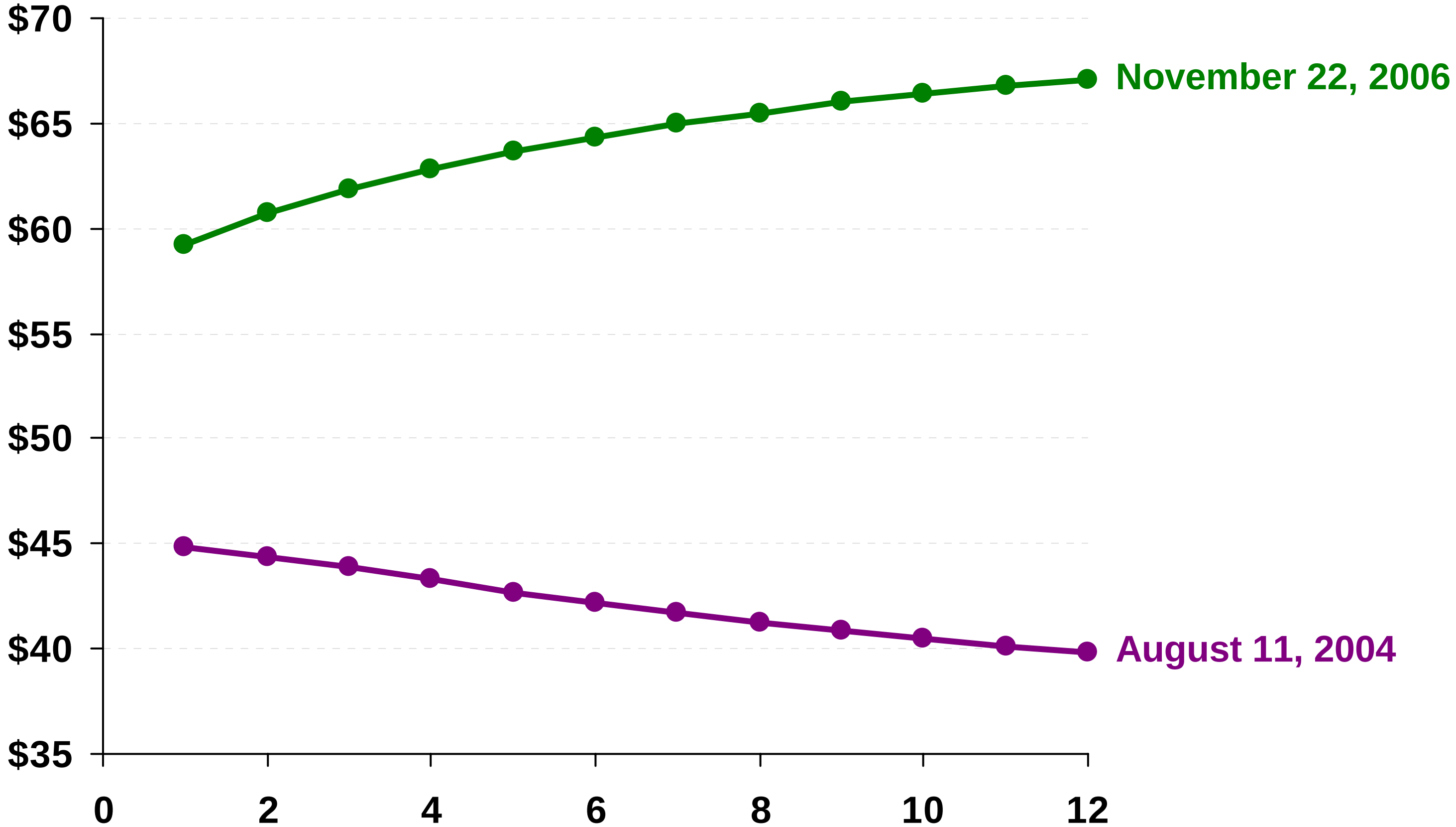
Recently, Oil Futures Moved Into “Contango”



