



SSD vs HDD \$/GB in Retail

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Agenda

- Overview
- HDD->SSD Market Transition Factors
- How Many GB Do You Really Need?
- Metrics Comparing SSD and HDD
- Trajectories & Forecast: \$/GB

1-Minute Managers Overview

- Why Substitute HDD with SSD?
 - SSD's advantages: reliability, form factor, power consumption, environmental toughness
- Why Now?
 - HDDs Incumbent Since 1980's
 - SSDs Are Catching Up!
 - Could always make a similar capacity SSD as HDD, but not commercially viable before
 - **Advances in: \$/GB, \$/Drive**



First Markets To Adopt SSD

- Markets that may adopt SSD as primary storage over the next several years

	Likely Stay with HDD	Possible Change to SSD
Notebook PC	<ul style="list-style-type: none"> ▪ Desktop Replacement ▪ Multimedia Notebook 	<ul style="list-style-type: none"> ▪ NetBook ▪ Mainstream PC ▪ Thin & Light
Desktop PC	<ul style="list-style-type: none"> ▪ Performance ▪ Multimedia 	<ul style="list-style-type: none"> ▪ Value PC
Enterprise	<ul style="list-style-type: none"> ▪ Write Intensive Applications 	<ul style="list-style-type: none"> ▪ Read Intensive Applications, Smaller GB

OEMs Think: Total Cost of Ownership

- History Lesson: MP3 Manufacturer
 - Hypothesis: consumers don't know or care what storage is inside
 - Mfg. switched 1.0" HDD to 1/2 as much capacity flash for ~\$20¹ more

TCO Equation

Low Power
Consumption



+

No mechanism



+

No moving parts



+

Fewer Failures

Warranty
Replacements

=

Happier Customers



Longer
Playback

No shock problem

Better Reliability

Smaller Costs

Repeat Buyers

Moral: TCO enables switching from HDD to SSD earlier, and can be applied to computing markets

Notebook PC: 80GB is “Enough” Inside the Box

- Microsoft Office Home and Business 2010 needs 3GB
- Installed O/S + programs in ballpark of 12GB – 50GB

	MSRP\$	HDD or SSD Size (GB)	O/S Formatted Size (GB)	Windows Directory (GB)	Other Programs (GB)	Free Space (GB)
Asus	\$299	160	12GB ⁴⁴	5.4	6.6	132
Asus	\$679	500	449	12.3	23.7	413
Compaq	\$349	250	50GB ⁶³	12.4	37.6	183
DELL-HDD	\$999	500	451	11.9	20.1	419
DELL-SSD	\$1199	128	104	12.2	11.4	80.4
GW2000	\$499	320	283	12.9	22.1	248
Toshiba	\$349	250	222	7.3	26.7	188

Source: BestBuy store on July 13, 2010

- Conclusion: how many GB do you really need inside the box?

Notebook PC: 80GB is “Enough” Inside the Box

- What can you do if you run out of space inside the box?
- Use one of these. It plugs in within seconds.

