

## Equities

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# Global Memory Beat

## At the Last Stage of Mid-Cycle Correction

- **About 50% PC DRAM price decline (60%+ spot decline) in last 2 quarters** — Slower demand along with high cost burden led to faster PC DRAM price adjustment in the short-term. High-cost laggards with high PC DRAM spot exposure have already started cash burning on about 60% spot price decline over the last 2 quarters.
- **Supply-adjustment from high-cost DRAM capacities** — High-cost laggards' inability to meet fast price decline will lead to inevitable supply-adjustment. Potential misexecution in laggards' urgent technology upgrade could also curtail industry supply. Secular growth of DRAM/NAND for mobile applications will effectively reduce industry capacity allocation for PC DRAM. Low demand expectation will result in about 40% CAPEX decline and slower supply growth of about 48% in 11E, which will lower the possibility of significant oversupply.
- **Price elasticity with new PC product cycles** — As DRAM portion in total PC BOM declines to about 5% in 4Q10E, below the historical average of 6~7% and down from about 10% in 2Q10, PC customers could show more elasticity to increase content. A new PC platform of Huron River, with graphic-integrated Sandy Bridge CPU, will also increase main memory requirement. Secular growth of new smart mobile applications and corporate servers will consume more industry wafer capacity.
- **Pricing inflection point anticipated in 1Q11E** — We expect the slope of price decline in PC DRAM will decelerate in coming months, thanks to improving demand/supply dynamics, and that the inflection point for pricing will come in 1Q11E.
- **Secular NAND growth ahead** — Despite demand volatility in the traditional retail market (memory card/USB drive), we expect secular demand growth for embedded storage solutions from smartphones, tablet PCs and SSDs of high-end notebooks will drive healthy industry revenue growth of 25% in 11E.
- **Top picks: Stick with the leaders** — We still prefer industry leaders like Samsung and Hynix as we they are less vulnerable to a PC DRAM price collapse thanks to a diversified mix with non-PC DRAM/NAND and superior cost structures. We also prefer Toshiba as a beneficiary of secular NAND flash industry growth. We like Elpida as an oversold cyclical play.

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Ticker	Rating		Target Price		Current Year Earnings Estimates		Next Year Earnings Estimates	
	Old	New	Old	New	Old	New	Old	New
000660.KS	1M	1M	W40,000	W40,000	W5,239	W4,942	W4,650	W4,385
005930.KS	1L	1L	W1,160,000	W1,160,000	W105,678	W104,205	W112,968	W113,686

See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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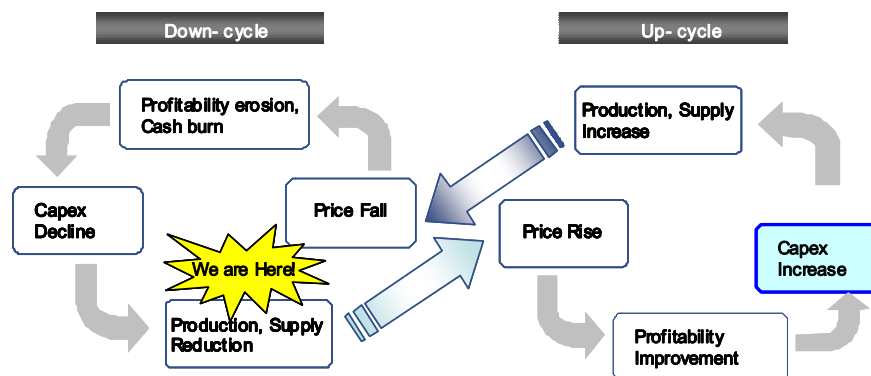
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# Last Stage of Short Mid-Cycle Correction

## Faster Price Decline but Earlier Inflection Point Likely

Figure 1. Global Memory Cycle — Where Are We Now? At the Last Stage of Mid-Cycle Correction



Source: Citi Investment Research and Analysis

### Sharper PC DRAM price erosion in 2H10

Unlike our expectation of a moderate PC DRAM price decline, actual PC DRAM price has declined at much faster slope with about 50% over the last 2 quarters. Negative elasticity on high 2Q10 pricing has led to weaker demand amid uncertain 2H demand. PC customers have become more cautious to carry inventories amid rapidly falling prices.

### Supply-adjustment across board – reduced overinvestment risk

As spot PC DRAM prices fall very fast, high-cost laggards like Promos and Powerchip, which account for about 10% of global supply, will start production cuts on their above 6nm technology node. Even Elpida will implement some production adjustment in its high-cost technology capacity. Leading makers will also decelerate PC DRAM supply growth on strategically prioritized capacity allocation for NAND/non-PC DRAM. Industry conservative expectation about demand will reduce industry CAPEX and lower the over-investment risk in the mid-term, which is positive for more industry stability.

### Demand elasticity and new PC platform launches

Although PC customers are still very conservative about aggressive inventory restocking amid falling prices ahead of new PC platform launches, we see signs of improving elasticity with more DRAM contents per system. Some PC makers have started free memory upgrade promotions recently and more PC makers are expected to increase density for year-end sales. We expect PC makers will become more active in inventory restocking from Dec or early next year with the launches of a new PC platform, Huron River.

### More moderate seasonal correction in NAND likely

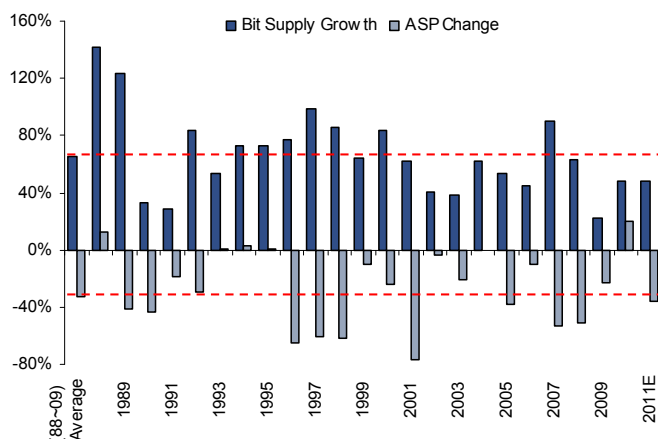
Although NAND demand for traditional applications like MP3P, memory card and USB drive will show some seasonal correction post peak year-end sales, we expect seasonal correction will be more moderate thanks to new tablet PC/smartphone launches in 1H11E. As most tablet PC makers are expected to launch new models on the upgraded HW specification and new OS (Android 3.0 Honeycomb) during 1H11E, NAND customers will start inventory stocking in 1H11E. Secular demand growth of smartphone/tablet PC/SSDs will continue to drive healthy industry dynamics in 11E.

### Top picks: Samsung, Hynix, Toshiba Elpida and Powertech

We see TWN DRAM makers as being more vulnerable to sharper PC DRAM price declines given the bigger spot PC DRAM market exposure under higher-cost structure. Laggards' supply adjustment from limited financial resources for cash-burning production will contribute to the industry reaching supply/demand equilibrium. On the other hand, leading memory makers like Samsung/Hynix will

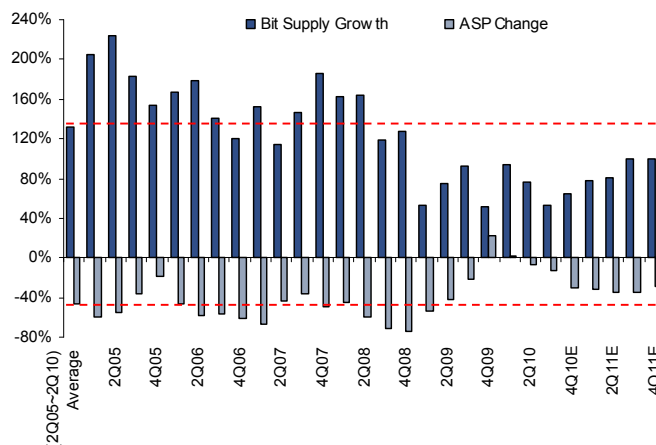
show relatively resilient earnings on their well-diversified product mix (non-PC DRAM and NAND) and superior technology (lower cost structure). Toshiba will also benefit from solid NAND industry fundamentals on secular demand for embedded storage demand in mobile applications. In memory back-end, we rate Powertech as a Buy with its stable business model and dividend yield support.

Figure 2. DRAM Historical Bit Supply Growth vs. Price Change



Source: WSTS and Citi Investment Research and Analysis estimates

Figure 3. NAND Historical Bit Supply Growth vs. Price Change



Source: WSTS and Citi Investment Research and Analysis estimates

## Secular industry revenue growth in 10E and 11E

**Historically high industry revenue with 57% yoy growth in 10E**

We forecast global memory revenue to increase 57% yoy to US\$58.5bn in 2010E, a new record. We expect 72% yoy DRAM revenue growth to US\$38.5bn, lower than previous forecast of \$42.2bn on weaker pricing in 2H10E. We also forecast NAND industry revenue to increase by 35% yoy to \$20.0bn, lower than previous estimate of \$20.9bn on softer retail card market.

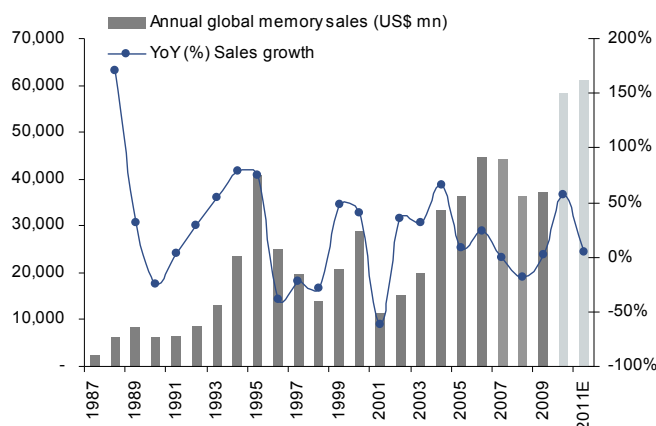
**4% yoy growth in 2011E: 6% DRAM revenue decline offset by solid 25% NAND growth**

We tweak down our 2011E global memory industry forecast by 10% and expect industry revenue will increase 4% yoy (DRAM -6% yoy, NAND 25% yoy), to US\$61 bn. In DRAM, we expect about 36% price decline in 11E (about -32% in 4Q10, -15% in 1Q11 and flat in the remaining quarters), lower than our previous estimate of 32% decline. In NAND, we expect price erosion to be slightly more moderate at 35%, compared to the previous estimate of 36%, due to lower pricing base in 2H10.

**Quarterly revenue bottom in 1Q11E**

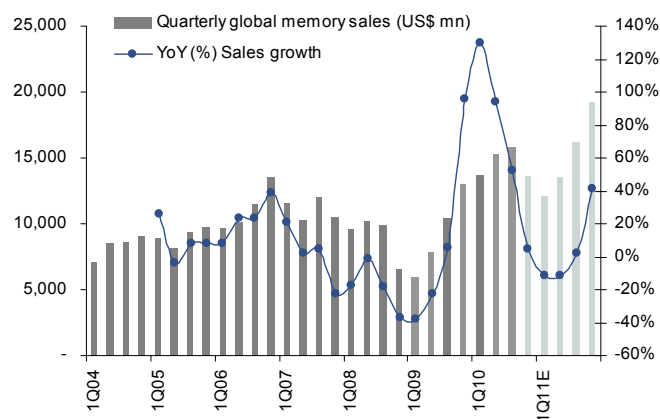
We estimate memory industry revenue to have peaked at about \$15.8bn in 3Q10 and expect to reach a mid-cycle bottom with \$12.1bn revenue in 1Q11E. On a yoy basis, we estimate memory industry growth momentum to have peaked at 130% in 1Q10 from a cyclical bottom in 1Q09. We also expect YoY revenue growth momentum to decelerate to 4% in 4Q10E and bottom at 12% yoy decline in 1Q11E.

Figure 4. Annual Global Memory Revenue Trend



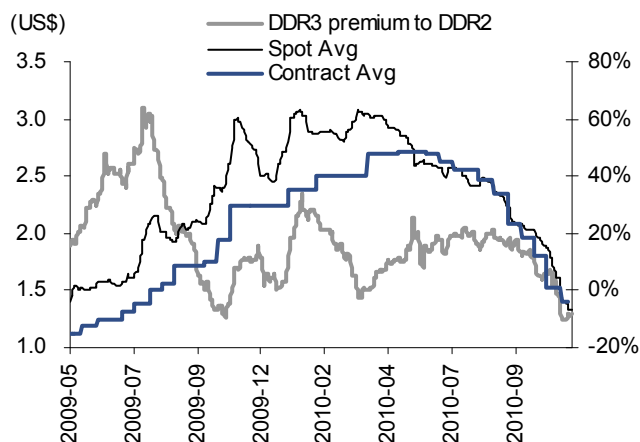
Source: WSTS and Citi Investment Research and Analysis estimates

Figure 5. Quarterly Global Memory Revenue Trend



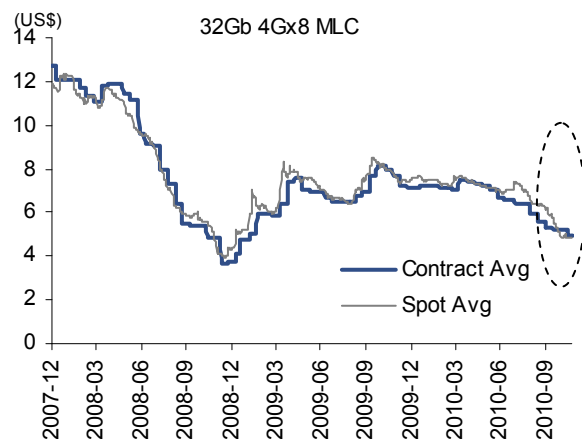
Source: WSTS and Citi Investment Research and Analysis estimates

Figure 6. DRAM – DDR3 1G Pricing trend



Source: DRAM Exchange; Citi Investment Research and Analysis

Figure 7. NAND – 32G MLC Pricing trend



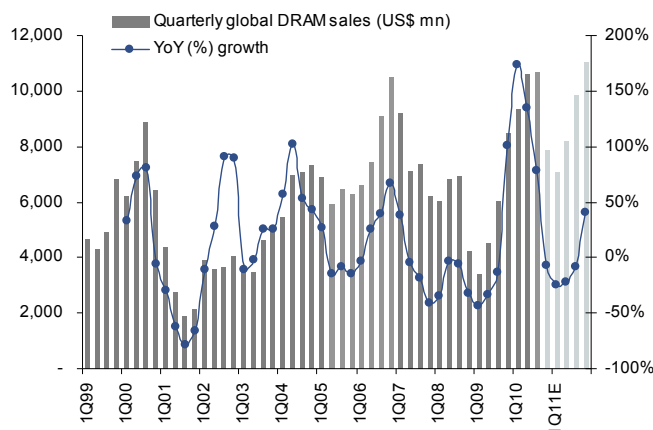
Source: DRAM Exchange; Citi Investment Research and Analysis

Figure 8. Global Memory — Key Assumption Changes

	2010			2011		
	New	Old	Chg	New	Old	Chg
<b>Memory Sales (US\$ mn)</b>						
<b>Total</b>	<b>58,453</b>	<b>63,097</b>	<b>-7.4%</b>	<b>61,052</b>	<b>67,680</b>	<b>-9.8%</b>
DRAM Sales	38,494	42,185	-8.7%	36,145	42,813	-15.6%
NAND Sales	19,959	20,913	-4.6%	24,907	24,867	0.2%
DRAM Sales Portion	65.9%	66.9%	-1.0%p	59.2%	63.3%	-4.1%p
NAND Sales Portion	34.1%	33.1%	1.0%p	40.8%	36.7%	4.1%p
<b>Memory Capacity ('000)</b>						
<b>DRAM+NAND Capacity</b>	<b>19,316</b>	<b>19,497</b>	<b>-0.9%</b>	<b>21,546</b>	<b>21,822</b>	<b>-1.3%</b>
DRAM Capacity	12,193	12,351	-1.3%	12,226	12,818	-4.6%
NAND Capacity	7,123	7,146	-0.3%	9,320	9,005	3.5%
<b>Memory Shipment (512Mb Equiv)</b>						
<b>DRAM+NAND Shipment</b>	<b>206,011</b>	<b>217,839</b>	<b>-5.4%</b>	<b>380,791</b>	<b>395,603</b>	<b>-3.7%</b>
DRAM Shipment	30,159	30,842	-2.2%	44,618	47,222	-5.5%
NAND Shipment	175,851	186,997	-6.0%	336,173	348,381	-3.5%
<b>Memory ASP (512Mb Equiv)</b>						
Avg of DRAM+NAND	0.3	0.3	-2.0%	0.2	0.2	-6.3%
DRAM	1.3	1.4	-6.7%	0.8	0.9	-10.6%
NAND flash	0.1	0.1	1.5%	0.1	0.1	3.8%
Price Parity (NAND/DRAM)	8.9%	8.2%	8.8%	9.1%	7.9%	16.2%
<b>Memory Sales % YoY Chg</b>						
<b>Total</b>	<b>57%</b>	<b>69%</b>	<b>-12.5%p</b>	<b>4%</b>	<b>7%</b>	<b>-2.8%p</b>
DRAM Sales	72%	88%	-16.5%p	-6%	1%	-7.6%p
NAND Sales	35%	41%	-6.4%p	25%	19%	5.9%p
<b>Bit Shipment % YoY Chg</b>						
<b>DRAM+NAND Shipment</b>	<b>62%</b>	<b>71%</b>	<b>-9.3%p</b>	<b>85%</b>	<b>82%</b>	<b>3.2%p</b>
DRAM Shipment	49%	52%	-3.4%p	48%	53%	-5.2%p
NAND Shipment	65%	75%	-10.4%p	91%	86%	4.9%p
<b>Wafer Capacity % YoY Chg</b>						
<b>DRAM+NAND</b>	<b>17%</b>	<b>18%</b>	<b>-1.1%p</b>	<b>12%</b>	<b>12%</b>	<b>-0.4%p</b>
DRAM Capacity	17%	19%	-1.5%p	0%	4%	-3.5%p
NAND Capacity	17%	18%	-0.4%p	31%	26%	4.8%p
<b>Memory ASP % YoY Chg</b>						
<b>Memory ASP</b>	<b>-3%</b>	<b>-1%</b>	<b>-2.0%p</b>	<b>-43%</b>	<b>-41%</b>	<b>-2.6%p</b>
DRAM ASP	20%	25%	-4.9%p	-36%	-32%	-4.1%p
NAND ASP	-18%	-19%	1.2%p	-35%	-36%	1.5%p
<b>Memory Capacity Allocation</b>						
DRAM	63%	63%	-0.2%p	57%	59%	-2.0%p
NAND	37%	37%	0.2%p	43%	41%	2.0%p
<b>Supply-to-Demand Ratio (%)</b>						
<b>DRAM</b>	<b>98%</b>	<b>95%</b>	<b>2.8%p</b>	<b>99%</b>	<b>98%</b>	<b>1.1%p</b>
<b>NAND</b>	<b>96%</b>	<b>96%</b>	<b>0.3%p</b>	<b>99%</b>	<b>97%</b>	<b>1.3%p</b>

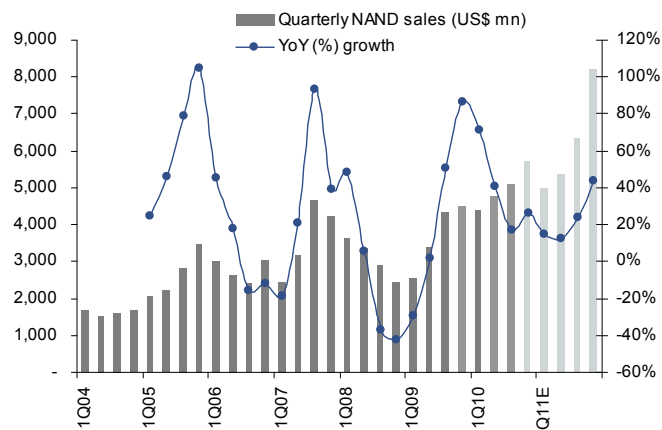
Source: Citi Investment Research and Analysis estimates

Figure 9. Quarterly Global DRAM Revenue Trend



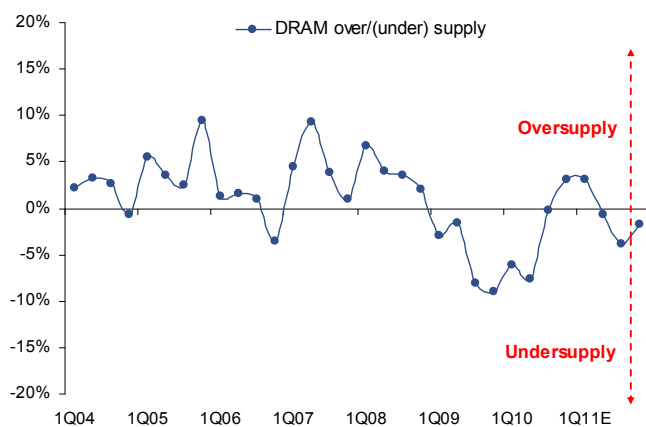
Source: WSTS and Citi Investment Research and Analysis estimates

Figure 10. Quarterly Global NAND Revenue Trend



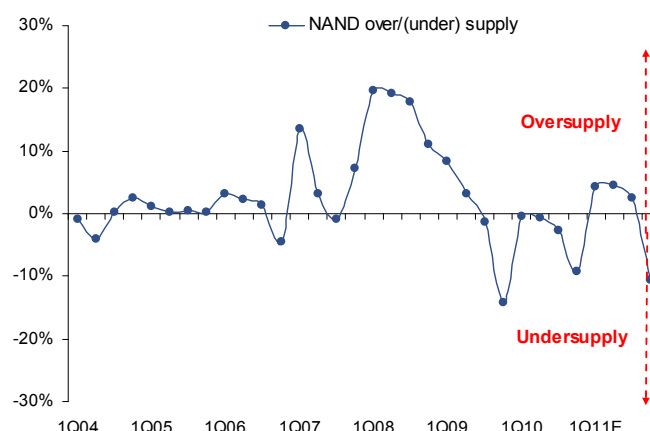
Source: WSTS and Citi Investment Research and Analysis estimates

Figure 11. DRAM — Over-/Under-Supply Ratio



Source: Company data, Citi Investment Research and Analysis

Figure 12. NAND — Over-/Under-Supply Ratio



Source: Company data, Citi Investment Research and Analysis

## Disciplined Supply Growth Continues

### Decelerating DRAM vs. Accelerating NAND supply growth

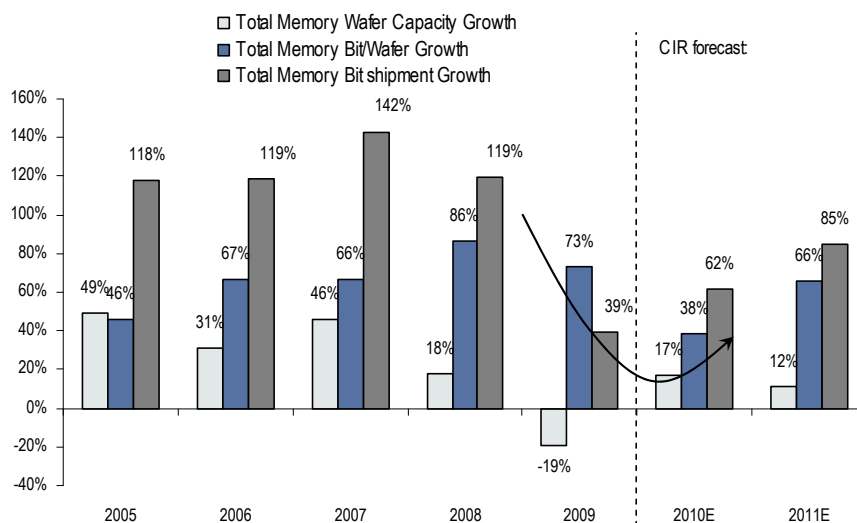
**Bit supply growth of 62% (DRAM 49%, NAND 65%) in 2010E, still far below historical average**

We forecast total memory bit supply to grow 62% in 10E, still far below the historical four-year (2004-08) CAGR of 124%. We revise down our DRAM bit supply forecast from 52% to 49% for 10E, reflecting slower production on poor execution in technology upgrade and supply adjustments by laggards. In 10E, the majority of the 17% yoy capacity growth, especially in DRAM, would come from utilization hikes on a low base in 1H09 rather than new capacity additions as in the case of 2005-08. Without any significant new wafer capacity addition, most of the incremental supply growth should come from technology upgrades (bit output growth from the same wafer capacity, that is, about 50% theoretical output growth per 1 generation technology upgrade of geometry shrinkage). Industry supply-side risks (up/down) would depend on the actual execution progress of tech upgrades at each company.

