

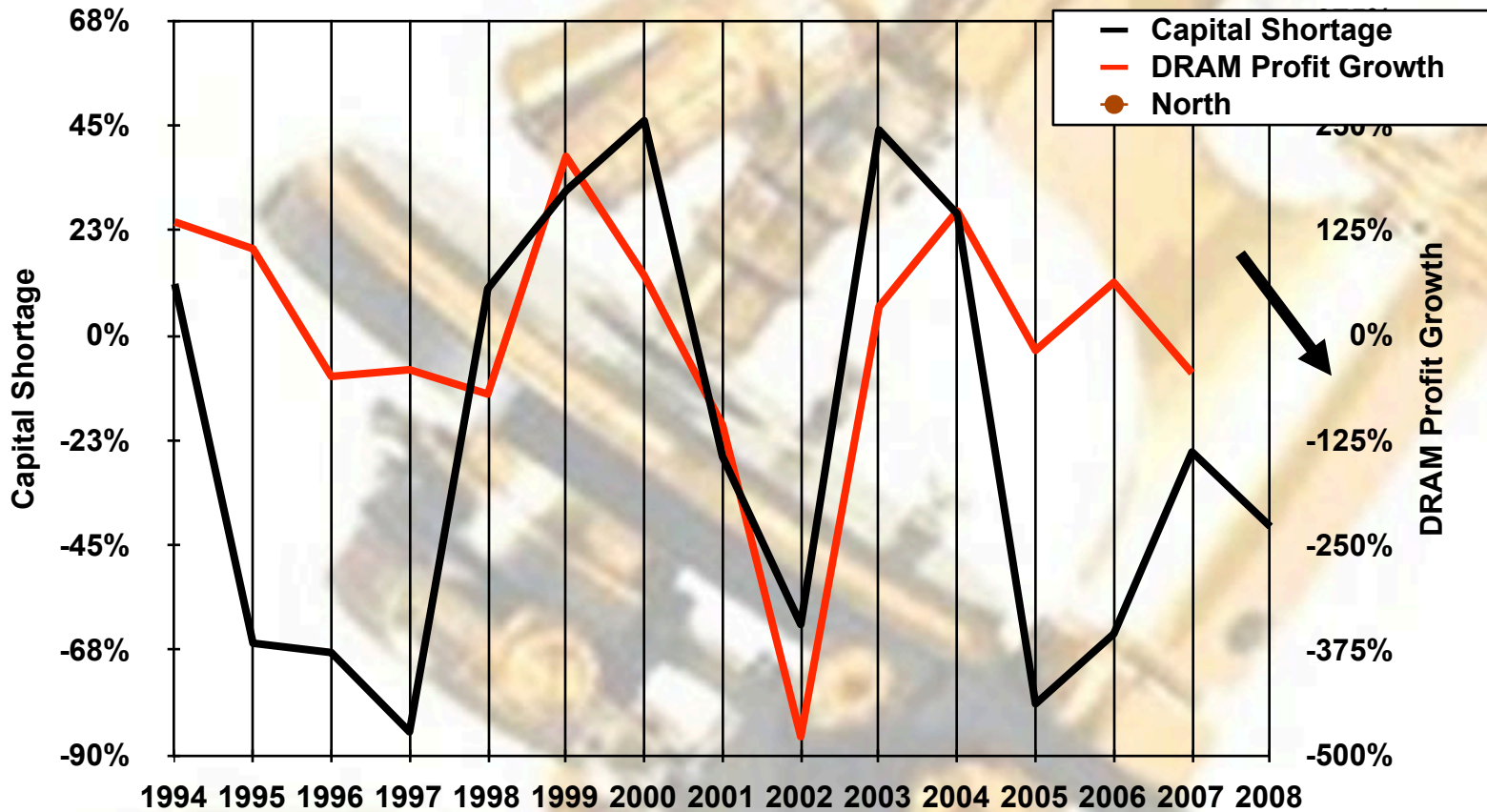
# The Future of Flash

**Jim Handy**

**OBJECTIVE  
ANALYSIS**



# Why Are NAND Prices So Low?



