

When Will the Turn Around Occur?

WALT CUSTER
CUSTER CONSULTING GROUP
www.custerconsulting.com
April 2001

TOPICS

What Caused It?

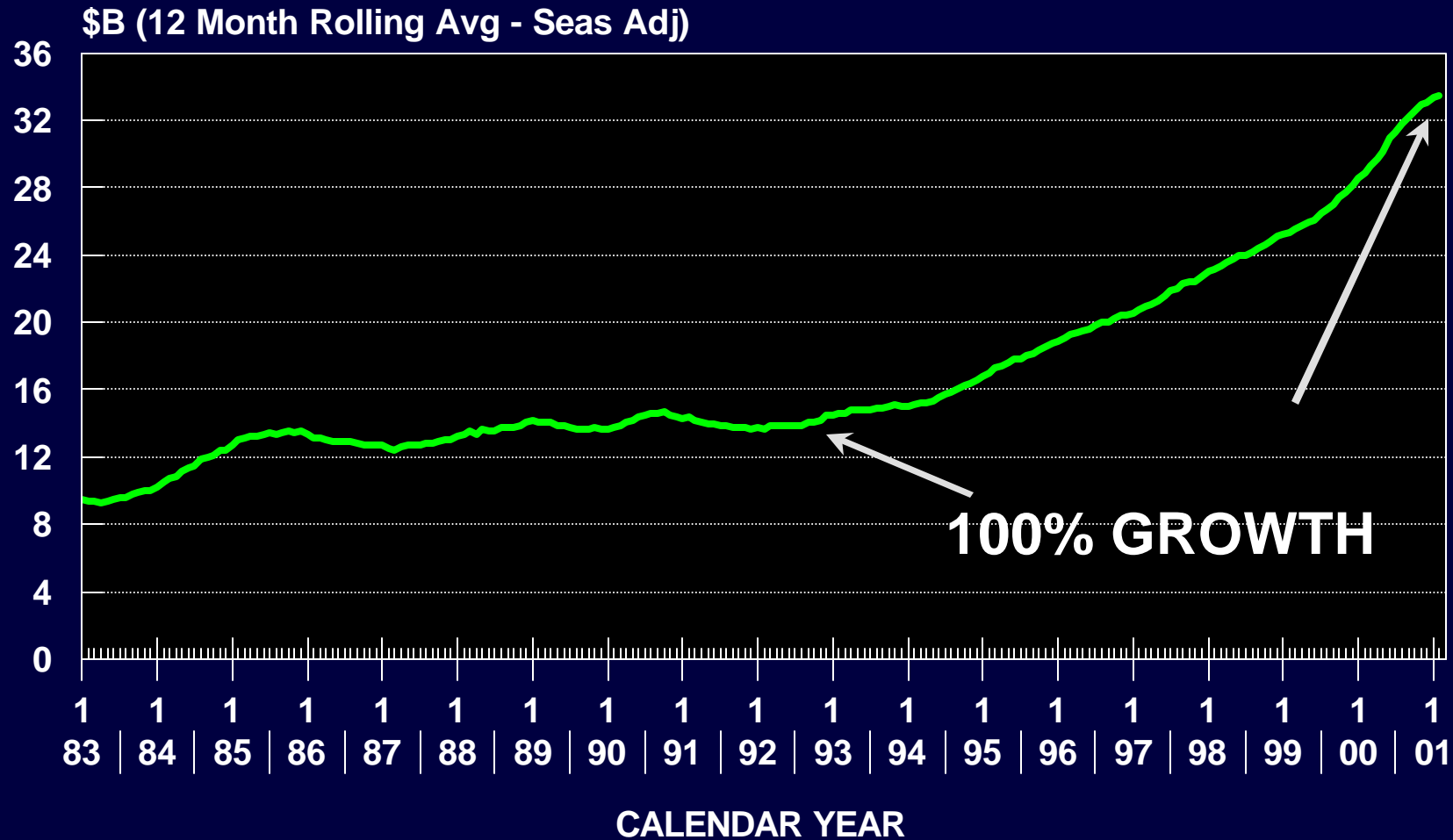
How Bad Is It?