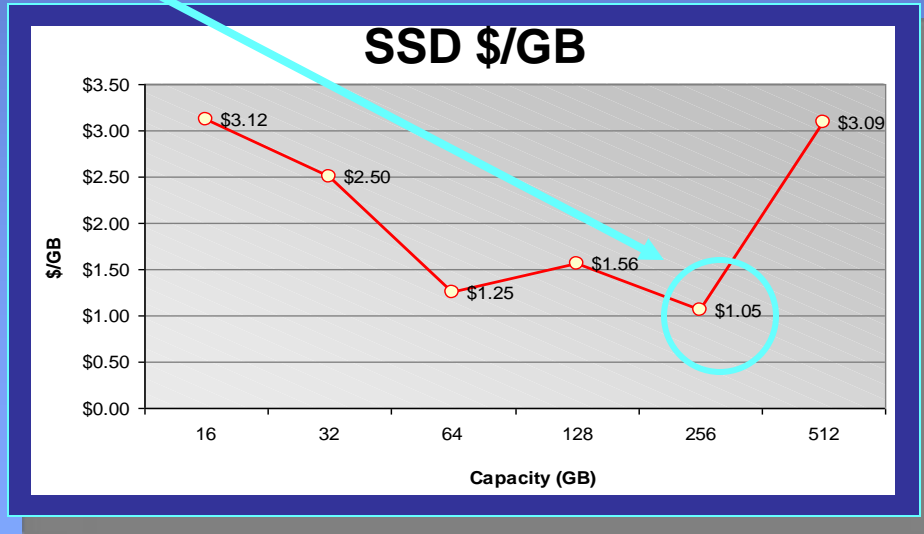
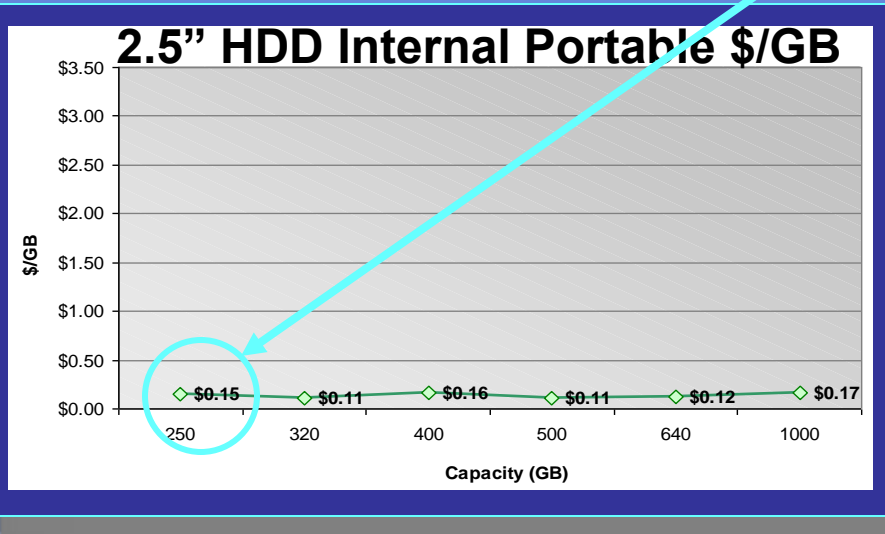


- Cost < \$39 or less retail for ≥ 160 GB

How Do They Compare Now: \$/GB

- Sunday, June 26, 2010, Snapshot of Prices, PC Class Drives
- Same/similar Capacity HDD 250GB vs. SSD 256GB:

SSD is 7X more expensive





How Do They Compare Now: \$/Drive

- Prices are Q2CY10
- SSD 64GB: wide range \$149.99 down to \$29.99. Ended quarter at -47%.
- HDD 160GB: single disk & head, lowest \$ new drive (not on special)=\$39.99