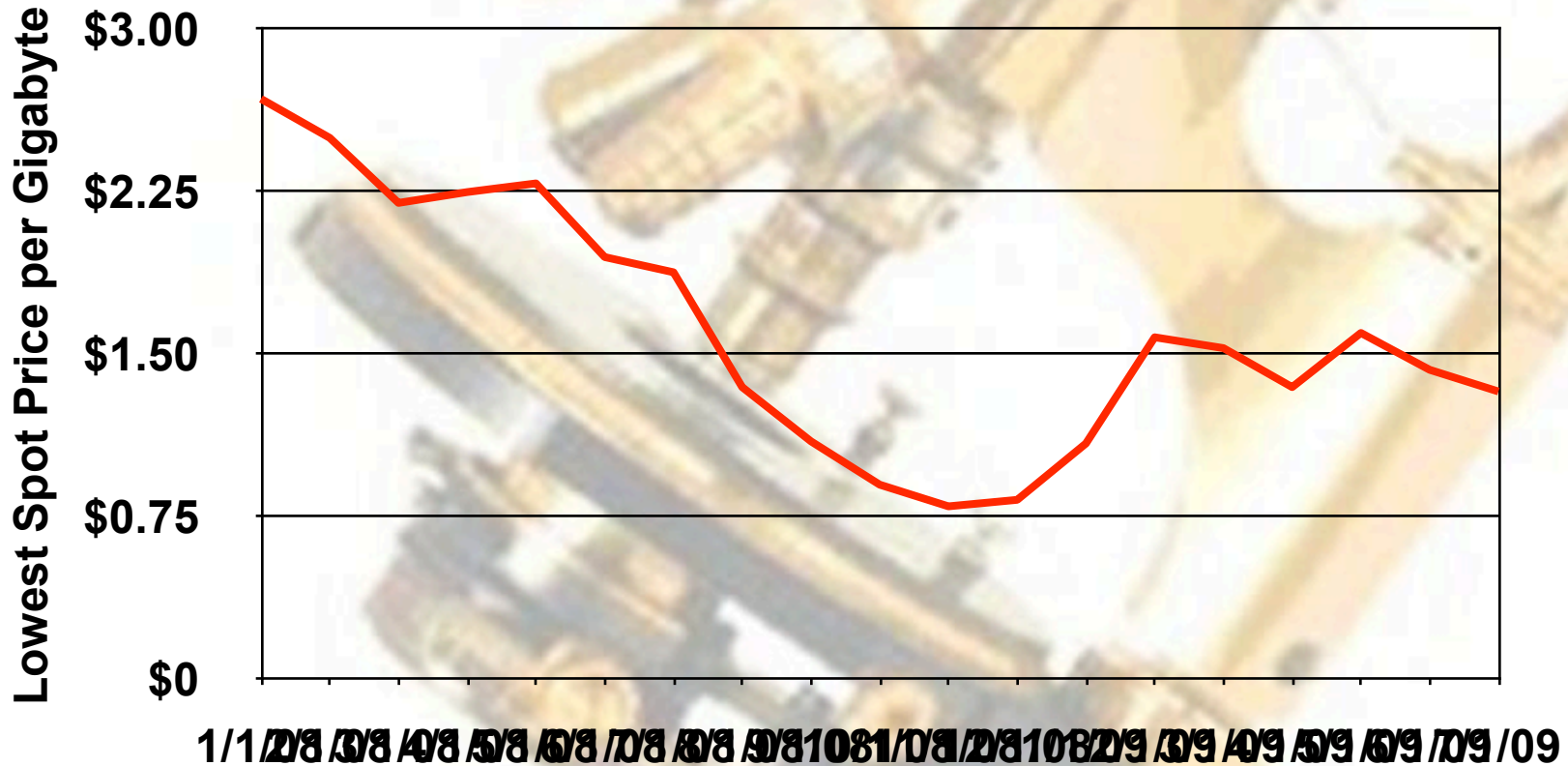
From: *2008: Tough Year Ahead*

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# Two Elements of a Recovery

