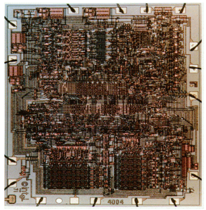
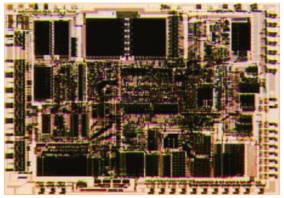
“Semiconductor Market: Changes For The Year Ahead”

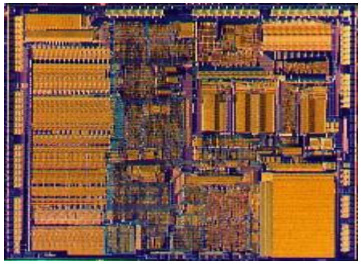
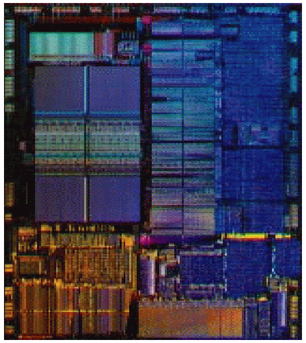
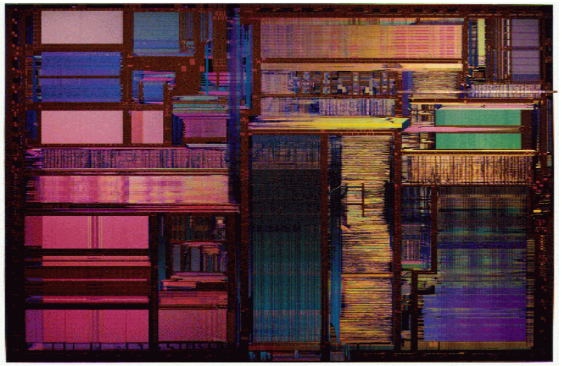
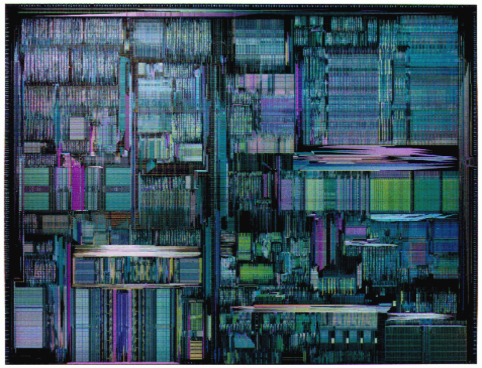
“Silicon*SouthWest*”

Malcolm Penn, Chairman & CEO, Future Horizons
Beachcroft LLP, Bristol, England – 25 Nov 2011

Chip Industry In Perspective

- **2012 Is The Transistor's 65th & The IC's 55th Birthday**
- **Together They Have Revolutionised The Way We Live Our Lives**
- **Tiny Piece Of Sand Comprising Millions Of Tiny Switches**

"SCs Are The Crude Oil Of The Electronics Industry" – J Sanders III
(Also …"Real Men Have Fabs" / "Niches Are For Roaches" / ...)

Industry Fundamentals

The Chip Industry Is Driven By:

- ❑ The Economy
- ❑ Fab Capacity
- ❑ Unit Demand
- ❑ ASPs

All Inter-Dependent But Mathematically Disconnected,
Overlaid By Industry Emotion, Fashion & Sentiment

Impossible To Model (Equation Or Algorithm)
… It Needs Understanding & Experience

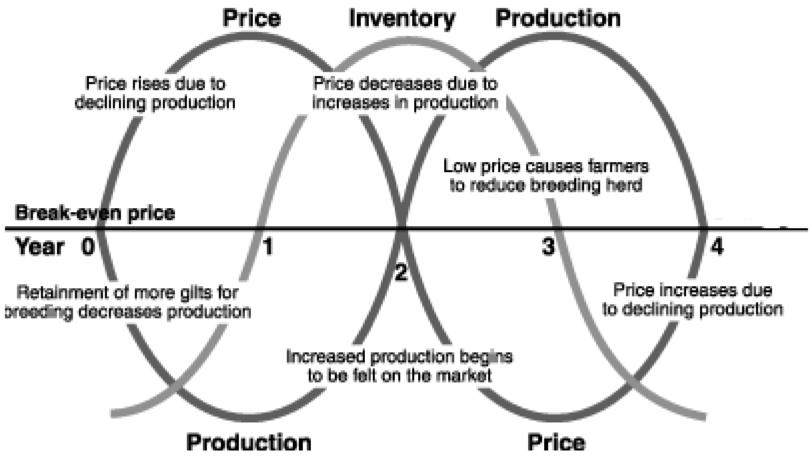
Rule 1: Market Dynamics – Violent Swings Are 'Normal'