**85% (48% DRAM, 91% NAND) yoy supply growth in 2011E**

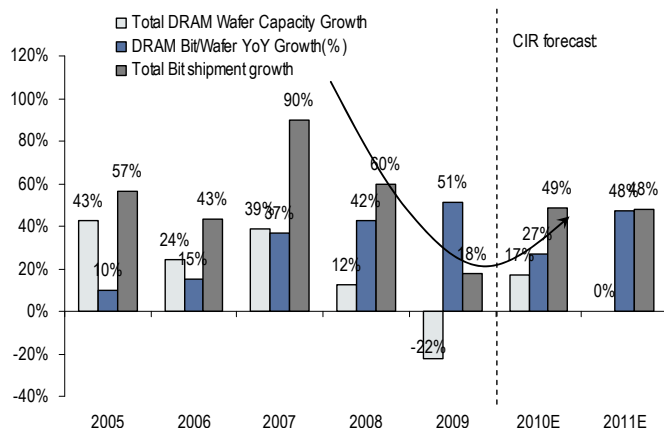
We forecast total memory supply bit to grow by 85% yoy, still well below the historical average, in 2011E. Given the limited new capacity addition of 12%, we expect industry supply growth will be more dependent on the technology migration effect (66% memory output growth from the same wafer capacity). We expect DRAM supply growth to decelerate to 48% with limited new capacity addition due to production adjustment of high-cost laggards in early 11E and strategic capacity allocation for non-DRAM production from leaders. DRAM supply growth will totally depend on the actual progress in technology upgrade. If any one of the major players shows bumpy execution, the actual supply could be lower than our current forecast.

**Figure 13. Memory Total Supply Growth Forecast**



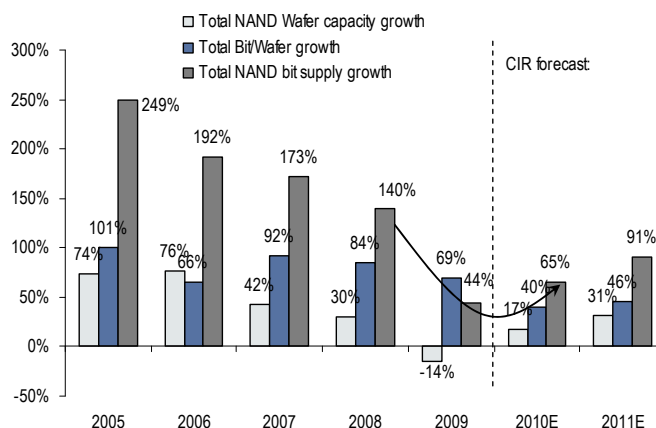
Source: Citi Investment Research and Analysis estimates

**Figure 14. DRAM Supply Growth Forecast**



Source: Citi Investment Research and Analysis estimates

**Figure 15. NAND Supply Growth Forecast**



Source: Citi Investment Research and Analysis estimates



167% increase in 10E but still 40% below the peak level in 07. CAPEX/Sales of 33% in 10E vs. average of 54% in 04~09

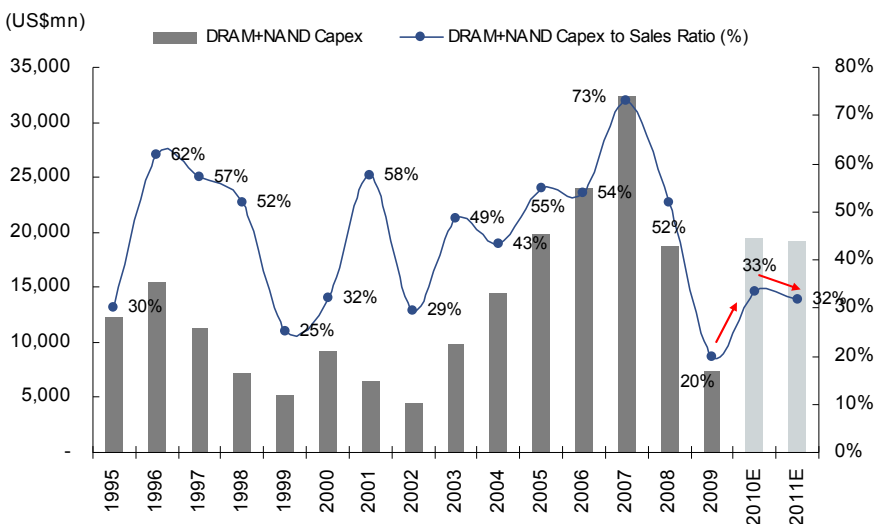
Flattish spending in 11E, DRAM cut offset by aggressive NAND expansion

## Capex: Flattish in 11E (DRAM -40% yoy, NAND 74% yoy)

We forecast memory industry capex to grow by 167% yoy (209% yoy in DRAM and 110% yoy in NAND) to US\$19.5bn in 10E, mostly for technology upgrades rather than new wafer capacity additions. Despite sharp CAPEX hike, we estimate industry CAPEX will be far below the peak of \$32.4bn in 07 and CAPEX/sales will remain very healthy at about 33% compared to averages of 54% in 04~09 and 45% in 95~09. Especially in DRAM, most companies should upgrade their technology node at first to reduce cost base before adding any new wafer capacity. Samsung will spend about \$8bn for memory CAPEX to enhance its market dominance by fully leveraging its strong financials and advanced technology. We estimate Samsung will account for about 42% of total industry CAPEX in 10E, a sharp increase from 20~30% in 04~08. Hynix has also increased its CAPEX budget from \$800mn in 2009 to \$3bn in 10E for faster DRAM technology upgrade and NAND capacity addition. The other players have also raised CAPEX budget to catch up with technology upgrade competition with leading makers.

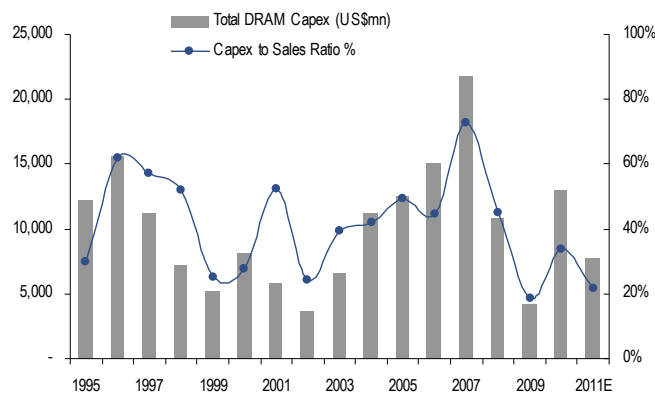
In 11E, we forecast industry CAPEX to remain flat at about \$19.3bn. We expect DRAM CAPEX to decline by 40% in 2011E as Samsung will reduce DRAM CAPEX allocation to strategically focus more on non-memory and NAND expansion. Most other DRAM companies will still focus on technology upgrade in order not to fall further in cost competitiveness with leaders and investment for new capacity addition will be limited. In NAND, we expect industry CAPEX to increase sharply by 74% yoy and most companies to add new wafer capacities with 31% yoy growth to meet strong digital storage demand from new applications like smartphone, iPad-like tablet PC and SSDs of high-end notebooks. We estimate memory industry CAPEX/sales will remain at controlled level of 32% in 11E.

Figure 16. Memory Total Capex and Capex/Sales Trend



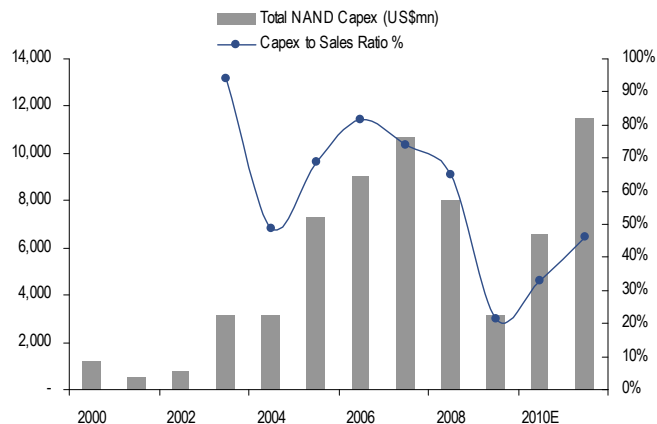
Source: WSTS, Company data and Citi Investment Research and Analysis estimates

Figure 17. DRAM — Capex and Capex/Sales Trend



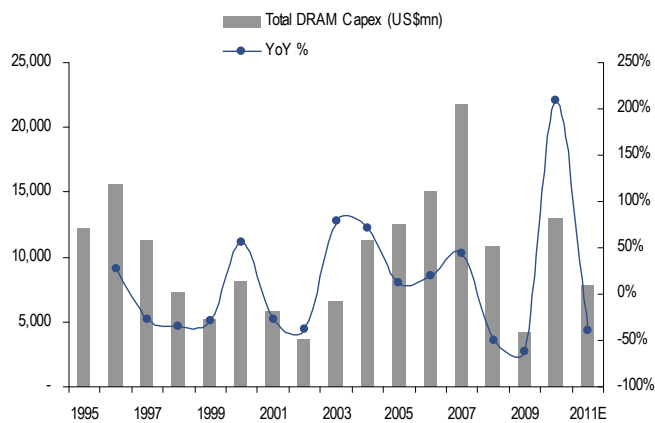
Source: WSTS, Company data, Citi Investment Research and Analysis estimates

Figure 18. NAND — Capex and Capex/Sales Trend



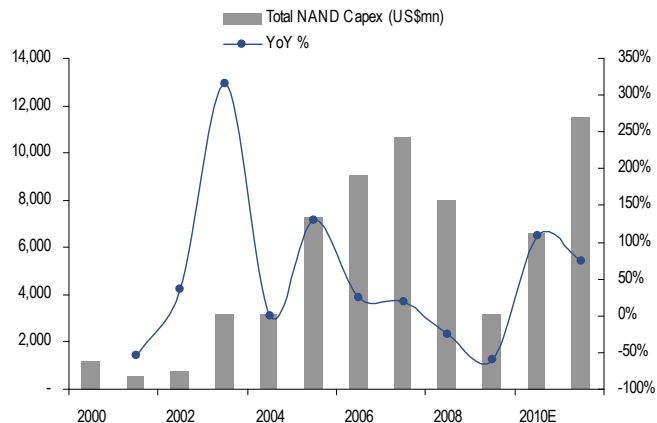
Source: WSTS, Company data, Citi Investment Research and Analysis estimates

Figure 19. DRAM — Capex Trend



Source: Company data, Citi Investment Research and Analysis estimates

Figure 20. NAND — Capex Trend



Source: Company data, Citi Investment Research and Analysis estimates

Figure 21. Global Memory Capex Trend

DRAM Capex by Player (US\$mn)	2005	2006	2007	2008	2009	2010E	2011E
Samsung	2,384	3,001	4,632	3,500	1,500	5,500	2,700
Micron	1,437	1,705	1,350	1,174	276	600	833
Qimonda (ex-Inotera)	1,112	921	1,166	417	-	-	-
Hynix (ex-China JV)	1,957	2,695	2,783	1,200	350	1,050	950
Hynix/ STM JV (China)	98	1,361	1,347	500	300	1,050	700
Elpida	1,702	1,303	1,415	882	500	778	400
Powerchip	1,221	1,576	1,927	750	100	350	250
Nanya (ex-Inotera)	131	122	1,424	360	400	900	500
Inotera	705	875	1,333	600	400	1,750	900
ProMos	979	849	1,840	350	50	100	50
SMIC	131	150	180	100	50	-	-
Winbond	735	450	246	459	90	422	200
Rexchip			2,060	571	167	444	300
<b>Total DRAM Capex (US\$mn)</b>	<b>12,593</b>	<b>15,009</b>	<b>21,703</b>	<b>10,863</b>	<b>4,183</b>	<b>12,944</b>	<b>7,783</b>
DRAM Capex YoY %	11.9%	19.2%	44.6%	-49.9%	-61.5%	209.4%	-39.9%

NAND Capex by Player (US\$mn)	2005	2006	2007	2008	2009	2010E	2011E
Samsung	2,070	2,526	2,720	2,500	1,500	2,500	4,300
Toshiba (only Toshiba)	1,873	2,171	2,137	1,502	600	2,000	2,941
JV of Toshiba & SanDisk	1,873	2,222	1,923	1,913	500	800	1,000
Hynix (ex-China JV)	489	482	500	600	150	900	1,500
Hynix/ STM JV (China)	40	50	270	-	-	-	-
Renesas (Trecenti)	727	261	261	200	-	-	-
Micron (Inc. IMFT)	40	900	2,500	939	398	400	1,767
Powerchip	64	255	215	184	-	-	-
Infineon	58	48	48	45	-	-	-
Spansion (AMD/Fujitsu)	15	30	30	30	-	-	-
ST Micro	35	88	85	80	-	-	-
<b>Total NAND Capex sum-up</b>	<b>7,284</b>	<b>9,033</b>	<b>10,690</b>	<b>7,993</b>	<b>3,148</b>	<b>6,600</b>	<b>11,508</b>
YoY %	130.3%	24.0%	18.3%	-25.2%	-60.6%	109.7%	74.4%
<b>Total DRAM+NAND Capex</b>	<b>19,876</b>	<b>24,042</b>	<b>32,393</b>	<b>18,856</b>	<b>7,331</b>	<b>19,544</b>	<b>19,291</b>
YoY %	37.8%	21.0%	34.7%	-41.8%	-61.1%	166.6%	-1.3%

Source: Company data and Citi Investment Research and Analysis estimates

## Actual executions in technology upgrade, a key swing factor

### Continuing 8" retirement

Obsolete 8" capacities will only be used for legacy memory products or non-memory applications. We estimate 74% of 8" DRAM capacity was shut down in 09. We also estimate 8" NAND capacity declined by about 66% in 09. We expect Samsung will continue to reduce 8" memory production for non-memory logic business expansion in the coming quarters. The contribution from 8" to DRAM and NAND production will sharply decline to 2% and 5% in 11E from 17% and 29% in 08, respectively, based on our estimates.

### Utilization hike – big contributor of output capacity growth in 10E but minimal in 11E

We estimate utilization hike will contribute about 70% and 40% of total 17% yoy DRAM and NAND wafer output growth, respectively, this year. But, from mid-4Q10, we estimate about 5% high-cost PC DRAM capacities are under utilization cuts due to rapid price erosion. In 2011E, we expect high-cost DRAM makers will control utilization until they see improving market pricing above their cash cost. And we expect other memory makers will not implement production adjustment.

### DRAM capacity: Very low new wafer addition, still lower than peak level

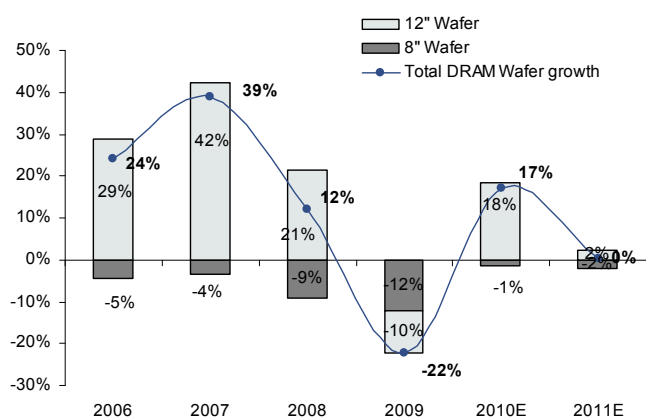
In the previous industry upturn in 2005~2006, every DRAM industry player built virtually 1 new fab per year on the back of elevated optimism. However, passing last 2-year big downturn, some DRAM makers even faced questions about their ability to survive. Although Samsung has been aggressive in new wafer capacity addition and in accelerating technology upgrade in recent years,

other players have been urgently trying to catch up with Samsung's steep cost reduction curve by making technology upgrade a top priority. We expect DRAM net new capacity addition, of which most will come from Samsung, will be still very low at below 5% in 10E. In 11E, we expect Samsung's new DRAM capacity addition will be minimal due to strategic non-DRAM capacity expansion burden and the other makers will keep focusing on technology migration for cost reduction. We estimate overall DRAM industry capacity will remain below the peak level in 08 at the end of 11E even after utilization hike and some marginal wafer addition. So output growth from existing capacities will determine the DRAM industry supply growth in the coming quarters.

**NAND capacity: Double-digit% growth to meet strong demand outlook**

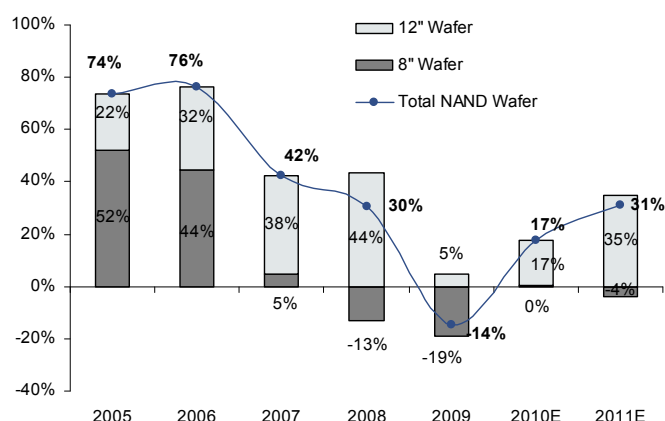
In NAND, we expect about 17% new capacity addition in 10E and about 31% in 11E, to meet the strong demand outlook from embedded storage applications like smartphone and iPad like Tablet PC.

Figure 22. DRAM Wafer Capacity Trend



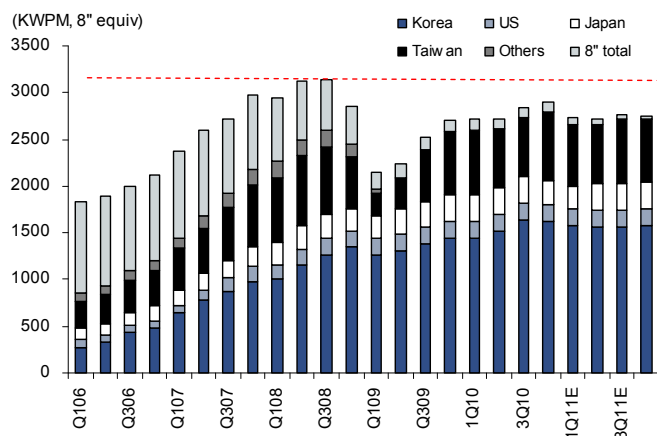
Source: DRAMexchange and Citi Investment Research and Analysis estimates

Figure 23. NAND Wafer Capacity Trend



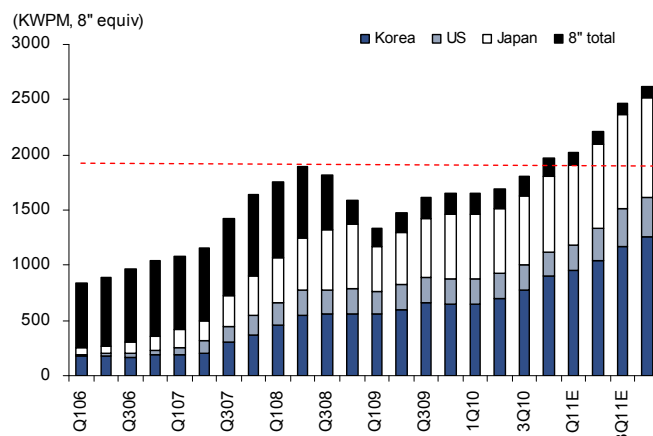
Source: DRAMexchange and Citi Investment Research and Analysis estimates

Figure 24. DRAM — Capacity by Country



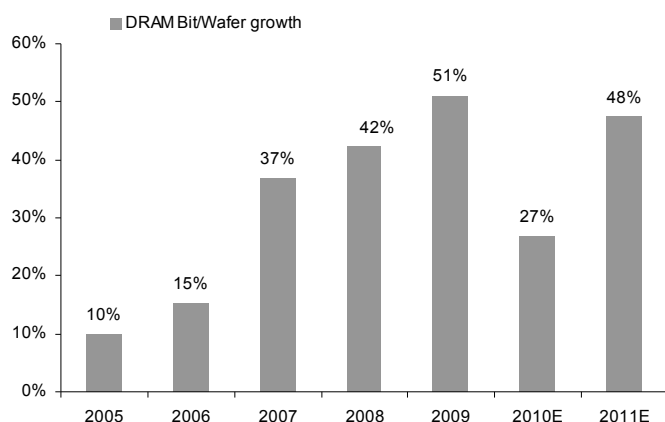
Source: Citi Investment Research and Analysis estimates

Figure 25. NAND — Capacity by Country



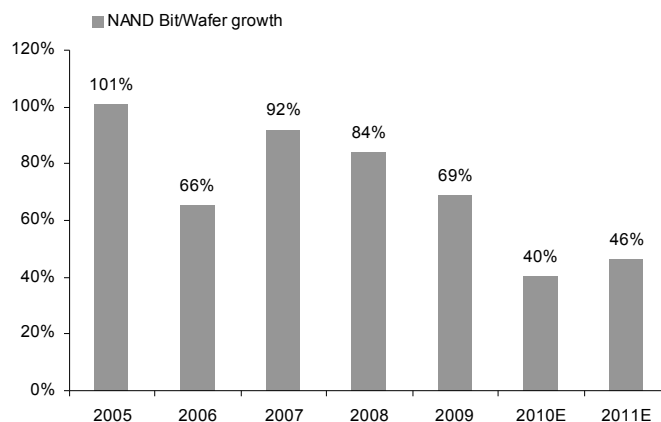
Source: Citi Investment Research and Analysis estimates

Figure 26. DRAM Bit/Wafer Growth Forecast



Source: Company data, Citi Investment Research and Analysis estimates

Figure 27. NAND Bit/Wafer Growth Forecast



Source: Company data, Citi Investment Research and Analysis estimates

**DRAM: Industry-wide big changes in equipment (ArF Immersion), material (copper) and design (2Gb DDR3). EUV will be another revolutionary change in the coming years.**

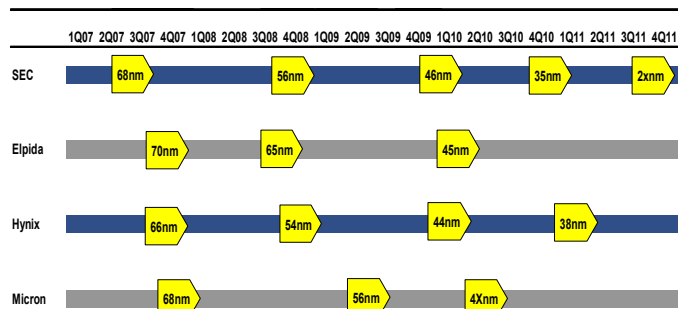
In 2005-06, the DRAM industry saw poor productivity (10~15% output growth per the same input wafer vs. normal growth of 30~40%) due to low production yields after adopting new dry ArF lithography equipment and the new design of DDR2. Much of the actual supply growth came from wafer capacity additions. It took about two years for the industry to normalize production on new equipment and design. In 10, we expect the DRAM industry will shift technology geometry to sub-60nm, adopt new photolithography equipment of ArF Immersion, new materials like copper and new product design like 2Gb DDR3. Although leading DRAM makers have already experienced big production transitions going back one or two years, we have seen poor execution in process migration for the laggards over last couple of quarters. We estimate actual output growth per wafer remains low at about 27% in 10E. Although we expect higher productivity gain of 48% on more normalization of industry technology upgrade process in 11E, we will see more downside in industry supply if any one of the major technology camps shows misexecution, just as was the case this year. EUV adoption in lithography tools will be another revolutionary change in the technology upgrade roadmap in the coming years, which could potentially accelerate polarization between leaders and laggards.