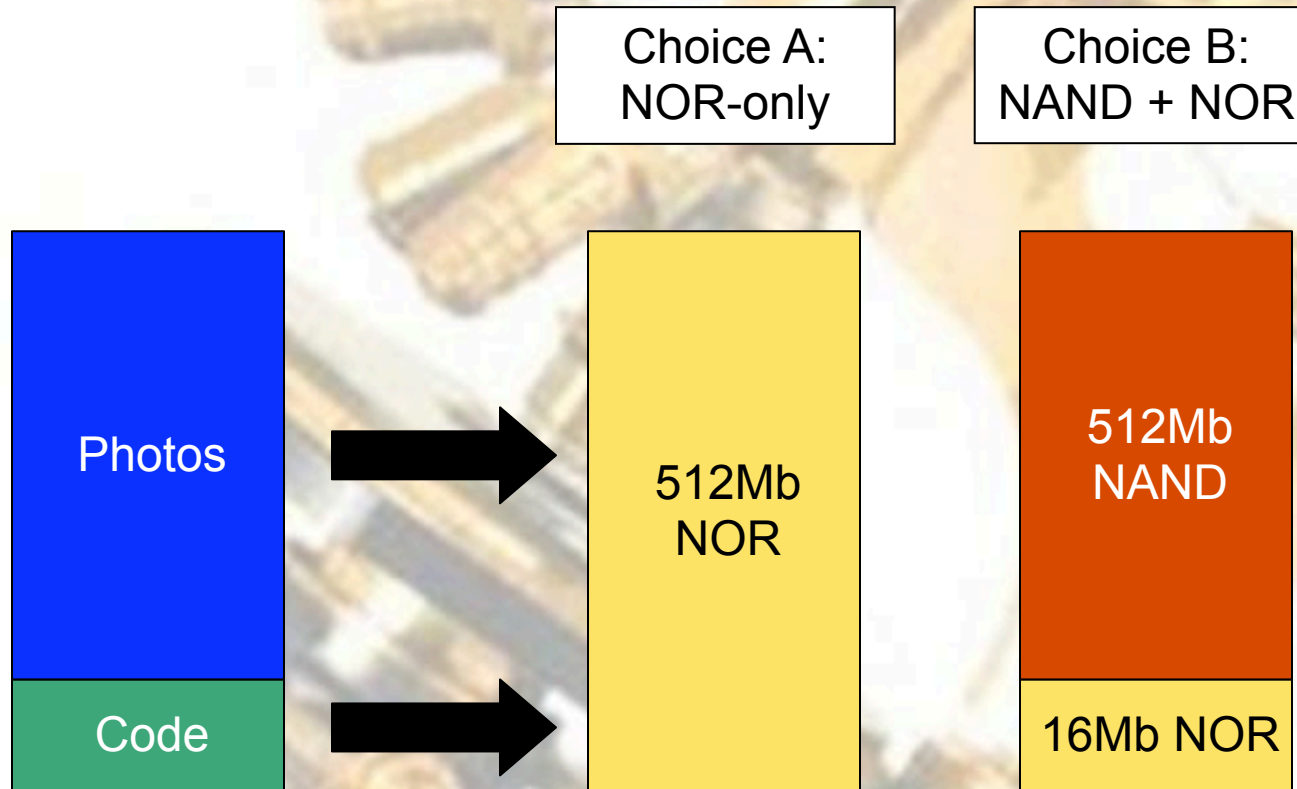
- Flat Prices
  - Collapse at the beginning of an oversupply
  - Track cost during the rest of the oversupply
  - Flat during a shortage
- Growing gigabyte shipments
  - Healthy demand drives GB shipment growth
  - When will the economy be healthy?

# NAND Prices Have Stabilized



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# Why are NOR Prices So Low?