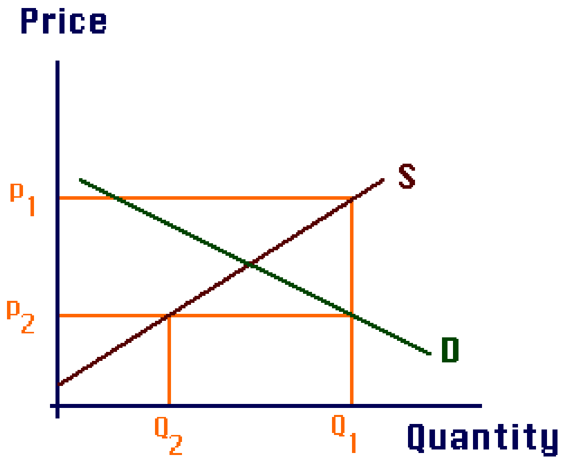
1960	42%	1966	30%	1974	10%	2008	-9%
1961	-5%	1967	-3%	1975	-19%	2009	+32%
Swing	**47%**	**Swing**	**33%**	**Swing**	**29%**	**Swing**	**41%**
1984	46%	1995	42%	2000	37%	2010	+32%
1985	-17%	1996	-9%	2001	-32%	2011	+1%
Swing	**63%**	**Swing**	**51%**	**Swing**	**69%**	**Swing**	**31%**

History May Not Repeat Itself … But It Does Rhyme A Lot (Mark Twain)

"Plus ça change … plus c'est la même chose" (The More Things Change … The More They Stay The Same)

Driven Hard By Pigs & Cobwebs





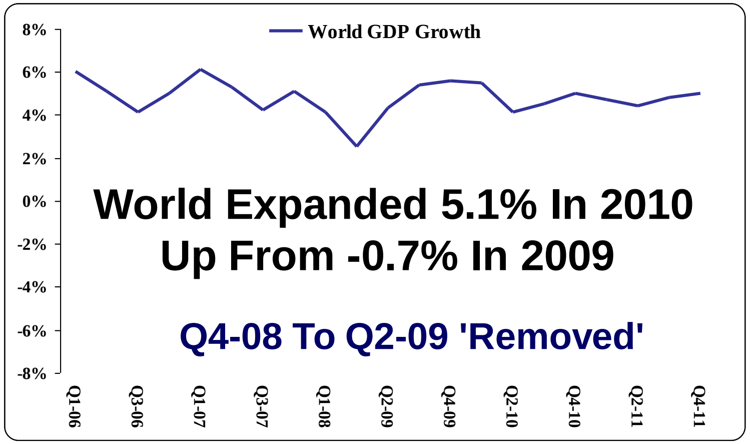
- **Hog (Investment) & Cobweb (Production) Cyclicality**
- **Constant Technological Change**
- **Long Supply-Side Lead Times**
  (Production … 4 Months / Capacity … 1-2 Years / Design … 1-3 Years
- **Supply Chain Complexity**
- **Needs Strategic Vision & Commitment**
  (Shareholders, Management, Financial & Government)

Micro Managed By … Tail Wagging Dog Syndrome

- Financial vs Business Objectives … *Bean Counters Are In Control*
- Over Reaction To Daily Deluge Of Data … *Ignoring The Trends*
- Risk Averse & Worry … *Timidity & Short-Term Focus*
- Kowtowing To "Wall Street" … *Driving Massive Industry Myopia*
- More Moore & Manufacturing's Too Difficult … *"IP & Niches For Us"*
- Pandemic Of Over (Under) Reaction … *Knee-Jerk Responses*

#1 (Economy) – The Fundamental Driver

Lehman Was NOT A Recession, Someone Turned Off The Lights
… All Products / All Markets / All Regions Collapsed Simultaneously
Take Out The Interrupt & The Underlying Trends Looked Fine

