

# Black Gold & Fool's Gold: Speculation in the Oil Futures Market

**19th Economia Panel Meeting  
Universidad de los Andes, Bogota, Colombia  
April 17, 2009  
John E. Parsons**

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# Outline

- Context Point #1: The Size Of Financial Investments In Oil
- Context Point #2: The Returns To Investments In Oil Futures
- Thesis: What Was Different About 2003-2008?

# THE SIZE OF FINANCIAL INVESTMENTS IN OIL

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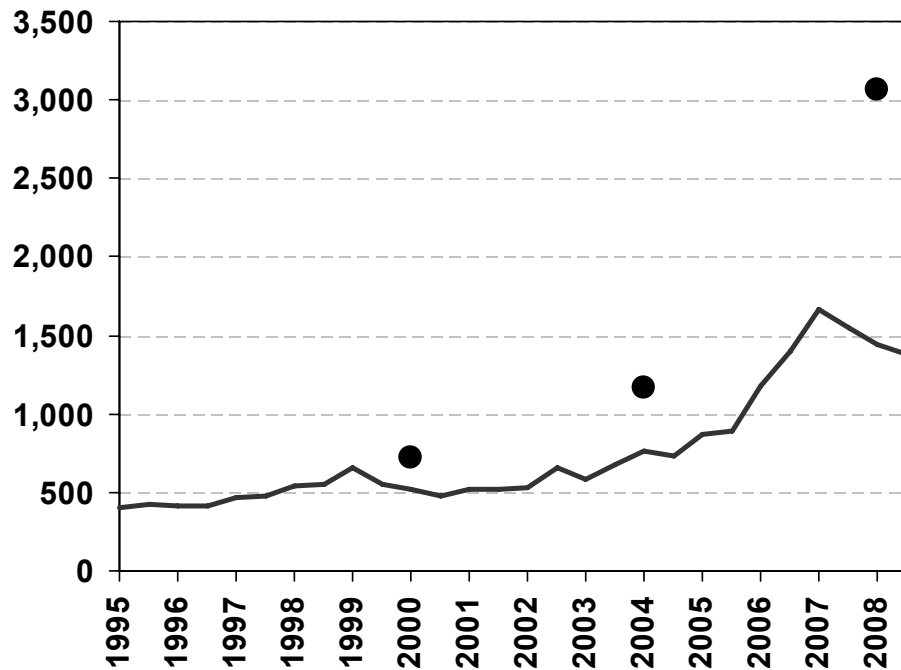
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# Exchange Traded Open Interest in Crude Oil

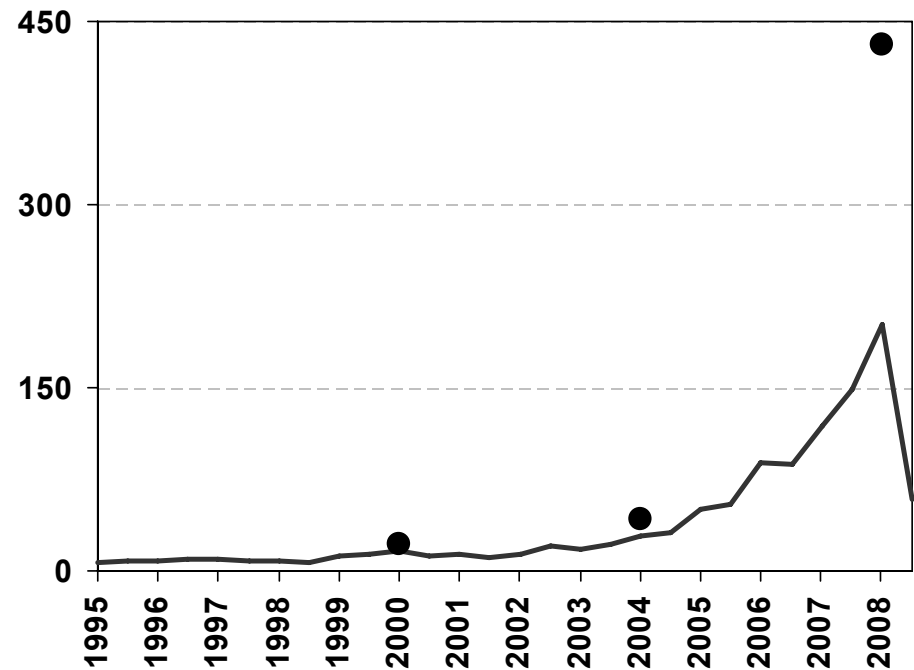
	Futures		+ Options	
	million barrels	billion \$	million barrels	billion \$
Jun 1995	398	6.8		
Dec 1995	419	7.9		
Jun 1996	415	8.3		
Dec 1996	416	10.2		
Jun 1997	466	9.1		
Dec 1997	478	8.4		
Jun 1998	546	7.9		
Dec 1998	549	6.4		
Jun 1999	653	12.5		
Dec 1999	555	13.8		
Jun 2000	517	16.0	724	22.5
Dec 2000	477	12.2		
Jun 2001	516	13.5		
Dec 2001	517	10.6		
Jun 2002	530	14.1		
Dec 2002	660	20.2		
Jun 2003	583	17.2		
Dec 2003	678	21.8		
Jun 2004	761	28.1	1,163	42.9
Dec 2004	733	31.8		
Jun 2005	866	49.8		
Dec 2005	895	55.2		
Jun 2006	1,180	88.2		
Dec 2006	1,400	87.2		
Jun 2007	1,669	118.5		
Dec 2007	1,549	148.2		
Jun 2008	1,441	202.5	3,068	431.2
Dec 2008	1,374	58.5		