**When Can We Expect
the Recovery?**

**What
Caused It?**

US ELECTRONIC EQUIPMENT ORDERS

COMMUNICATION, COMPUTER & OFFICE,
MILITARY, INSTRUMENTS



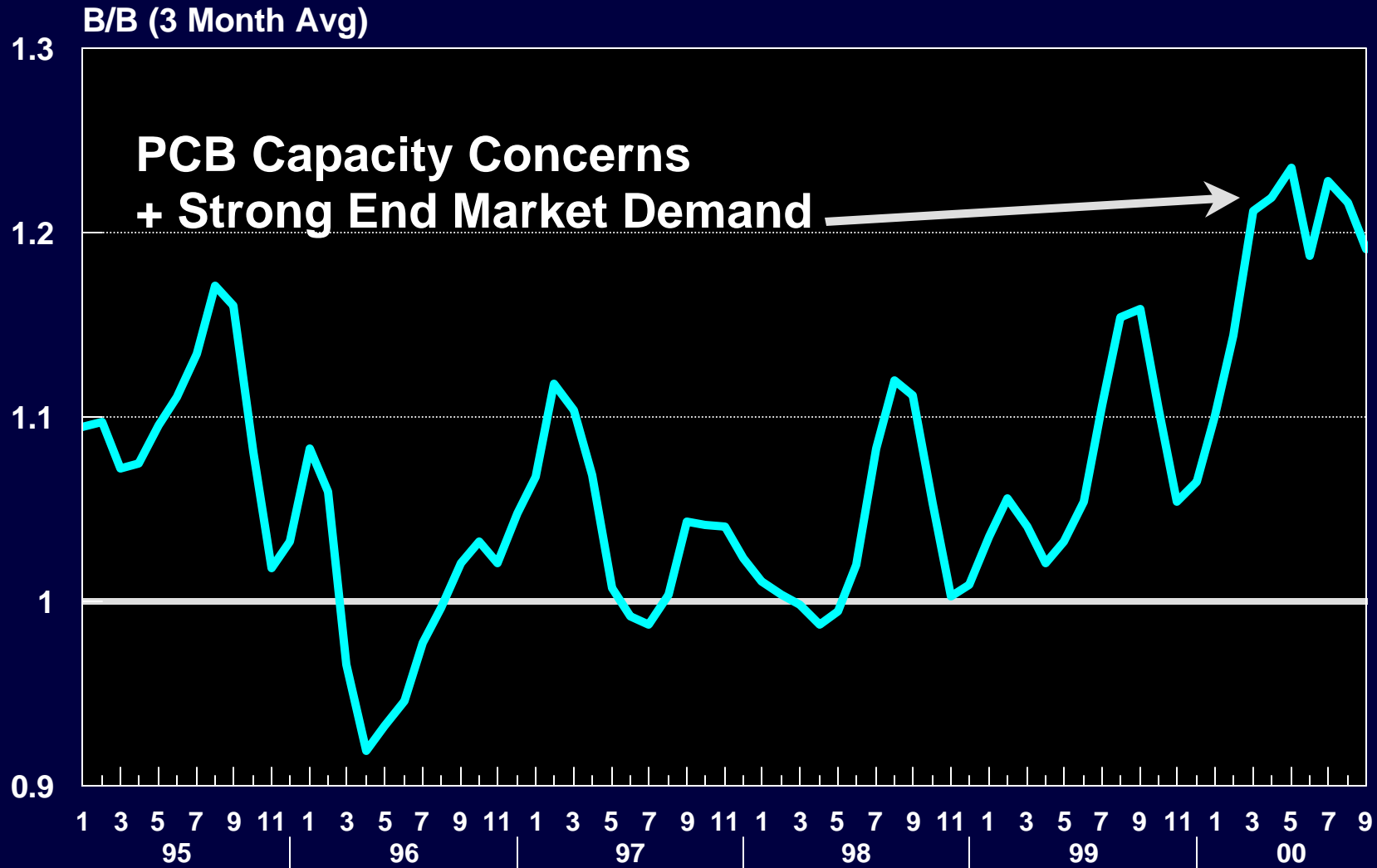
Electronic Equipment Order Growth

Computer & Office, Communications, Measurement & Control and Military



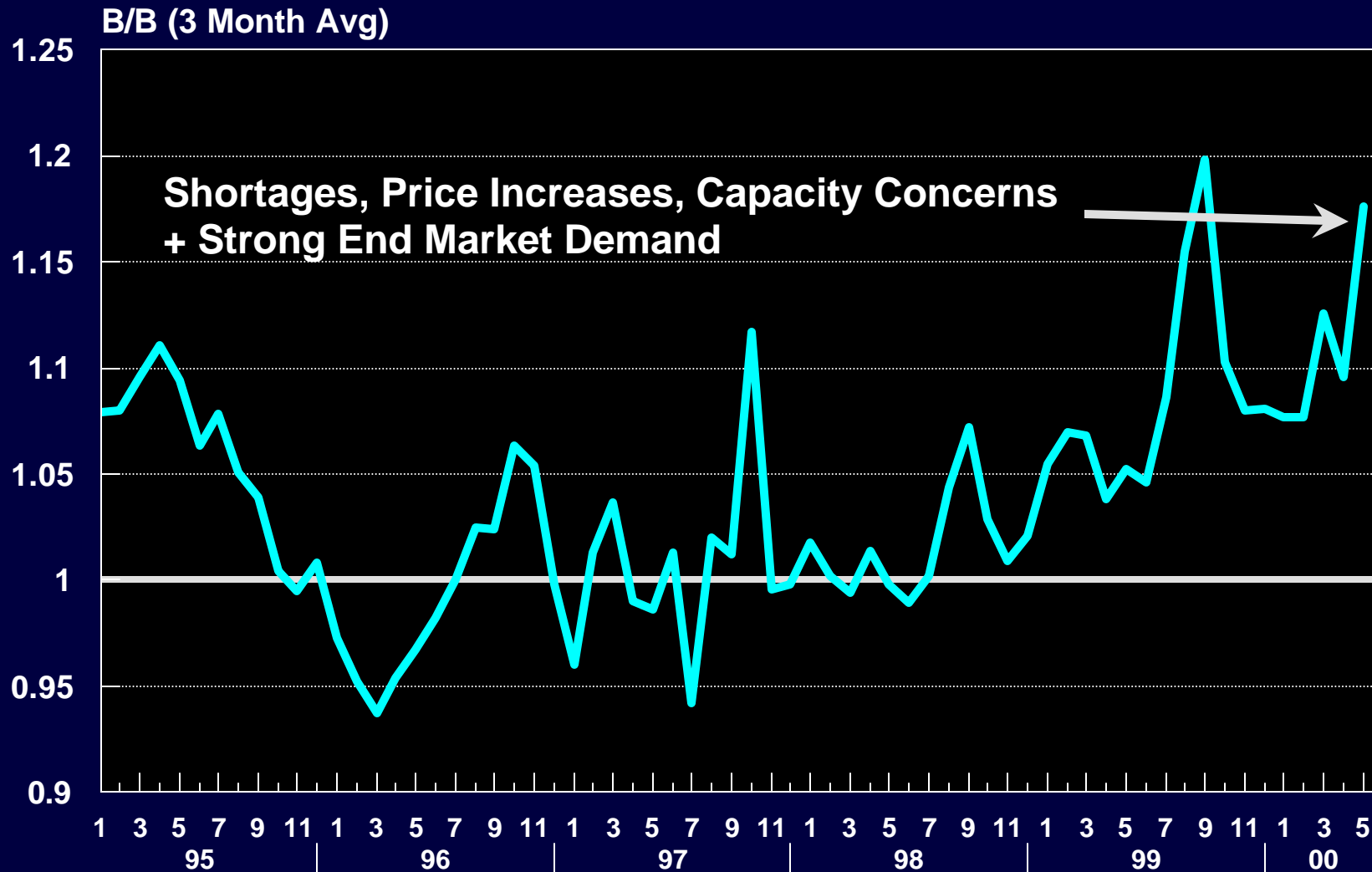
Rigid PCB Book/Bill

N. America



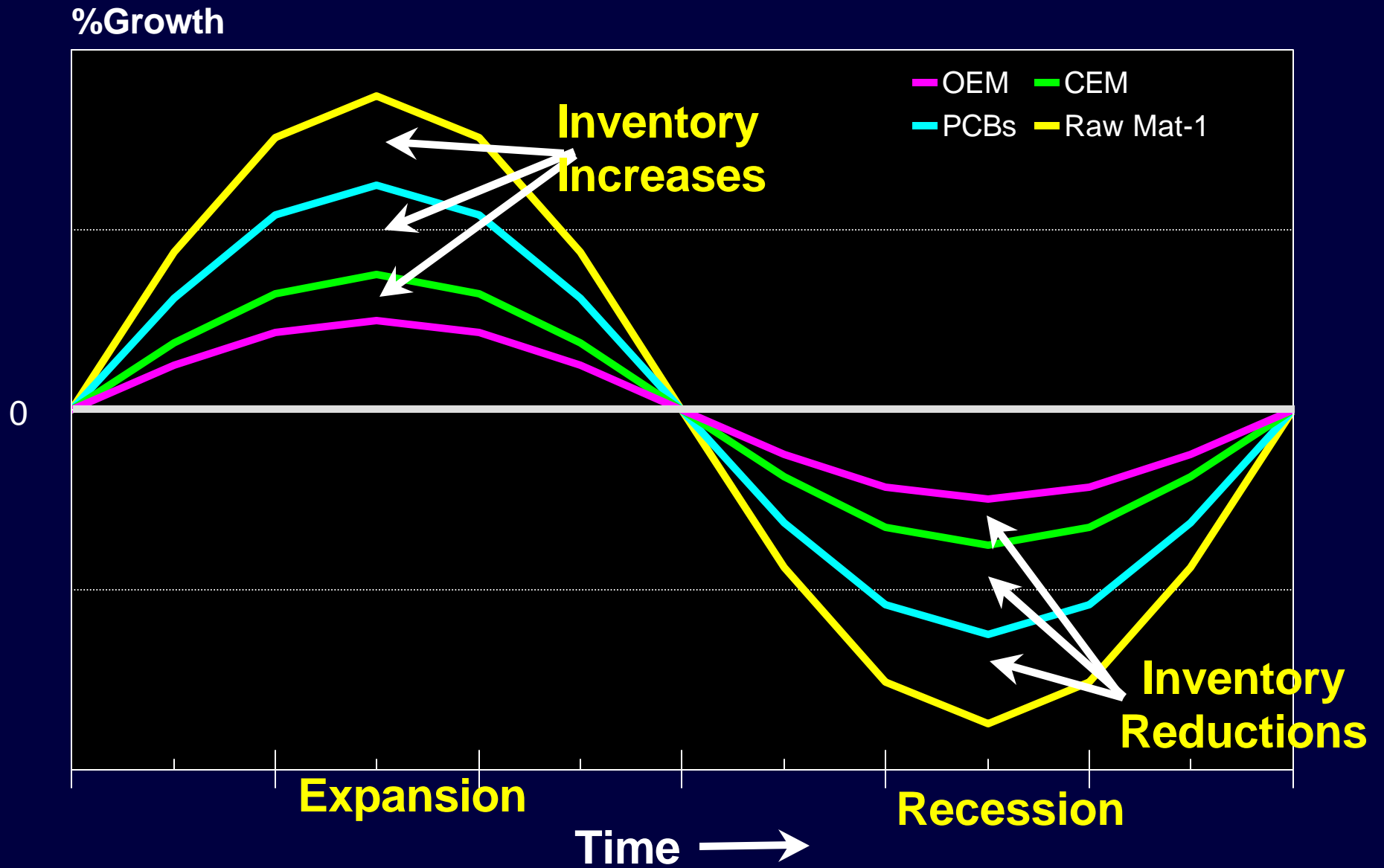
U.S. Electronic Component Book/Bill Ratio