**DRAM: Samsung/Hynix – 4x/3x nm upgrade. No new capacity addition from Samsung in 2011E.**

Following successful migration to 5xnm node last year, Samsung and Hynix will accelerate 4xnm node migration this year and introduce 3xnm product at year-end (Samsung) or early next year (Hynix). Samsung will also introduce 2xnm geometry node in 2H11E and plans to lower cost base more drastically. We expect both companies will start R&D for the next lithography process using new EUV tools next year. Especially, Samsung will be the most aggressive in 4xnm migration (more than 60% by 4Q10E), to widen the technology/cost gap by further leveraging its R&D leadership and strong financials for upgrade investment. With the industry high DRAM CAPEX budget of about \$5.5bn this year, Samsung has tried to shorten equipment delivery and expand capacities as much as possible in order to maximize profit generation and solidify its market dominance. However, we expect Samsung will focus more on technology upgrade (cost reduction) to allocate more resources for fast growing non-memory and NAND businesses instead of new wafer capacity addition in DRAM next year. We estimate Samsung DRAM supply growth to decelerate from about 70% this year to mid-50% next year. We expect Hynix will also continue to focus

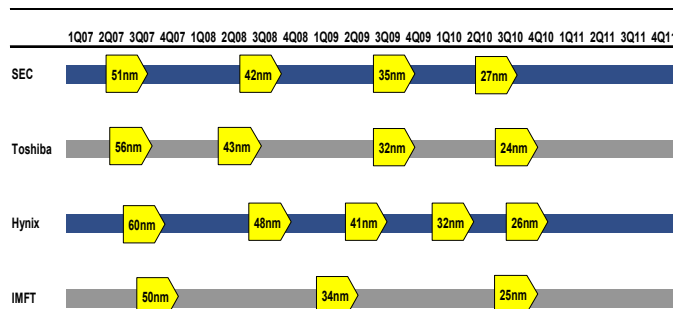
on technology upgrade and product mix improvement for stabilization of operations and deleveraging instead of new wafer capacity addition. Despite Samsung's aggressive expansion strategy, we expect Hynix will stick to CAPEX discipline and focus on smooth technology upgrade for sub-4xnm to sustain cost leadership compared to the laggards. We estimate Samsung and Hynix could make a decent profit with the lower cost and high non-PC mix even in the case of a 50% commodity PC DRAM price decline until 4Q10E.

Figure 28. DRAM — Technology Roadmap by Players



Source: Company data, Citi Investment Research and Analysis

Figure 29. NAND — Technology Roadmap by Players



Source: Company data, Citi Investment Research and Analysis

Figure 30. DDR3 Validation Status

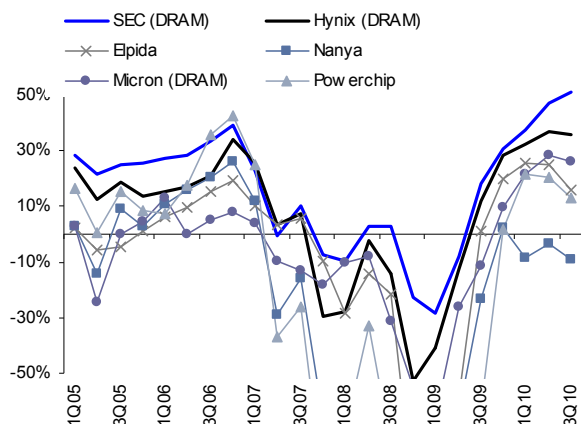
	4x nm	5x nm	6x nm	7x nm
SEC	40	85	NM	NM
Hynix	44	90	NM	NM
Micron	-	4	27	43
Elpida	-	-	14	33

Source: Citi Investment Research and Analysis

**DRAM: Micron – 5x/4x nm migration and diversification into mobile DRAM, NANYA/Inotera – focus on stabilization of new technology**

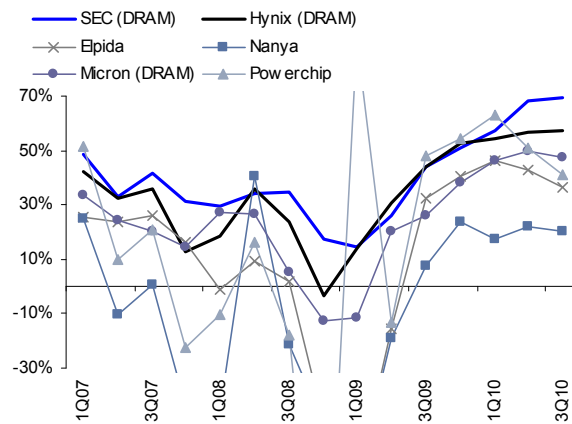
We estimate Micron has normalized 5xnm technology from late 2009 and expect it will start 4xnm mass production from 2H10E. We expect Micron will not add its own new DRAM wafer capacity this year and focus on stabilizing 5x/4xnm stack technology upgrade in its technology partner of Nanya and DRAM foundry lines in Inotera. After acquisition of Numonyx, Micron will strategically try to expand its product lineups for higher growth specialty mobile DRAM market. Given increasing wafer consumption for the bigger chip-sized specialty DRAM, we estimate supply growth from stand-alone Micron will be relatively lower even with ongoing technology upgrade. On the other hand, Nanya and Inotera have experienced supply declines on yield/capacity losses with some delayed Immersion tool installment during the initial technology migration process in 1H10. So they continuously lowered 2010 supply growth guidance by about 50% recently. After normalizing their 5xnm production lines in late 3Q or early 4Q10, we expect Nanya and Inotera could increase supply meaningfully in 4Q10 and 1Q11. Nanya and Inotera would also prepare some pilot runs for 4xnm technology node in 2H10 but we expect 4xnm mass production to start mainly from 1H11E. Nanya decided to add about 30K 12" WPM capacity for empty fab space this year but actual production contribution would take place in 2011E. Micron and Nanya will determine the new wafer capacity addition for empty previous Inotera fab space but we expect they will keep focusing on smooth geometry shrink amid uncertain demand outlook.

Figure 31. Global Memory Players: OP Margin Trend



Source: Company data and Citi Investment Research and Analysis

Figure 32. Global Memory Players: EBITDA Margin Trend



Source: Company data and Citi Investment Research and Analysis

**DRAM: Elpida – Production cut in PC DRAM, more diversification into mobile/graphic DRAM and non-DRAM (NAND/NOR foundry), Powerchip/Promos/Winbond – seeking self-survival plan**

Elpida is the laggard in sub-60nm technology competition. Due to limited financial resources for technology upgrade investment, Elpida has focused on improving productivity on the legacy technology node of 6xnm. On 5xnm node progress, Elpida has produced specialty mobile DRAM with limited wafer capacity inputs due to limited Immersion availability instead of PC DRAM. Unlike other DRAM makers' 1 generation technology upgrade plan, Elpida has desperately pursued alternative frugal shortcuts by skipping 5xnm upgrade and moving directly to 4xnm technology node in commodity PC DRAM. Elpida announced 4xnm technology development last December, with less Immersion steps and minimum copper processes unlike other players' conventional equipment system. Elpida targets 50% 4xnm shift by the end of 2010 and plans to convert the full capacity of Rexchip, its consolidated subsidiary, to 4xnm by the end of 1Q11, about 1 quarter delay. Even though Elpida has succeeded in small pilot run production in the R&D lab, applying its unique 4xnm DRAM technology to the mass production lines will be a big challenge, in our view. We believe less Immersion exposure in critical layers and less copper usage in circuit could result in significant yield losses or poorer performance which could fully offset the benefit of shorter process steps with less capex burden. Even some DRAM makers have adopted copper layer to improve the product reliability from 5xnm node. Although Elpida could save Immersion/copper equipment investment cost, we expect Elpida should sacrifice the chip size, data processing clock speed and system reliability from circuit noises. Elpida (including Rexchip)'s supply growth has been very limited for preparation of 4xnm transition in 1H10E. If they, with about 20% DRAM capacity share, fail to stabilize their challenging 4xnm technology, well-anticipated seasonal correction in 1H11E would be much more moderate than market fears. Even after efficient 4xnm upgrade, we expect achieving 3xnm upgrade will be another big challenge for Elpida in the mid-term because more complicated double patterning technology with more ArF Immersion steps and copper interconnect will become inevitable choices. Along with technology catch-up, Elpida will try to diversify its product mix into mobile DRAM, graphic and non-DRAM foundry (NAND, NOR and other applications) to stabilize overall operations and monetize faster growing mobile computing markets. So DRAM production growth from stand-alone Elpida will stay relatively lower until product

mix stabilizes. On the other hand, Elpida reduced PC DRAM production plan by 60K 12" wafers (about 5% of global DRAM capacity), compared to original plan of 230K wafers, through reducing in-house high-cost production and cutting foundry sourcing from Powerchip and Promos. We expect Elpida to maintain its production/outsourcing adjustment until it confirms market improvement. While adopting Elpida's technology roadmap for commodity PC DRAM development, Powerchip will continue to dedicate some capacity for non-DRAM foundry business to stabilize overall business. We expect Powerchip to start 4xnm production in 11E after adopting Elpida's technology and securing financial resources. Winbond could pursue a niche special DRAM player business model focusing on mobile and graphic applications in alliance with Elpida.

**NAND: New capacities required due to meet demand amid decelerating technology upgrade effect**

We expect most NAND players will add capacity to meet the strong demand because it will be very difficult to achieve about 80~90% yoy bit supply growth from pure geometry shrinkage, even applying TLC (3 layer per cell) technology. We forecast about 31% wafer capacity growth in 2011E. We estimate normalized annual output growth per wafer will decelerate to about 50% from the past 80~90% level. Unlike 80~90% MLC transition effect from SLC in the past, TLC transition results in just 30~40% output growth these days. Given the poorer performance and limited applications to low-end external memory cards, TLC pricing is also 10~20% lower than MLC's and NAND makers' economic motivation for TLC transition is relatively low. Most NAND makers will start mass production of 2xnm technology node from 2Q~3Q10 and achieve the some mature yield in 2H11. 1xnm technology development in 2011 will be a big challenge for the whole NAND industry because industry should explore the possibility of brand new 3D/vertical fabrication or more advanced lithography tools of even EUV lithography usage, which is still in early stage of development, in addition to current ArF Immersion and new material/cell structure adoption.

**NAND: New fab constructions to meet strong storage demand**

We expect Samsung will maintain profit maximization strategy with differentiated product mix of high embedded storage solutions while maintaining revenue market share at about 40%. To pursue total mobile system solution business model, Samsung should allocate more CAPEX budget for NAND capacity expansion next year and even convert some DRAM capacities for NAND production late this year, in our view. We expect Samsung will install NAND flash production capacity in its new fab 16, instead of DRAM line, next year. Toshiba/Sandisk will also continue to add new wafers for the empty clean room space in fab 4 and start mass production from newly-built fab 5 from 2H11E. We expect IMFT will focus on technology upgrade to 25nm this year and start equipment installment in Singapore fab for mass production in 11E. After seeing some technical breakthrough in 32nm and 26nm node, Hynix is the most aggressive in NAND capacity expansion but actual industry supply impacts will likely be limited, given the very low market share base of below 10%. We expect Hynix will install maximum design capacity of 120K WPM by the end of next year from 80K WPM at the end of this year. We expect Elpida and Powerchip could try to enter NAND flash foundry production to diversify end applications and stabilize their operations in 2011 but overall impact on the NAND supply will be low. If they share existing DRAM fabs for NAND productions, their effective DRAM capacities will decline. In a relatively more consolidated industry structure, overall NAND makers will not subsidize new application demand creation by sacrificing profitability significantly and leading companies would be willing to adjust production plans if they see any disruptions in demand/supply dynamics, in our view.

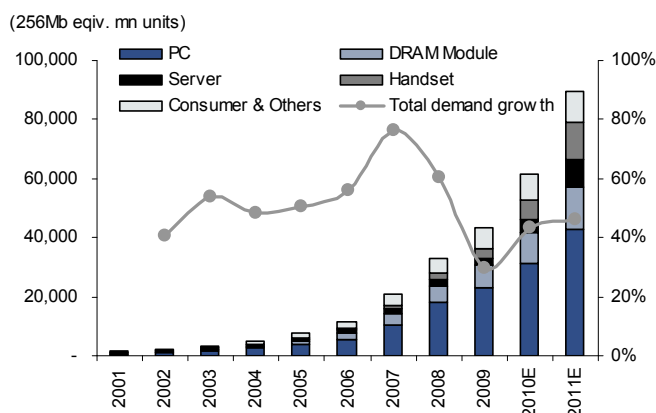


## Smarter Applications: Key Growth Drivers

About 46% DRAM demand growth with  
5% PC growth in 11E

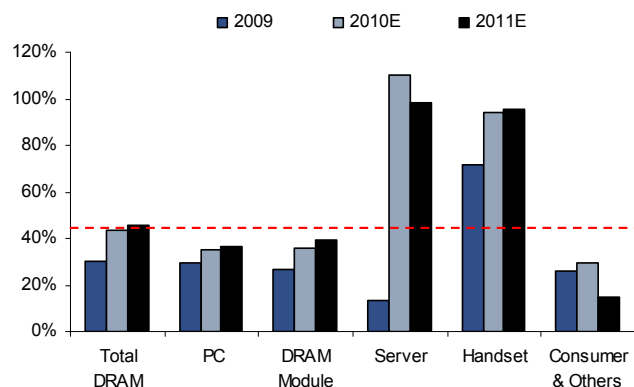
We estimate DRAM demand growth to return to normal growth trajectory of about 45% in 2010E/2011E from a sharply depressed growth rate of 30% in 2009. We conservatively forecast conventional PC (ex. Tablet) demand to grow by 14% this year on steady corporate replacement and muted consumer demand but to decelerate to 5% (unlike PC team's forecast of 9%) in 2011E, on more cannibalization in notebook segment from Tablet PC. Including Tablet PC shipment of 15mn in 10E and 45mn (unlike 35mn forecast of CIRA hardware team) in 11E, we estimate overall PC demand will grow by 19% in 10E and 13% in 11E, respectively.

Figure 33. DRAM Demand Forecast by Application



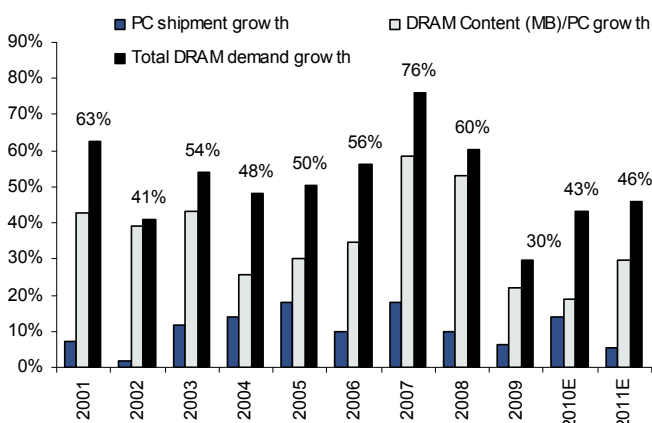
Source: Citi Investment Research and Analysis estimates

Figure 34. Demand Growth Estimates by Application



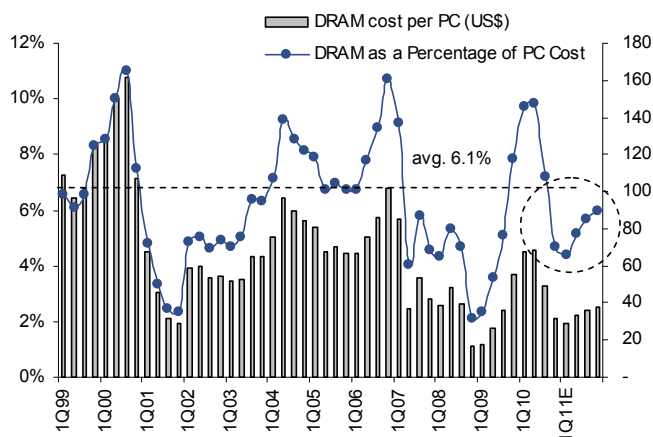
Source: Citi Investment Research and Analysis estimates

Figure 35. DRAM Demand Growth Forecast



Source: Citi Investment Research and Analysis estimates

Figure 36. DRAM Memory Cost per PC System



Source: Citi Investment Research and Analysis estimates

We expect DRAM content growth per conventional PC will increase to 30%, still far below the past 5-year average of about 40%, in 11E from 19% in 10E, thanks to positive elasticity on lower pricing. However, given the strong penetration outlook of lower DRAM consuming tablet PC (512MB~1GB mobile DRAM vs. 3~4GB PC DRAM) next year, overall DRAM content growth per overall PC will decelerate to low 20%. Overall demand growth from conventional PC application will be slower at low- to mid-30% yoy growth, below the average demand growth, in 2010E/2011E.

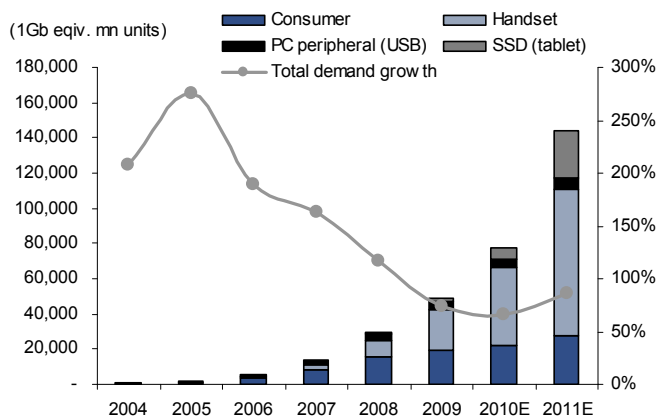
**Smarter applications: stronger DRAM consumption**

Although PC (DT/NB) main memory still accounts for about 60~70% of total DRAM demand, we expect much stronger DRAM demand growth in other applications. Increased data traffic will drive solid spending for central server and DRAM contents requirement will show higher growth of more than 60%. Corporate server DRAM requires more stable performance and leading DRAM makers like Samsung/Hynix dominate with 70~80% share thanks to 2Gb DDR3 leadership in 4x nm. As most of high-end smartphones and tablet PCs adopt 1HGz microprocessors to handle more powerful data processing, we see average mobile DRAM density increase from 128~256MB to 256~512MB this year. We expect most high-end smartphones/tablet PCs to adopt 1.4~2GHz mobile dual-core CPU with 512~1GB mobile DRAM next year. So we expect mobile DRAM demand will continue to grow by more than 100% next year. Due to longer design-in process and higher qualification requirement, mobile DRAM market is also dominated by leading makers like Samsung and Hynix with 70~80% combined market share. Despite graphic-integrated Sandy Bridge CPU introduction, Graphic DRAM will also show firm growth on the back of proliferation of 3D/full HD resolution graphics in high-end PC/game console and Samsung/Hynix dominate with more than 95% share. Elpida plans to enter graphic market after acquisition of Qimonda graphic R&D division. As in the case of Google TV plan, we expect internet connectivity in digital TV systems will accelerate in the coming quarters and data processing requirement, especially for 3D contents, in smart TV (internet, connected or convergence TV) will increase sharply. According to our checks, most TV makers plan to adopt at least 1GHz microprocessors and 1GB DRAM for mainstream smart TV.

**NAND: Handset / tablet PC – key growth drivers**

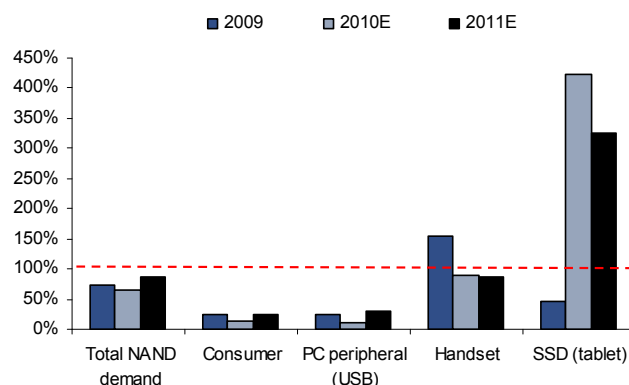
We estimate NAND bit demand growth to remain at about 86% in 11E, compared to a 184% CAGR over the past five years. We expect storage demand growth for traditional consumer applications like digital camera and MP3 players will decelerate to about 20~30% on some cannibalization from converged smartphones from the past five-year CAGR of 170%. We forecast handsets will lead NAND industry demand growth with near 100% yoy growth, as smartphones will drive higher data storage demand. Handsets (smartphones) will continue to lead the growth and account for about 50% of total NAND demand in 10E/11E. Although SSD adoption in high-end NB was slow due to higher prices, the successful introduction of tablets like iPad and Galaxy Tab is positive for secular NAND consumption growth. We expect other major NB and even smartphone makers will competitively introduce NAND-based tablet PC applications in 1H11E. Although tablet PC industry players target about 100mn shipments in aggregate according to our channel checks, we conservatively assume about 45mn tablet shipment in 11E on potential component constraint and still inferior HW specifications. We estimate NAND demand for SSD, including embedded NAND for tablet PCs, will increase 423% yoy and 326% yoy in 10E and 11E, respectively. We estimate embedded NAND demand for (tablet) PC applications will account for about 16% of total NAND demand in 11E from 7% in 10E.

Figure 37. NAND Demand Forecast by Application



Source: Citi Investment Research and Analysis estimates

Figure 38. Demand Growth Estimate by Application



Source: Citi Investment Research and Analysis estimates

#### Scenario analysis: Conventional PC and tablet PC demand

In our base-case model, we assume 5% PC shipment growth and 45mn tablets in 11E on the more conservative tablet cannibalization expectation. Our current industry model implies marginal supply shortage or balanced dynamics in both DRAM and NAND. But if we assume 9% PC growth and 35mn tablet shipment in 11E, we will see much severer DRAM supply shortage and slight NAND flash oversupply. On the other hand, if we assume 2% PC growth and 35mn tablet shipment as a worst case scenario in 11E, both DRAM and NAND will be in slight oversupply.