# Exchange Traded Open Interest in Crude Oil

million barrels

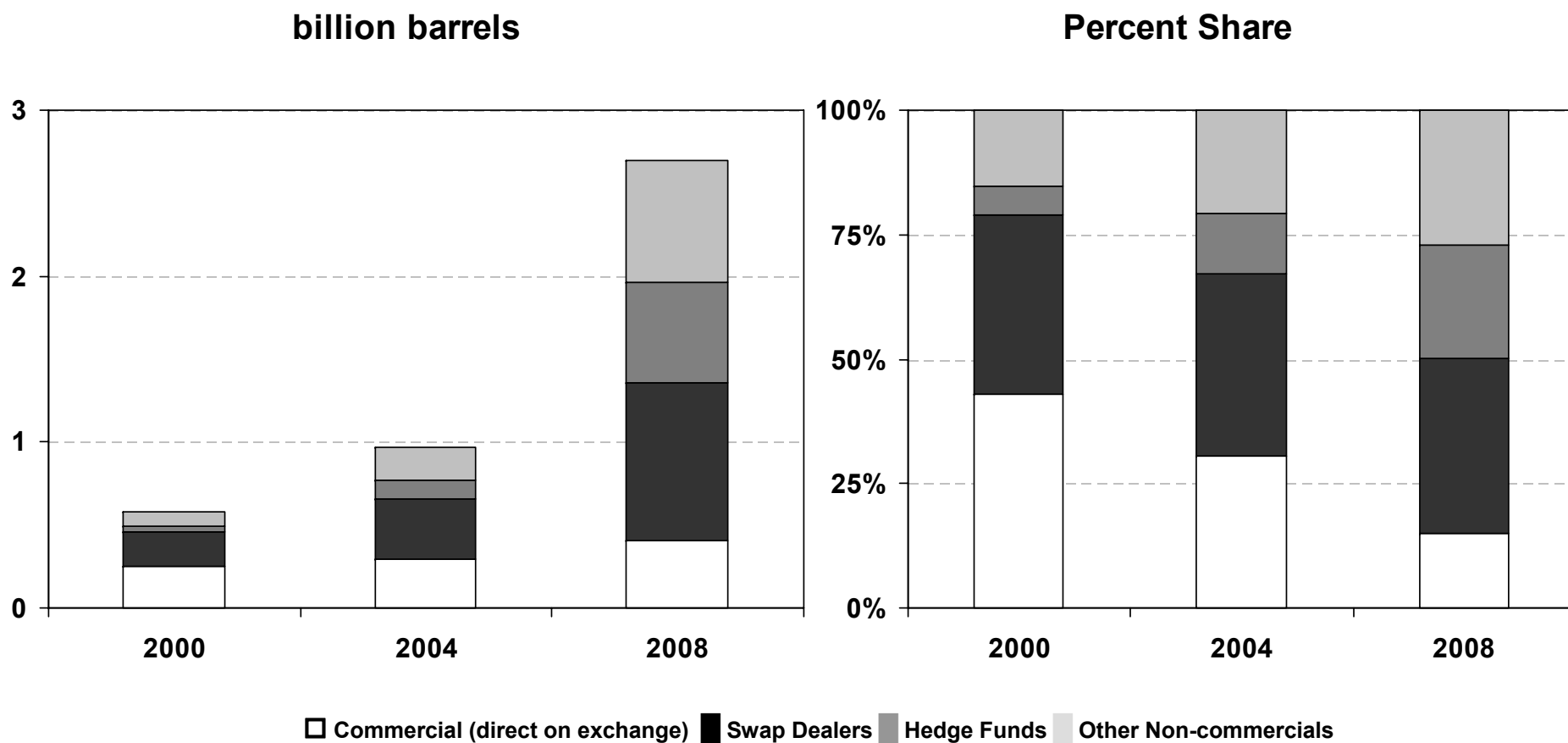


billion \$



Source: Bloomberg. Open Interest is the sum of contracts for all months for the NYMEX WTI, ICE WTI and ICE Brent crude contracts.