3-Month Average



BUSINESS CYCLE

SUPPLY CHAIN EFFECT



2000

Strong Equipment Demand

Telecom

Internet Infrastructure/Dot.coms

Semiconductor Fab

Cell Phones

Industrial Electronics

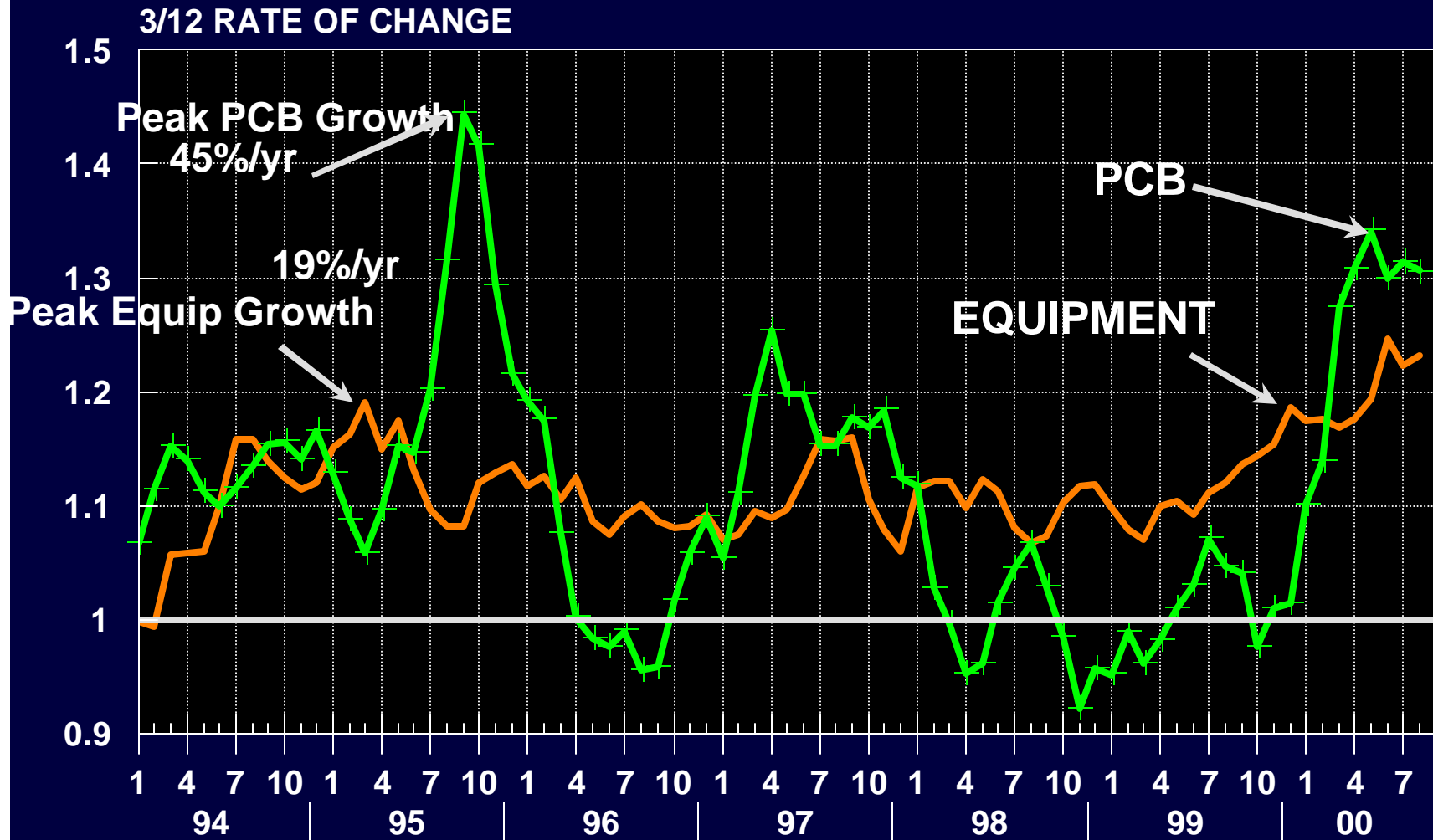
Shortages & Capacity Fears