Figure 39. Scenario Analysis on Conventional PC/tablet PC assumptions

		Demand growth (11E)	Sufficiency Ratio
<b>Base case - 5% PC / 45mn tablets</b> (total 13% growth)	DRAM	46%	-1.1%
	NAND	86%	-1.4%
<b>9% yoy PC growth / 35mn tablets</b> (total 13% growth)	DRAM	49%	-4.4%
	NAND	81%	1.7%
<b>2% yoy PC growth / 35mn tablets</b> (total 7% growth)	DRAM	42%	1.3%
	NAND	81%	1.7%
<b>9% yoy PC growth / 55mn tablets</b> (total 19% growth)	DRAM	49%	-4.8%
	NAND	92%	-4.5%
<b>2% yoy PC growth / 55mn tablets</b> (total 13% growth)	DRAM	43%	0.8%
	NAND	92%	-4.5%

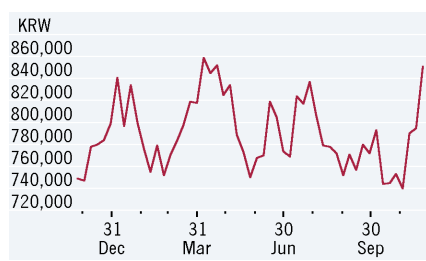
Source: Citi Investment Research and Analysis

## Company Focus

- Company Update
- Estimate Change

<b>Buy/Low Risk</b>	<b>1L</b>
Price (25 Nov 10)	W845,000
Target price	W1,160,000
Expected share price return	37.3%
Expected dividend yield	1.2%
<b>Expected total return</b>	<b>38.5%</b>
Market Cap	W124,467,942M
	US\$108,426M

Price Performance (RIC: 005930.KS, BB: 005930 KS)



## Samsung Electronics (005930.KS) Passing the Quarterly Bottom with Decent Earnings

- **Near-term earnings: Bottoming** — We forecast 4Q10 OP of W3.5tr (-28% QoQ, 2% YoY) due to strong KRW and sharp semi/LCD price decline. We expect 1Q11 OP to marginally improve (to 9% vs 8% in 4Q10E) on consumer recovery (telecom/digital media) despite earnings decline in semiconductor.
- **Semiconductor: About W2tr OP in the bottom of mid-cycle correction** — Even with a 50% PC DRAM price collapse in just 2 quarters, we estimate Samsung could sustain above 20% OPM in 4Q10E/1Q11E. With the lowest cost structure/the steepest cost reduction curve through technology leadership (2x/3x/4xnm DRAM), and the most diversified premium non-PC mix (mobile DRAM/NAND) in memory industry, we expect Samsung could minimize negative impacts from PC commodity DRAM price decline, enhance market dominance further passing mid-cycle correction period and sustain excess margin. Samsung will be uniquely positioned to fully benefit from rapid secular growth in mobile computing devices like tablet PC (iPad) and smartphone as a total mobile system solution provider (low-powered high performance application processor in logic IDM/foundry, specialty mobile DRAM/NAND flash storage in memory), in our view. We expect Samsung's industry-high CAPEX, capacity expansion (more allocation for NAND and System LSI in 2011E) and seamless R&D expenditure will support ongoing transformation into a "Total System Solution Provider" beyond "Total Memory Solution Provider".
- **TFT-LCD: Pursuing excess margin through destructive AMOLED technology** — Despite on-going pricing pressure in LCD TV panels, we estimate Samsung could manage to be profitable thanks to solid SMD (AMOLED) performance. Given the limited excess margin opportunity in existing TFT-LCD industry, we expect Samsung will accelerate AMOLED expansion into mid- to large-size applications through industry-first 5.5G and 8G capacity introduction in the coming years instead of new TFT-LCD capacity addition. By maximizing internal executions in semiconductor-like manufacturing process of AMOLED, Samsung will target to achieve lower cost structure with superior quality and seek excess margin opportunities over crowded TFT-LCD panel industry.
- **Telecom: Enhanced smartphone competitiveness and tablet upside** — With continuous mix improvement with higher smartphone contribution, handset ASP will sequentially improve in 4Q10E. Despite higher year-end marketing spending, we expect positive initial market response of Galaxy Tab will give upside risk to slight OP decline expectation in 4Q10E. Debottlenecking in Galaxy Tab core components will help increasing shipment in 1Q11E.
- **Digital Media: Focus on restoring profitability** — With proactive inventory management in late 3Q and early 4Q, Samsung will focus on restoring TV profitability instead of volume market share competition in 4Q10E, in our view. Strategic investment for non-TV expansion will continue but incremental cost burden will decelerate with revenue generation.
- **Reiterate Buy (1L): New high earnings ahead** — Samsung should continue to prove its enhanced earnings power from market-dominating competitiveness (marketing/product leadership in consumer, cost/technology leadership in components), which would drive new high earnings, in our view.

Fiscal year end 31-Dec	2008	2009	2010E	2011E	2012E
<b>Valuation Ratios</b>					
P/E adjusted (x)	22.5	13.0	8.1	7.4	7.1
EV/EBITDA adjusted (x)	8.3	4.4	3.2	2.7	2.4
P/BV (x)	2.1	1.8	1.5	1.3	1.1
Dividend yield (%)	0.7	0.9	1.2	1.2	1.2
<b>Per Share Data (W)</b>					
EPS adjusted	37,515	64,980	104,205	113,686	118,658
EPS reported	37,515	64,980	104,205	113,686	118,658
BVPS	393,715	471,459	566,282	671,639	782,812
DPS	5,500	7,500	10,000	10,000	10,000
<b>Profit &amp; Loss (WB)</b>					
Net sales	72,953	136,324	154,306	174,355	188,740
Operating expenses	-68,819	-125,399	-136,534	-153,886	-167,200
<b>EBIT</b>	<b>4,134</b>	<b>10,925</b>	<b>17,773</b>	<b>20,468</b>	<b>21,539</b>
Net interest expense	351	-174	31	41	41
Non-operating/exceptionals	1,423	1,441	1,587	1,017	1,017
<b>Pre-tax profit</b>	<b>5,908</b>	<b>12,192</b>	<b>19,390</b>	<b>21,527</b>	<b>22,598</b>
Tax	-382	-2,431	-3,720	-4,305	-4,520
Extraord./Min.Int./Pref.div.	0	-189	-320	-476	-600
<b>Reported net income</b>	<b>5,526</b>	<b>9,572</b>	<b>15,349</b>	<b>16,746</b>	<b>17,478</b>
Adjusted earnings	5,526	9,572	15,349	16,746	17,478
Adjusted EBITDA	11,753	22,874	32,138	36,558	39,004
<b>Growth Rates (%)</b>					
Sales	15.5	86.9	13.2	13.0	8.3
EBIT adjusted	-30.4	164.3	62.7	15.2	5.2
EBITDA adjusted	-9.6	94.6	40.5	13.8	6.7
EPS adjusted	-25.6	73.2	60.4	9.1	4.4
<b>Cash Flow (WB)</b>					
<b>Operating cash flow</b>	<b>10,633</b>	<b>18,522</b>	<b>24,237</b>	<b>24,407</b>	<b>25,694</b>
Depreciation/amortization	7,619	11,949	14,365	16,090	17,464
Net working capital	-2,433	-6,599	-2,905	-3,403	-2,853
<b>Investing cash flow</b>	<b>-9,290</b>	<b>-14,467</b>	<b>-21,943</b>	<b>-19,838</b>	<b>-19,931</b>
Capital expenditure	-9,489	-8,072	-20,000	-18,000	-18,000
Acquisitions/disposals	422	-6,315	-1,862	-1,757	-1,850
<b>Financing cash flow</b>	<b>-1,010</b>	<b>-1,364</b>	<b>-2,217</b>	<b>-2,548</b>	<b>-2,463</b>
Borrowings	26	-622	-939	-846	-761
Dividends paid	-1,172	-824	-1,277	-1,702	-1,702
<b>Change in cash</b>	<b>333</b>	<b>3,246</b>	<b>77</b>	<b>2,021</b>	<b>3,299</b>
<b>Balance Sheet (WB)</b>					
<b>Total assets</b>	<b>72,519</b>	<b>112,180</b>	<b>126,459</b>	<b>142,707</b>	<b>159,514</b>
Cash & cash equivalent	6,649	20,884	21,043	25,201	31,990
Accounts receivable	4,137	17,819	20,169	22,790	24,670
Net fixed assets	32,422	43,560	52,560	58,965	64,051
<b>Total liabilities</b>	<b>14,406</b>	<b>39,135</b>	<b>38,690</b>	<b>38,579</b>	<b>38,123</b>
Accounts payable	2,388	8,235	9,321	10,533	11,402
Total Debt	114	9,395	8,455	7,610	6,849
<b>Shareholders' funds</b>	<b>58,113</b>	<b>73,045</b>	<b>87,769</b>	<b>104,128</b>	<b>121,391</b>
<b>Profitability/Solvency Ratios (%)</b>					
EBITDA margin adjusted	16.1	16.8	20.8	21.0	20.7
ROE adjusted	10.1	15.0	20.1	18.4	16.3
ROIC adjusted	12.1	19.9	23.8	23.1	21.6
Net debt to equity	-11.2	-15.7	-14.3	-16.9	-20.7
Total debt to capital	0.2	11.4	8.8	6.8	5.3

For further data queries on Citi's full coverage universe please contact CIRA Data Services Asia Pacific at CIRADataServicesAsiaPacific@citi.com or +852-2501-2791



Figure 40. SEC – Statistical Abstract

Year to 31-12	Sales (Wbn)	OP (Wbn)	NP (Wbn)	EPS (Won)	EPS Growth (%)	P/E (x)	P/B (x)	ROE (%)
2008	72,953	4,134	5,526	37,515	-25.6	22.5	2.1	10.1
2009	136,324	10,925	9,572	64,980	73.2	13.0	1.8	15.0
2010E	154,306	17,773	15,349	104,205	60.4	8.1	1.5	20.1
2011E	174,355	20,468	16,746	113,686	9.1	7.4	1.3	18.4
2012E	188,740	21,539	17,478	118,658	4.4	7.1	1.1	16.3

Source: Company Data, Citi Investment Research and Analysis Estimates

Figure 41. SEC – 4Q10E Preview (Consolidated, Wbn)

Year to Dec 31	4Q10E	3Q10	4Q09	QoQ%	YoY%
FX Rate (Won/US\$)	1,120	1,181	1,169	-5.2%	-4%
<b>Sales</b>	<b>41,545</b>	<b>40,229</b>	<b>39,248</b>	<b>3.3%</b>	<b>6%</b>
Semiconductor	9,569	10,660	8,000	-10.2%	20%
TFT-LCD	7,866	8,100	7,290	-2.9%	8%
Telecom	12,450	11,120	10,170	12.0%	22%
Media& Appliance	15,660	14,130	14,680	10.8%	7%
<b>Operating Profit</b>	<b>3,488</b>	<b>4,865</b>	<b>3,437</b>	<b>-28.3%</b>	<b>2%</b>
Semiconductor	2,309	3,420	1,340	-32.5%	72%
TFT-LCD	9	520	530	-98.4%	-98%
Telecom	1,081	1,130	1,050	-4.3%	3%
Media& Appliance	89	-230	480	NM	-81%
<b>Net Non-OP Items</b>	<b>191</b>	<b>559</b>	<b>292</b>	<b>-65.8%</b>	<b>-35%</b>
<b>EBT</b>	<b>3,680</b>	<b>5,424</b>	<b>3,729</b>	<b>-32.2%</b>	<b>-1%</b>
Taxes	736	968	691	-24.0%	7%
<b>Net Profit (ex. Min. Int.)</b>	<b>2,825</b>	<b>4,335</b>	<b>3,030</b>	<b>-34.8%</b>	<b>-7%</b>
<b>Profitability</b>					
<b>OP Margin</b>	<b>8%</b>	<b>12%</b>	<b>9%</b>		
Semiconductor	24%	32%	17%		
TFT-LCD	0%	6%	7%		
Telecom	9%	10%	10%		
Media& Appliance	1%	-2%	3%		
<b>EBT Margin</b>	<b>9%</b>	<b>13%</b>	<b>9%</b>		
<b>Net Margin</b>	<b>7%</b>	<b>11%</b>	<b>8%</b>		

Source: Company Data, Citi Investment Research and Analysis Estimates

Figure 42. SEC – Earnings Revision (Consolidated)

	Sales (Wbn)			OP (Wbn)			NP (Wbn)			EPS (Wbn)		
	New	Old	Chg	New	Old	Chg	New	Old	Chg	New	Old	Chg
2010E	154,306	154,312	0.0%	17,773	18,055	-1.6%	15,349	15,566	-1.4%	104,205	105,678	-1.4%
2011E	174,355	172,630	1.0%	20,468	20,382	0.4%	16,746	16,640	0.6%	113,686	112,968	0.6%

Source: Citi Investment Research and Analysis estimates

We slightly lower our 10E OP estimate by 2% on downward revision in semiconductor on weaker near-term pricing. Our 11E estimates are largely unchanged.

Figure 43. SEC – CIRA vs. Consensus Estimates for 2010E-2011E (Consolidated)

(Wbn)	2010E			2011E		
	CIRA	Consensus	Diff	CIRA	Consensus	Diff
Sales	154,306	154,584	0%	174,355	165,249	6%
OP	17,773	18,073	-2%	20,468	17,059	20%
NP	15,349	15,709	-2%	16,746	15,136	11%

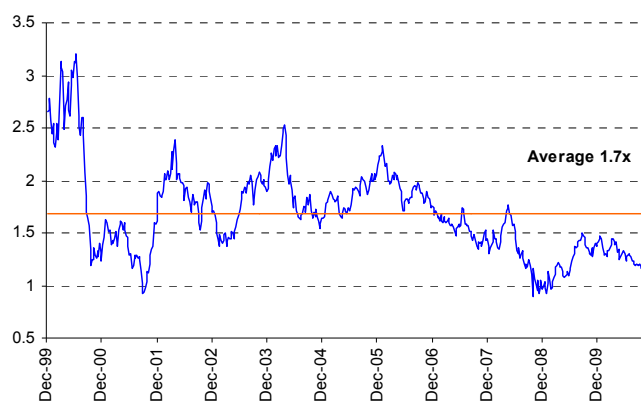
Source: Bloomberg, Citi Investment Research and Analysis estimates

Figure 44. SEC – Key Assumption Changes (Consolidated)

		New		Old		Chg	
		2010E	2011E	2010E	2011E	2010E	2011E
Currency	KRW/US\$	1,152	1,090	1,152	1,090	0.0%	0.0%
DRAM	YoY Shipment growth	71%	54%	71%	54%	0.0%p	0.0%p
	YoY ASP chg (256Mb)	17%	-31%	20%	-30%	-2.7%p	-0.9%p
	OP Margin (%)	44.0%	42.2%	45.2%	43.4%	-1.2%p	-1.2%p
NAND	YoY Shipment growth	68%	85%	68%	85%	0.0%p	0.0%p
	YoY ASP chg (1Gb)	-19%	-32%	-19%	-32%	0.0%p	0.0%p
	OP Margin (%)	31.4%	35.5%	31.4%	34.3%	0.0%p	1.2%p
Handset	Shipment (mn)	275	322	275	322	0.0%	0.0%
	ASP (US\$)	119	129	119	129	0.0%	0.0%
	OP Margin (%)	9.9%	9.9%	10.0%	9.6%	-0.1%p	0.3%p
TFT-LCD	YoY Shipment growth	16%	25%	16%	25%	0.0%p	0.0%p
	ASP Chg (US\$/sqm)	-2%	-6%	-2%	-6%	0.0%p	0.0%p
	OP Margin (%)	6.2%	5.6%	6.2%	5.4%	0.0%p	0.2%p
Sales	Total	154,306	174,355	154,312	172,630	0.0%	1.0%
	Semiconductor	37,964	41,320	38,339	41,929	-1.0%	-1.5%
	TFT-LCD	30,576	35,785	30,576	35,785	0.0%	0.0%
	Telecom	41,532	53,345	41,163	51,012	0.9%	4.6%
	Appliance/Media	56,940	59,151	56,940	59,151	0.0%	0.0%
EBIT	Total	17,773	20,468	18,055	20,382	-1.6%	0.4%
	Semiconductor	10,664	11,761	11,040	12,118	-3.4%	-2.9%
	TFT-LCD	1,900	2,006	1,900	1,932	0.0%	3.8%
	Telecom	3,946	5,104	3,946	4,748	0.0%	7.5%
	Appliance/Media	738	1,599	645	1,584	14.5%	0.9%
NP	Total	15,349	16,746	15,566	16,640	-1.4%	0.6%

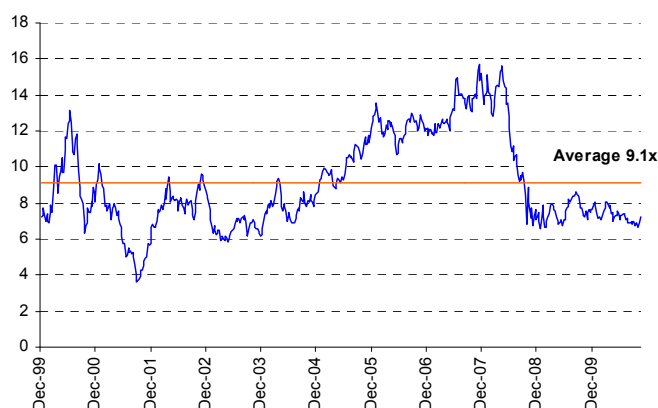
Source: Citi Investment Research and Analysis estimates

Figure 45. SEC – 12-Month Forward P/B



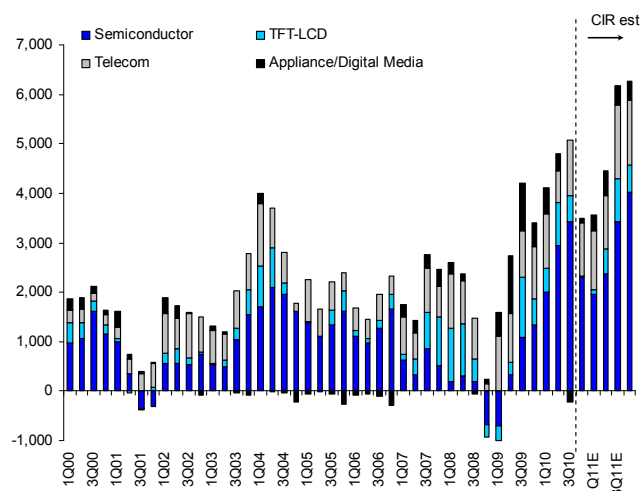
Source: Citi Investment Research and Analysis, Bloomberg

Figure 46. SEC – 12-Month Forward P/E



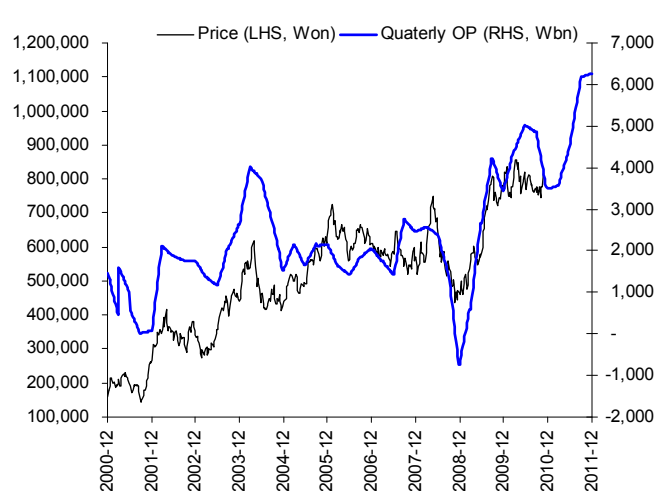
Source: Citi Investment Research and Analysis, Bloomberg

Figure 47. SEC – Divisional OP Breakdown (Wbn)



Source: Company Data, Citi Investment Research and Analysis Estimates

Figure 48. SEC – Stock Price vs. Quarterly OP Trend



Source: Citi Investment Research and Analysis, Bloomberg

Figure 49. SEC – SOTP Valuation

(Wbn)	2011E EBITDA	Target Multiple	EV	Details
Semiconductor	19,761	5.1	99,932	52% 30% premium to Hynix's target price implied multiple
TFT-LCD	4,672	3.5	16,120	8% LG Display's target price implied multiple
Telecom	5,509	5.6	30,594	16% 10% discount to Nokia's target price implied multiple
DM & DA	2,120	4.7	9,860	5% Global peer average
<b>Total Operating Value</b>	<b>32,063</b>	<b>4.9</b>	<b>156,505</b>	<b>81%</b>
-	-	-	-	-
Net Cash	17,591	-	17,591	9% 2011E Estimate
Net Treasury Value	-	-	7,256	4% BV as of June-30-10
Equity Method Investment Asset Value	11,156	-	11,156	6% 2011E BV
<b>Total Equity Value</b>	-	-	<b>192,509</b>	<b>100%</b>
Pref. Shares Value	-	-	21,176	-
<b>Pref. Shares Adjusted Value</b>	-	-	<b>171,333</b>	-
No of Shares (mn)	-	-	147	-
<b>Fair Value (Won)</b>	-	-	<b>1,163,162</b>	-

Source: Citi Investment Research and Analysis estimates



Figure 50. SEC – Peer Valuations

Code	Company	CCY	Rating	Target Price	Close Price	P/E		P/B		ROE		EV/EBITDA	
						2010E	2011E	2010E	2011E	2010E	2011E	2010E	2011E
005930.KS	SEC	KRW	1L	1,160,000	845,000	8.1	7.4	1.5	1.3	20.1%	18.4%	3.5	3.0
000660.KS	Hynix	KRW	1M	40,000	25,200	5.1	5.7	1.6	1.3	39.5%	24.9%	3.1	2.8
006400.KS	Samsung SDI	KRW	3M	155,000	171,000	20.9	19.9	1.5	1.4	7.2%	7.1%	9.4	9.9
066570.KS	LGE	KRW	1L	140,000	106,000	13.9	9.3	1.4	1.3	11.2%	14.3%	12.7	5.5
034220.KS	LG Display	KRW	1M	48,000	41,800	12.0	9.6	1.3	1.2	11.7%	12.9%	3.4	3.0
009150.KS	SEMCO	KRW	1M	160,000	134,000	15.6	14.8	2.9	2.5	20.6%	18.1%	7.2	6.5
001300.KS	Cheil Industries	KRW	1M	110,000	109,000	21.5	17.5	2.4	2.1	12.0%	12.7%	10.9	8.8
012450.KS	Samsung Techwin	KRW	1M	140,000	107,000	22.0	13.1	4.3	3.3	21.5%	28.5%	16.7	10.7
<b>KOREA Tech Average</b>		-	-	-	-	<b>14.9</b>	<b>12.2</b>	<b>2.1</b>	<b>1.8</b>	<b>18.0%</b>	<b>17.1%</b>	<b>8.4</b>	<b>6.3</b>
000660.KS	Hynix	KRW	1M	40,000	25,200	4.8	5.4	1.6	1.2	41.4%	25.8%	3.1	2.8
MU.O	Micron	USD	2S	9.00	7.75	4.2	6.0	0.9	0.8	28.5%	16.2%	2.3	1.8
6665.T	Elpida Memory Inc	JPY	1H	1,400	1,052	4.1	11.4	0.7	0.6	26.3%	8.0%	2.5	2.6
3474.TW	Inotera	TWD	NR	NA	13.90	NA	22.6	1.0	1.0	-8.1%	3.3%	4.3	3.2
5346.TWO	Powerchip	TWD	NR	NA	6.03	2.9	9.5	0.9	0.8	31.2%	2.5%	2.0	3.0
<b>Global Memory Average</b>		-	-	-	-	<b>4.0</b>	<b>11.0</b>	<b>1.0</b>	<b>0.9</b>	<b>23.9%</b>	<b>11.1%</b>	<b>2.8</b>	<b>2.7</b>
NOK1V.HE	Nokia	EUR	3H	6.30	7.20	12.6	13.3	1.9	2.0	12.6%	11.5%	5.8	5.4
<b>Global Handset Average</b>		-	-	-	-	<b>12.6</b>	<b>13.3</b>	<b>1.9</b>	<b>2.0</b>	<b>12.6%</b>	<b>11.5%</b>	<b>5.8</b>	<b>5.4</b>
034220.KS	LG Display	KRW	1M	48,000	41,800	12.0	9.6	1.3	1.2	11.7%	12.9%	3.4	3.0
2409.TW	AU Optonics	TWD	NR	NA	31.00	17.2	12.5	1.0	0.9	7.0%	9.4%	3.0	2.8
<b>TFT-LCD Average</b>		-	-	-	-	<b>14.6</b>	<b>11.0</b>	<b>1.2</b>	<b>1.0</b>	<b>9.3%</b>	<b>11.2%</b>	<b>3.2</b>	<b>2.9</b>
6753.T	Sharp Corp	JPY	2H	850	810	24.0	19.5	0.9	0.8	3.7%	4.5%	3.6	3.4
6752.T	Matsushita	JPY	1H	1,500	1,215	28.1	15.9	0.9	0.9	3.2%	5.8%	4.8	4.6
6758.T	Sony	JPY	2H	2,700	2,894	44.4	21.5	1.0	0.9	2.2%	4.4%	5.5	3.9
PHG.AS	Philips	EUR	2M	27.00	22.47	11.1	11.0	1.3	1.3	10.1%	9.8%	6.0	5.2
<b>Digital Media Average</b>		-	-	-	-	<b>26.9</b>	<b>17.0</b>	<b>1.0</b>	<b>1.0</b>	<b>4.8%</b>	<b>6.1%</b>	<b>5.0</b>	<b>4.3</b>
HPQ.N	HPQ	USD	1M	70	44	9.5	8.2	2.5	2.2	21.7%	25.0%	5.5	5.3
INTC.O	Intel	USD	1M	25	21	10.7	11.0	2.8	2.6	26.9%	24.2%	5.1	5.1
2330.TW	TSMC	TWD	1L	78	64	10.3	10.1	2.9	2.5	29.9%	26.6%	6.1	5.3
AAPL.O	Apple	USD	1H	390	315	20.8	16.6	6.0	4.4	35.3%	31.2%	14.2	10.6
<b>Global Leading Tech Avg</b>		-	-	-	-	<b>12.8</b>	<b>11.5</b>	<b>3.5</b>	<b>2.9</b>	<b>28.4%</b>	<b>26.8%</b>	<b>7.7</b>	<b>6.6</b>

Source: Powered by DataCentral (\*Priced at close on 25 Nov 2010), Bloomberg for NR (Non-Rated) companies.