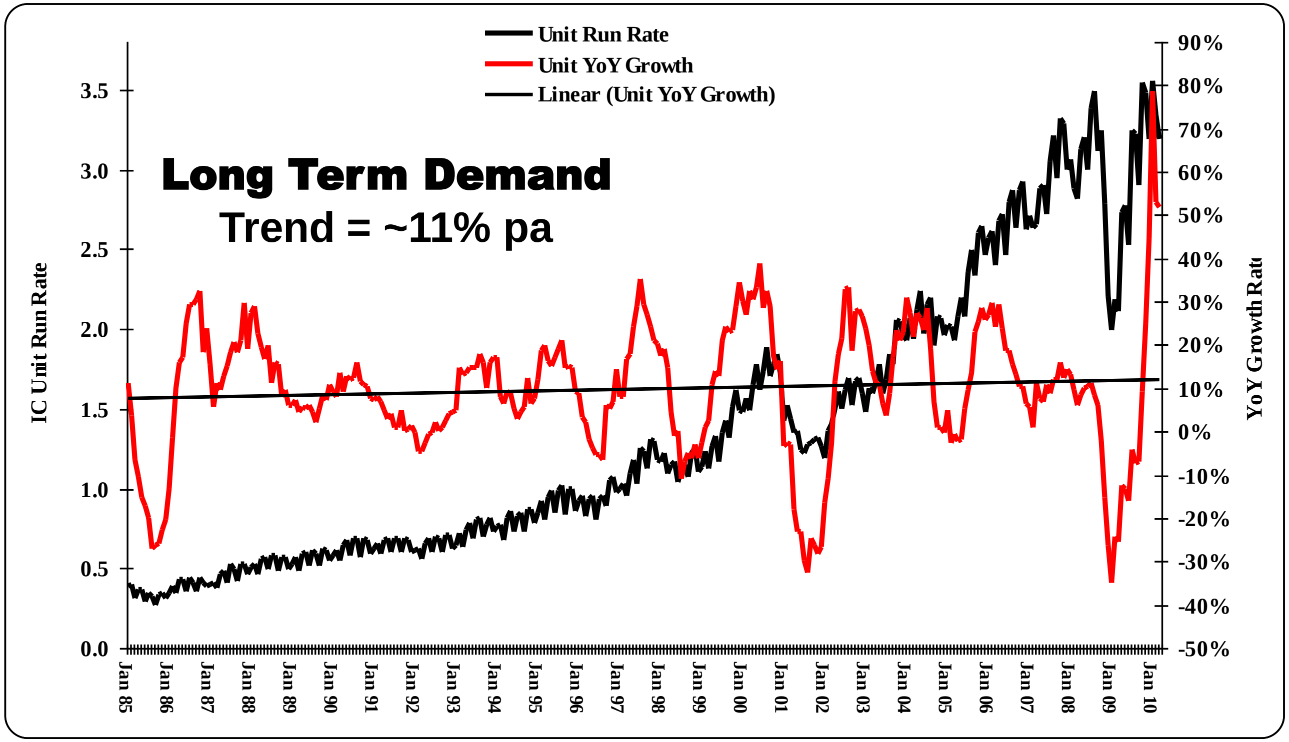


Post Lehman World Economic Outlook Is Once Again Dire

- ‘Mild Slowdown’ Risk Now Teetering On Recession (Melt-Down?)
- Greece Debt Default Risk To Euro With Unthinkable Global Repercussions
- Collapse Of ‘Super Committee’ US Debt Crisis Plan
- FUD (Fear, Uncertainty & Doubt) Replaced By FAD (Fear, Anger & Disbelief)
- Not Quite Lehman Proportions (Yet) … But Potentially Far Worse

Source: IMF/Future Horizons

#2 (Unit Demand) – Long-Term Trend Is Solid



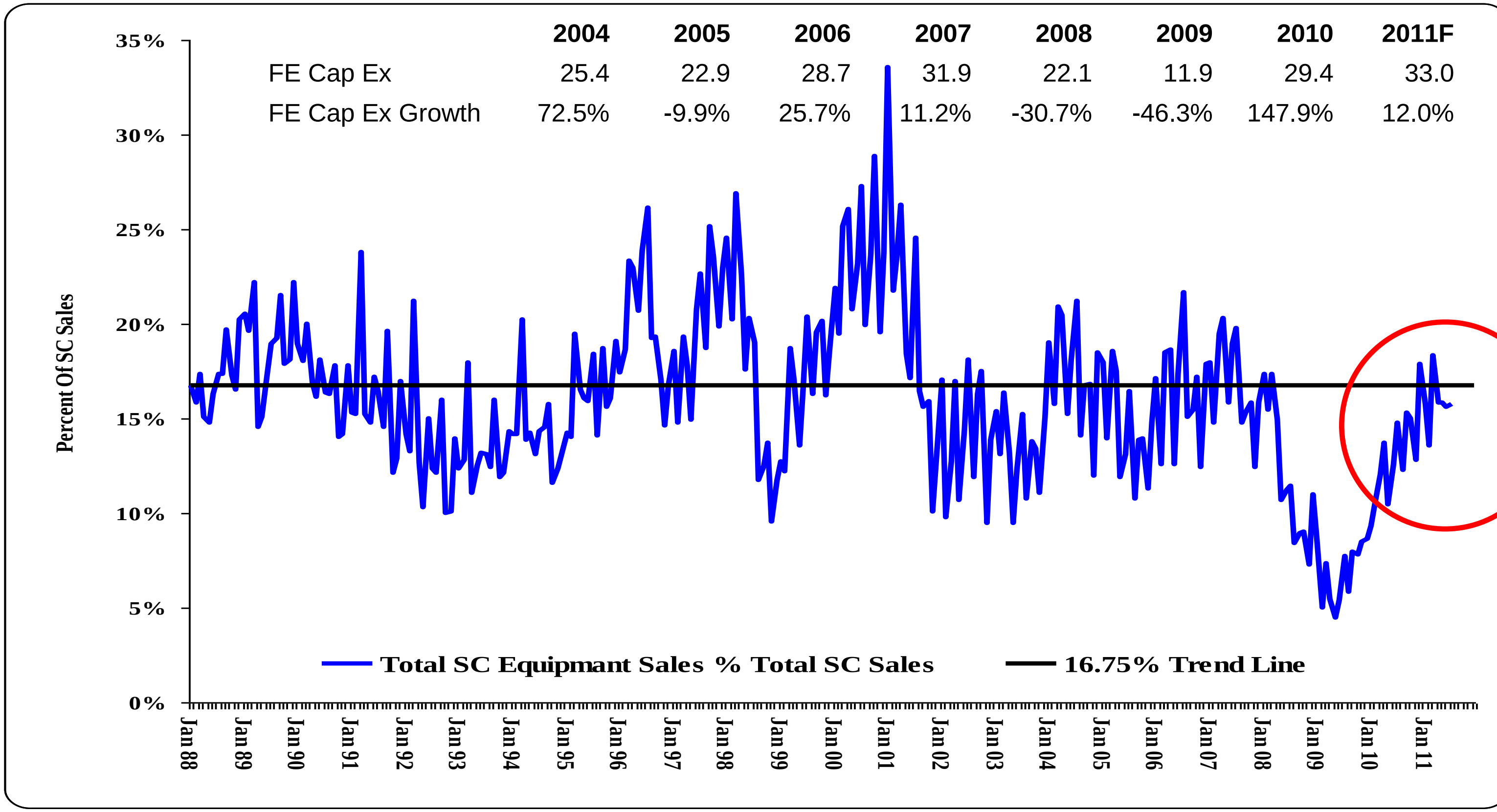
Problem Is Matching Capacity With Demand Is A Vision Of Faith