# Shares of Open Interest by Type of Trader



Source: Büyüksahin et al. (2008), based on Table 5. "Hedge Fund" category aggregates several finer categories in the CFTC LTRS database. See original source for breakdown.

# What's Missing?

- Data is limited to trades taken onto the exchange.
- The role of swap dealers has grown tremendously.
  - Popularly known as OTC trades.
- Swap dealers attempt to run a balanced book. They only bring the unhedged, net position onto the exchange.
- Therefore there is a significant share of “open interest” that is not included in the commonly cited data on open interest.
- The CFTC has haltingly reported partial data on swap dealers’ off-exchange positions. It obtained the data for a couple of recent years, but produced a report on only a subset of transactions. The aggregate data remains unreported.

# Evaluating the Size of Futures Exposures

	Futures		+ Options		compared to...		
	million barrels	billion \$	million barrels	billion \$	Global Production million barrels	Global Reserves billion barrels	US Reserves billion barrels
Jun 1995	398	6.8					
Dec 1995	419	7.9			25,649		
Jun 1996	415	8.3					
Dec 1996	416	10.2			26,250		
Jun 1997	466	9.1					
Dec 1997	478	8.4			27,068		
Jun 1998	546	7.9					
Dec 1998	549	6.4			27,614		
Jun 1999	653	12.5					
Dec 1999	555	13.8			27,316		
Jun 2000	517	16.0	724	22.5			
Dec 2000	477	12.2			28,383		
Jun 2001	516	13.5					
Dec 2001	517	10.6			28,355		
Jun 2002	530	14.1					
Dec 2002	660	20.2			28,101		
Jun 2003	583	17.2					
Dec 2003	678	21.8			29,055		
Jun 2004	761	28.1	1,163	42.9			
Dec 2004	733	31.8			30,333		
Jun 2005	866	49.8					
Dec 2005	895	55.2			30,871		
Jun 2006	1,180	88.2					
Dec 2006	1,400	87.2			30,858		
Jun 2007	1,669	118.5					
Dec 2007	1,549	148.2			30,821	1,239	30
Jun 2008	1,441	202.5	3,068	431.2			
Dec 2008	1,374	58.5					



# Evaluating the Size of Futures Exposures

- 2008 open interest of 3 billion barrels.
- Compared to total oil production...
  - 2007 global production of more than 30 billion barrels, i.e., 10 times.
  - Stocks vs. flows.
- Compared to reserves.
  - 2007 global reserves of 1.2 trillion barrels, i.e., 400 times.
  - Mostly non-traded reserves.
  - 2007 US reserves of 30 billion barrels, i.e., 10 times.