Figure 51. SEC – Quarterly Earnings Forecast (Consolidated)

(Wbn)	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2009	2010E	2011E	2012E
<b>Sales</b>																
Semiconductor	5,210	6,130	7,460	8,000	8,205	9,530	10,660	9,569	8,843	9,565	10,944	11,968	26,800	37,964	41,320	46,044
TFT-LCD	4,880	5,910	7,760	7,290	6,850	7,760	8,100	7,866	7,688	8,766	9,847	9,485	25,840	30,576	35,785	36,639
Telecom	8,760	9,100	9,570	10,170	9,182	8,780	11,120	12,450	11,407	12,537	14,082	15,319	37,600	41,532	53,345	56,731
Appliance/Digital Media	10,070	11,770	12,370	14,680	12,610	14,540	14,130	15,660	12,728	14,105	15,005	17,313	48,890	56,940	59,151	65,334
<b>Total</b>	<b>28,671</b>	<b>32,511</b>	<b>35,894</b>	<b>39,248</b>	<b>34,640</b>	<b>37,892</b>	<b>40,229</b>	<b>41,545</b>	<b>38,018</b>	<b>41,712</b>	<b>45,341</b>	<b>49,284</b>	<b>136,324</b>	<b>154,306</b>	<b>174,355</b>	<b>188,740</b>
<b>OP</b>																
Semiconductor	-710	340	1,090	1,340	1,995	2,940	3,420	2,309	1,950	2,378	3,421	4,012	2,060	10,664	11,761	12,313
TFT-LCD	-280	250	1,200	530	491	880	520	9	93	491	875	547	1,700	1,900	2,006	1,982
Telecom	1,120	980	950	1,050	1,104	630	1,130	1,081	1,205	1,091	1,497	1,310	4,100	3,946	5,104	5,324
Appliance/Digital Media	470	1,160	960	480	519	360	-230	89	325	502	382	389	3,070	738	1,599	1,920
<b>Total</b>	<b>593</b>	<b>2,674</b>	<b>4,222</b>	<b>3,437</b>	<b>4,406</b>	<b>5,014</b>	<b>4,865</b>	<b>3,488</b>	<b>3,573</b>	<b>4,462</b>	<b>6,175</b>	<b>6,259</b>	<b>10,925</b>	<b>17,773</b>	<b>20,468</b>	<b>21,539</b>
<b>Operating Margin</b>																
Semiconductor	-14%	6%	15%	17%	24%	31%	32%	24%	22%	25%	31%	34%	8%	28%	28%	27%
TFT-LCD	-6%	4%	15%	7%	7%	11%	6%	0%	1%	6%	9%	6%	7%	6%	6%	5%
Telecom	13%	11%	10%	10%	12%	7%	10%	9%	11%	9%	11%	9%	11%	10%	10%	9%
Appliance/Digital Media	5%	10%	8%	3%	4%	2%	-2%	1%	3%	4%	3%	2%	6%	1%	3%	3%
<b>Total</b>	<b>2%</b>	<b>8%</b>	<b>12%</b>	<b>9%</b>	<b>13%</b>	<b>13%</b>	<b>12%</b>	<b>8%</b>	<b>9%</b>	<b>11%</b>	<b>14%</b>	<b>13%</b>	<b>8%</b>	<b>12%</b>	<b>12%</b>	<b>11%</b>
<b>Net non-operating income</b>	<b>210</b>	<b>305</b>	<b>460</b>	<b>292</b>	<b>567</b>	<b>300</b>	<b>559</b>	<b>191</b>	<b>193</b>	<b>270</b>	<b>386</b>	<b>210</b>	<b>1,266</b>	<b>1,617</b>	<b>1,059</b>	<b>1,059</b>
<b>Net equity-method gain</b>	<b>328</b>	<b>438</b>	<b>505</b>	<b>442</b>	<b>462</b>	<b>553</b>	<b>558</b>	<b>391</b>	<b>392</b>	<b>470</b>	<b>586</b>	<b>410</b>	<b>1,713</b>	<b>1,963</b>	<b>1,858</b>	<b>1,951</b>
<b>Net Financial Income</b>	<b>-118</b>	<b>-133</b>	<b>-45</b>	<b>-151</b>	<b>106</b>	<b>-253</b>	<b>1</b>	<b>-199</b>	<b>-200</b>	<b>-200</b>	<b>-200</b>	<b>-200</b>	<b>-447</b>	<b>-346</b>	<b>-800</b>	<b>-893</b>
Net Interest income	-56	-82	-45	-21	10	2	-19	10	10	10	10	10	-204	4	41	41
Net FX transaction gains	-62	-51	-0	-129	106	-255	20	-199	-199	-199	-199	-199	-243	-328	-798	-798
Net Other Financial Inc.	0	0	0	0	-11	0	0	-11	-11	-11	-11	-11	0	-21	-43	-43
<b>Pretax Profit</b>	<b>803</b>	<b>2,979</b>	<b>4,681</b>	<b>3,729</b>	<b>4,973</b>	<b>5,314</b>	<b>5,424</b>	<b>3,680</b>	<b>3,766</b>	<b>4,732</b>	<b>6,561</b>	<b>6,469</b>	<b>12,192</b>	<b>19,390</b>	<b>21,527</b>	<b>22,598</b>
RP Margin%	3%	9%	13%	9%	14%	14%	13%	9%	10%	11%	14%	13%	9%	13%	12%	12%
<b>Income taxes</b>	<b>221</b>	<b>644</b>	<b>875</b>	<b>691</b>	<b>979</b>	<b>1,037</b>	<b>968</b>	<b>736</b>	<b>753</b>	<b>946</b>	<b>1,312</b>	<b>1,294</b>	<b>2,431</b>	<b>3,720</b>	<b>4,305</b>	<b>4,520</b>
Effective tax rate (%)	28%	22%	19%	19%	20%	20%	18%	20%	20%	20%	20%	20%	20%	19%	20%	20%
<b>Net Profit</b>	<b>522</b>	<b>2,274</b>	<b>3,746</b>	<b>3,030</b>	<b>4,016</b>	<b>4,173</b>	<b>4,335</b>	<b>2,825</b>	<b>2,893</b>	<b>3,667</b>	<b>5,130</b>	<b>5,056</b>	<b>9,572</b>	<b>15,349</b>	<b>16,746</b>	<b>17,478</b>
NP Margin%	2%	7%	10%	8%	12%	11%	11%	7%	8%	9%	11%	10%	7%	10%	10%	9%

Source: Company Data, Citi Investment Research and Analysis estimates

Figure 52. SEC – Key Assumptions

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2009	2010E	2011E	2012E
FX Rate(Won/US\$)	1,415	1,286	1,239	1,169	1,143	1,165	1,181	1,120	1,100	1,100	1,090	1,070	1,277	1,152	1,090	1,000
<b>Total Sales (Wbn)</b>	<b>28,671</b>	<b>32,511</b>	<b>35,894</b>	<b>39,248</b>	<b>34,640</b>	<b>37,892</b>	<b>40,229</b>	<b>41,545</b>	<b>38,018</b>	<b>41,712</b>	<b>45,341</b>	<b>49,284</b>	<b>136,324</b>	<b>154,306</b>	<b>174,355</b>	<b>188,740</b>
%Chg	-13%	13%	10%	9%	-12%	9%	6%	3%	-8%	10%	9%	9%	15%	13%	13%	8%
<b>Operating Profit (Wbn)</b>	<b>593</b>	<b>2,674</b>	<b>4,222</b>	<b>3,437</b>	<b>4,406</b>	<b>5,014</b>	<b>4,865</b>	<b>3,488</b>	<b>3,573</b>	<b>4,462</b>	<b>6,175</b>	<b>6,259</b>	<b>10,925</b>	<b>17,773</b>	<b>20,468</b>	<b>21,539</b>
%Chg	NM	351%	58%	-19%	28%	14%	-3%	-28%	2%	25%	38%	1%	91%	63%	15%	5%
OPMargin(%)	2%	8%	12%	9%	13%	13%	12%	8%	9%	11%	14%	13%	8%	12%	12%	11%
<b>DRAM</b>																
Shipments(mnUnits,256MbEquiv)	2,624	3,186	3,471	3,805	4,338	4,963	6,238	6,886	7,218	7,819	9,013	10,398	13,087	22,425	34,447	55,390
QoQ ASP chg(256MbEquiv)	-13%	12%	22%	13%	5%	8%	-8%	-28%	-12%	0%	2%	0%	-27%	17%	-31%	-30%
<b>Revenue (Wbn)</b>	<b>1,606</b>	<b>1,975</b>	<b>2,530</b>	<b>2,955</b>	<b>3,461</b>	<b>4,358</b>	<b>5,126</b>	<b>3,863</b>	<b>3,500</b>	<b>3,791</b>	<b>4,416</b>	<b>5,002</b>	<b>9,066</b>	<b>16,808</b>	<b>16,709</b>	<b>17,282</b>
<b>Operating Profit (Wbn)</b>	<b>-454</b>	<b>-161</b>	<b>436</b>	<b>858</b>	<b>1,306</b>	<b>2,052</b>	<b>2,614</b>	<b>1,424</b>	<b>1,160</b>	<b>1,401</b>	<b>1,996</b>	<b>2,497</b>	<b>680</b>	<b>7,396</b>	<b>7,053</b>	<b>6,992</b>
OP Margin(%)	-28%	-8%	17%	29%	38%	47%	51%	37%	33%	37%	45%	50%	7%	44%	42%	40%
<b>NAND</b>																
Shipments(mnUnits,1GbEquiv)	3,863	4,199	4,696	4,936	5,677	7,034	7,736	9,228	10,162	12,072	14,900	17,835	17,693	29,675	54,969	101,661
QoQ ASP chg(1GbEquiv)	18%	21%	3%	4%	-11%	-10%	-6%	-15%	-10%	-7%	-3%	-10%	-22%	-19%	-32%	-33%
<b>Revenue (Wbn)</b>	<b>1,290</b>	<b>1,541</b>	<b>1,711</b>	<b>1,756</b>	<b>1,758</b>	<b>1,998</b>	<b>2,094</b>	<b>2,013</b>	<b>1,960</b>	<b>2,165</b>	<b>2,568</b>	<b>2,716</b>	<b>6,298</b>	<b>7,864</b>	<b>9,409</b>	<b>10,712</b>
<b>Operating Profit (Wbn)</b>	<b>-35</b>	<b>297</b>	<b>488</b>	<b>517</b>	<b>513</b>	<b>643</b>	<b>706</b>	<b>609</b>	<b>575</b>	<b>682</b>	<b>1,013</b>	<b>1,063</b>	<b>1,268</b>	<b>2,471</b>	<b>3,333</b>	<b>3,520</b>
OP Margin(%)	-3%	19%	29%	29%	29%	32%	34%	30%	29%	32%	39%	39%	20%	31%	35%	33%
<b>TFT-LCD</b>																
Large Panel Shipments (Ksqm)	4,366	5,740	6,667	6,660	6,297	6,839	6,861	7,084	7,281	8,171	9,050	9,264	23,433	27,082	33,766	39,501
Large Panel ASP(US\$/sqm)	614	660	785	794	854	864	862	849	842	865	879	834	725	857	855	812
<b>Revenue (Wbn)</b>	<b>4,880</b>	<b>5,910</b>	<b>7,760</b>	<b>7,290</b>	<b>6,850</b>	<b>7,760</b>	<b>8,100</b>	<b>7,866</b>	<b>7,688</b>	<b>8,766</b>	<b>9,847</b>	<b>9,485</b>	<b>25,840</b>	<b>30,576</b>	<b>35,785</b>	<b>36,639</b>
<b>Operating Profit (Wbn)</b>	<b>-280</b>	<b>250</b>	<b>1,200</b>	<b>530</b>	<b>491</b>	<b>880</b>	<b>520</b>	<b>9</b>	<b>93</b>	<b>491</b>	<b>875</b>	<b>547</b>	<b>1,700</b>	<b>1,900</b>	<b>2,006</b>	<b>1,982</b>
OP Margin(%)	-6%	4%	15%	7%	7%	11%	6%	0%	1%	6%	9%	6%	7%	6%	6%	5%
<b>Handset</b>																
Shipments (mn Units)	46	52	60	69	64	64	71	76	69	75	85	94	227	275	322	366
ASP(US\$)	122	126	121	116	117	108	123	129	129	129	129	129	121	119	129	129
<b>Revenue (Wbn)</b>	<b>7,920</b>	<b>8,450</b>	<b>9,010</b>	<b>9,330</b>	<b>8,570</b>	<b>8,050</b>	<b>10,380</b>	<b>11,666</b>	<b>10,701</b>	<b>11,796</b>	<b>13,334</b>	<b>14,533</b>	<b>34,710</b>	<b>38,666</b>	<b>50,363</b>	<b>53,600</b>
<b>Operating Profit (Wbn)</b>	<b>990</b>	<b>972</b>	<b>946</b>	<b>933</b>	<b>1,071</b>	<b>596</b>	<b>1,100</b>	<b>1,050</b>	<b>1,177</b>	<b>1,062</b>	<b>1,467</b>	<b>1,279</b>	<b>3,841</b>	<b>3,817</b>	<b>4,984</b>	<b>5,199</b>
OP Margin (%)	13%	12%	11%	10%	13%	7%	11%	9%	11%	9%	11%	9%	11%	10%	10%	10%

Source: Company Data, Citi Investment Research and Analysis estimates

## Company Focus

- Company Update
- Estimate Change

<b>Buy/Medium Risk</b>	<b>1M</b>
Price (25 Nov 10)	W25,200
Target price	W40,000
Expected share price return	58.7%
Expected dividend yield	0.0%
<b>Expected total return</b>	<b>58.7%</b>
Market Cap	W14,874,969M
	US\$12,958M

### Price Performance (RIC: 000660.KS, BB: 000660.KS)



## Hynix (000660.KS)

### Profitable at the Bottom of Mid-Cycle Correction

- **Well-anticipated weak 4Q10E earnings** — We forecast 4Q10E OP of W534bn (-47% QoQ, -25% YoY) with 19% OPM on sharper DRAM price decline assumption of 28% (previous 21%) amid about 5% KRW appreciation forecast and lower 10E OP estimate by 5%. Steep cost reduction from matured 44nm yield and increasing mix to stable mobile DRAM will mitigate rapid PC DRAM price decline. Excluding Samsung, we expect most other DRAM makers with higher PC DRAM/spot market exposure will report operating loss in 4Q10E.
- **Still profitable with double-digit OPM in 1Q11E** — We forecast 1Q11E OP of W400bn (-25% QoQ, -50% YoY) with 15% OPM on additional DRAM price decline of 12% and 1% KRW appreciation. We estimate Hynix could generate above W1tr of EBITDA and free cash flow even in the negative environment of more than 50% PC DRAM price decline over 2~3 quarters.
- **Rush order continues in mobile DRAM** — According to our channel checks, leading mobile DRAM makers like Samsung and Hynix continue to see rush orders from smartphone and tablet PCs. Despite strong demand, competitors' product qualification process continues to be pushed out due to poor product quality and unstable production yield. We expect Hynix will prioritize wafer capacity allocation for mobile DRAM production at the expense of PC commodity DRAM.
- **NAND growth opportunities** — We expect Hynix will accelerate penetration into embedded storage applications by narrowing technology gap in 2xnm 64Gbit products and developing embedded controller technology. Hynix could start mass shipment after final qualifications from major NAND customers during this quarter. We expect Hynix will show the strongest NAND shipment growth momentum from the current low base in 11E.
- **Conviction Buy (1M): Rerating will continue** — We expect the market will continue to rerate the stock from current market misperception that it is a pure commodity PC DRAM maker as it confirms its sustainable competitiveness (low cost structure in commodity PC DRAM, increasing non-PC DRAM mix of >60% (vs. 30% in 1Q07) and NAND growth opportunities) even under very weak PC commodity DRAM pricing conditions expected in the coming quarters.

Figure 53. Statistical Abstract

31-Dec	Sales (Wbn)	OP (Wbn)	NP (Wbn)	EPS (W)	EPS Growth (%)	P/E (x)	P/B (x)	ROE (%)
2008A	6,818	-1,920	-4,720	-10,195	NM	NM	2.1	-63.6
2009A	7,906	192	-333	-561	NM	NM	2.5	-5.8
2010E	12,185	3,388	3,037	4,942	NM	5.1	1.6	39.5
2011E	13,094	3,397	2,695	4,385	-11%	5.7	1.3	24.9
2012E	13,904	3,749	2,981	4,851	11%	5.2	1.0	21.9

Source: Company, Citi Investment Research and Analysis estimates

Fiscal year end 31-Dec	2008	2009	2010E	2011E	2012E
<b>Valuation Ratios</b>					
P/E adjusted (x)	-2.5	nm	5.1	5.7	5.2
EV/EBITDA adjusted (x)	21.1	7.1	3.0	2.7	2.2
P/BV (x)	2.1	2.5	1.6	1.3	1.0
Dividend yield (%)	0.0	0.0	0.0	0.0	0.0
<b>Per Share Data (W)</b>					
EPS adjusted	-10,195	-561	4,942	4,385	4,851
EPS reported	-10,195	-561	4,942	4,385	4,851
BVPS	11,932	9,980	15,387	19,771	24,622
DPS	0	0	0	0	0
<b>Profit &amp; Loss (WB)</b>					
Net sales	6,818	7,906	12,185	13,094	13,904
Operating expenses	-8,738	-7,714	-8,797	-9,697	-10,154
<b>EBIT</b>	<b>-1,920</b>	<b>192</b>	<b>3,388</b>	<b>3,397</b>	<b>3,749</b>
Net interest expense	-329	-404	-331	-236	-153
Non-operating/exceptionals	-2,525	-159	30	-64	-130
<b>Pre-tax profit</b>	<b>-4,775</b>	<b>-371</b>	<b>3,087</b>	<b>3,097</b>	<b>3,466</b>
Tax	30	38	0	-403	-485
Extraord./Min.Int./Pref.div.	25	0	-50	0	0
<b>Reported net income</b>	<b>-4,720</b>	<b>-333</b>	<b>3,037</b>	<b>2,695</b>	<b>2,981</b>
Adjusted earnings	-4,720	-333	3,037	2,695	2,981
Adjusted EBITDA	910	2,846	6,165	6,397	6,749
<b>Growth Rates (%)</b>					
Sales	-21.1	16.0	54.1	7.5	6.2
EBIT adjusted	-473.8	110.0	nm	0.3	10.4
EBITDA adjusted	-67.9	212.6	116.6	3.8	5.5
EPS adjusted	nm	94.5	981.1	-11.3	10.6
<b>Cash Flow (WB)</b>					
<b>Operating cash flow</b>	<b>-401</b>	<b>1,340</b>	<b>4,549</b>	<b>5,388</b>	<b>5,725</b>
Depreciation/amortization	2,831	2,654	2,777	3,000	3,000
Net working capital	-1,256	-894	-1,315	-307	-256
<b>Investing cash flow</b>	<b>-2,038</b>	<b>-1,004</b>	<b>-3,400</b>	<b>-3,500</b>	<b>-3,500</b>
Capital expenditure	-2,811	-620	-3,400	-3,500	-3,500
Acquisitions/disposals	0	0	0	0	0
<b>Financing cash flow</b>	<b>1,171</b>	<b>355</b>	<b>-1,136</b>	<b>-1,553</b>	<b>-46</b>
Borrowings	1,620	-378	-1,600	-1,500	0
Dividends paid	0	0	0	0	0
<b>Change in cash</b>	<b>-1,268</b>	<b>690</b>	<b>13</b>	<b>334</b>	<b>2,179</b>
<b>Balance Sheet (WB)</b>					
<b>Total assets</b>	<b>16,576</b>	<b>16,304</b>	<b>18,351</b>	<b>19,634</b>	<b>22,653</b>
Cash & cash equivalent	720	1,518	1,272	1,608	3,786
Accounts receivable	750	1,733	2,671	2,870	3,048
Net fixed assets	12,363	10,143	10,766	11,266	11,766
<b>Total liabilities</b>	<b>11,050</b>	<b>10,384</b>	<b>8,895</b>	<b>7,483</b>	<b>7,521</b>
Accounts payable	719	740	850	939	976
Total Debt	7,749	7,016	5,416	3,916	3,916
<b>Shareholders' funds</b>	<b>5,526</b>	<b>5,919</b>	<b>9,456</b>	<b>12,151</b>	<b>15,132</b>
<b>Profitability/Solvency Ratios (%)</b>					
EBITDA margin adjusted	13.4	36.0	50.6	48.9	48.5
ROE adjusted	-63.6	-5.8	39.5	24.9	21.9
ROIC adjusted	-15.1	2.0	27.7	22.0	22.7
Net debt to equity	127.2	92.9	43.8	19.0	0.9
Total debt to capital	58.4	54.2	36.4	24.4	20.6

For further data queries on Citi's full coverage universe please contact CIRA Data Services Asia Pacific at CIRADatServicesAsiaPacific@citi.com or +852-2501-2791