(3-4 Month Production Cycle / 12-24 Month Capacity Cycle)

But A Very Safe Long-Term Bet Provided You Execute Properly … Most Firm's Don't! Too Busy Chasing Short-Term Dreams

Source: WSTS/Future Horizons

#3 (Fab Capacity) – Welcome To Fab-Tight

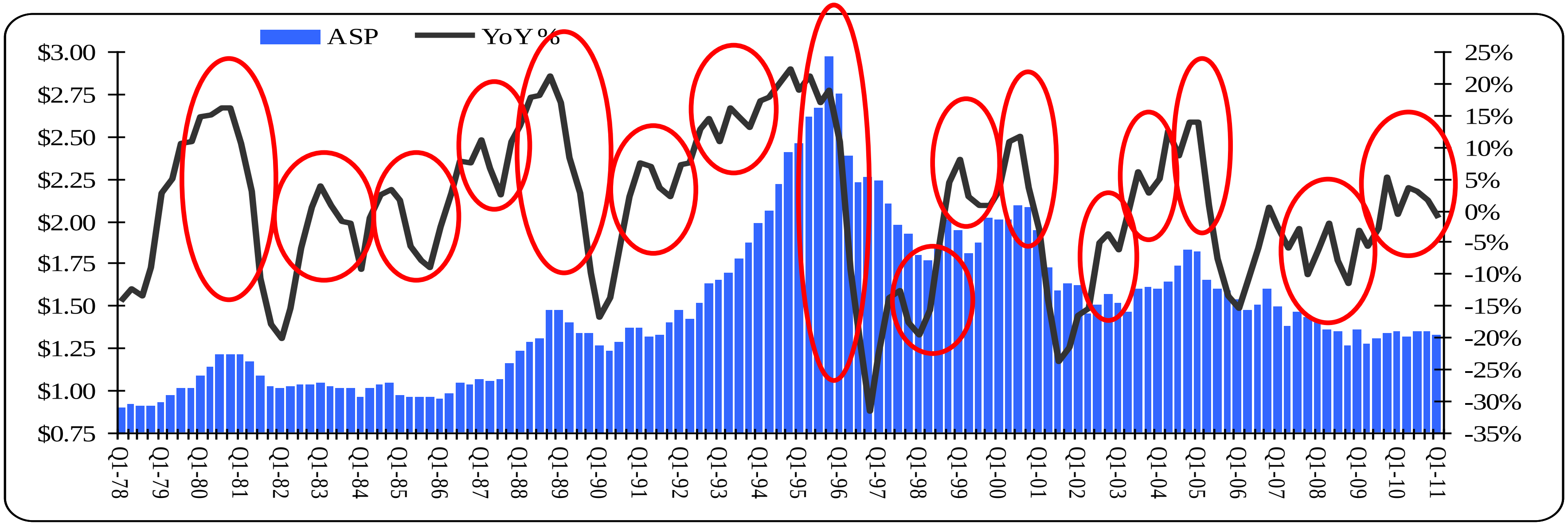


	2004	2005	2006	2007	2008	2009	2010	2011F
FE Cap Ex	25.4	22.9	28.7	31.9	22.1	11.9	29.4	33.0
FE Cap Ex Growth	72.5%	-9.9%	25.7%	11.2%	-30.7%	-46.3%	147.9%	12.0%

- **2010 Cap Ex Up 148% … But Barely Reached Trend Line**
- **Already Slowing Down … 2011 Spend Now Looking Flat (At Best)**
- **Zero Net New Capacity Growth For 2012 …It *<u>IS</u>* Different This Time (But No-One Believes It, Especially The Fab-Lites & OEMs!!)**