Double / Over-ordering Components

Inventory Builds - including CEMs

U.S. ELECTRONIC EQUIPMENT vs PCBs

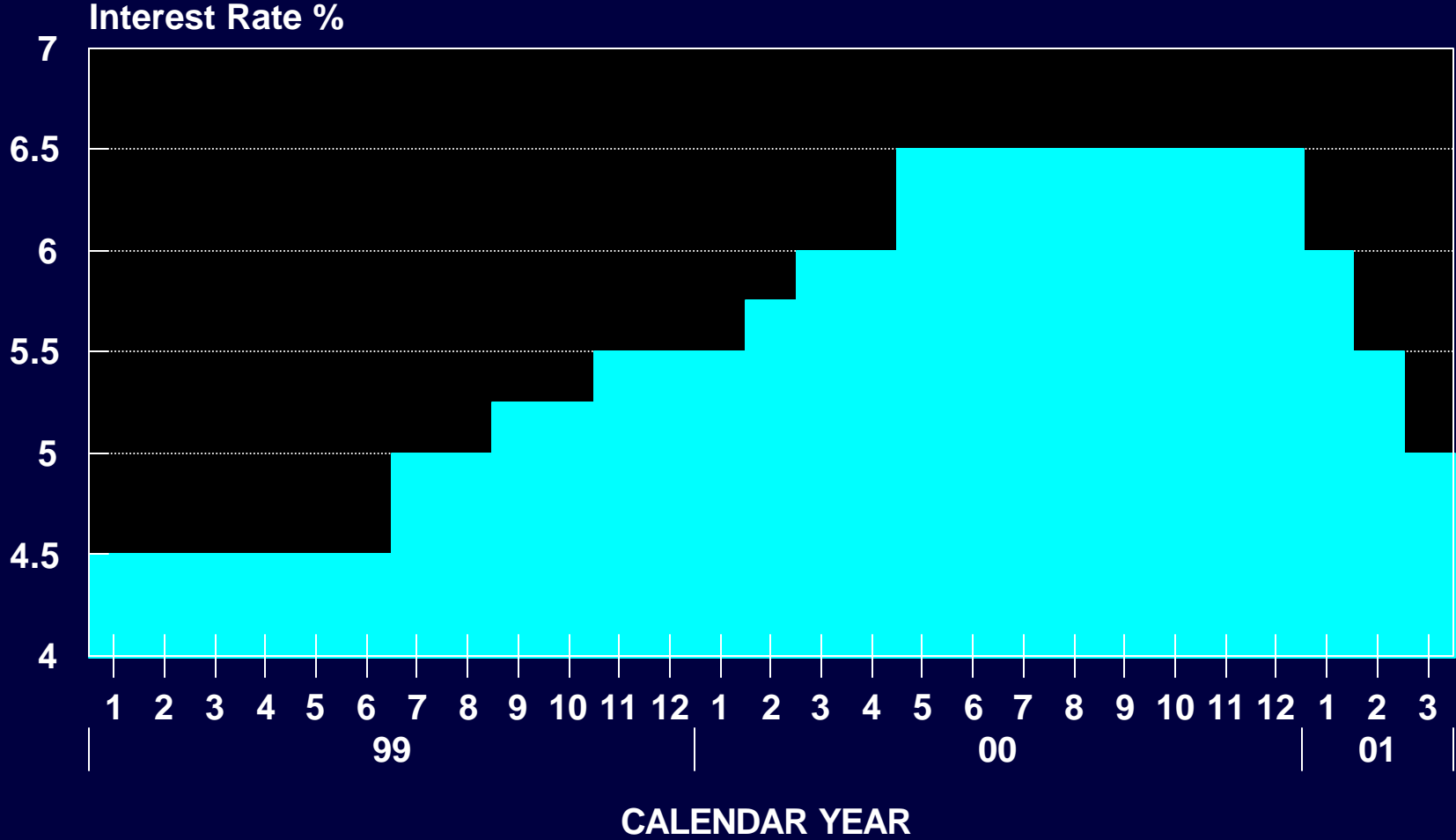
\$ BOOKINGS GROWTH



Overheated Economy

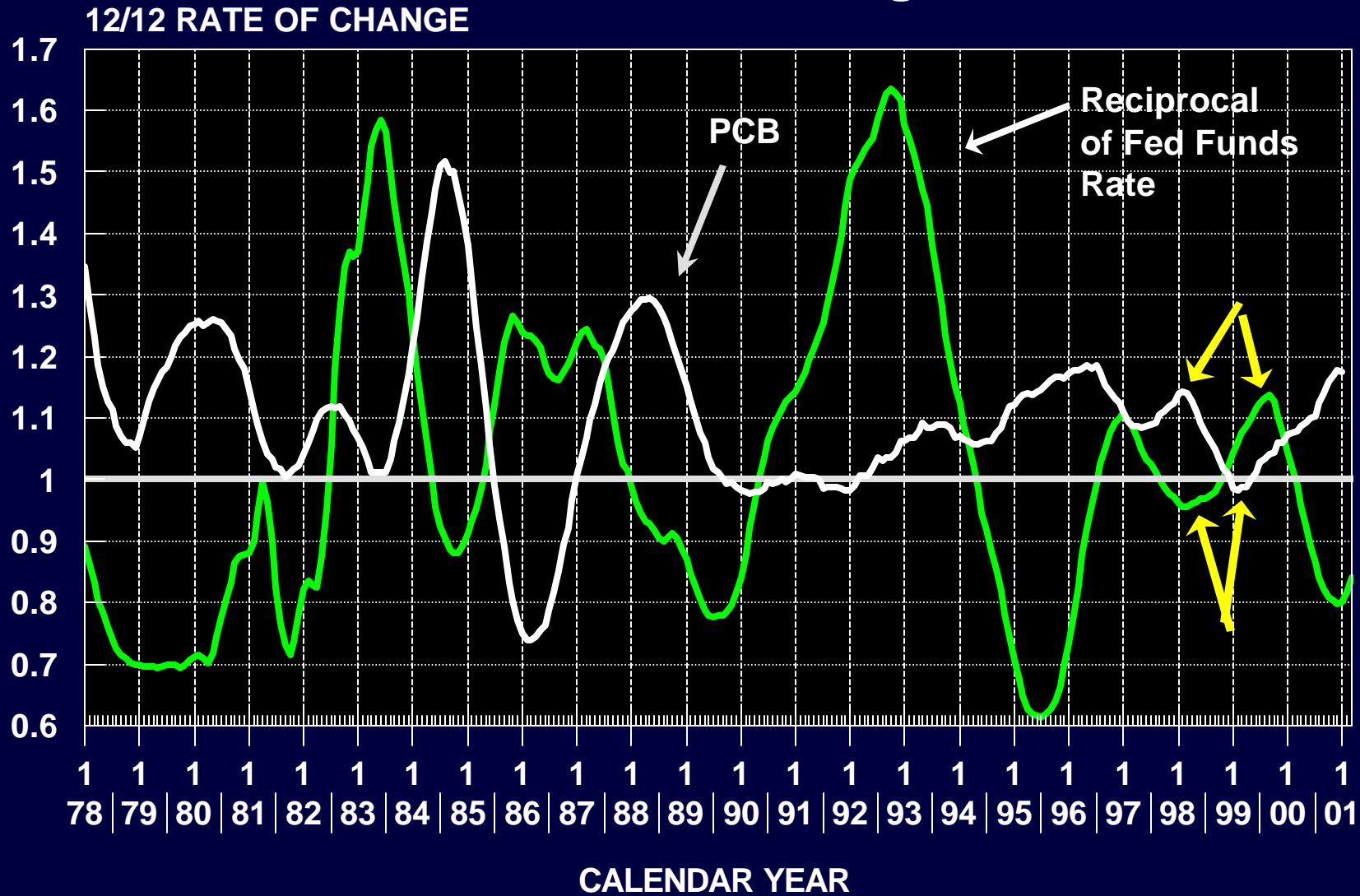
**Fed Reacts
with
Interest Rate
Adjustments**