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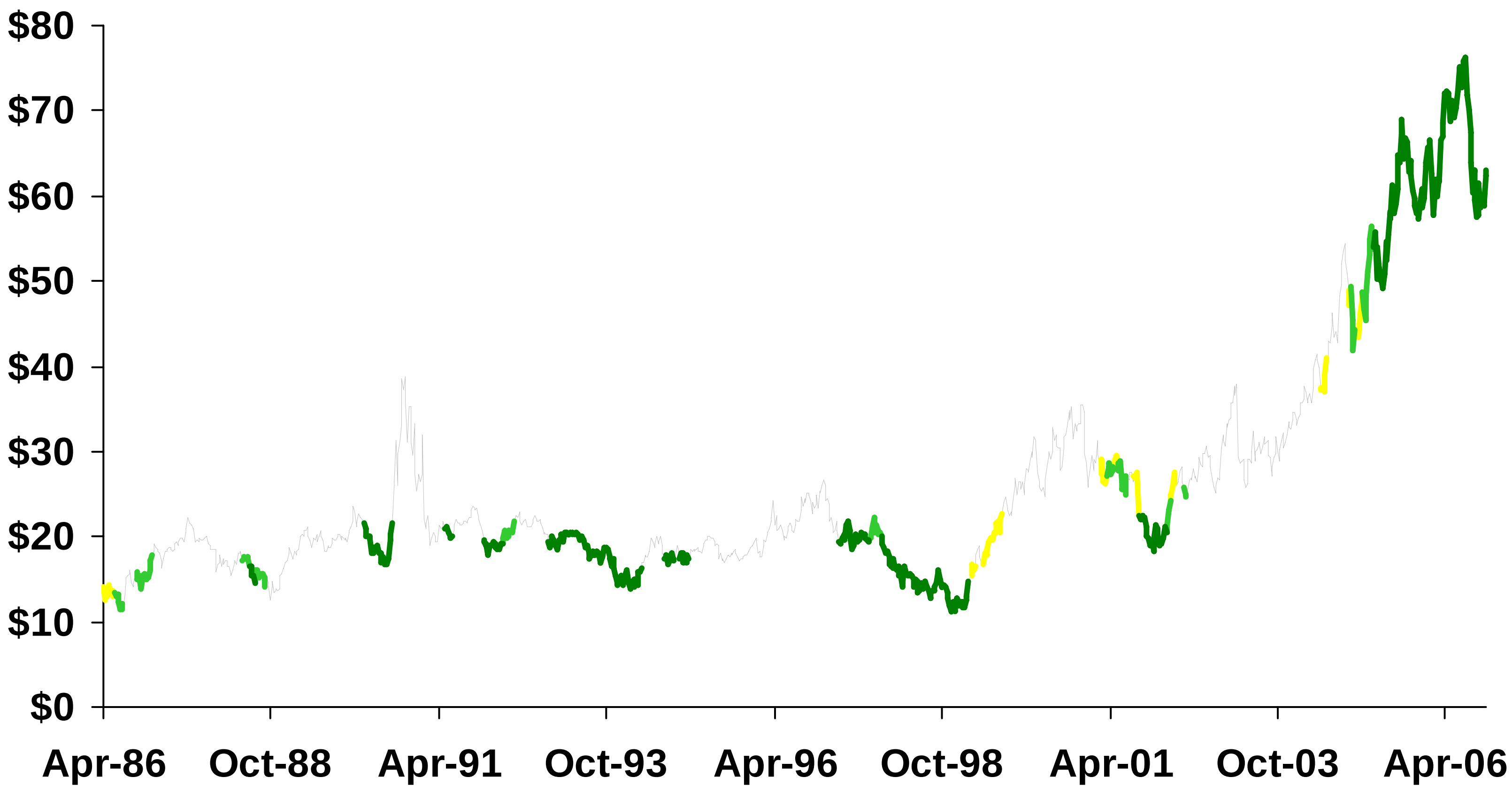
This is a Normal, Occasional Phenomenon



Current Contango Has Been Long-lasting

- Since Nov ’04, two years running in contango out to 12M
- Previous 5 years, 12M contango less than 9% of the time
  - Mention other notable windows
- Not just at a trough