#4 (IC ASPs) – More Complex Than You Think

Course Of ASPs (Like Love) Never Runs Smoothly … *"Stuff Happens"*



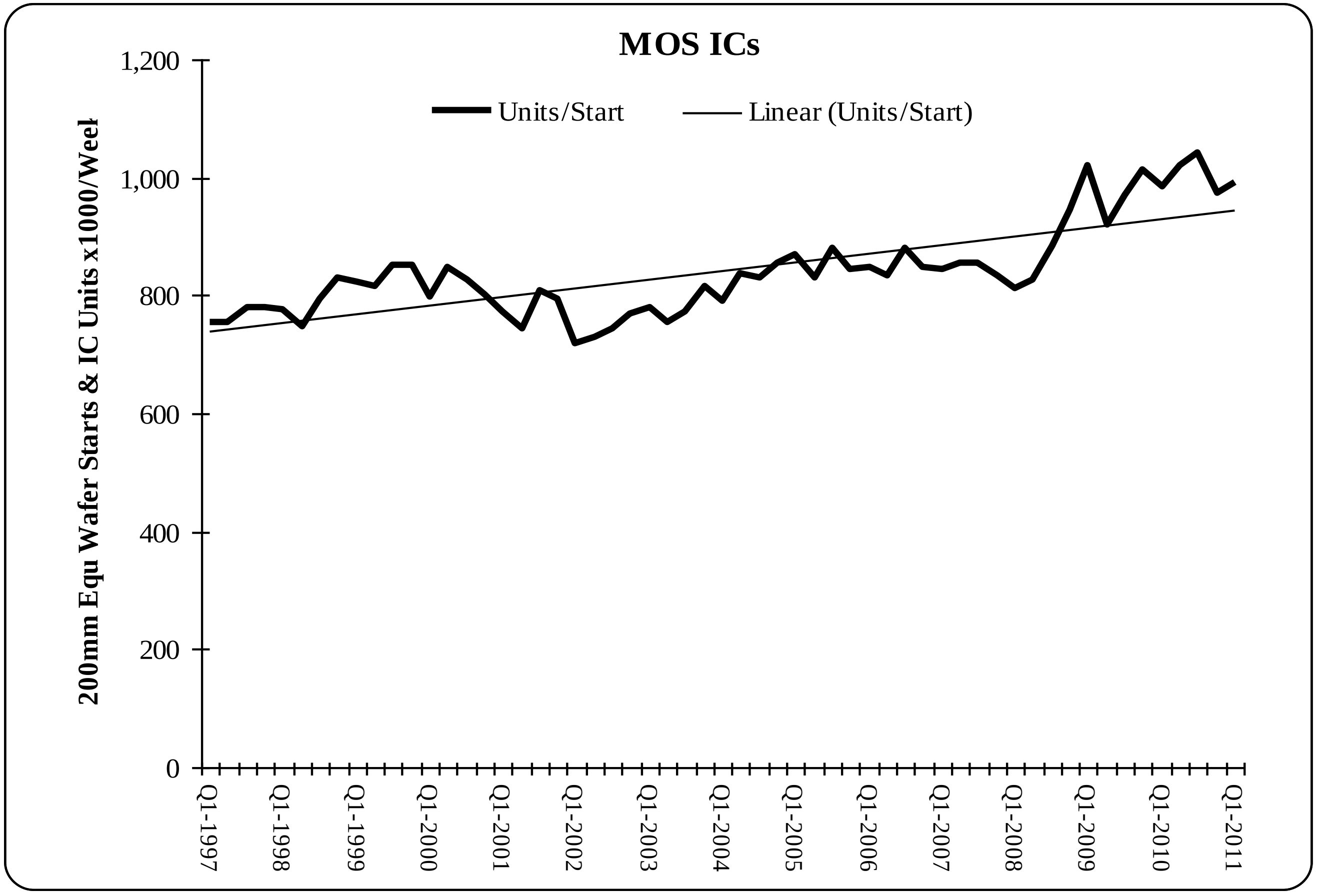
IC ASP Growth Rate Peaks & Troughs, 1978-2007

Low	Gap	High	Gap
Q1-78	-	Q1-83	-
Q1-82	16	Q4-84	16
Q1-90	32	Q4-94	26
Q4-96	27	Q3-00	27
Q3-01	15	Q1-05	18
Q1-06	18	???	???
Range	**4-8 Years**	**Range**	**4-7 Years**