# THE RETURNS TO INVESTMENTS IN OIL FUTURES

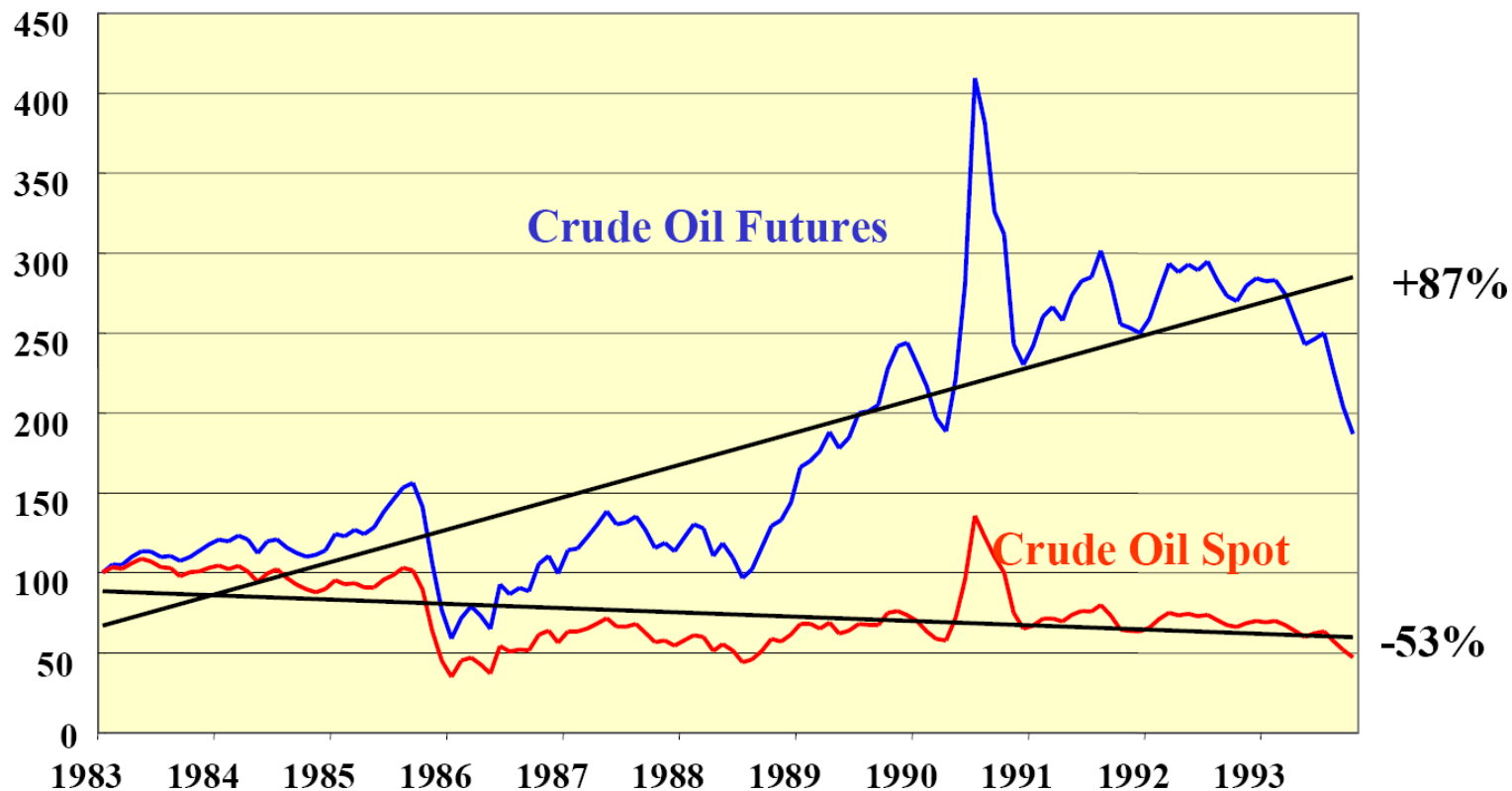


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# Until Recently, Oil Futures Investments Were NOT a Bet on Price Increases

## Returns to a Portfolio of Futures v. the Level of the Spot Price (1983-1994)



Source: Gorton, Gary, and K. Geert Rouwenhorst, 2006, Facts and Fantasies About Commodity Futures, Financial Analysts Journal, 62:47-68.  
Figure is taken from a presentation by Rouwenhorst.