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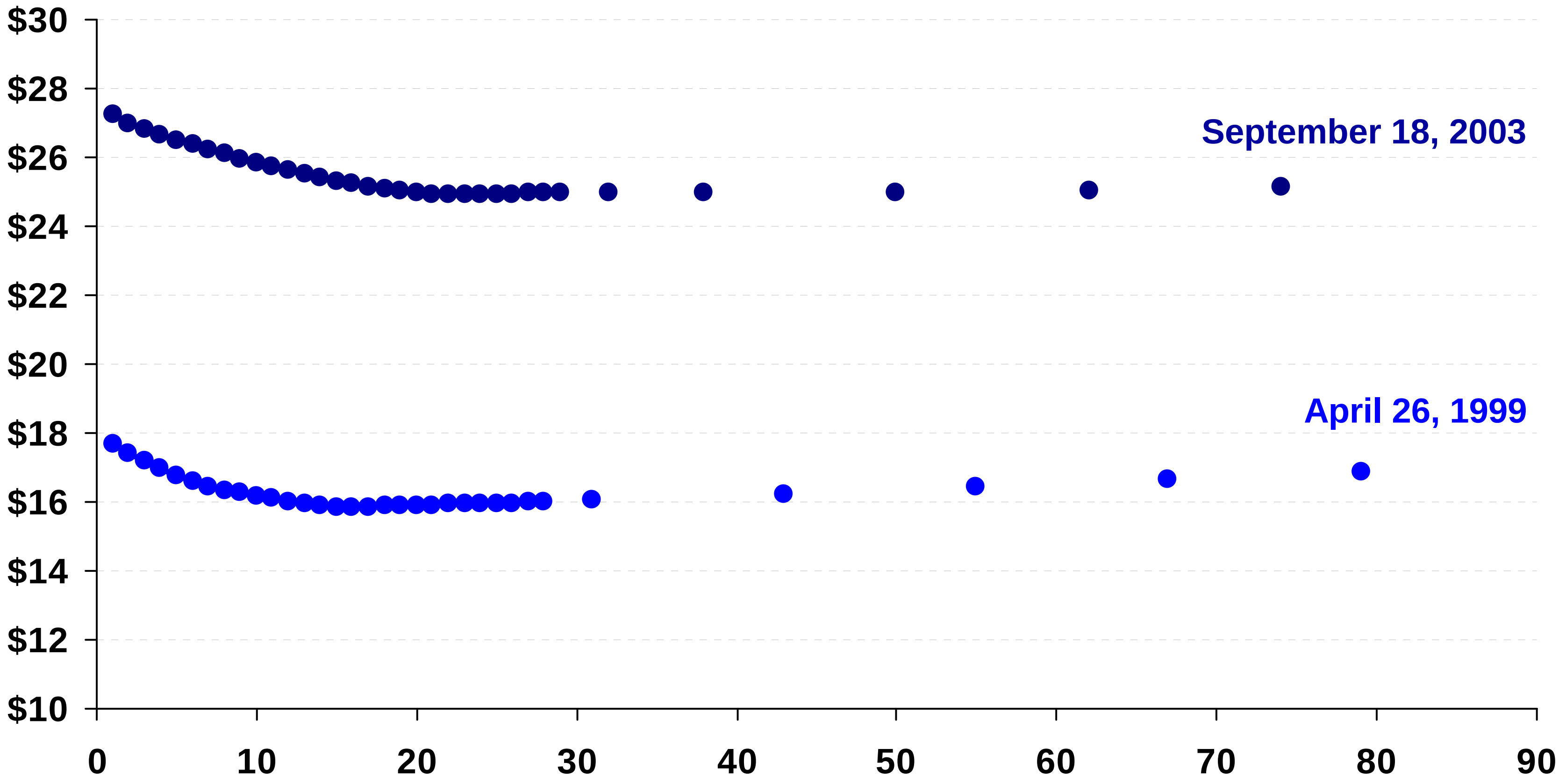
Long-end of the Curve Used to Rise