IC ASP Growth Rate Transitions, 1978-2007

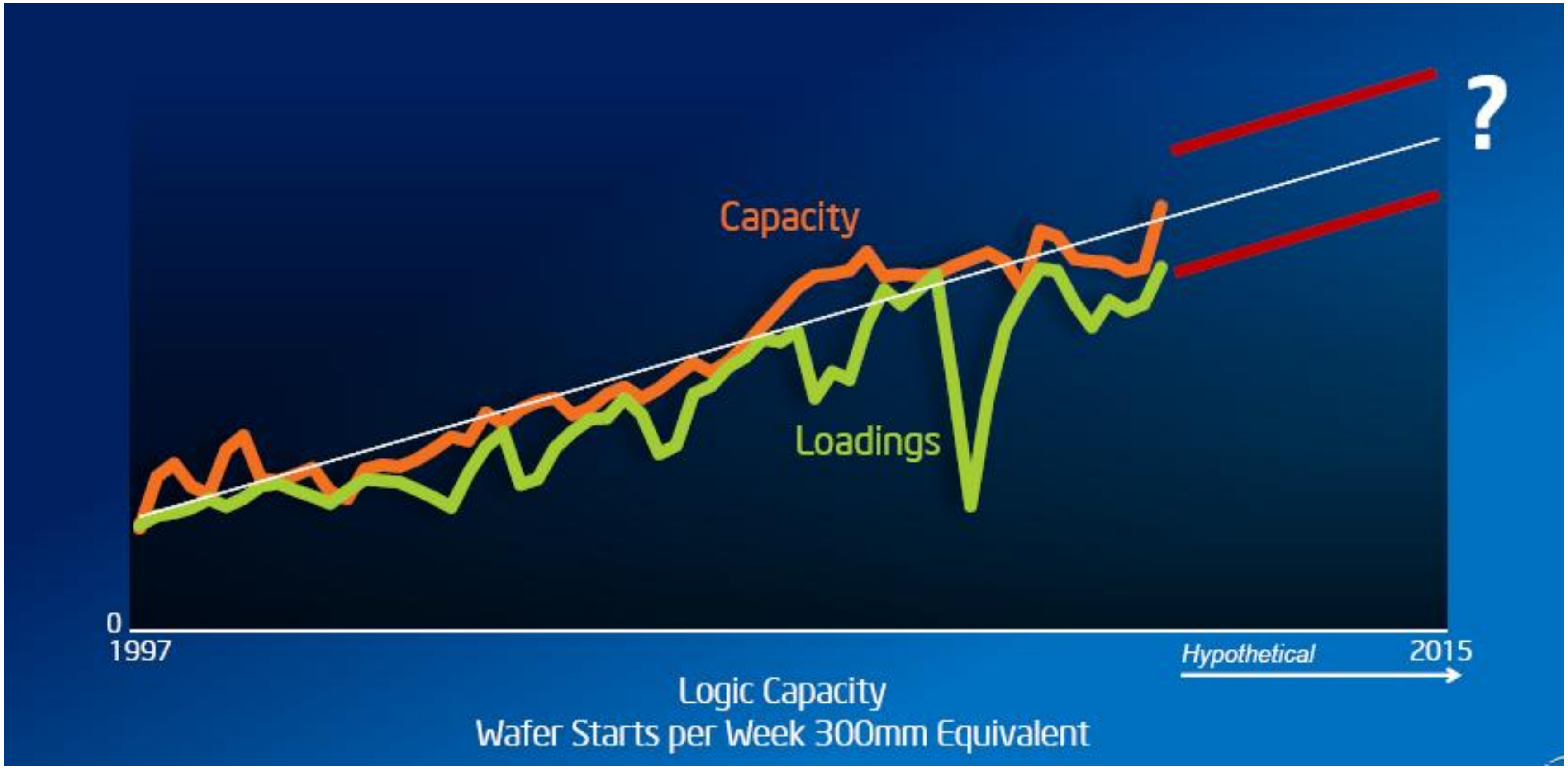
Low To High	Gap	High To Low	Gap
Q1-78 to Q4-80	11	Q4-80 to Q1-82	5
Q1-82 to Q4-88	27	Q4-88 to Q1-90	5
Q1-90 to Q4-94	19	Q4-94 to Q4-96	8
Q4-96 to Q3-00	15	Q3-00 to Q3-01	4
Q3-01 to Q1-05	14	Q1-05 to Q1-06	4
Q1-06 to ???	???	???	???
Range	**3-7 Years**	**Range**	**1-2 Years**

Supply & Demand



Capacity Needs To Match IC Unit Growth

Must Plan For The Long Term



Difficult (Impossible) To Balance Capacity vs Loading

Source: Intel

First The Bad News …

Economic Setback	Result
Arab country unrest	Higher oil prices
Devastating earthquake in Japan	Weak Japan IC market and supply chain disruptions in the electronic system market
Surge of natural disasters in the U.S. (floods, tornadoes, wildfires, etc.)	Disruptions to local economies and a "hit" to U.S. GDP growth
European debt crises and U.S. debt ceiling deadline	Extremely high levels of economic uncertainty
Flooding in Thailand	Shortage of HDDs for PC applications
IC inventory build due to overzealous forecasts for tablet PC and cellphone sales	Inventory burn in numerous IC market segments in 2H11

Shortcut to In humor, truth In humor, truth.lnk

Now The Good News …

Screw The US$15 Trillion Debt … I'm In This For The Short-Term

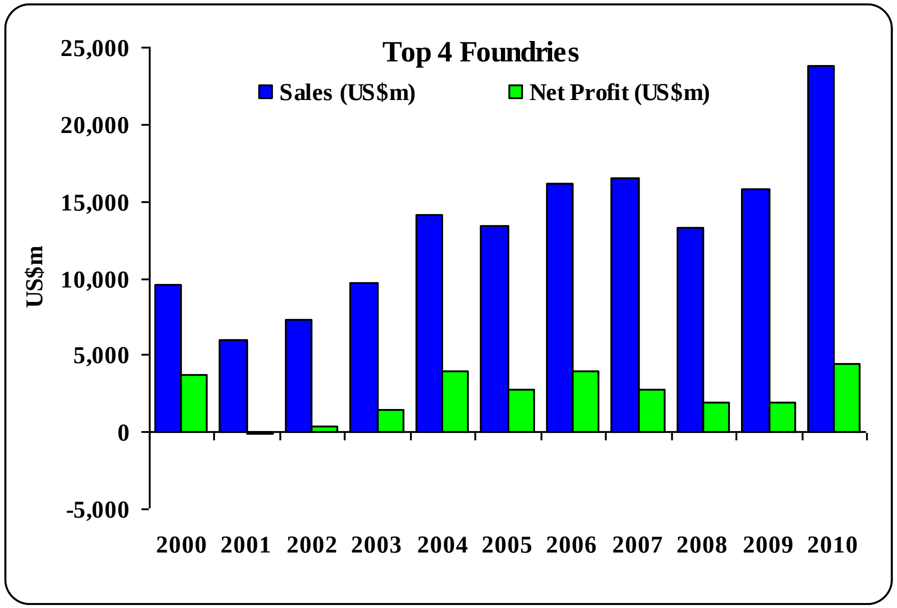
It's The 2012 Elections Stupid!!!