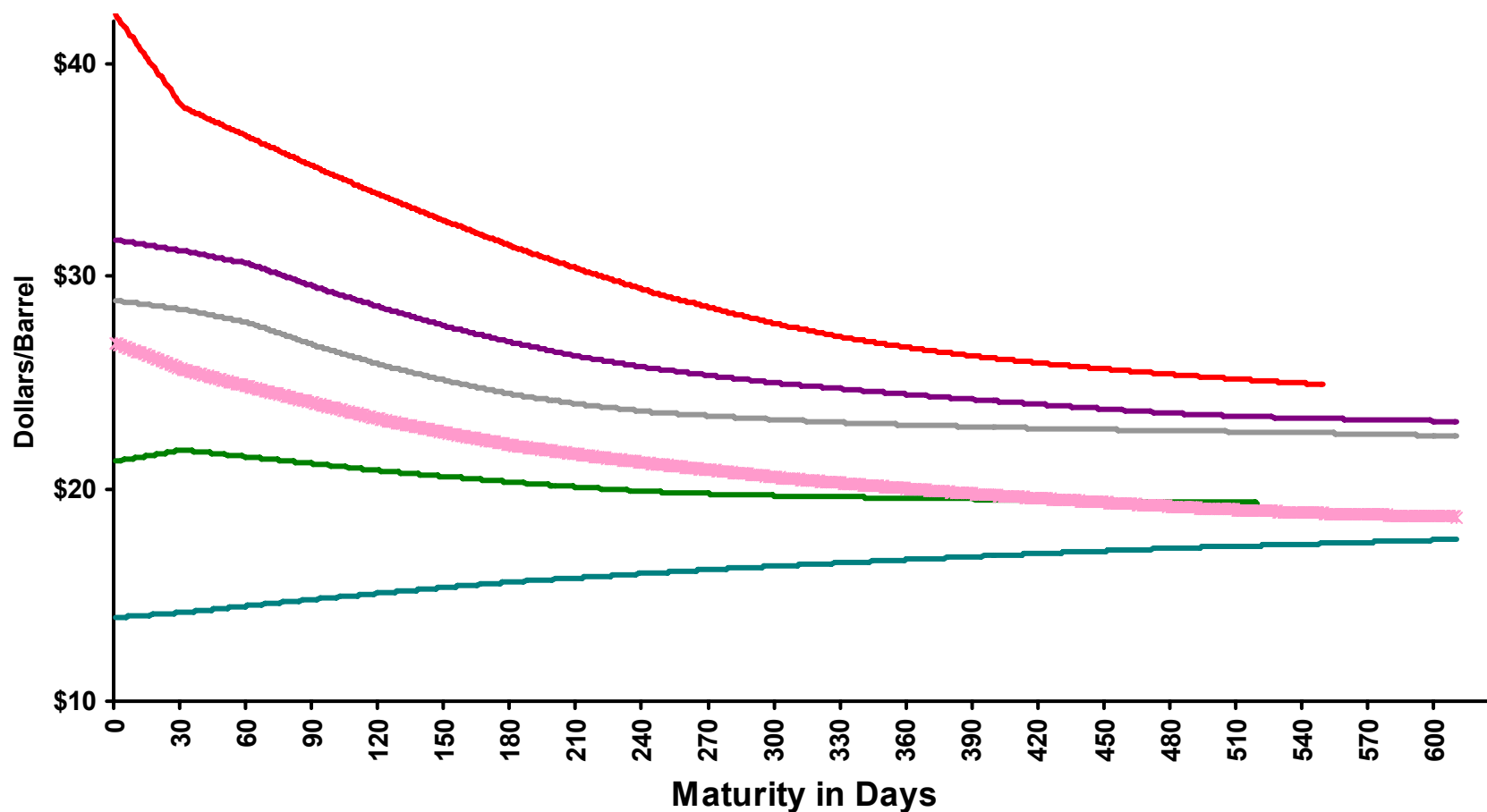
# The Term Structure of Oil Futures

- Economists should stop focusing exclusively on the spot price of commodities and look at the full term structure.
- The spot price contains volatility that washes out in the long run.
- If anything, longer maturities ought to be more reflective of long run fundamentals (and beliefs) than the spot price is.
- Combined, the spot and long maturity futures (i.e., the full term structure) ought to yield superior information.