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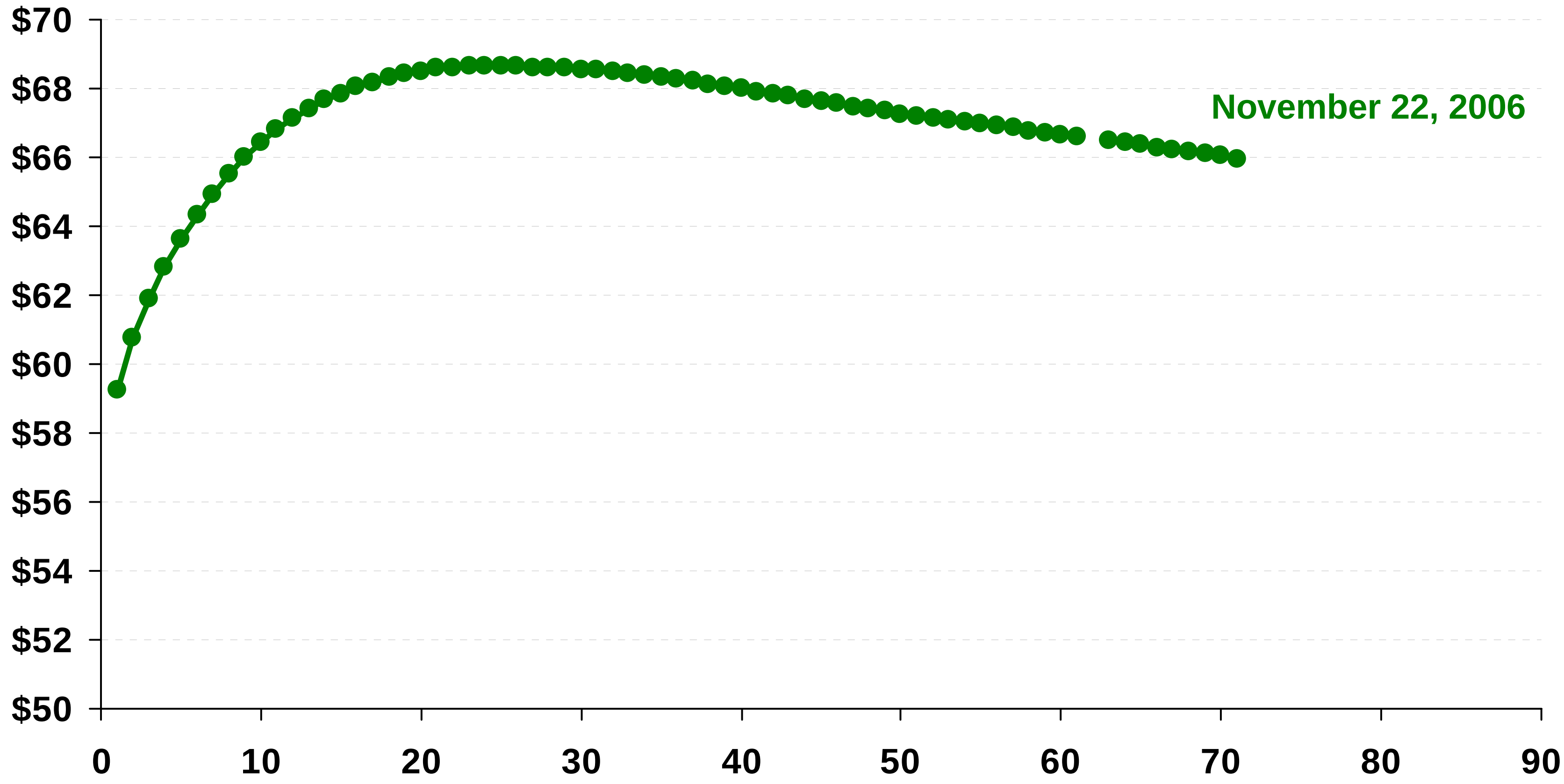
…But Now Falls