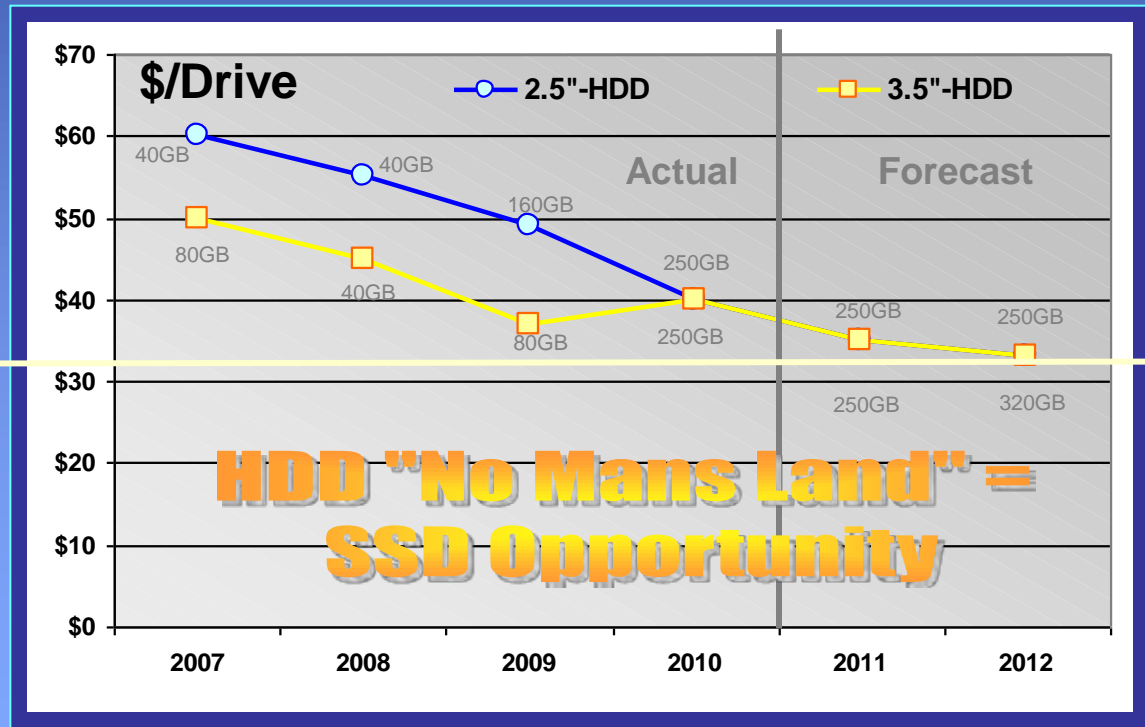
Lowest Prices Tracked														2.5" HDD Internal Portable	
GB	WK14	WK15	WK16	WK17	WK18	WK19	WK20	WK21	WK22	WK23	WK24	WK25	WK26	QTD%Δ	
160	\$39.99	\$39.99	\$39.99	\$39.99	\$44.96	\$44.96	\$44.96	\$44.96	\$39.99	\$39.99	\$39.99	\$39.99	\$39.99		
250	\$47.99	\$47.99	\$38.00	\$47.99	\$44.99	\$44.99	\$44.99	\$44.99	\$39.99	\$39.99	\$35.00	\$39.99	\$36.99	-23%	
320	\$54.99	\$54.99	\$49.99	\$45.00	\$49.99	\$49.99	\$49.99	\$49.99	\$49.99	\$49.99	\$49.99	\$34.99	\$34.99	-36%	
400	\$96.00	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	\$64.99	-32%	
500	\$69.99	\$74.99	\$69.99	\$69.99	\$69.99	\$69.99	\$69.99	\$64.99	\$64.99	\$69.99	\$59.99	\$54.99	\$54.99	-21%	
640	\$94.99	\$89.99	\$94.99	\$94.99	\$94.99	\$94.99	\$94.99	\$94.99	\$89.99	\$89.99	\$89.97	\$74.99	\$74.99	-21%	
750	\$110	\$110	\$110	\$110	\$122	\$115	\$115	\$115	\$115	\$114	\$114	\$114	\$109	-1%	
1000	\$190	\$190	\$190	\$190	\$185	\$185	\$185	\$180	\$180	\$190	\$190	\$190	\$170	-11%	

Lowest Prices Tracked														SSD	
	WK14	WK15	WK16	WK17	WK18	WK19	WK20	WK21	WK22	WK23	WK24	WK25	WK26	QTD%Δ	
8	\$49.99	\$49.99	\$49.99	\$49.99	\$44.99	\$44.99	\$44.99	\$44.99	\$51.99	\$51.99	\$53.99	\$53.99	\$45.99	-8%	
16	\$49.99	\$49.99	\$39.99	\$49.99	\$49.99	\$39.99	\$49.99	\$49.99	\$49.99	\$49.99	\$49.99	\$39.99	\$49.99		
32	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99	\$79.99		
64	\$150	\$49.90	\$49.90	\$150	\$49.90	\$49.90	\$49.90	\$49.90	\$29.99	\$29.99	\$115	\$79.99	\$79.99	-47%	
128	\$262	\$262	\$262	\$262	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	-24%	
256	\$305	\$305	\$305	\$305	\$330	\$305	\$305	\$305	\$300	\$300	\$300	\$270	\$270	-11%	
512	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580	\$1,580		

SSD 64GB: was \$29.99 in Week 22, 23 after \$100 rebate from Asus/Patriot

Single Key Warning: \$/Drive Trend

- Watch for HDD \$/Drive Asymptote
 - How Low Can HDD Go? Improved since 2007 but has a limit
 - Can SSD go lower? Sell => 80GB for under \$30 regularly?



Will this be the HDD Asymptote?