Figure 54. Hynix — Earnings Revisions

(Wbn)	Sales			OP			RP			NP		
	New	Old	Chg	New	Old	Chg	New	Old	Chg	New	Old	Chg
2010E	<b>12,185</b>	12,395	-1.7%	<b>3,388</b>	3,569	-5.1%	<b>3,087</b>	3,270	-5.6%	<b>3,037</b>	3,220	-5.7%
2011E	<b>13,094</b>	13,561	-3.4%	<b>3,397</b>	3,582	-5.2%	<b>3,097</b>	3,285	-5.7%	<b>2,695</b>	2,858	-5.7%
2012E	<b>13,904</b>	14,366	-3.2%	<b>3,749</b>	3,666	2.3%	<b>3,466</b>	3,384	2.4%	<b>2,981</b>	2,911	2.4%

Source: Citi Investment Research and Analysis Estimates

Figure 55. Hynix — Key Assumption Changes

		2010E			2011E		
		New	Old	Chg	New	Old	Chg
Currency	KRW/US\$	1,154	1,153	0.1%	1,088	1,089	-0.1%
DRAM	YoY Shipment growth	39%	39%	0.0%p	51%	51%	0.0%p
	YoY ASP chg (256Mb)	25%	28%	-2.7%p	-32%	-31%	-1.8%p
	OP Margin (%)	32%	33%	-1.1%p	30%	31%	-0.8%p
NAND	YoY Shipment growth	101%	101%	0.0%p	145%	145%	0.0%p
	YoY ASP chg (1Gb)	-28%	-28%	0.0%p	-35%	-35%	0.1%p
	OP Margin (%)	8%	8%	-0.1%p	16%	15%	1.2%p

Source: Citi Investment Research and Analysis estimates

Figure 56. Hynix — Citi Estimates vs. Consensus

(Wbn)	2010E			2011E		
	Citi est	Consensus	Diff.	Citi est	Consensus	Diff.
Sales	<b>12,185</b>	12,270	-1%	<b>13,094</b>	11,669	12%
OP	<b>3,388</b>	3,463	-2%	<b>3,397</b>	2,159	57%
NP	<b>3,037</b>	3,177	-4%	<b>2,695</b>	1,816	48%

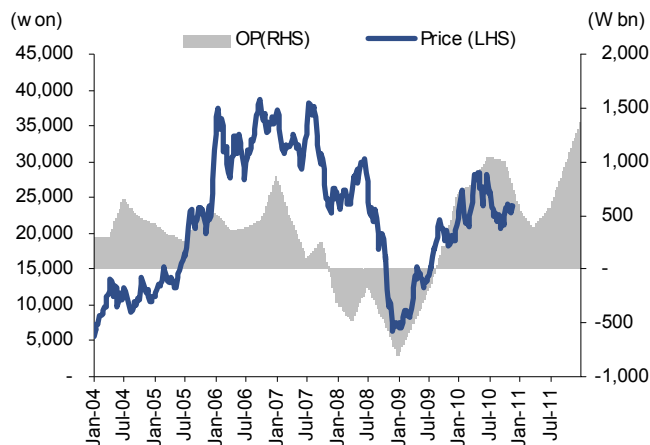
Source: Bloomberg, Citi Investment Research and Analysis estimates

Figure 57. Hynix — 4Q10E Earnings Preview

(Wbn)	4Q10E	3Q10	4Q09	QoQ	YoY
KRW/US\$	1,120	1,181	1,169	-5.2%	-4.2%
<b>Total Sales</b>	<b>2,835</b>	<b>3,250</b>	<b>2,799</b>	<b>-12.8%</b>	<b>1.3%</b>
DRAM	2,161	2,595	2,224	-16.7%	-2.8%
NAND	584	585	502	-0.3%	16.3%
<b>Operating Profit</b>	<b>534</b>	<b>1,011</b>	<b>708</b>	<b>-47%</b>	<b>-25%</b>
DRAM	477	926	633	-48%	-25%
NAND	52	60	72	-14%	-28%
<b>OP Margin (%)</b>					
<b>Total</b>	<b>18.8%</b>	<b>31.1%</b>	<b>25.3%</b>	<b>-12%p</b>	<b>-6%p</b>
DRAM	22.1%	35.7%	28.5%	-14%p	-6%p
NAND	8.9%	10.3%	14.3%	-1%p	-5%p

Source: Company, Citi Investment Research and Analysis estimates

Figure 58. Hynix — Quarterly OP & Stock Price



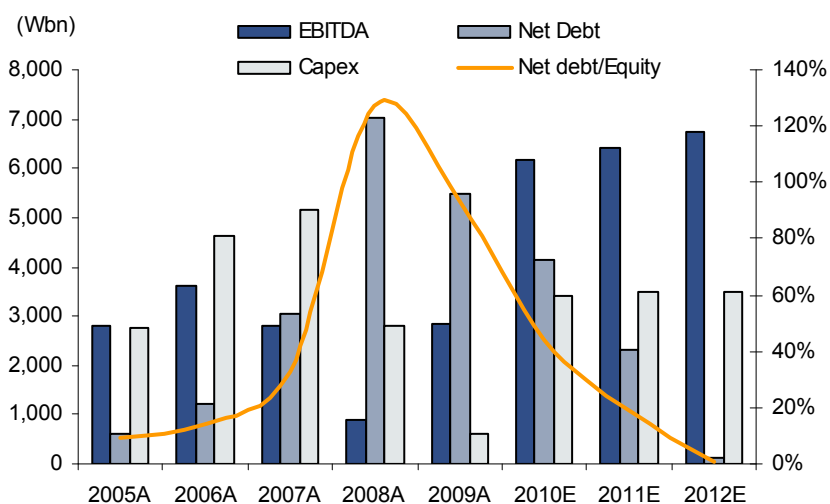
Source: Bloomberg, Citi Investment Research and Analysis

Figure 59. Hynix — Historical P/B (12mth Forward)



Source: Bloomberg, Citi Investment Research and Analysis

Figure 60. Hynix — EBITDA / CAPEX / Net Debt / Net-Debt-Equity (W bn)



Source: Company, Citi Investment Research and Analysis Estimates

Figure 61. Hynix — Peer Comparison

Code	Company	CCY	Rating	Target Price	Nov-25	P/E		P/B		ROE		EV/EBITDA	
					Close Price	2010E	2011E	2010E	2011E	2010E	2011E	2010E	2011E
000660.KS	Hynix	KRW	1M	40,000	25,200	5.1	5.7	1.6	1.3	40%	25%	3.1	2.8
005930.KS	SEC	KRW	1L	1,160,000	845,000	8.1	7.4	1.5	1.3	20%	18%	3.5	3.0
006400.KS	Samsung SDI	KRW	3M	155,000	171,000	20.9	19.9	1.5	1.4	7%	7%	9.4	9.9
066570.KS	LGE	KRW	1L	140,000	106,000	13.9	9.3	1.4	1.3	11%	14%	12.7	5.5
034220.KS	LG Display	KRW	1M	48,000	41,800	12.0	9.6	1.3	1.2	12%	13%	3.4	3.0
009150.KS	SEMCO	KRW	1M	160,000	134,000	15.6	14.8	2.9	2.5	21%	18%	7.2	6.5
001300.KS	Cheil Industries	KRW	1M	110,000	109,000	21.5	17.5	2.4	2.1	12%	13%	10.9	8.8
012450.KS	Samsung Techwin	KRW	1M	140,000	107,000	22.0	13.1	4.3	3.3	22%	28%	16.7	10.7
<b>KOREA Tech Average</b>				-	-	<b>16.3</b>	<b>13.1</b>	<b>2.2</b>	<b>1.8</b>	<b>15%</b>	<b>16%</b>	<b>9.1</b>	<b>6.8</b>
MU.N	Micron	USD	2S	9.00	7.75	4.2	6.0	0.9	0.8	29%	16%	2.3	1.8
6665.T	Elpida Memory Inc	JPY	1H	1,400	1,052	4.1	11.4	0.7	0.6	26%	8%	2.6	2.8
2408.TW	Nanya	TWD	NR	NA	16.80	NA	78.5	1.5	1.4	-13%	3%	9.0	6.2
3474.TW	Inotera	TWD	NR	NA	13.90	NA	22.6	1.0	1.0	-8%	3%	4.3	3.2
5346.TWO	Powerchip	TWD	NR	NA	6.03	2.9	9.5	0.9	0.8	31%	2%	2.0	3.0
6502.T	Toshiba	JPY	1H	600	423	21.4	10.4	2.2	1.9	11%	21%	5.0	4.3
<b>Memory Average</b>				-	-	<b>8.2</b>	<b>23.1</b>	<b>1.2</b>	<b>1.1</b>	<b>13%</b>	<b>9%</b>	<b>4.2</b>	<b>3.6</b>

Source: Company and Citi Investment Research and Analysis estimates



Figure 62. Hynix — Quarterly Estimates

(Wbn)	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2009A	2010E	2011E	2012E
KRW/US\$	1,415	1,286	1,239	1,169	1,143	1,165	1,181	1,120	1,100	1,100	1,090	1,070	1,277	1,154	1,088	1,000
<b>Total Sales</b>	<b>1,313</b>	<b>1,676</b>	<b>2,118</b>	<b>2,799</b>	<b>2,821</b>	<b>3,279</b>	<b>3,250</b>	<b>2,835</b>	<b>2,693</b>	<b>2,910</b>	<b>3,472</b>	<b>4,019</b>	<b>7,906</b>	<b>12,185</b>	<b>13,094</b>	<b>13,904</b>
DRAM	998	1,241	1,676	2,224	2,376	2,746	2,595	2,161	1,999	2,139	2,497	2,874	6,139	9,878	9,509	9,523
NAND	305	401	420	502	452	529	585	584	624	691	885	1,045	1,628	2,150	3,245	3,981
<b>Operating Profit</b>	<b>(515)</b>	<b>(211)</b>	<b>209</b>	<b>708</b>	<b>799</b>	<b>1,045</b>	<b>1,011</b>	<b>534</b>	<b>400</b>	<b>580</b>	<b>1,000</b>	<b>1,400</b>	<b>191</b>	<b>3,388</b>	<b>3,397</b>	<b>3,749</b>
DRAM	(409)	(158)	197	633	767	1,018	926	477	348	505	825	1,163	263	3,188	2,840	2,863
NAND	(107)	(56)	10	72	30	26	60	52	49	72	170	232	(81)	168	523	847
<b>OP Margin (%)</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
<b>Total</b>	<b>-39%</b>	<b>-13%</b>	<b>10%</b>	<b>25%</b>	<b>28%</b>	<b>32%</b>	<b>31%</b>	<b>19%</b>	<b>15%</b>	<b>20%</b>	<b>29%</b>	<b>35%</b>	<b>2%</b>	<b>28%</b>	<b>26%</b>	<b>27%</b>
DRAM	-41%	-13%	12%	28%	32%	37%	36%	22%	17%	24%	33%	40%	4%	32%	30%	30%
NAND	-35%	-14%	2%	14%	7%	5%	10%	9%	8%	10%	19%	22%	-5%	8%	16%	21%
<b>Shipments (Units in mn)</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM (256Mb equiv)	2,014	2,206	2,462	2,750	2,915	3,119	3,185	3,885	4,157	4,448	5,138	6,026	9,432	13,104	19,770	30,778
NAND (1Gb equiv)	575	807	845	1,127	1,127	1,377	1,952	2,281	2,760	3,287	4,470	5,973	3,354	6,738	16,490	33,840
<b>Wafer capacity (Kwpm, 8"equiv)</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM	551	585	635	675	675	675	675	675	675	675	684	698	7,337	8,100	8,195	8,505
NAND	138	176	191	203	203	225	238	250	273	295	340	385	2,120	2,745	3,878	4,823
<b>Blended ASP (US\$)</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM (256Mb equiv)	0.4	0.4	0.5	0.7	0.7	0.8	0.7	0.5	0.4	0.4	0.4	0.4	0.5	0.7	0.4	0.3
NAND (1Gb equiv)	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.28	0.18	0.12
<b>Fully Loaded Cost (US\$)</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM (256Mb equiv)	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.5	0.4	0.3	0.2
NAND (1Gb equiv)	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.4	0.3	0.2	0.1
<b>Sequential % Chg</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
<b>Sales Growth</b>	<b>-13%</b>	<b>28%</b>	<b>26%</b>	<b>32%</b>	<b>1%</b>	<b>16%</b>	<b>-1%</b>	<b>-13%</b>	<b>-5%</b>	<b>8%</b>	<b>19%</b>	<b>16%</b>	<b>16%</b>	<b>54%</b>	<b>7%</b>	<b>6%</b>
DRAM	-13%	24%	35%	33%	7%	16%	-5%	-17%	-8%	7%	17%	15%	23%	61%	-4%	0%
NAND	-16%	31%	5%	20%	-10%	17%	11%	0%	7%	11%	28%	18%	-11%	32%	51%	23%
<b>OP Growth</b>	<b>NM</b>	<b>NM</b>	<b>NM</b>	<b>239%</b>	<b>13%</b>	<b>31%</b>	<b>-3%</b>	<b>-47%</b>	<b>-25%</b>	<b>45%</b>	<b>72%</b>	<b>40%</b>	<b>NM</b>	<b>1674%</b>	<b>0%</b>	<b>10%</b>
DRAM	NM	NM	NM	222%	21%	33%	-9%	-48%	-27%	45%	64%	41%	NM	1113%	-11%	1%
NAND	NM	NM	NM	590%	-58%	-14%	132%	-14%	-7%	48%	137%	36%	NM	NM	210%	62%
<b>Bit Growth</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM (256Mb equiv)	-2%	10%	12%	12%	6%	7%	2%	22%	7%	7%	16%	17%	28%	39%	51%	56%
NAND (1Gb equiv)	-4%	40%	5%	33%	0%	22%	42%	17%	21%	19%	36%	34%	-15%	101%	145%	105%
<b>Wafer capacity Growth</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM	-19%	6%	8%	6%	0%	0%	0%	0%	0%	0%	1%	2%	-16%	10%	1%	4%
NAND	-18%	28%	9%	6%	0%	11%	6%	5%	9%	8%	15%	13%	-42%	29%	41%	24%
<b>ASP Changes</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
DRAM (256Mb equiv)	-7.0%	19.5%	25.5%	26.0%	3.0%	6.0%	-8.7%	-28.0%	-12.0%	0.0%	2.0%	0.0%	-16.8%	25.1%	-32.3%	-30.0%
NAND (1Gb equiv)	10.0%	22.5%	4.0%	-5.0%	-8.0%	-6.0%	-23.0%	-10.0%	-10.0%	-7.0%	-5.0%	-10.0%	-11.4%	-28.4%	-34.6%	-35.0%

Source: Company Data, Citi Investment Research and Analysis estimates

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## Other Company Updates

### Toshiba (6502.T; ¥423; 1H)

- **Conclusion** — We rate the shares Buy with a ¥600 target price. Yen strengthening and the absence of catalyst near term are headwinds for the share price. However, we expect Toshiba to post a record OP in FY3/12 on (1) growth in the NAND business and in the social infrastructure business, centering on nuclear power operations; and (2) the emergence of restructuring benefits in the systems LSI and small/medium-size LCD panel businesses. We do not believe the share price properly reflects the value of a company that aims for a ROE of 20% in FY3/12.
- **NAND margin improvement to pause in October-December, but we still forecast stable growth medium term** — NAND spot prices (64G MLCC) fell 14% QoQ in July-September. Toshiba's ASP only declined 6% (yen basis, on a dollar basis it was almost flat), confirming the strength of demand for high-end NAND. An acceleration in the shift to 32nm processing resulted in the OP margin rising to 22%, from 15% in April-June. Demand for embedded memory remains firm although Toshiba has been unable to completely avoid the affects of a steep drop in spot prices. We understand its ASP fell in October and we expect price declines to put margins under pressure in October-December. However, we look for demand to expand in January-March, centering on embedded memory, and we believe that profitability could also improve. In addition, we expect (1) a large improvement in product portfolio (increase in the weighting of SSD and embedded memory, decline in the weighting of cards, etc) and (2) continued robust demand for embedded memory to lift profit to a record level in FY3/12.
- **Miniaturization advancing faster than we expected** — The construction and installation of equipment in Fab5 is moving forward toward a start of operations in summer 2011. Until Fab5 comes on stream, Toshiba plans to use empty space at Fab4 and we understand production capacity steadily increased in July-September. Toshiba had switched 90% of production to 32nm or lower processing nodes by the end of September (it had targeted end-December). We expect sub-32n output to increase in October-December.

### Elpida Memory (6665.T; ¥1,052; 1H)

- **Investment opinion** — We reiterate our Buy rating with a target price of ¥1,400. DRAM prices continue to trend down, but Elpida has announced plans to scale back production, supporting expectations that prices will firm up. We expect recovery to normal seasonality in the PC market in April-June, which is also likely to bring good news for DRAM supply/demand. We look for a resulting upturn in Elpida's share price, which shows significant correlation with DRAM prices. We expect October-December earnings to be close to breakeven.
- **Production cuts** — Elpida announced it plans to reduce production by more than 20% from November, to 170,000 units/month from 230,000. We understand this is mainly due to reduced supplies from Taiwanese firms (PSC, ProMOS). Taiwanese companies are likely to undertake effective production cutbacks. Reduced procurement from Taiwanese makers with high production costs may not only contribute to improved supply/demand, but also help minimize earnings deterioration.

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- **Mobile DRAM** — We expect Elpida's Hiroshima production facility will be specializing in mobile DRAM and NAND flash memory in future. Elpida commands the bulk of the mobile DRAM market, and we understand it is supplying seven or eight handset makers in Japan and overseas.
- **Expanding earnings opportunities** — In a growing number of cases including tablet PCs and slim notebook PCs, DRAM is likely to be fixed directly to motherboards, with favorable implications for earnings at DRAM makers in general. New CPUs are proliferating with the rise of tablet PCs, many of them using PoP (Package on Package) stacking with DRAM chips on CPU cores, which could be a chance for companies without NAND capabilities to eliminate their disadvantage. Furthermore, there are some modest signs of growth in tablet PCs using Intel Atom processors, which require a substantial amount of DRAM, and this is promising. DRAM installation volumes are also likely to rise as production of Internet-ready TVs with Atom processors (2GB of DRAM) increases, with a potential market of 5mn-10mn units.

### Micron Technology (MU.O; US\$7.75; 2S)

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- **Greater than Expected Nov Qtr Price Declines** — Micron saw November contract pricing down high single digit % for DRAM with NAND down 2-5% m/m. For its F1Q11(Nov) quarter, Micron expects DRAM production growth to be up mid single digits q/q with DRAM cost downs in the mid to high single digit %, as the cost of manufacturing at Inotera remains higher than Micron's own DRAM fabs. The company will remain focused on diversification away from commodity PC DRAM, and towards specialty DRAM applications such as mobile, server, networking, automotive, and consumer electronics. We note that for Micron's F1Q11(Nov) quarter, industry average 1Gb DDR3 contract pricing was -29% q/q (assuming linear bit shipments), lower than the F1Q11 QTD estimate of down 18-19% given on F4Q10 earnings. Micron expects NAND bit production to be up ~15-19% q/q on the continued transition to 25nm, with NAND cost declines also in the mid to high teens % benefiting from the increased mix of 25nm. For the Nov quarter, industry average 64Gb MLC contract was -26% q/q, with 32Gb TLC & 64Gb TLC contract pricing -22% and -19% q/q respectively (assuming linear bit shipments), lower than the F1Q11 QTD estimate of down ~5-9% q/q in October.
- **Inotera's Lower Bit Growth to Limit MU DRAM Production** — Last month, Inotera lowered its C4Q10 bit growth guidance to +70-80% q/q from prior guidance of +100%+ q/q given in July, due in part to the decline in DRAM pricing and 50nm stack yields (although improving). With Inotera's remaining trench DRAM wafer outs completed in October, Inotera targets 110 wspm+ on 50nm stack in 4Q10 (down from 130k wspm). The company expects all C4Q bit shipments to be 50nm 2Gb DDR3 (up from ~50% in C2Q), and 2010 bit growth up 30-40% y/y, down from prior guidance for greater than 50% bit shipment growth. Inotera is targeting conversion of core DRAM to 42nm by mid 2011, and expects to start a pilot run for 3xnm in mid 2011.
- **IMFS Ramp Driving FY2011 CapEx** — Micron guided its F2011 capex in the range of \$2.4B-\$2.9B, +180% y/y at the mid-pt from FY10's \$946M. Micron expects to spend ~2/3 of FY11 capex primarily for the ramp of NAND flash at the IM Flash Singapore fab. Recall that Micron is targeting a ramp to 60kwpm at IMFS by CY11 end (total capacity ~100k wpm).

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- **Diversification Helps Sustain Profitability** — Unlike past cycles where Micron was more dependent on commodity DRAM, Micron is now relatively more diversified. In F4Q10(Aug), DDR2/DDR3 accounted for ~38% of sales, with specialty DRAM ~13%. NAND accounted for ~29% of sales with NOR Flash 15% of sales (Aptina, Other 5%). This compares to FY2005 where DRAM accounted for 89% of sales, NAND 5%, and Image sensors/Other at 6%.

### **Powertech Technology (6239.TW; NT\$97.40; 1L)**

- **Toned-down 2011E outlook** – Despite a strong conviction in the growth prospects of mobile DRAM and NAND Flash, management's tone has turned a little softer after the dramatic DRAM price declines in the past two quarters. Key concern is the lack of volume visibility on commodity DRAM given the production cut announced by Elpida. Memory backend ASP is believed to decline normally (2-3% per quarter) in 1Q11, although PTI is in on-going negotiations with Elpida. On this basis, our forecast of revenue growth of 4% QoQ in 1Q11 and 18% YoY in 2011 may prove a little optimistic.
- **Price elasticity is expected** – Our channel checks suggested that both NanYa Tech and Inotera had improved their 50nm yield rates to around 70-80%, a stable yield although still lower than the average for peers. Both companies are aggressively migrating to 40nm for more cost benefits. Rexchip, in the meantime, has also achieved a stable (>80%) yield rate at 45nm. The company is moving-in the 5th immersion lithography equipment in Nov-10 and is expecting to migrate to 45nm all of its 88K WSPM capacity in 1H11. Given that second-tier DRAM suppliers have been catching up on the technology and achieving a lower cost structure, in conjunction with the already lower-than-historical average DRAM portion in total PC BOM, we expect DRAM content per box to increase in 1H11. PTI will be one of the key beneficiaries from this secular DRAM content growth trend, in our view.
- **Maintain Buy** – PTI's shares have decoupled from the DRAM price – the share price is holding firm at around NT\$97 while the DRAM price has declined by 50%+ in the past couple of quarters. We believe that PTI's product diversification to NAND Flash and mobile DRAM has protected revenue/earnings from huge fluctuations. Given a decelerated DRAM price decline trend and a likely increase in content per box, we remain positive on PTI. The shares are trading attractively at FY10E P/E of 8.2x and P/B of 2.0x, versus respective averages of 8.7x and 2.0x from 2003 to 2010, and offer a 5% dividend yield.