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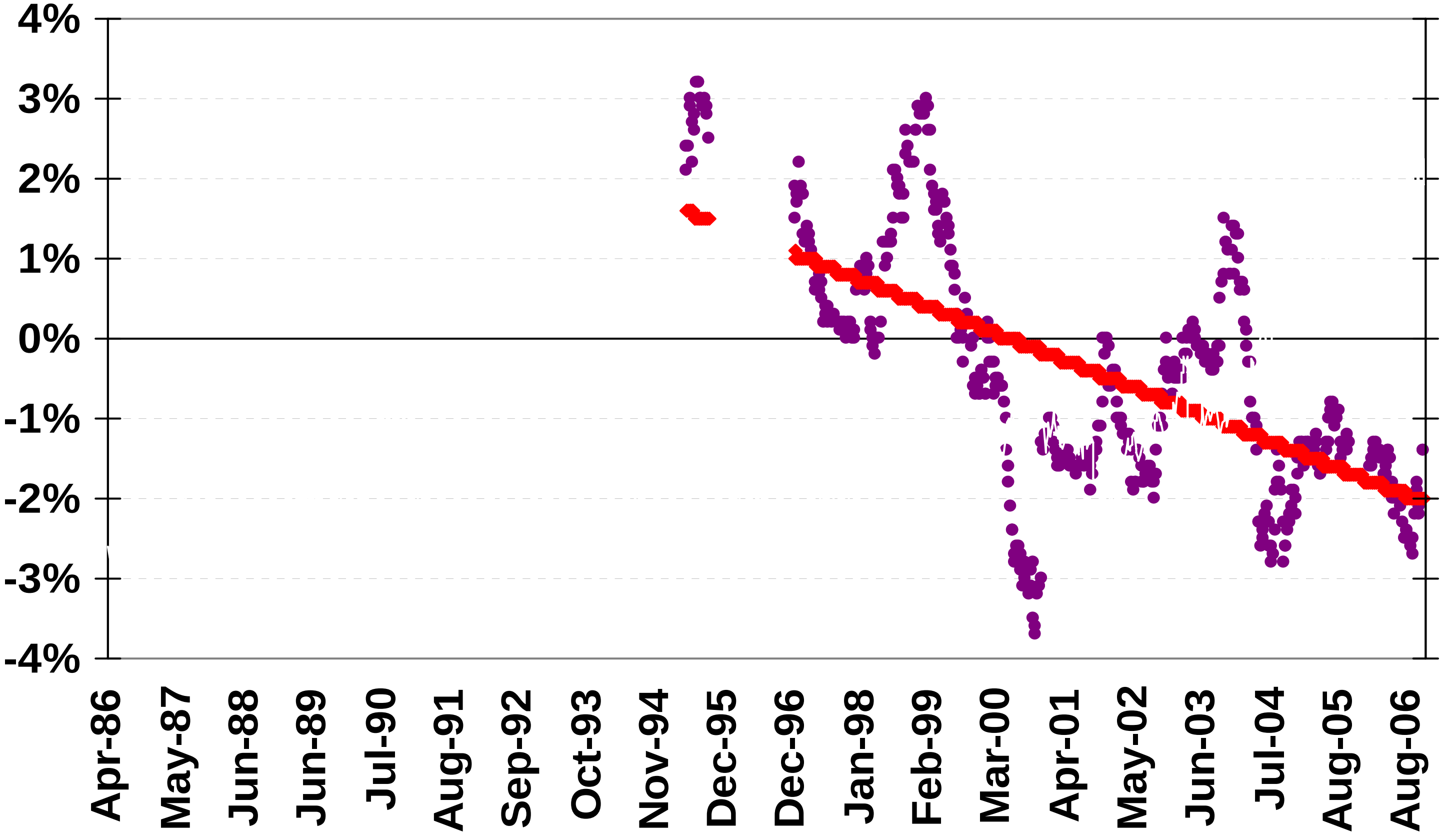
Declining Risk-Neutral Drift?