1. The NOR-only price must compete against NAND + NOR
2. NAND has been selling below cost

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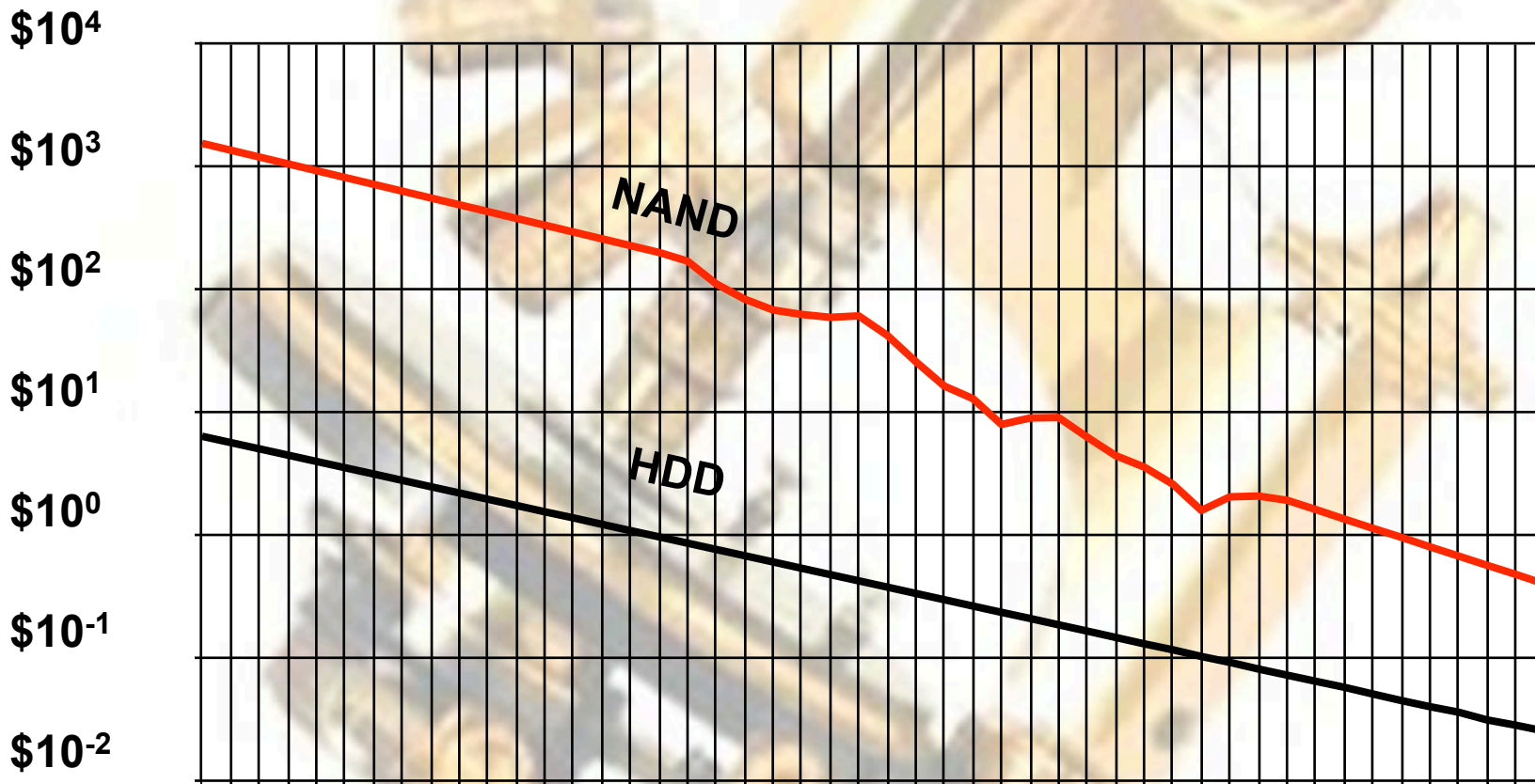
# Why aren't SSDs Popular?