U.S. FEDERAL FUNDS RATE



PCB Shipments vs Interest Rates

18-Month Lag



Data: IPC T/MRC & U.S. Federal Reserve Board

<http://www.federalreserve.gov/releases/h15/data.htm>

Current Electronics Situation

Electronic Equipment Order Growth

Computer & Office, Communications, Measurement & Control and Military



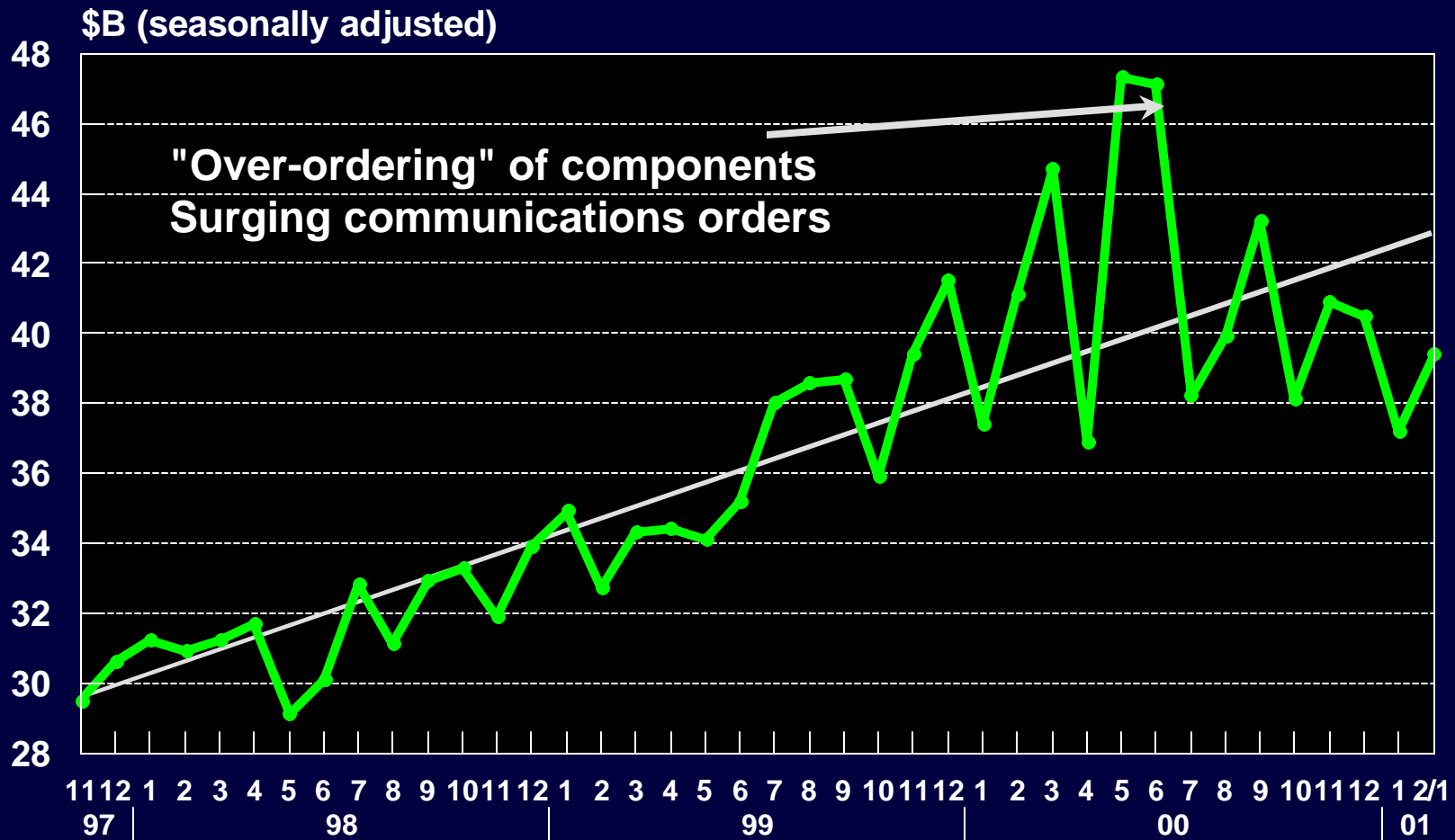
4/2001

<http://www.census.gov/indicator/www/m3/>

Recent Job Cutbacks - Announced

DaimlerChrysler	26,000
Motorola	22,000
Lucent Technologies	16,000
Nortel Networks	15,000
Delphi Automotive Systems	11,500
Verizon	10,000
Solectron	8,200
Cisco	5,000
Compaq	5,000
Intel	5,000
Xerox	4,000
Ericsson LM	3,300
Gateway	3,000
Seagate	2,000
Dell	1,700
Hewlett-Packard	1,700
3Com	1,200