# The 2-Factor Model of Oil Prices

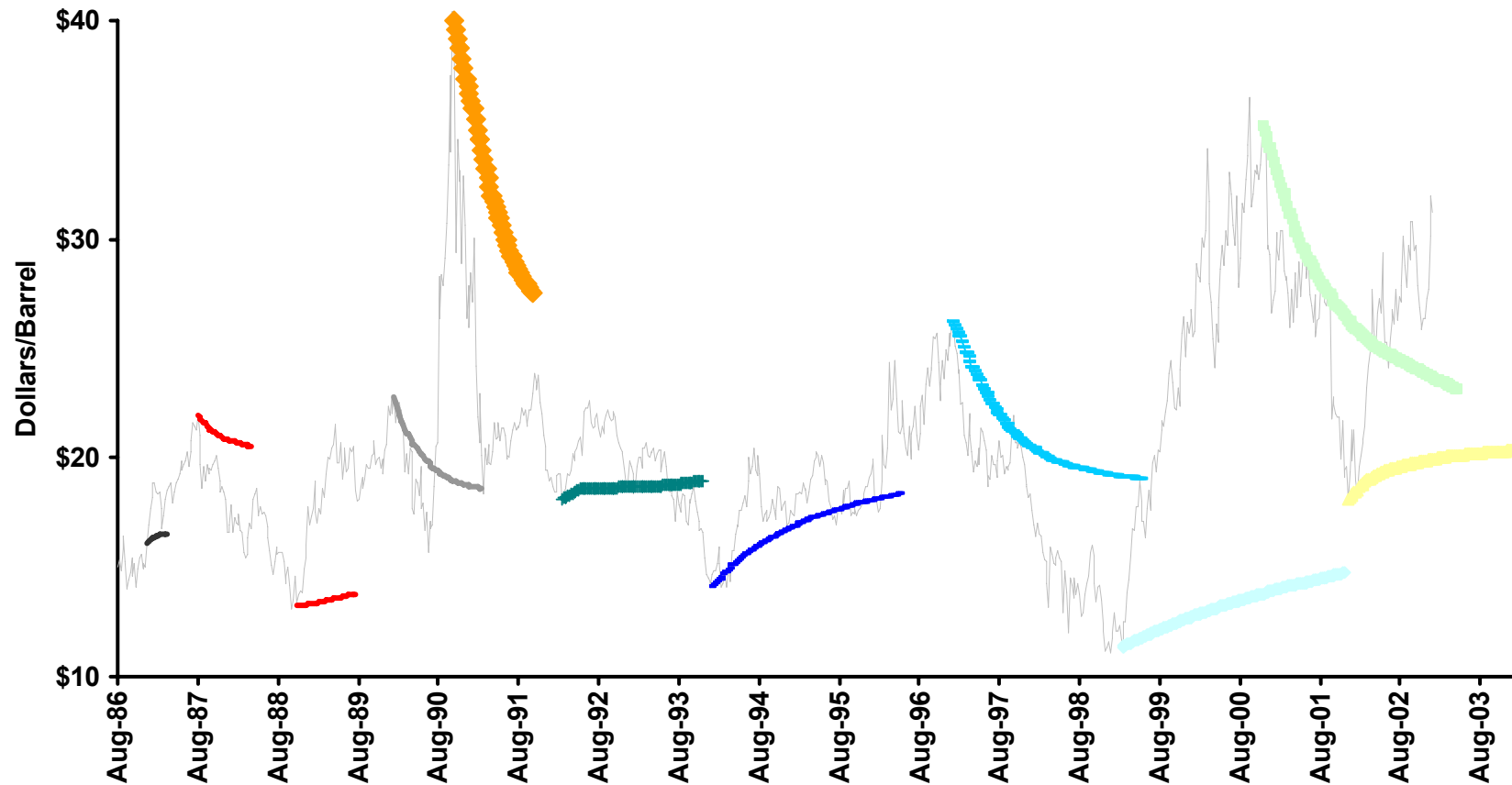
- Two factors determine the full term structure of oil prices:
  - a long term factor, and
  - a short term factor.
- Long term factor evolves as a random walk.
- Short term factor evolves as a mean reverting process.
- Short term factor moves the spot price around the current long term price.
- Spot volatility is a product of both the volatility of the long term factor and the volatility of the short term factor.
- Volatility in long maturity contracts more purely reflects volatility in the long term factor.

# The Term Structure of Oil Futures on Selected Dates



Source: Bloomberg.