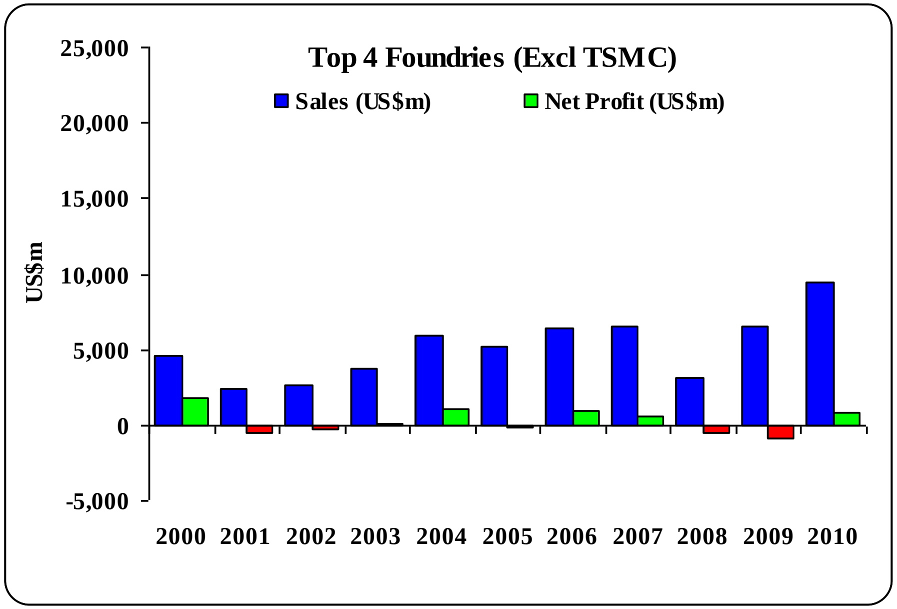
Supply Chain Uncertainty

A Hypothetical Scenario

- OEM Company 'A' Places Module / Box Order On CEM Company 'B' Whereupon CEM Company 'B' Places Component Order On Chip Company 'C', Who In Turn Places Wafer Requirements Order From Foundry Company 'D'. Job Done, Sit Back & Relax
- Foundry Company 'D' Suddenly Cannot Supply Chip Company 'C' With Enough ICs; Forced To Allocate Available Production
- Chip Company 'C' Receives Only Partial Delivery & Cannot Supply CEM Company 'B' With Enough ICs; Forced To Allocate What's Available To Its Customers
- CEM Company 'B' Cannot Supply Enough Modules Or Finished Units To OEM Company 'A'; Forced To Allocate Available Units Across Its Customer Case
- OEM Company 'A' Suffers Shortfall In Supply, At Best Missed Sales, Worst Case, A Full Line Stoppage

Endless Supply Of Ever-Cheaper Foundry Wafers?





Revenue Per Sq Cm (US$)	2003	2004	2005	2006	2007	2008	2009	2010
Chartered/Global Foundries	3.21	3.29	3.13	3.57	3.00	2.88	3.75	3.55
SMIC	2.45	3.38	2.80	2.89	2.67	2.68	2.47	2.49
TSMC	5.04	4.81	4.66	4.31	3.97	3.84	3.81	3.87
UMC	3.54	4.00	3.22	3.13	2.92	2.81	2.71	2.93
Foundry Avg	**4.22**	**4.30**	**3.89**	**3.77**	**3.45**	**3.37**	**3.43**	**3.49**
Industry Avg	**7.50**	**8.37**	**8.48**	**8.09**	**7.42**	**6.96**	**7.70**	**8.27**

Doing "More For Less" Cannot Continue Forever

Top 4 (US$m)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TSMC Share (Sales)	52%	59%	64%	62%	58%	61%	60%	61%	77%	59%	61%
TSMC Share (Profit)	53%	686%	152%	96%	72%	104%	74%	79%	127%	149%	81%

(Especially When You're The Only Game In Town)

The Shape Of Things To Come?

Wherever The Blame, The Nissan Impact Was Colossal

A $10 IC Impacts (x1)
A $10k Car Wiping (x1000)
$30k/Car Off Nissan's Market Cap (x3000)

- **This Is The Real Measure Of The IC Industry Power Yet Everyone Treats It So Terribly Superficially … "It's Only A Component"**
- **Whatever Happened To Security Of Supply? Now That IS An Old-Fashioned/Outmoded Concept**
- **We Outsource Everything (Except The IP) So We Not Only Have Better Cash Flow & Cheap Products, The Supply Chain Takes Good Care Of The Logistics**
- **Until, As With Nissan, One Day Disaster Strikes**

Security Of Wafer Supply Is Crucial

It's Not Just An Outsourcing Make/Buy Decision

No Capacity ⇨ No Sales

No Sales ⇨ No Company

- **That's A 20:20 Correlation, No Matter How Good Your Design Wins & Order Books Are**
- **Long-Term Security Of Wafer Fab Supply Is Fundamental**
- **This Is The Underlying Fabless (Fablite) Achilles Heel**
  & The Reason The FSA (GSA) Was Formed In 1994)
- **Wafer Fab Source Is Determined At The Start Of The Design Process. Once Fixed It's 'Impossible' To Switch**

"The Wafer Fab Drives The Electronics Value Chain & Therefore, Given Its Economic Potential, Knowledge Intensity, Contribution To Solving Social Challenges & Driving GDP Growth, Is A Key Enabling Technology."