U.S. DURABLE GOODS ORDERS ELECTRONIC & OTHER ELECTRICAL EQUIPMENT



U.S Dept of Commerce 3/2001

U.S. "Purchasing Managers" Index

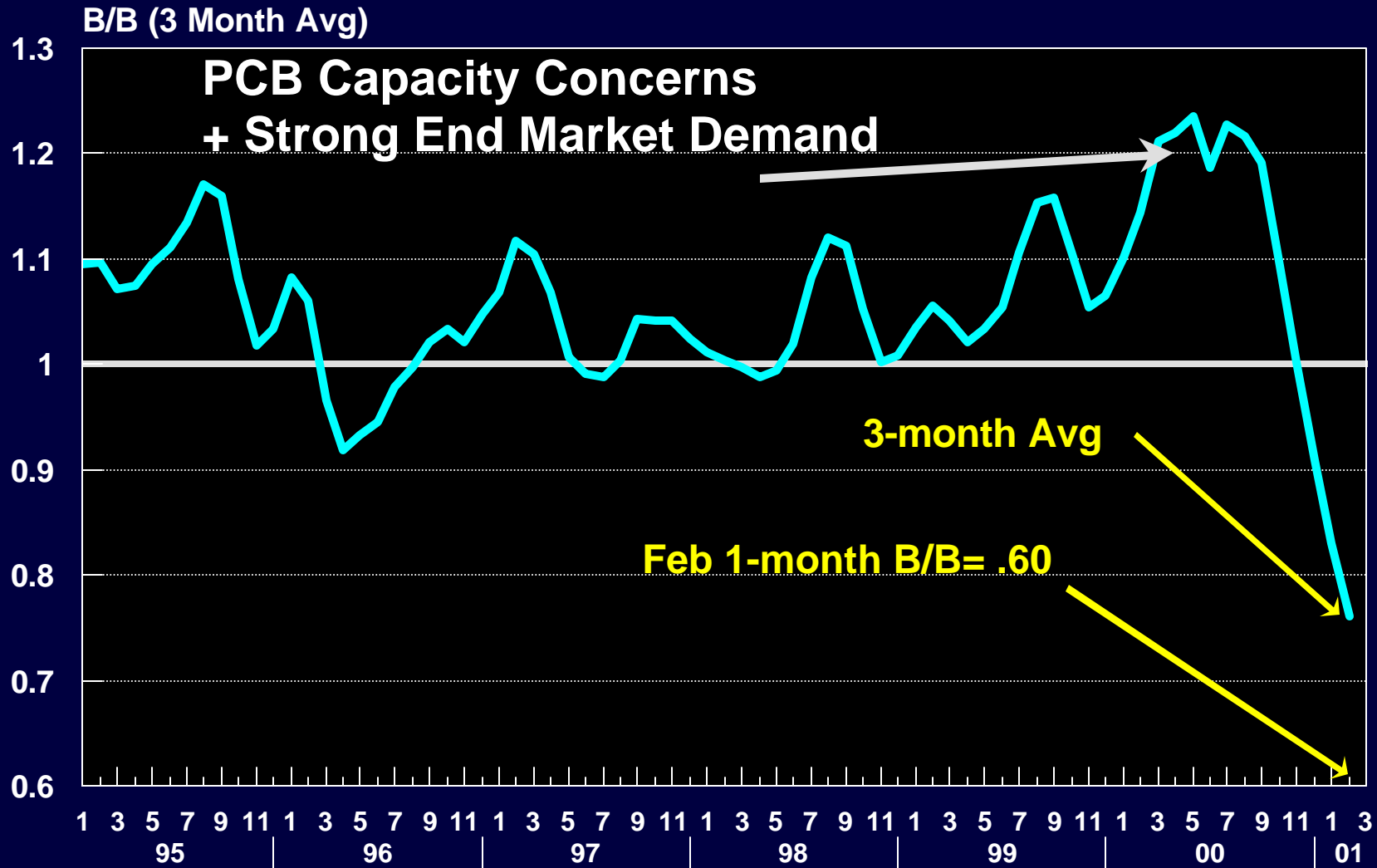
DIFFUSION INDEX



NATIONAL ASSOC of PURCHASING MANAGERS

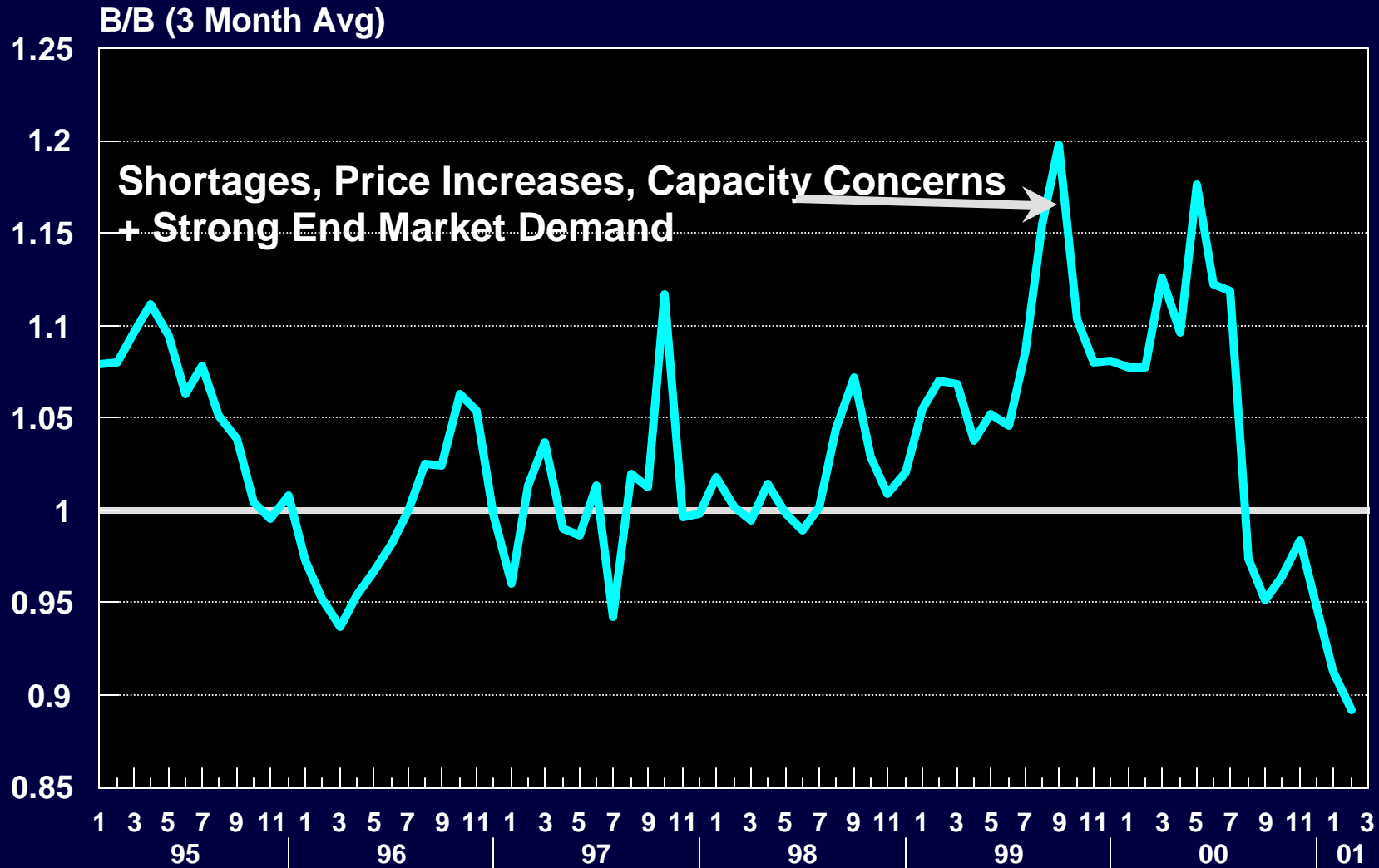
Rigid PCB Book/Bill

N. America



U.S. Electronic Component Book/Bill Ratio

3-Month Average



LONG TERM GROWTH DRIVERS

INCREASING ELECTRONIC CONTENT OF CAPITAL GOODS

PRODUCTS THAT DID NOT EXIST A DECADE AGO

EMERGING GLOBAL MARKETS

**GLOBAL PERSONAL COMPUTER CATCH-UP TO USA
LEVELS**