- Expensive
- Minor speed advantage
- Expensive
- Slight battery life improvement
- Expensive
- A little quieter
- Expensive

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# NAND vs. HDD \$/GB

Price per Gigabyte



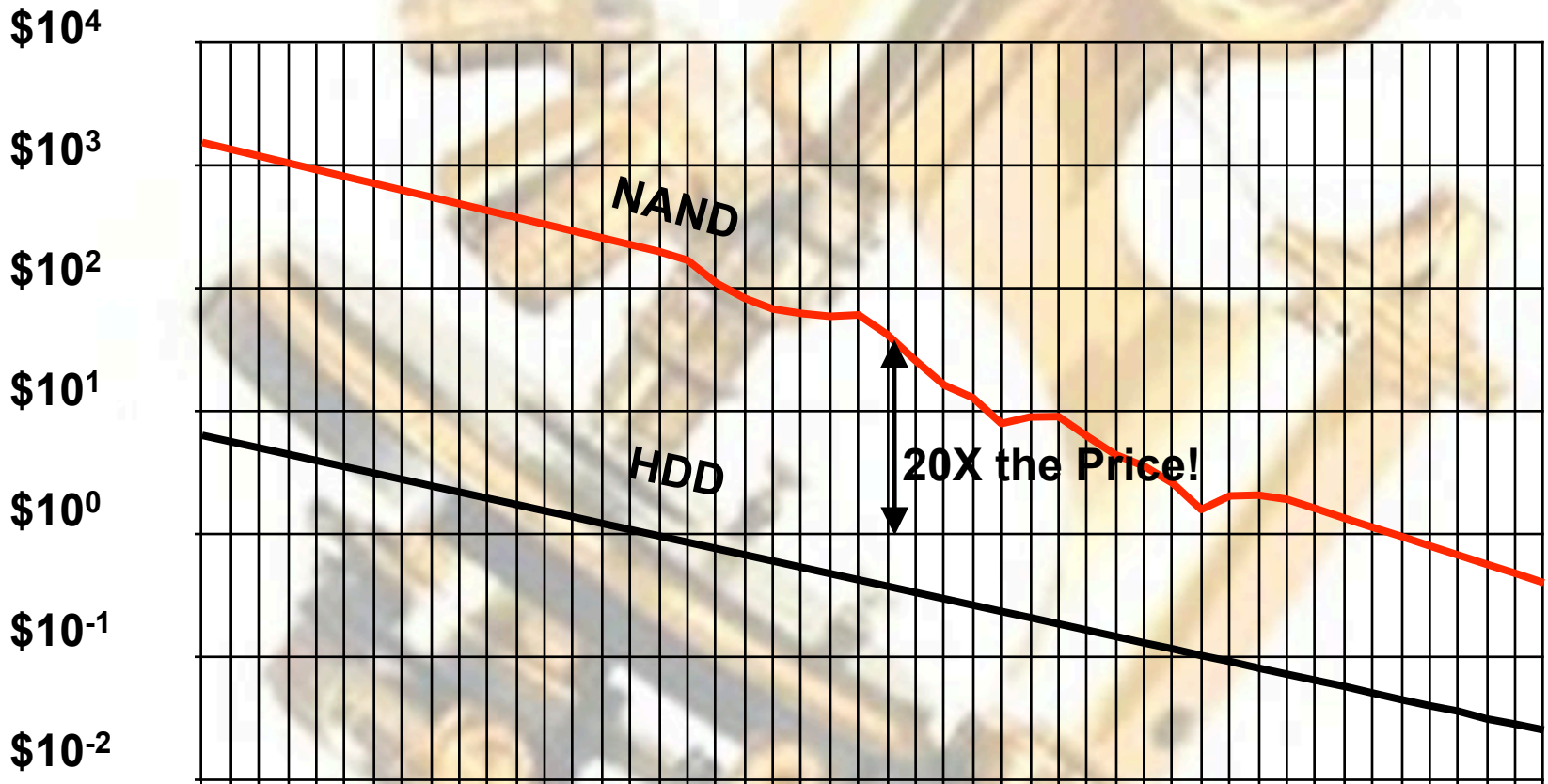
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