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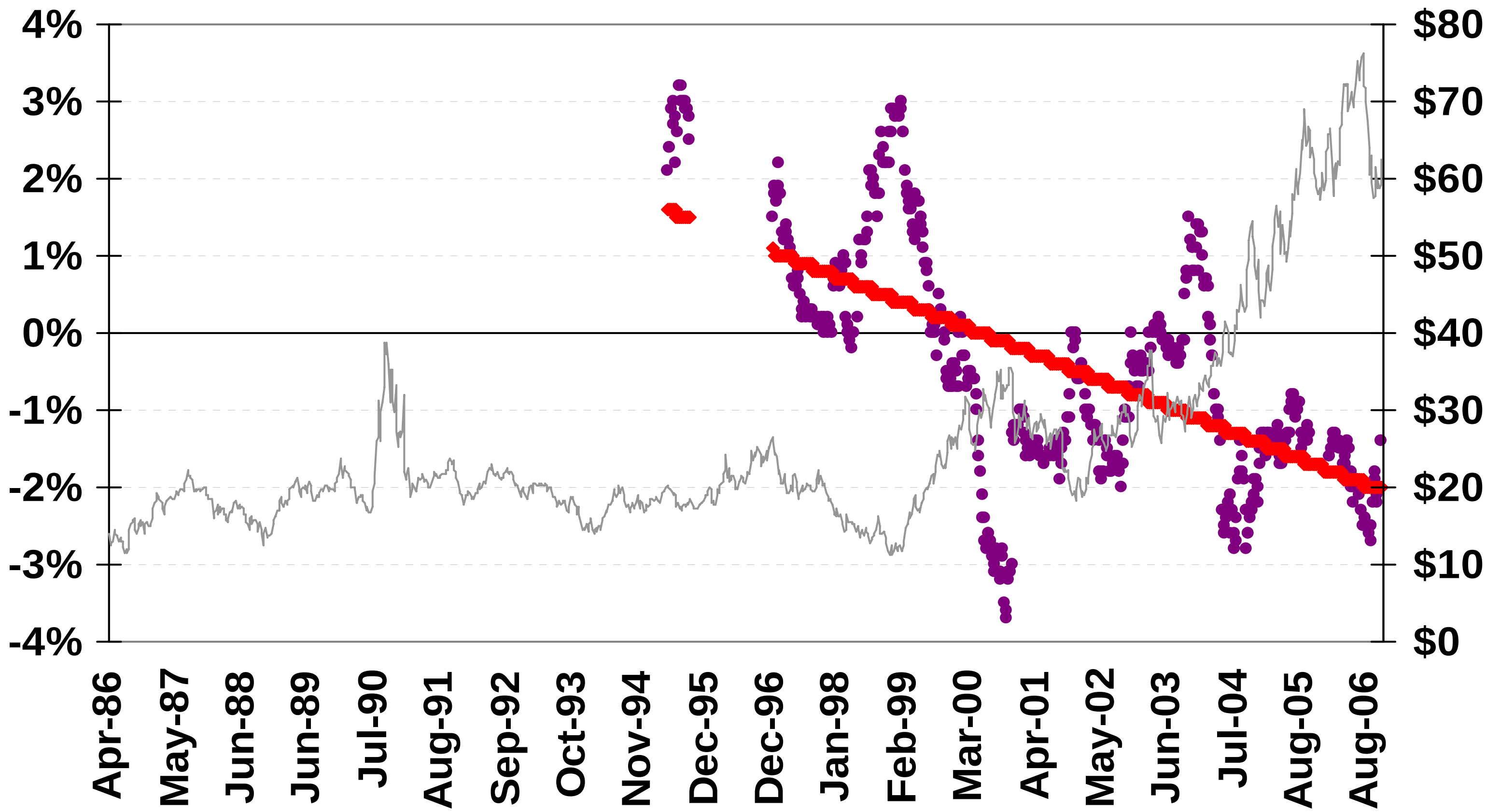