# Global Memory Valuation

Figure 63. Global Memory Valuation

		Samsung	Toshiba	Hynix	Micron	Elpida	Powertech
Rating		1L	1H	1M	2S	1H	1L
RIC		005930.KS	6502.T	000660.KS	MU.O	6665.T	6239.TW
Local Currency		KRW	JPY	KRW	USD	JPY	TWD
Share Price		845,000	423	25,200	7.75	1,052	97.40
Target Price		1,160,000	600	40,000	9.00	1,400	130.00
Market Cap (US\$ mn)		108,426	21,440	12,958	7,721	2,557	2,285
PER (x)	07	16.8	11.6	33.7	-18.0	-5.9	9.7
	08	22.5	-4.3	-2.5	-3.7	-0.8	13.1
	09	13.0	-94.5	-44.9	-3.3	68.1	8.7
	10E	8.0	21.4	4.8	4.2	4.1	7.6
	11E	7.5	10.4	5.4	6.0	11.4	6.7
P/BV (x)	07	2.4	1.3	1.3	0.8	0.4	3.0
	08	2.1	3.1	2.1	1.0	0.9	2.6
	09	1.8	2.2	2.5	1.3	0.9	2.1
	10E	1.5	2.2	1.6	0.9	0.7	1.8
	11E	1.3	1.9	1.2	0.8	0.6	1.5
EV/EBITDA (x)	07	7.9	5.0	5.8	5.8	4.1	5.6
	08	8.3	35.0	21.1	11.6	-10.2	5.6
	09	4.4	8.3	7.1	19.5	4.9	4.3
	10E	3.5	5.9	3.1	2.6	2.9	3.6
	11E	3.0	5.2	2.8	2.0	3.1	3.1
EV/Sales (x)	07	1.6	0.4	1.9	1.5	0.7	2.6
	08	1.3	0.5	2.8	1.9	1.6	2.5
	09	0.7	0.5	2.6	2.4	1.6	1.9
	10E	0.7	0.5	1.5	1.1	1.1	1.6
	11E	0.6	0.4	1.2	0.8	1.1	1.4
EBITDA Margin	07	21%	8%	33%	26%	17%	46%
	08	16%	1%	13%	16%	-16%	45%
	09	17%	7%	36%	12%	32%	44%
	10E	21%	8%	51%	42%	37%	43%
	11E	21%	8%	48%	37%	34%	44%
ROE	07	15%	12%	4%	-4%	-6%	33%
	08	10%	-47%	-64%	-23%	-69%	21%
	09	15%	-3%	-6%	-33%	2%	27%
	10E	20%	11%	41%	29%	26%	25%
	11E	18%	21%	26%	16%	8%	25%

Source: Citi Investment Research and Analysis estimates  
Note: Closing price as of Nov 25

Figure 64. Global Memory — Demand/Supply Forecast (Units in Millions, US Dollars in Billions)

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
<b>Memory Sales (US\$ mn)</b>																	
<b>Total</b>	<b>5,958</b>	<b>7,909</b>	<b>10,384</b>	<b>13,008</b>	<b>13,684</b>	<b>15,369</b>	<b>15,816</b>	<b>13,585</b>	<b>12,081</b>	<b>13,557</b>	<b>16,175</b>	<b>19,239</b>	<b>44,408</b>	<b>36,303</b>	<b>37,258</b>	<b>58,453</b>	<b>61,052</b>
DRAM Sales	3,401	4,509	6,021	8,490	9,315	10,593	10,709	7,877	7,068	8,189	9,844	11,043	29,925	24,021	22,420	38,494	36,145
NAND Sales	2,556	3,400	4,364	4,518	4,368	4,776	5,107	5,708	5,013	5,368	6,331	8,196	14,483	12,282	14,838	19,959	24,907
<b>Memory Capacity ('000)</b>																	
DRAM Capacity	2,376	2,425	2,709	2,901	2,950	3,006	3,126	3,110	2,955	3,041	3,119	3,112	11,916	13,367	10,411	12,193	12,226
NAND Capacity	1,331	1,476	1,611	1,649	1,649	1,694	1,811	1,970	2,027	2,210	2,463	2,620	5,474	7,091	6,066	7,123	9,320
<b>Memory Shipment (512Mb Equiv)</b>																	
<b>DRAM+NAND Shipment</b>	<b>25,007</b>	<b>28,861</b>	<b>34,278</b>	<b>38,970</b>	<b>41,705</b>	<b>48,189</b>	<b>53,371</b>	<b>62,745</b>	<b>71,831</b>	<b>85,044</b>	<b>102,565</b>	<b>121,350</b>	<b>41,607</b>	<b>91,245</b>	<b>127,116</b>	<b>206,011</b>	<b>380,791</b>
DRAM Shipment	4,029	4,673	5,350	6,250	6,548	6,998	7,852	8,761	9,244	10,326	11,667	13,381	10,810	17,270	20,302	30,159	44,618
NAND Shipment	20,978	24,188	28,928	32,720	35,157	41,191	45,518	53,985	62,587	74,719	90,898	107,969	30,796	73,975	106,814	175,851	336,173
<b>Memory ASP (512Mb Equiv)</b>																	
<b>Avg of DRAM+NAND</b>	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>1.1</b>	<b>0.4</b>	<b>0.3</b>	<b>0.3</b>	<b>0.2</b>
DRAM	0.8	0.9	1.1	1.4	1.4	1.5	1.4	0.9	0.8	0.8	0.8	0.8	2.8	1.4	1.1	1.3	0.8
NAND flash	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.1	0.1	0.1
Price Parity (NAND/DRAM)	15.1%	15.2%	13.5%	10.2%	8.8%	7.7%	8.0%	10.4%	10.6%	9.5%	8.8%	8.4%	17.0%	11.9%	12.6%	8.9%	9.1%
<b>Memory Sales % Chg</b>																	
<b>Total</b>	<b>-10%</b>	<b>33%</b>	<b>31%</b>	<b>25%</b>	<b>5%</b>	<b>12%</b>	<b>3%</b>	<b>-14%</b>	<b>-11%</b>	<b>12%</b>	<b>19%</b>	<b>19%</b>	<b>-1%</b>	<b>-18%</b>	<b>3%</b>	<b>57%</b>	<b>4%</b>
DRAM Sales	-19%	33%	34%	41%	10%	14%	1%	-26%	-10%	16%	20%	12%	-11%	-20%	-7%	72%	-6%
NAND Sales	5%	33%	28%	4%	-3%	9%	7%	12%	-12%	7%	18%	29%	31%	-15%	21%	35%	25%
<b>Bit Shipment % Chg</b>																	
<b>DRAM+NAND Shipment</b>	<b>-11%</b>	<b>15%</b>	<b>19%</b>	<b>14%</b>	<b>7%</b>	<b>16%</b>	<b>11%</b>	<b>18%</b>	<b>14%</b>	<b>18%</b>	<b>21%</b>	<b>18%</b>	<b>142%</b>	<b>119%</b>	<b>39%</b>	<b>62%</b>	<b>85%</b>
DRAM Shipment	-13%	16%	14%	17%	5%	7%	12%	12%	6%	12%	13%	15%	94%	60%	18%	49%	48%
NAND Shipment	-10%	15%	20%	13%	7%	17%	11%	19%	16%	19%	22%	19%	173%	140%	44%	65%	91%
<b>Wafer Capacity % Chg</b>																	
<b>DRAM+NAND</b>	<b>-22%</b>	<b>5%</b>	<b>11%</b>	<b>5%</b>	<b>1%</b>	<b>2%</b>	<b>5%</b>	<b>3%</b>	<b>-2%</b>	<b>5%</b>	<b>6%</b>	<b>3%</b>	<b>46%</b>	<b>18%</b>	<b>-19%</b>	<b>17%</b>	<b>12%</b>
DRAM Capacity	-24%	2%	12%	7%	2%	2%	4%	-1%	-5%	3%	3%	0%	47%	12%	-22%	17%	0%
NAND Capacity	-16%	11%	9%	2%	0%	3%	7%	9%	3%	9%	11%	6%	42%	30%	-14%	17%	31%
<b>Memory ASP % Chg</b>																	
<b>Memory ASP</b>	<b>0.6%</b>	<b>15.0%</b>	<b>10.6%</b>	<b>10.2%</b>	<b>-1.7%</b>	<b>-2.8%</b>	<b>-7.1%</b>	<b>-26.9%</b>	<b>-22.3%</b>	<b>-5.2%</b>	<b>-1.1%</b>	<b>0.5%</b>	<b>-59%</b>	<b>-63%</b>	<b>-26%</b>	<b>-3%</b>	<b>-43%</b>
DRAM ASP	-13.0%	14.7%	21.1%	20.9%	3.6%	7.6%	-9.5%	-32.0%	-15.0%	0.0%	3.0%	0.0%	-50%	-50%	-28%	20%	-36%
NAND ASP	17.6%	15.3%	7.3%	-8.5%	-10.4%	-6.8%	-5.3%	-12.0%	-13.0%	-10.0%	-5.0%	-5.0%	-51%	-65%	-16%	-18%	-35%
<b>Memory Capacity Allocation</b>																	
DRAM	64.1%	62.2%	62.7%	63.8%	64.2%	64.0%	63.3%	61.2%	59.3%	57.9%	55.9%	54.3%	68.5%	65.3%	63.2%	63.1%	56.7%
NAND	35.9%	37.8%	37.3%	36.2%	35.8%	36.0%	36.7%	38.8%	40.7%	42.1%	44.1%	45.7%	31.5%	34.7%	36.8%	36.9%	43.3%
<b>Supply-to-Demand Ratio (%)</b>																	
DRAM	97.1%	98.4%	91.9%	91.1%	93.9%	92.3%	99.8%	103.1%	103.0%	99.3%	96.2%	98.3%	104.3%	103.9%	94.1%	97.5%	98.9%
NAND	108.2%	103.1%	98.5%	85.7%	99.5%	99.4%	97.2%	90.8%	104.3%	104.6%	102.5%	89.4%	105.1%	116.2%	96.8%	96.1%	98.6%

Source: WSTS, Company data, Citi Investment Research and Analysis estimates

Figure 65. Global DRAM — Demand/Supply Forecast, (Units in Millions, US Dollars in Billions)

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
Supply-to-demand Ratio (%)	97.1%	98.4%	91.9%	91.1%	93.9%	92.3%	99.8%	103.1%	103.0%	99.3%	96.2%	98.3%	104.3%	103.9%	94.1%	97.5%	98.9%
Over/ (Under) Supply Ratio (%)	-2.9%	-1.6%	-8.1%	-8.9%	-6.1%	-7.7%	-0.2%	3.1%	3.0%	-0.7%	-3.8%	-1.7%	4.3%	3.9%	-5.9%	-2.5%	-1.1%
Supply (256Mb)	8,058	9,347	10,700	12,500	13,096	13,997	15,705	17,521	18,488	20,652	23,335	26,762	21,620	34,540	40,605	60,319	89,237
Demand (256Mb)	8,301	9,501	11,643	13,722	13,947	15,157	15,739	17,001	17,946	20,793	24,268	27,224	20,735	33,236	43,167	61,843	90,232
% Chg																	
Supply (256Mb)	-13.1%	16.0%	14.5%	16.8%	4.8%	6.9%	12.2%	11.6%	5.5%	11.7%	13.0%	14.7%	90.0%	59.8%	17.6%	48.6%	47.9%
Demand (256Mb)	-8.7%	14.5%	22.5%	17.9%	1.6%	8.7%	3.8%	8.0%	5.6%	15.9%	16.7%	12.2%	76.1%	60.3%	29.9%	43.3%	45.9%
Wafer Capacity (8-inch wpm)	2,376	2,425	2,709	2,901	2,950	3,006	3,126	3,110	2,955	3,041	3,119	3,112	2,979	3,342	3,115	2,853	2,662
% Chg	-24.2%	2.0%	11.7%	7.1%	1.7%	1.9%	4.0%	-0.5%	-5.0%	2.9%	2.6%	-0.2%	38.9%	12.2%	-6.8%	-8.4%	-6.7%
DRAM Revenue (US\$ mn)	3,401	4,509	6,021	8,490	9,315	10,593	10,709	7,877	7,068	8,189	9,844	11,043	29,925	24,021	22,420	38,494	36,145
% Chg of Sales	-19.3%	32.6%	33.5%	41.0%	9.7%	13.7%	1.1%	-26.4%	-10.3%	15.9%	20.2%	12.2%	-11.1%	-19.7%	-6.7%	71.7%	-6.1%
ASP (US\$)	0.4	0.5	0.6	0.7	0.7	0.8	0.7	0.5	0.4	0.4	0.4	0.4	1.4	0.7	0.5	0.6	0.4
ASP % chg	-13%	15%	21%	21%	4%	8%	-10%	-32%	-15%	0%	3%	0%	-50%	-50%	-28%	20%	-36%
<b>DRAM Demand</b>																	
PC	4,550	5,043	6,256	7,292	7,515	7,834	7,809	8,167	8,828	10,117	11,494	12,288	10,651	17,897	23,141	31,324	42,727
Server + Workstation	412	458	573	756	828	999	1,264	1,530	1,652	2,082	2,519	2,909	1,310	1,937	2,199	4,621	9,161
Other computer + memory module	1,486	1,650	2,047	2,386	2,459	2,571	2,562	2,687	2,927	3,384	3,877	4,164	3,766	5,969	7,569	10,279	14,352
Mobile Phone	608	732	905	1,148	1,220	1,514	1,744	2,107	2,270	2,756	3,450	4,383	2,484	2,670	3,394	6,585	12,859
Others	1,245	1,618	1,861	2,140	1,926	2,215	2,325	2,442	2,198	2,307	2,654	3,052	3,710	5,456	6,863	8,908	10,210
<b>Device Shipment</b>																	
PC (mn units)	66	68	81	90	83	83	89	93	87	87	94	97	262	287	305	347	365
Desktop PC	32	32	35	37	35	36	37	38	36	37	38	38	154	145	136	146	149
Laptop PC	34	36	46	53	48	46	52	54	51	50	56	59	108	142	169	201	217
Server+Workstation (mn units)	1.4	1.4	1.6	1.9	1.8	1.9	2.2	2.4	2.1	2.2	2.5	2.6	7.5	7.9	6.4	8.2	9.4
Handsets (mn units)	275	287	309	341	315	326	341	374	351	355	370	409	1,153	1,222	1,211	1,356	1,485
<b>MB contents per Device</b>																	
PC (mn units)	2,206	2,360	2,478	2,602	2,888	3,032	2,820	2,820	3,243	3,730	3,916	4,034	1,303	1,993	2,429	2,887	3,743
Server+Workstation (mn units)	9,264	10,191	11,210	12,891	14,825	17,049	18,754	20,629	24,755	29,706	32,676	35,944	5,554	7,888	11,041	18,050	31,074
Handset	71	82	94	108	124	149	164	180	207	249	298	343	36	52	90	155	277
<b>PC ASP</b>	<b>759</b>	<b>729</b>	<b>714</b>	<b>705</b>	<b>698</b>	<b>691</b>	<b>684</b>	<b>677</b>	<b>664</b>	<b>650</b>	<b>637</b>	<b>625</b>	<b>921</b>	<b>890</b>	<b>891</b>	<b>891</b>	<b>891</b>
Memory cost as % of PC Cost	2.4%	3.6%	5.1%	7.9%	9.7%	9.9%	7.2%	4.7%	4.4%	5.2%	5.7%	6.0%	5.9%	4.2%	4.7%	7.9%	5.3%
DRAM Revenue % Chg	-19.3%	32.6%	33.5%	41.0%	9.7%	13.7%	1.1%	-26.4%	-10.3%	15.9%	20.2%	12.2%	-11.1%	-19.7%	-6.7%	71.7%	-6.1%
PC Unit Growth % Chg	-11.2%	3.6%	18.2%	11.0%	-7.2%	-0.7%	7.2%	4.6%	-6.0%	-0.4%	8.2%	3.8%	18.0%	9.8%	6.1%	13.9%	5.2%
PC's DRAM MB per device growth	4.0%	7.0%	5.0%	5.0%	11.0%	5.0%	-7.0%	0.0%	15.0%	15.0%	5.0%	3.0%	58.4%	53.0%	21.9%	18.9%	29.6%

Source: WSTS, Company data, Citi Investment Research and Analysis estimates

Figure 66. Global DRAM Sector — DRAM Players: Wafer and Shipment Forecast (WPM in Thousands, Bits in Millions)

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
<b>8" Equiv. Capacity ('000)</b>																	
Samsung	830	827	840	860	860	934	1,058	1,015	950	919	898	878	2,675	3,414	3,357	3,866	3,644
Hynix (excluding Promos)	540	585	635	675	675	675	675	675	675	675	684	698	2,408	2,748	2,435	2,700	2,732
Micron	250	228	200	200	200	200	200	200	200	200	200	200	1,018	1,045	878	800	800
Qimonda (excl'd-Inotera and SMIC)	37	-	-	-	-	-	-	-	-	-	-	-	881	761	37	-	-
Elpida (excl'd Rexchip, SMIC, PWC)	245	263	284	286	286	286	286	259	248	286	286	286	876	987	1,078	1,116	1,105
Winbond	45	45	45	68	68	68	68	68	68	68	68	68	338	302	203	270	270
Nan Ya (ex-Inotera)	33	34	50	55	55	73	95	118	118	129	140	140	295	328	171	340	526
Powerchip	84	98	197	254	270	270	270	225	180	225	270	270	1,216	1,173	634	1,035	945
ProMOS (including OEM wafer)	34	23	56	90	113	113	113	90	56	79	113	113	894	833	203	428	360
Inotera (to Nanya, Qimonda, Micron)	122	153	234	234	234	198	172	270	270	270	270	270	923	1,071	743	874	1,080
Others	158	169	169	180	191	191	191	191	191	191	191	191	395	707	675	765	765
<b>Total</b>	<b>2,376</b>	<b>2,425</b>	<b>2,709</b>	<b>2,901</b>	<b>2,950</b>	<b>3,006</b>	<b>3,126</b>	<b>3,110</b>	<b>2,955</b>	<b>3,041</b>	<b>3,119</b>	<b>3,112</b>	<b>11,916</b>	<b>13,367</b>	<b>10,411</b>	<b>12,193</b>	<b>12,226</b>
Sequential % Growth	-24.2%	2.0%	11.7%	7.1%	1.7%	1.9%	4.0%	-0.5%	-5.0%	2.9%	2.6%	-0.2%	38.9%	12.2%	-22.1%	17.1%	0.3%
<b>Bit Shipment (256Mb Equivt)</b>																	
Samsung	2,624	3,186	3,471	3,805	4,338	4,963	6,238	6,886	7,218	7,819	9,013	10,398	5,243	9,244	13,087	22,425	34,447
Hynix	2,014	2,206	2,462	2,750	2,915	3,119	3,185	3,885	4,157	4,448	5,138	6,026	4,950	7,353	9,432	13,104	19,770
Micron	983	934	887	949	987	1,027	1,078	1,132	1,188	1,248	1,435	1,650	1,894	2,990	3,753	4,223	5,521
Qimonda	66	66	-	-	-	-	-	-	-	-	-	-	1,537	1,896	132	-	-
Elpida	919	1,038	1,173	1,584	1,457	1,486	1,561	1,483	1,483	1,779	2,046	2,353	2,078	3,315	4,714	5,987	7,661
Winbond													306	-	-	-	-
Nan Ya	79	83	121	124	99	115	151	187	206	226	248	273	516	669	406	552	952
Powerchip	315	370	759	980	1,041	1,072	1,179	1,041	885	1,195	1,553	1,709	1,989	3,521	2,424	4,333	5,342
Inotera	372	525	672	746	723	622	628	1,094	1,368	1,505	1,731	1,990	1,868	2,758	2,315	3,068	6,594
ProMos	71	71	184	299	374	385	416	354	232	331	490	514	1,389	1,691	625	1,529	1,567
Rexchip (to Elipda)	615	868	972	1,263	1,162	1,209	1,269	1,459	1,751	2,101	1,681	1,849	156	1,102	3,717	5,099	7,383
<b>Total</b>	<b>8,058</b>	<b>9,347</b>	<b>10,700</b>	<b>12,500</b>	<b>13,096</b>	<b>13,997</b>	<b>15,705</b>	<b>17,521</b>	<b>18,488</b>	<b>20,652</b>	<b>23,335</b>	<b>26,762</b>	<b>21,620</b>	<b>34,540</b>	<b>40,605</b>	<b>60,319</b>	<b>89,237</b>
<b>Sequential Growth (%)</b>																	
Samsung	3%	21%	9%	10%	14%	14%	26%	10%	5%	8%	15%	15%	85%	76%	42%	71%	54%
Hynix	-2%	10%	12%	12%	6%	7%	2%	22%	7%	7%	16%	17%	152%	49%	28%	39%	51%
Micron	0%	-5%	-5%	7%	4%	4%	5%	5%	5%	5%	15%	15%	60%	58%	26%	13%	31%
Qimonda	-85%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	45%	23%	-93%	-100%	
Elpida	1%	13%	13%	35%	-8%	2%	5%	-5%	0%	20%	15%	15%	63%	59%	42%	27%	28%
Winbond													36%				
Nan Ya	-50%	5%	46%	2%	-20%	16%	32%	24%	10%	10%	10%	10%	19%	30%	-39%	36%	73%
Powerchip	-65%	18%	105%	29%	6%	3%	10%	-12%	-15%	35%	30%	10%	96%	77%	-31%	79%	23%
Inotera	-49%	41%	28%	11%	-3%	-14%	1%	74%	25%	10%	15%	15%	109%	48%	-16%	33%	115%
ProMos	-68%	0%	158%	63%	25%	3%	8%	-15%	-35%	43%	48%	5%	92%	22%	-63%	144%	2%
Rexchip (to Elipda)	80%	41%	12%	30%	-8%	4%	5%	15%	20%	20%	-20%	10%		605%	237%	37%	45%
<b>Total</b>	<b>-13.1%</b>	<b>16.0%</b>	<b>14.5%</b>	<b>16.8%</b>	<b>4.8%</b>	<b>6.9%</b>	<b>12.2%</b>	<b>11.6%</b>	<b>5.5%</b>	<b>11.7%</b>	<b>13.0%</b>	<b>14.7%</b>	<b>90.0%</b>	<b>59.8%</b>	<b>17.6%</b>	<b>48.6%</b>	<b>47.9%</b>