From: *Understanding the NAND Market*

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# NAND vs. HDD \$/GB

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# NAND vs. HDD \$/GB

Price per Gigabyte

\$10<sup>4</sup>

\$10<sup>3</sup>

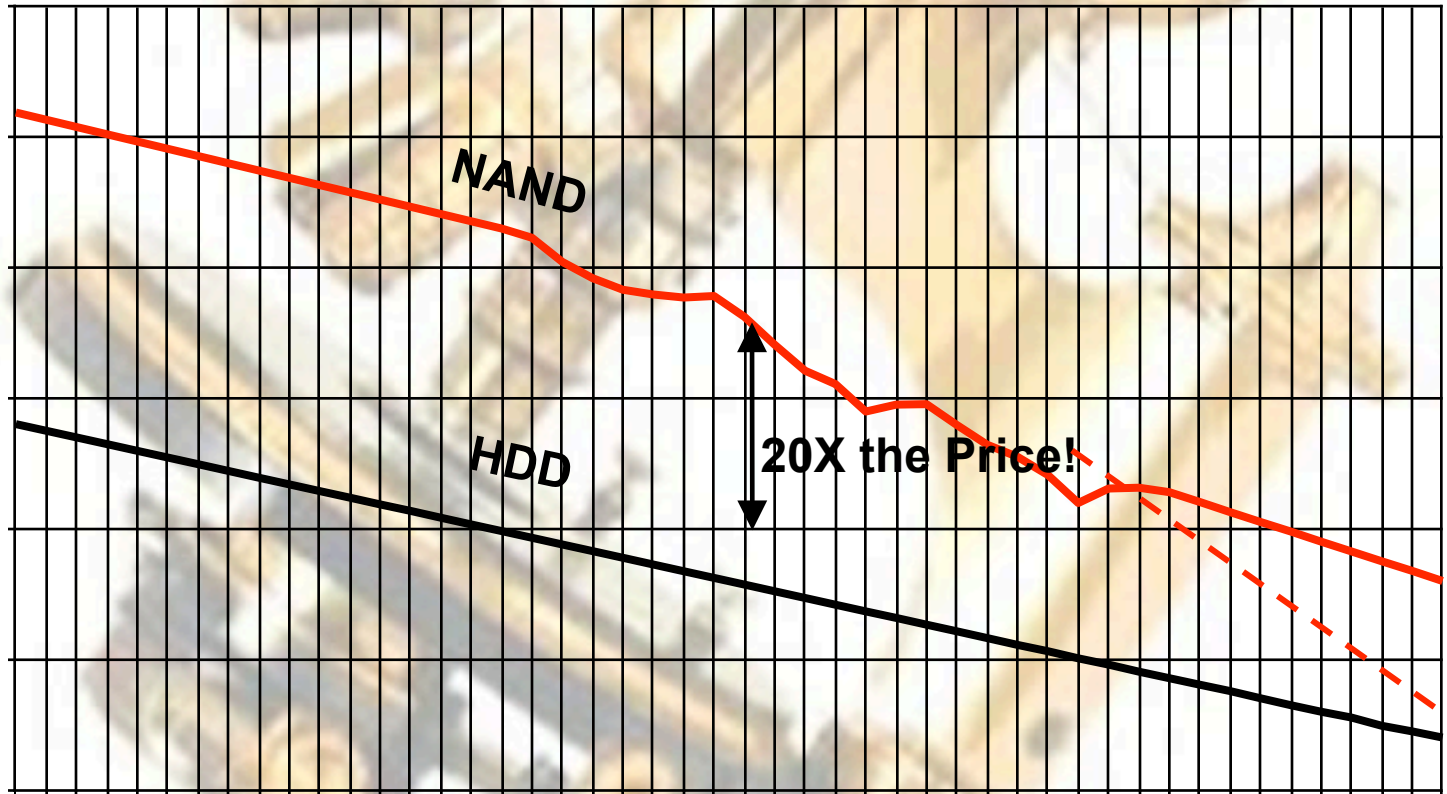
\$10<sup>2</sup>

\$10<sup>1</sup>

\$10<sup>0</sup>

\$10<sup>-1</sup>

\$10<sup>-2</sup>



2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

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# What Happens Now?

- Memory shortage is coming
  - Demand must catch up with supply
    - Highly contingent on economy as a whole
    - Could already be happening
- SSDs will stay weak in PCs
  - Braidwood will delay acceptance
  - Not SSD vs. HDD, but SSD vs. DRAM
- High density NOR will yield somewhat to NAND



**Thank You!**

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