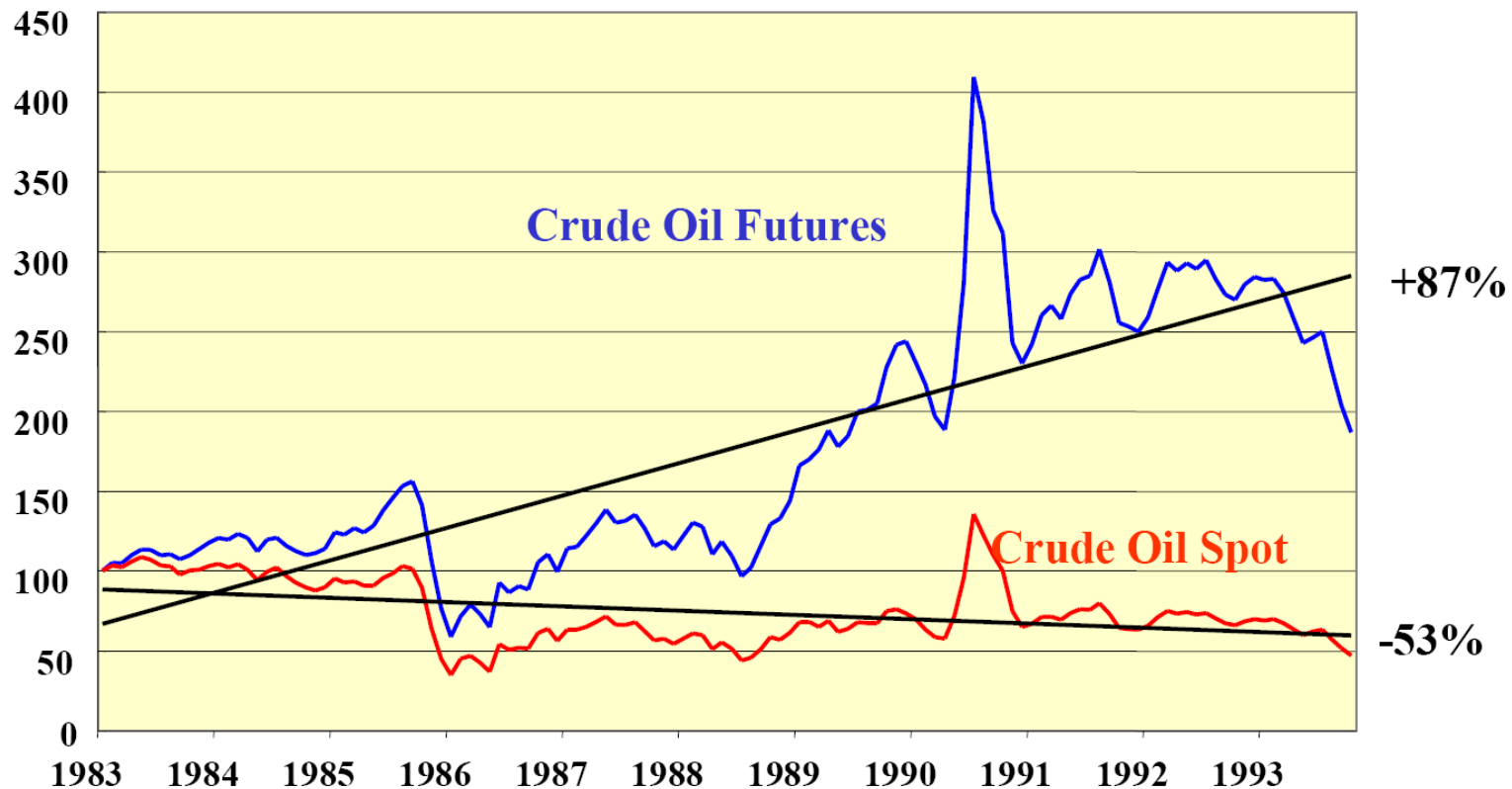
# Selected Futures Term Structures, 1986-2002



Source: Bloomberg.

# Until Recently, Oil Futures Investments Were NOT a Bet on Price Increases

## Returns to a Portfolio of Futures v. the Level of the Spot Price (1983-1994)



Source: Gorton, Gary, and K. Geert Rouwenhorst, 2006, Facts and Fantasies About Commodity Futures, Financial Analysts Journal, 62:47-68.  
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# What Was Different About 2003-2008?