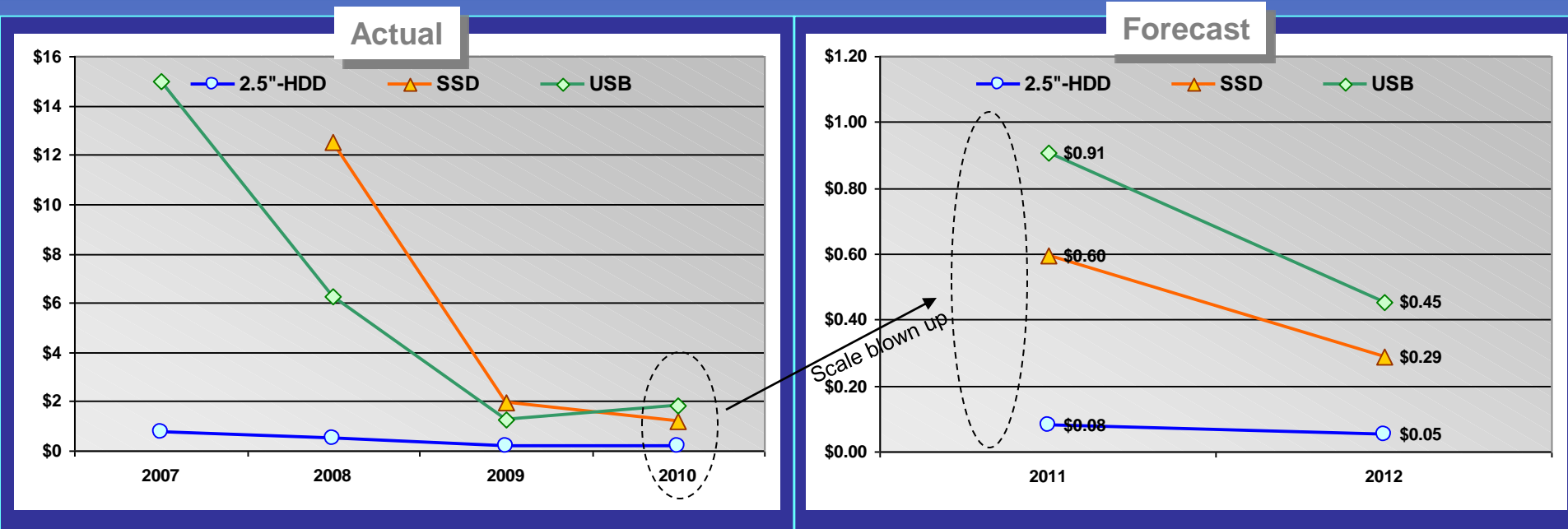
HDD "No Mans Land" = SSD Opportunity

Note: HDD are brand new, single head/disk drive. Prices measured in week 1 of each year.

Trajectories & Forecast: \$/GB

- Dramatic decrease in retail USB, SSD \$/GB starting 2007
- Forecast 2011 – 2012: flash memory estimated at ~-50% per year reduction
- Implication: may have 80GB SSD in 2012 for only ~\$23 (= \$0.29/GB * 80GB)

Lowest Retail \$/GB Snapshot from Week 1 of Each Year



2012 may be pivotal year when SSD makes dramatic unit shipments increase

What is Slowing Market Acceptance?

- Switching costs not quite “in the money”
- Consumer Mentality in Sticker Shopping:
 - “This one goes up to 11”. Future choice might be:



- Flash Memory/DRAM Market Dynamics
- F.U.D. on ReWrites

Single Most Important Issue

- Allocation and Golf
- When the market is tight, the people who make allocations¹ may:
 - ✓ Raise prices
 - ✓ Book P.O.'s for the quarter
 - ✓ Go Golfing



SSD Needs:

- 1) Continuity of Supply
- 2) Continuity of Price

1) dramatization for amusement



Single Best Source for Information

- PriceG2 Tracks Retailers Products Daily Over the Internet
- Standard Metric: S/w Runs the Same Way Every Time
- Thousands of Data Points Transformed Into Information

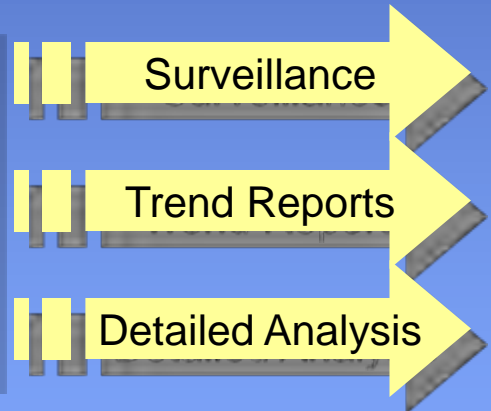
Retailers

- Amazon
- Best Buy
- CDW
- CompUSA
- Frys
- Office Depot
- OfficeMax
- NewEgg
- Staples
- Target
- Tiger
- Walmart

Internet



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Thank You

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