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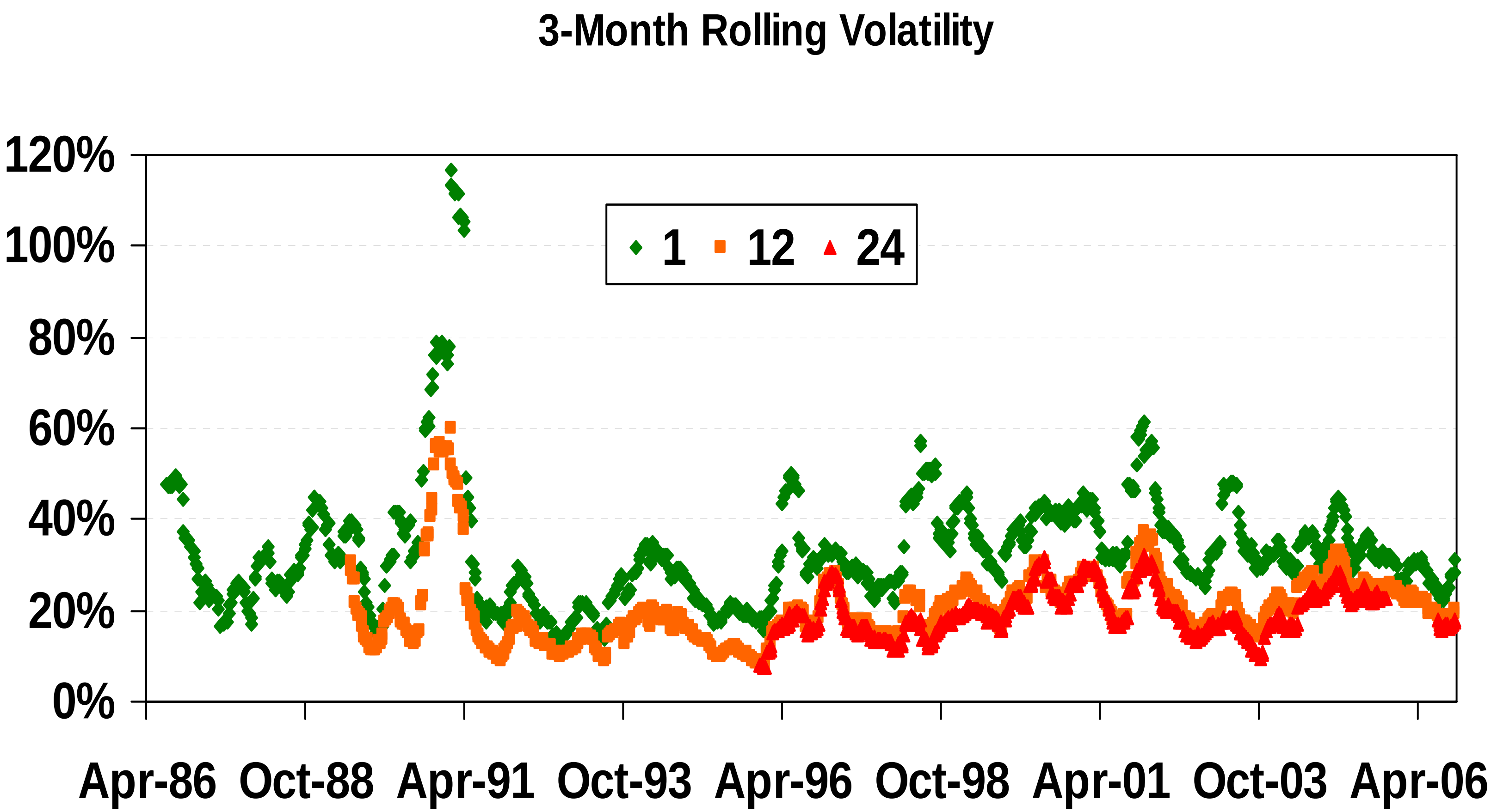
Volatility Has Not Increased



What Can Explain These Phenomena?

Model of Futures Prices

- Futures prices equal the expected spot price…
- But risk-adjusted!
- Futures prices are the risk-neutral oil price
- The size of the risk-premia determine how the shape of the futures curve deviates from the shape of the forecasted spot price

Determinants of the Shape of the Futures Curve at the Long End

- Slope (not the level) at the long-end has two elements

  growth rate in the spot price

  less the market price of long-term oil factor risk

- Assuming spot prices are flat or falling in the long-run, then a rising futures curve implies a negative market price of long-term oil factor risk.

- A shift to a falling futures curve implies a rise in the market price of long-term oil factor risk

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Determinants of the Shape of the Futures Curve at the Short End

- The primary factor at the short end is the transient disruptions in the supply-demand balance;
  - is the short-run spot price above or below the long-run trajectory?
  - if above, then it is expected to fall, and futures prices will reflect this and slope downward,
  - if below, then it is expected to rise, and futures prices will reflect this
- The market price of short-term oil factor risk also enters the equation
- To get the degree of contango obsered recently, and to get it consistently as the spot price has spike and fallen sharply requires a <u>negative</u> market price of short-term oil factor risk

What Can Explain These Phenomena?

- increasing market price of long-term oil price risk
  - or a shift to a belief in the long-term decline in oil prices
- declining market price of short-term oil price risk?
  - evidence for inflow of available risk-capital at the short end?
  - evidence is not in the levels, but in the shape of the curve
- timing is not coincident