Source: Citi Investment Research and Analysis estimates



Figure 67. Global NAND — Demand/Supply Forecast

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
<b>Total NAND Demand</b>	<b>9,690</b>	<b>11,732</b>	<b>14,679</b>	<b>19,085</b>	<b>17,659</b>	<b>20,726</b>	<b>23,411</b>	<b>29,733</b>	<b>30,016</b>	<b>35,712</b>	<b>44,336</b>	<b>60,416</b>	<b>14,645</b>	<b>31,841</b>	<b>55,186</b>	<b>91,529</b>	<b>170,480</b>
<b>Total NAND Supply</b>	<b>10,489</b>	<b>12,094</b>	<b>14,464</b>	<b>16,360</b>	<b>17,579</b>	<b>20,596</b>	<b>22,759</b>	<b>26,992</b>	<b>31,294</b>	<b>37,359</b>	<b>45,449</b>	<b>53,985</b>	<b>15,398</b>	<b>36,988</b>	<b>53,407</b>	<b>87,926</b>	<b>168,086</b>
<b>Supply-to-Demand Ratio (%)</b>	<b>108%</b>	<b>103%</b>	<b>99%</b>	<b>86%</b>	<b>100%</b>	<b>99%</b>	<b>97%</b>	<b>91%</b>	<b>104%</b>	<b>105%</b>	<b>103%</b>	<b>89%</b>	<b>105%</b>	<b>116%</b>	<b>97%</b>	<b>96%</b>	<b>99%</b>
<b>NAND Flash Sales (US\$mn)</b>	<b>2,556</b>	<b>3,400</b>	<b>4,364</b>	<b>4,518</b>	<b>4,368</b>	<b>4,776</b>	<b>5,107</b>	<b>5,708</b>	<b>5,013</b>	<b>5,368</b>	<b>6,331</b>	<b>8,196</b>	<b>14,483</b>	<b>12,282</b>	<b>14,838</b>	<b>19,959</b>	<b>24,907</b>
% Chg	5%	33%	28%	4%	-3%	9%	7%	12%	-12%	7%	18%	29%	30.7%	-15.2%	21%	35%	25%
NAND Flash ASP (US\$, 1Gb equiv)	0.24	0.28	0.30	0.28	0.25	0.23	0.22	0.19	0.17	0.15	0.14	0.14	0.94	0.33	0.28	0.23	0.15
QoQ ASP Change %	18%	15%	7%	-8%	-10%	-7%	-5%	-12%	-13%	-10%	-5%	-5%	-51.3%	-64.7%	-16%	-18%	-35%
<b>Demand Breakdown (1Gb equiv. Mn)</b>																	
<b>Total</b>	<b>9,690</b>	<b>11,732</b>	<b>14,679</b>	<b>19,085</b>	<b>17,659</b>	<b>20,726</b>	<b>23,411</b>	<b>29,733</b>	<b>30,016</b>	<b>35,712</b>	<b>44,336</b>	<b>60,416</b>	<b>14,645</b>	<b>31,841</b>	<b>55,186</b>	<b>91,529</b>	<b>170,480</b>
Digital Camera - Cards	1,614	1,848	2,102	2,547	2,099	2,248	2,248	2,596	2,285	2,639	3,048	3,680	3,206	6,369	8,112	9,191	11,652
MP3 Player+PMPs	1,231	1,253	1,382	1,669	1,375	1,444	1,372	1,512	1,331	1,464	1,691	2,041	3,284	5,000	5,535	5,703	6,527
Mobile Phone	3,418	4,646	6,498	8,959	8,688	9,978	11,494	14,515	14,958	17,406	20,877	30,271	3,321	9,244	23,521	44,675	83,513
USB Flash Drive	939	1,015	1,184	1,402	1,155	1,213	1,250	1,378	1,288	1,445	1,749	2,020	2,231	3,676	4,540	4,996	6,502
PNDs	899	991	1,167	1,373	1,298	1,403	1,432	1,606	1,590	1,837	2,121	2,450	1,033	3,093	4,430	5,739	7,998
Game Consoles	143	210	288	484	143	210	288	484	143	210	288	484	458	854	1,125	1,125	1,125
Robson Tech	14	13	16	18	14	13	16	18	14	13	16	18	8	42	61	61	61
Hybrid Drives	7	7	8	9	7	7	8	9	7	7	8	9	5	21	30	30	30
Ultra Portables (OLPC)	1	1	2	2	1	4	2	2	1	4	2	2	4	6	6	9	9
SSD(Solid State Drives)\Tablet	312	359	237	287	248	1,067	1,605	3,332	3,450	4,743	7,364	11,101	34	819	1,195	6,252	26,658
<b>Demand Mix (%)</b>																	
Digital Camera - Cards	17%	16%	14%	13%	12%	11%	10%	9%	8%	7%	7%	6%	22%	20%	15%	10%	7%
MP3 Player+PMPs	13%	11%	9%	9%	8%	7%	6%	5%	4%	4%	4%	3%	22%	16%	10%	6%	4%
Mobile Phone	35%	40%	44%	47%	49%	48%	49%	49%	50%	49%	47%	50%	23%	29%	43%	49%	49%
USB Flash Drive	10%	9%	8%	7%	7%	6%	5%	5%	4%	4%	4%	3%	15%	12%	8%	5%	4%
PNDs	9%	8%	8%	7%	7%	7%	6%	5%	5%	5%	5%	4%	7%	10%	8%	6%	5%
Game Consoles	1%	2%	2%	3%	1%	1%	1%	2%	0%	1%	1%	1%	3%	3%	2%	1%	1%
All New PC Applications	3%	3%	2%	2%	2%	5%	7%	11%	12%	13%	17%	18%	0%	3%	2%	7%	16%

Source: WSTS, Company data, Citi Investment Research and Analysis estimates

Figure 68. Global NAND — Demand/Supply Forecast (continued)

	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
<b>Device Shipment (mn units)</b>																	
Digital Camera - Cards	55.0	60.0	65.0	75.0	60.0	61.2	61.2	67.3	53.9	56.5	59.4	68.3	262	274	255	260	261
MP3 Player+PMPs	40.8	39.6	41.6	47.8	38.2	38.2	36.3	38.1	30.5	30.5	32.0	36.8	201	200	170	167	166
Mobile Phone	274.6	287.1	308.9	340.7	314.7	325.6	340.9	374.4	350.7	354.9	370.2	408.9	1,114	1,223	1,211	1,251	1,290
USB Flash Drive	35.0	36.0	40.0	46.0	36.8	36.8	37.9	39.8	33.8	34.5	38.0	39.9	151	164	157	159	160
Game Consoles	10.3	13.8	17.2	27.6	10.3	13.8	17.2	27.6	10.3	13.8	17.2	27.6	71	78	69	69	69
Robson Tech	1.7	1.6	1.9	2.2	1.7	1.6	1.9	2.2	1.7	1.6	1.9	2.2	2	5	7	7	7
Hybrid Drives	1.7	1.6	1.9	2.2	1.7	1.6	1.9	2.2	1.7	1.6	1.9	2.2	2	5	7	7	7
Ultra Portables (OLPC)	0.3	0.3	0.4	0.5	0.3	1.0	0.4	0.5	0.3	1.0	0.4	0.5	1	1	2	2	2
SSD(Solid State Drives)\Tablet	1.5	1.5	0.8	0.9	0.8	3.0	4.3	8.5	8.0	10.0	13.5	18.5	1	7	5	17	50
<b>NAND Demand per device (MB)</b>																	
Digital Camera - Cards	3,667	3,851	4,043	4,245	4,373	4,591	4,591	4,821	5,303	5,833	6,417	6,737	1,530	2,904	3,976	4,419	5,576
MP3 Player+PMPs	3,771	3,959	4,157	4,365	4,496	4,721	4,721	4,957	5,452	5,998	6,597	6,927	2,046	3,125	4,077	4,265	4,921
Mobile Phone	1,556	2,023	2,630	3,287	3,451	3,831	4,214	4,846	5,331	6,131	7,050	7,403	373	945	2,427	4,463	8,094
USB Flash Drive	3,355	3,523	3,699	3,810	3,925	4,121	4,121	4,327	4,759	5,235	5,759	6,335	1,844	2,802	3,615	3,932	5,092
Game Consoles	1,727	1,899	2,089	2,194	1,727	1,899	2,089	2,194	1,727	1,899	2,089	2,194	811	1,363	2,039	2,039	2,039
Robson Tech	1,024	1,024	1,024	1,024	1,024	1,024	1,024	1,024	1,024	1,024	1,024	1,024	512	1,024	1,024	1,024	1,024
Hybrid Drives	512	512	512	512	512	512	512	512	512	512	512	512	256	512	512	512	512
Ultra Portables (OLPC)	512	512	512	512	512	512	512	512	512	512	512	512	512	512	512	729	512
SSD(Solid State Drives)\Tablet	25,350	30,420	34,983	38,481	40,405	44,446	46,668	49,002	53,902	59,292	68,186	75,004	4,000	15,643	31,170	47,173	66,644
<b>NAND Demand Growth (%)</b>																	
Total	-8%	21%	25%	30%	-7%	17%	13%	27%	1%	19%	24%	36%	163%	117%	73%	66%	86%
Digital Camera - Cards	-19%	15%	14%	21%	-18%	7%	0%	16%	-12%	16%	16%	21%	121%	99%	27%	13%	27%
MP3 Player+PMPs	-16%	2%	10%	21%	-18%	5%	-5%	10%	-12%	10%	16%	21%	106%	52%	11%	3%	14%
Mobile Phone	5%	36%	40%	38%	-3%	15%	15%	26%	3%	16%	20%	45%	208%	178%	154%	90%	87%
USB Flash Drive	-16%	8%	17%	18%	-18%	5%	3%	10%	-7%	12%	21%	16%	160%	65%	24%	10%	30%
Game Consoles	-62%	47%	38%	68%	-70%	47%	38%	68%	-70%	47%	38%	68%	143%	87%	32%	0%	0%
All New PC Applications	-23%	14%	-31%	20%	-15%	304%	49%	106%	3%	37%	55%	51%		1615%	45%	392%	321%

Source: Company data, Citi Investment Research and Analysis estimates

Figure 69. Global NAND — Bit Supply Forecast (units in mn)

NAND Shipments Model (1Gb Equiv)	1Q09	2Q09	3Q09	4Q09	1Q10	2Q10	3Q10	4Q10E	1Q11E	2Q11E	3Q11E	4Q11E	2007	2008	2009	2010E	2011E
Samsung	3,863	4,199	4,696	4,936	5,677	7,034	7,736	9,228	10,162	12,072	14,900	17,835	5,923	13,831	17,693	29,675	54,969
Hynix (inc. ST Micro)	575	807	845	1,127	1,127	1,377	1,952	2,281	2,760	3,287	4,470	5,973	2,859	3,951	3,354	6,738	16,490
Toshiba (incl. 50% of Flash Vision)	2,503	2,958	3,818	4,399	4,501	5,158	5,866	6,922	8,445	9,458	10,877	12,508	3,004	8,091	13,679	22,446	41,287
SanDisk (50% of JV Flash Vision)	1,642	1,889	2,361	2,720	2,783	3,189	3,627	4,280	5,222	5,848	6,726	7,734	2,135	5,405	8,612	13,880	25,530
Renesas (ex-Powerchip)	-	-	-	-	-	-	-	-	-	-	-	-	96	-	-	-	-
Powerchip (Foundry)	-	-	-	-	-	-	-	-	-	-	-	-	50	-	-	-	-
Micron (Inc IM Technology)	1,846	2,178	2,679	3,108	3,419	3,761	3,498	4,197	4,617	6,602	8,380	9,832	1,267	5,487	9,812	14,875	29,431
Spansion (AMD/Fujitsu)	59	62	66	69	72	76	80	84	88	92	97	102	65	222	256	312	379
ST Micro (33% of JV)	72	76	80	84	88	92	97	102	107	112	118	123	264	213	311	378	460
Others	12	13	14	14	12	13	14	14	12	13	14	14	2	35	53	53	53
<b>Global Total</b>	<b>10,489</b>	<b>12,094</b>	<b>14,464</b>	<b>16,360</b>	<b>17,579</b>	<b>20,596</b>	<b>22,759</b>	<b>26,992</b>	<b>31,294</b>	<b>37,359</b>	<b>45,449</b>	<b>53,985</b>	<b>15,398</b>	<b>36,988</b>	<b>53,407</b>	<b>87,926</b>	<b>168,086</b>
% Market Share																	
Samsung	37%	35%	32%	30%	32%	34%	34%	34%	32%	32%	33%	33%	38%	37%	33%	34%	33%
Hynix (inc. ST Micro)	5%	7%	6%	7%	6%	7%	9%	8%	9%	9%	10%	11%	19%	11%	6%	8%	10%
Toshiba (incl. 50% of JV FlashVision)	24%	24%	26%	27%	26%	25%	26%	26%	27%	25%	24%	23%	20%	22%	26%	26%	25%
SanDisk (50% of JV Flash Vision)	16%	16%	16%	17%	16%	15%	16%	16%	17%	16%	15%	14%	14%	15%	16%	16%	15%
Renesas (ex-Powerchip)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Powerchip (Foundry)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Micron (Inc IM Technology)	18%	18%	19%	19%	19%	18%	15%	16%	15%	18%	18%	18%	8%	15%	18%	17%	18%
Spansion (AMD/Fujitsu)	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
ST Micro (33% of JV)	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	2%	1%	1%	0%	0%
Sequential % Chg																	
Samsung	-9%	9%	12%	5%	15%	24%	10%	19%	10%	19%	23%	20%	141%	134%	28%	68%	85%
Hynix (inc. ST Micro)	-4%	40%	5%	33%	0%	22%	42%	17%	21%	19%	36%	34%	164%	38%	-15%	101%	145%
Toshiba (incl. 50% of JV FlashVision)	-12%	18%	29%	15%	2%	15%	14%	18%	22%	12%	15%	15%	177%	169%	69%	64%	84%
SanDisk (50% of JV Flash Vision)	-15%	15%	25%	15%	2%	15%	14%	18%	22%	12%	15%	15%	211%	153%	59%	61%	84%
Renesas (ex-Powerchip)													-4%	-100%			
Powerchip (Foundry)													108%	-100%			
Micron (Inc IM Technology)	-8%	18%	23%	16%	10%	10%	-7%	20%	10%	43%	27%	17%	563%	333%	79%	52%	98%
Spansion (AMD/Fujitsu)	-15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	553%	242%	15%	22%	22%
ST Micro (33% of JV)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	118%	-19%	46%	22%	22%
<b>Global Total</b>	<b>-10%</b>	<b>15%</b>	<b>20%</b>	<b>13%</b>	<b>7%</b>	<b>17%</b>	<b>11%</b>	<b>19%</b>	<b>16%</b>	<b>19%</b>	<b>22%</b>	<b>19%</b>	<b>173%</b>	<b>140%</b>	<b>44%</b>	<b>65%</b>	<b>91%</b>

Source: Company data, Citi Investment Research and Analysis estimates

## Samsung Electronics

### Valuation

Our 12-month target price of W1,160,000 is derived using a sum-of-the-parts methodology, based on 2011E EBITDA. In calculating total operating value, we reference global peers in assigning fair-value EV/EBITDA multiples for the four main divisions (5.1x for Semiconductor, 3.5x for TFT-LCD, 5.6x for Handset, and 4.7x for Media & Appliance). On the non-operating side, we employ 2Q10 book value to value treasury shares and our 2011E estimate for equity-method investment assets. The 5.1x target multiple for Semiconductors represents a 30% premium to Hynix's target price implied multiple, justified given SEC's superior market position on: 1) rising market share; 2) outstanding profitability; and 3) healthier-than-peers' financial status. As for other divisions, we apply the implied target price multiples of: a) Nokia with a 10% discount to the Handset division, given the smaller scale, b) LG Display without premium or discount to the TFT-LCD division, c) The global peer average to the Digital Media division.

### Risks

We rate SEC shares Low Risk, in line with the risk rating flagged by our quantitative risk-rating system, which tracks 260-day historical share-price volatility. Downside risks that could prevent the shares from reaching our target price include: 1) PC sales weaken more than our forecast and NAND oversupply proves worse than our forecast; 2) Aggressive investment by competitors in the highly cyclical memory semiconductor/TFT-LCD industries could have a negative impact on prices; 3) Competition in the handset market intensifies, reducing SEC's handset margin; 4) Any major appreciation of the won would hit SEC's earnings.

## Hynix

### Valuation

Our W40,000 target price for Hynix is derived by applying a P/B of 2.0x, the up-cycle multiple for Hynix, to our 2011E BVPS. We use an up-cycle multiple based on our positive stance on the improved competitiveness with sustainable ROE of above 20%.

### Risks

We rate Hynix shares Medium Risk based on our view of sustainable profitability. The following downside risks could prevent the shares from reaching our target price: 1) A more prolonged DRAM downturn than our forecast; 2) Weaker NAND demand than our forecast; and 3) A collapse in global consumption.

# Appendix A-1

## Analyst Certification

The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and that no part of their compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

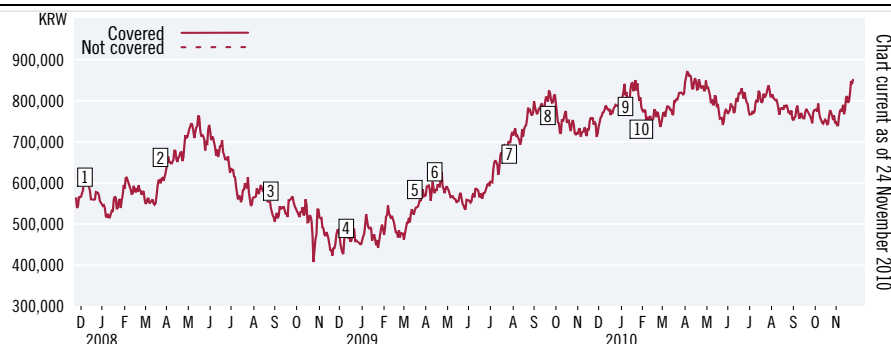
## IMPORTANT DISCLOSURES

### Samsung Electronics (005930.KS)

#### Ratings and Target Price History

##### Fundamental Research

Analyst: Henry H Kim, CFA  
Covered since August 11 2008



Date	Rating	Target Price	Closing Price
1 7-Dec-07	*1L	*790,000.00	608,000.00
2 24-Mar-08	1L	*820,000.00	599,000.00
3 26-Aug-08	1L	*700,000.00	540,000.00
4 10-Dec-08	1L	*664,000.00	481,000.00

Date	Rating	Target Price	Closing Price
5 17-Mar-09	1L	*690,000.00	534,000.00
6 14-Apr-09	1L	*810,000.00	575,000.00
7 28-Jul-09	1L	*900,000.00	700,000.00
8 21-Sep-09	1L	*1,030,000.00	798,000.00

Date	Rating	Target Price	Closing Price
9 7-Jan-10	1L	*1,100,000.00	813,000.00
10 29-Jan-10	1L	*1,160,000.00	784,000.00

\* Indicates change

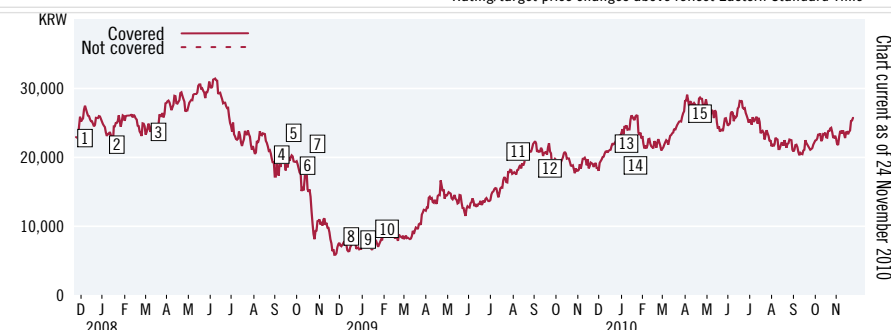
Rating/target price changes above reflect Eastern Standard Time

### Hynix (000660.KS)

#### Ratings and Target Price History

##### Fundamental Research

Analyst: Henry H Kim, CFA  
Covered since August 11 2008



Date	Rating	Target Price	Closing Price
1 7-Dec-07	*2M	*31,300.00	27,500.00
2 22-Jan-08	2M	*30,000.00	25,000.00
3 20-Mar-08	2M	*29,000.00	24,750.00
4 10-Sep-08	2M	*24,000.00	20,100.00
5 26-Sep-08	*1M	*30,000.00	19,400.00

Date	Rating	Target Price	Closing Price
6 16-Oct-08	1M	*28,000.00	15,350.00
7 30-Oct-08	1M	*25,500.00	10,750.00
8 17-Dec-08	1M	*22,500.00	7,230.00
9 9-Jan-09	1M	*21,400.00	7,340.00
10 5-Feb-09	1M	*24,000.00	9,350.00

Date	Rating	Target Price	Closing Price
11 10-Aug-09	1M	*26,000.00	18,200.00
12 23-Sep-09	1M	*31,000.00	20,850.00
13 8-Jan-10	1M	*33,000.00	24,650.00
14 21-Jan-10	1M	*35,000.00	25,950.00
15 22-Apr-10	1M	*40,000.00	28,700.00

\* Indicates change

Rating/target price changes above reflect Eastern Standard Time

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is Samsung Elec. As at 24 Nov 10, CGMK holds 3,299,990 Citi ELW 0745, 3,587,000 Citi ELW 0757, 3,246,310 Citi ELW 0758, 3,374,620 Citi ELW 0819, 3,386,000 Citi ELW 0851, 3,600,000 Citi ELW 0905, 3,396,950 Citi ELW 0906, 3,400,000 Citi ELW 0940, 1,190,190 Citi ELW 0590, 3,600,000 Citi ELW 0941, 3,400,000 Citi ELW 0A11, 3,400,000 Citi ELW 0A55, 3,400,000 Citi ELW 0A59 Call warrants & 10,795 shares of Samsung Elec.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is Hynix Semiconductor. As at 24 Nov 10 CGMK holds 3,372,630 Citi ELW 0339, 3,319,030 Citi ELW 0616, 3,536,790 Citi ELW 0655, 3,348,640 Citi ELW 0694, 3,120,370 Citi ELW 0696, 3,400,000 Citi ELW 0726, 2,994,210 Citi ELW 0738, 3,377,690 Citi ELW 0751, 3,599,810 Citi ELW 0810, 3,393,890 Citi ELW 0811, 3,360,060 Citi ELW 0848, 3,400,000 Citi ELW 0891, 3,593,000 Citi ELW 0892, 3,400,000 Citi ELW 0930, 3,589,000 Citi ELW 0931, 3,400,000 Citi ELW 0998, 3,400,000 Citi ELW 0A44 Call warrants & 36,500 shares of Hynix Semiconductor.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is Samsung SDI. As at 24 Nov 10, CGMK holds 3,084,030 Citi ELW 0385, 3,344,350 Citi ELW 0820, 3,233,490 Citi ELW 0852, 3,387,790 Citi ELW 0908, 3,400,000 Citi ELW 0942, 3,400,000 Citi ELW 0A12, 3,400,000 Citi ELW 0A57 Call warrants & 3,297 shares of Samsung SDI.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is Samsung ElecMechanics. As at 24 Nov 10, CGMK holds 3,142,560 Citi ELW 0365, 3,400,000 Citi ELW 0596, 3,399,000 Citi ELW 0636, 3,600,000 Citi ELW 0637, 3,063,700 Citi ELW 0709, 3,092,610

Citi ELW 0710, 1,729,580 Citi ELW 0746, 2,626,150 Citi ELW 0760, 3,355,000 Citi ELW 0822, 3,337,240 Citi ELW 0853, 3,390,380 Citi ELW 0910, 3,000,000 Citi ELW 0944, 3,600,000 Citi ELW 0945, 3,351,640 Citi ELW 0A13 Call warrants & 27,732 shares of Samsung ElecMechanics.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is Samsung Techwin. As at 24 Nov 10, CGMK holds 3,400,000 Citi ELW 0643, 3,399,990 Citi ELW 0829, 3,385,000 Citi ELW 0916, 3,400,000 Citi ELW 0A22 Call warrants & 441 shares of Samsung Techwin.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is LG Display. As at 24 Nov 10, CGMK holds 3,599,970 Citi ELW 0662, 3,400,000 Citi ELW 0718, 2,938,130 Citi ELW 0733, 3,000,000 Citi ELW 0748, 3,400,000 Citi ELW 0749, 3,393,270 Citi ELW 0770, 3,399,500 Citi ELW 0837, 3,400,000 Citi ELW 0858, 3,385,000 Citi ELW 0922, 3,400,000 Citi ELW 0958, 3,399,900 Citi ELW 0A31, 3,400,000 Citi ELW 0A73 Call warrants & 2,040 shares of LG Display.

Citigroup Global Markets Korea Securities Limited (CGMK) performs the role of liquidity provider on the warrants of which the underlying asset is LG Elec. As at 24 Nov 10, CGMK holds 2,772,740 Citi ELW 0651, 3,395,640 Citi ELW 0664, 3,398,410 Citi ELW 0736, 3,389,050 Citi ELW 0775, 3,335,730 Citi ELW 0926, 3,379,990 Citi ELW 0964, 3,454,800 Citi ELW 0965, 3,400,000 Citi ELW 0A41, 3,400,000 Citi ELW 0A78 Call warrants & 35,244 shares of LG Elec.

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**Data current as of 30 Sep 2010**

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