The Fabless/Fab-Lite Wafer Reality

E.G. Nokia
Buys Chip Sets From

Qualcomm | **Broadcom** | **ST-Ericsson** | **MediaTek**

Freescale | **TI** | **Etc …**

Who In Turn All Buy Their Wafers From E.g. TSMC

Nokia Is Single Sourced

Not Disputing TSMC's Integrity, But Where Is The Security Of Supply?
Who Decides Who Get's Shipment Priority … NOT Nokia etc's Supplier !!!

(PS … There's Not Much Choice At 45/32nm & Below)

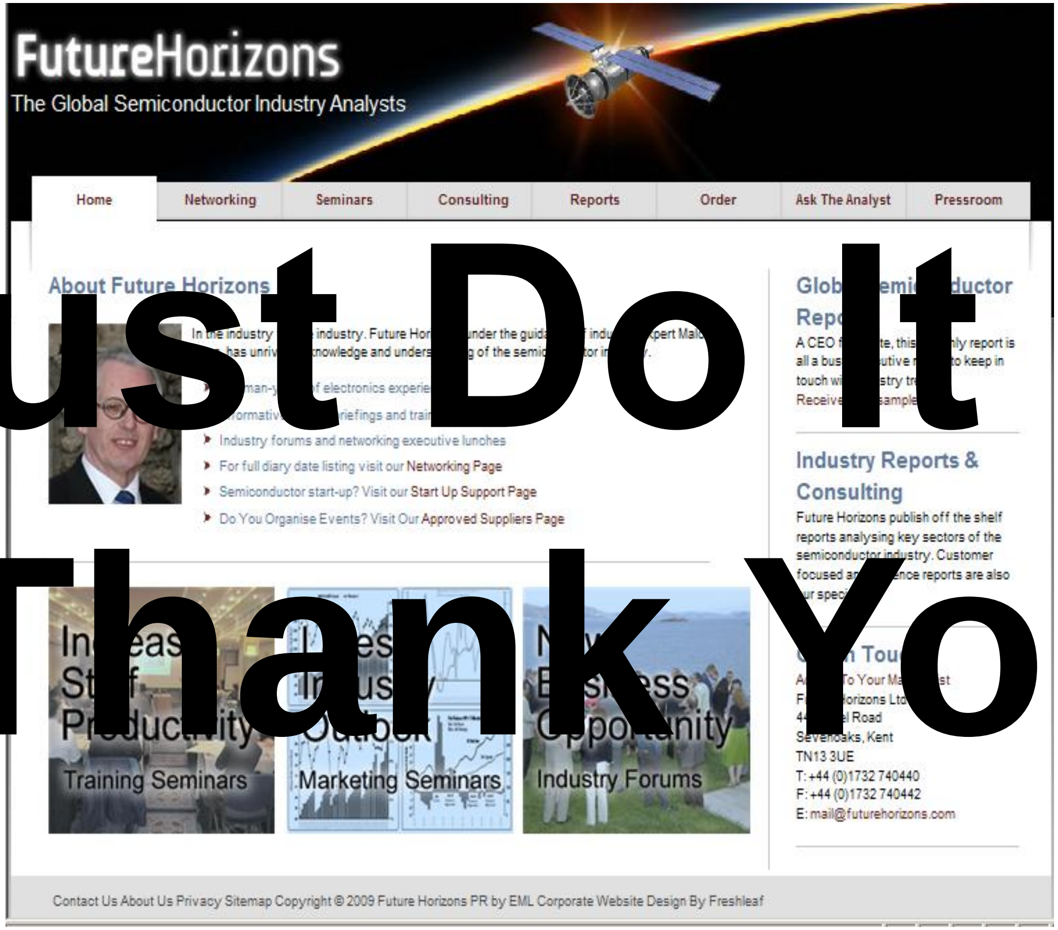
Back To Chip Market Boot Camp

The World May Have Changed But Not The Principles

1. **Industry Fundamentals Don't Lie**
   (Believe In Them Or Die)
2. **Capacity Famine Was Instigated 3+ Years Ago**
   (Well Before The Financial Crises … 2012's Shortages Are Inevitable)
3. **Recovery Dynamics Will Continue To Strengthen**
   (2012 Could Easily Be 20%+ Growth Year … Remember 2010!)
4. **Economic Uncertainty Still The Biggest Risk**
   (Greece / Euro / Japan / US / Government Deficits / Stagflation / Etc)
5. **Global Financial System Still Flawed & Discredited**
   (Goldman Sachs, Lehman Bros, Repro 105, Ratings Agencies … People & Governments Are Angry … Even Las Vegas Is Complaining!)
6. **Profit = Sales – Cost**
   Most Firms Attack 'Costs' (Easy) … The Real Culprit Is Sales (Hard) !!!!!

Contact Details - www.futurehorizons.com

Just Do It … Thank You



Future Horizons Ltd, 44 Bethel Road, Sevenoaks, Kent TN13 3UE, England

Tel: +44 1732 740440 Fax: +44 1732 740440

Regional Offices In The UK & Russia – Affiliates In Europe, India, Israel, Japan, Russia & USA