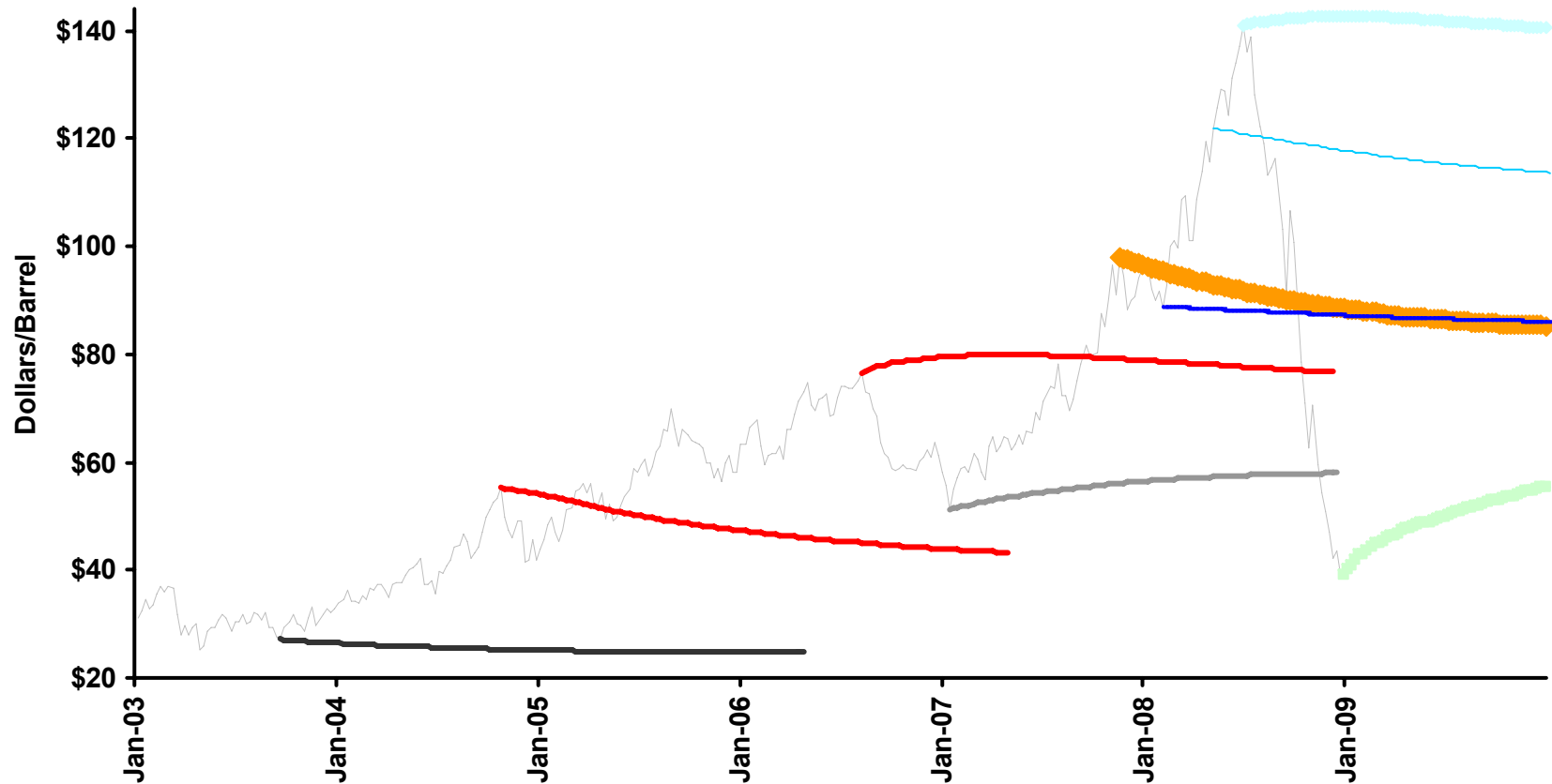
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# What Was Different About 2003-2008?

- First, on the pattern of returns...
  - The rising level of prices produced profits from betting on the price, i.e., on the long-term factor.
  - Simultaneously, a shift into a long-lasting contango starting in 2004 created persistent expected losses on the traditional long index holdings at short maturities.
  - Consequently, liquidity in the oil futures market moved out to longer and longer maturities. Only recently did it truly become possible to speculate on the “level” of oil prices. Only recently did oil become a true financial asset.
  
- Second, this intersected with an exponentially increasing flow of investment dollars into oil futures...
  - This flow was originally based upon returns from backwardation, i.e., from the short run factor,
  - But the majority of new investment earned returns from the rising level of the oil price, i.e., from the long-term factor.

# In 2003-2008 the Term Structure Behaved Very Differently



Source: Bloomberg.

# The Puzzle of the Missing Stocks

- An artificially high oil price created by speculation ought to generate production that exceeds consumption. It ought to generate accumulated stocks.
- The data on oil in above-ground storage shows no change in the level of stocks.
- Therefore, the price is not too high.

# Solution to the Puzzle: the Term Structure and the Time Profile of Production Capacity

- This argument focuses on the spot price only, and is a good example of why attention to the full term structure is essential.
- For oil, only a small amount of storage is ever held above-ground. Above-ground storage responds to the shape of the term structure at the near end. A high spot price relative to the 1-month future, argues for selling existing inventories. A high 1-month future relative to the spot price argues for accumulating inventory.
- The term structure was moving up in parallel, at all maturities, creating no shifting incentives to store above-ground.
- This parallel upward shift does create distorted investment and production incentives. There will be too much investment in oil production. But the excess capacity will be reflected only in longer time scales. The parallel upward shift does not shift the incentives across alternative investments towards earlier production of oil and away from later production. Above ground stocks should not increase measurably.

# Conclusion

- A portion of the oil price spike of 2003-2008 probably was a part of the larger global asset bubble.
- Increasing availability of investment at the long end of the futures curve created the possibility to speculate on the level of the oil price, i.e., made oil a financial asset.
- Coincidences of timing created...
  - a growing flow of investors into oil futures
  - pushed investors into the long maturities where profit was tied to the level of price
  - and generated a sequence of high returns to this speculation that reinforced the cycle.
- The term structure of futures rose in parallel during this time, reflecting beliefs that the long run price of oil was climbing.

The End

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