CELLULAR PHONES - DEVELOPING NATIONS

INTERNET EXPLOSION

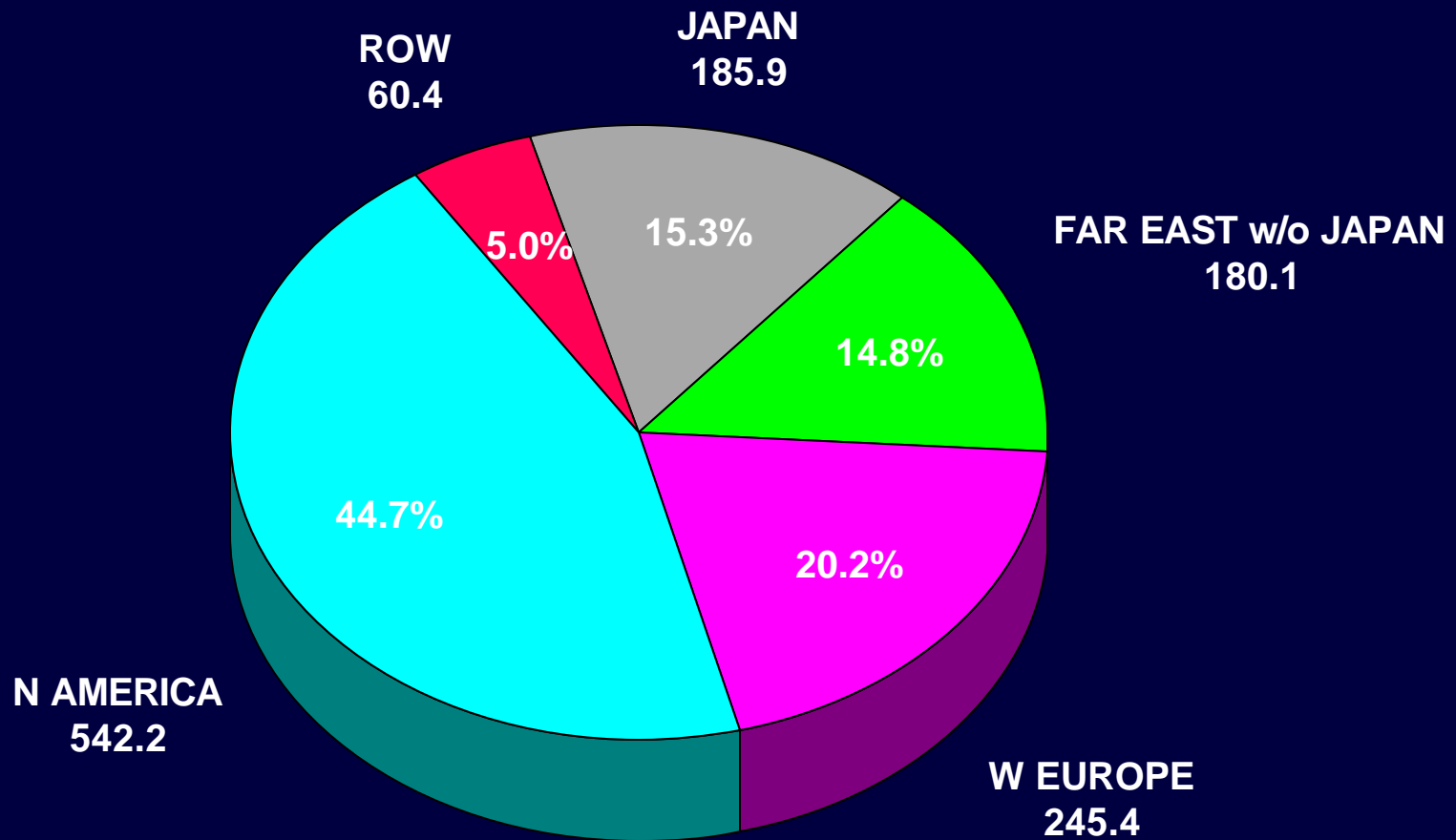
E-BUSINESS INFRASTRUCTURE

DATA STORAGE - MASSIVE INCREASE IN NEED

Electronic Equipment

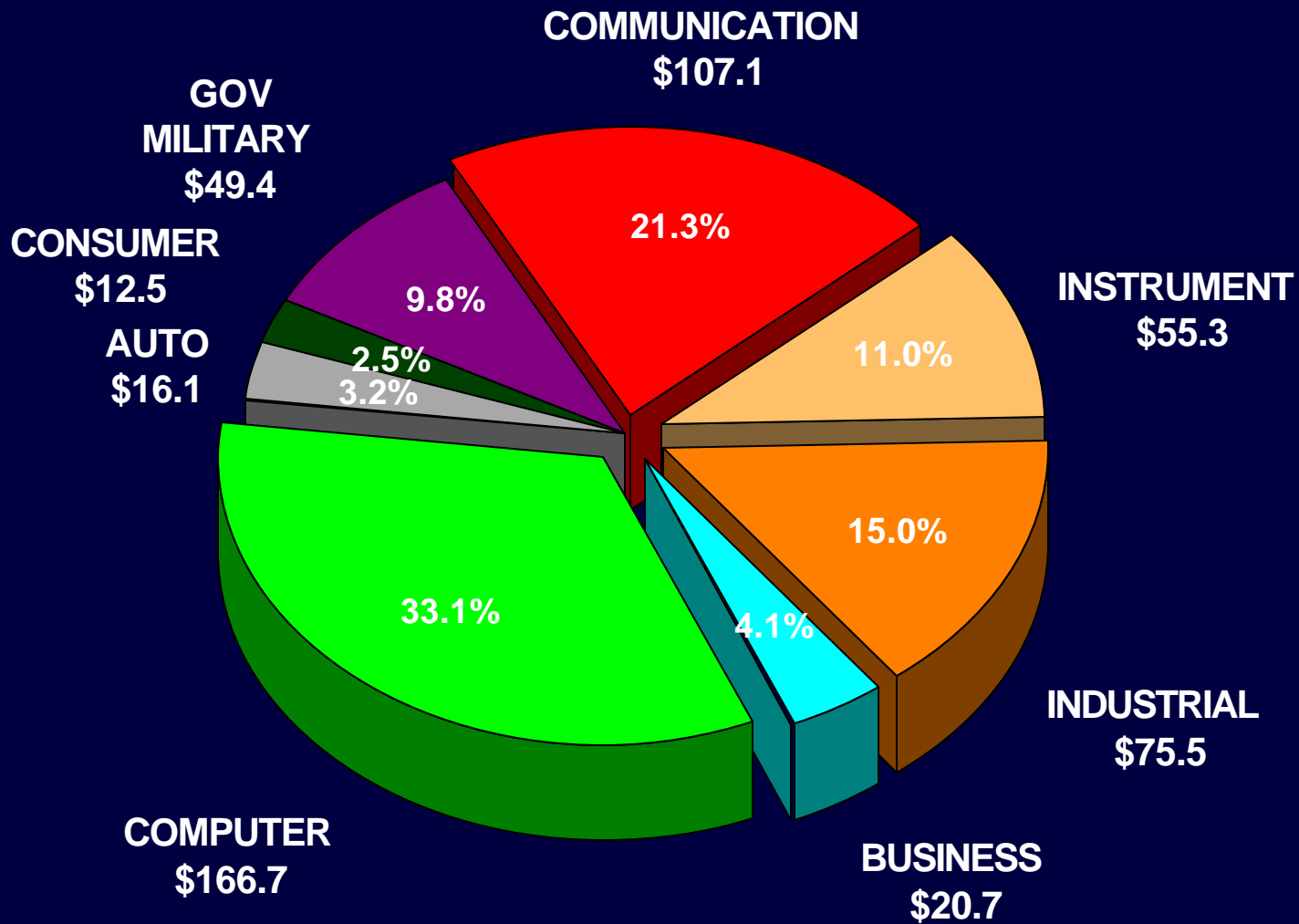
WORLD ELECTRONIC EQUIPMENT PRODUCTION

2000



TOTAL \$1,214 Billion

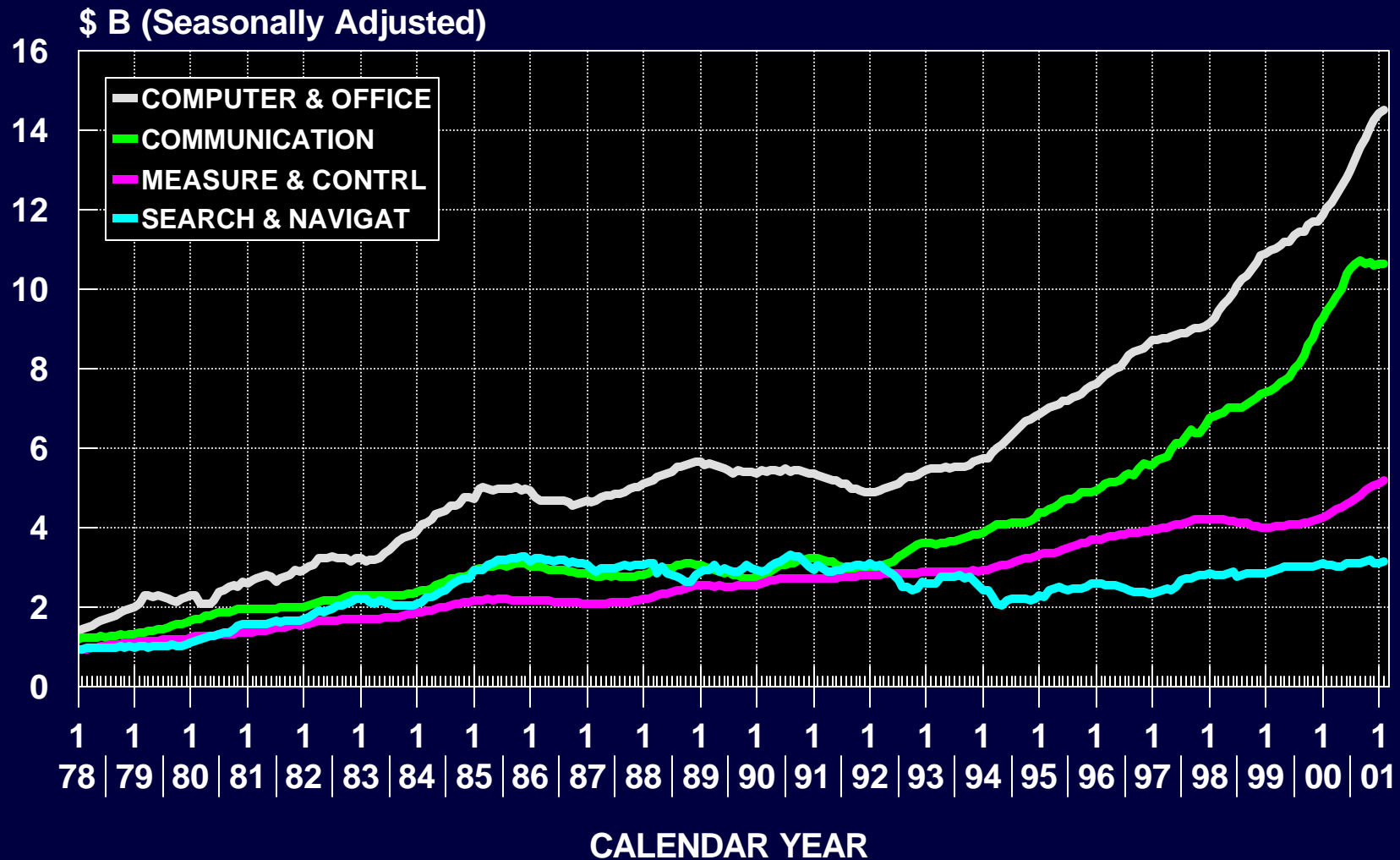
US PRODUCTION OF ELECTRONIC EQUIPMENT 2000 ESTIMATE (\$B)



TOTAL = \$503 Billion

US ELECTRONIC EQUIPMENT BOOKINGS

12 MONTH ROLLING AVERAGE



Communications Equipment

Top Eight Worldwide Telecommunications Equipment Manufacturers (\$B)

	<u>2000 Revenue</u>	<u>1999 Revenue</u>	<u>Constant \$ Growth (%)</u>	<u>Local Currency Growth (%)</u>
Ericsson	31.3	25.7	21.5	34.9
Nortel	30.3	21.3	42.2	42.2
Nokia	27.2	20.1	35.4	57.0
Lucent*	25.8	33.8	-23.5	-23.5
Cisco	23.9	15.0	59.3	59.3
Siemens**	22.8	20.0	14.5	32.5
Motorola	22.8	19.7	15.3	15.3
Alcatel***	21.6	17.1	26.6	46.8
Top 8 Total	205.7	172.7	19.1	-

* Lucent 2000 figures exclude Avaya; combined figure would be \$33.2 billion

** Siemens 1999 figure re-estimated because of exchange rate updates

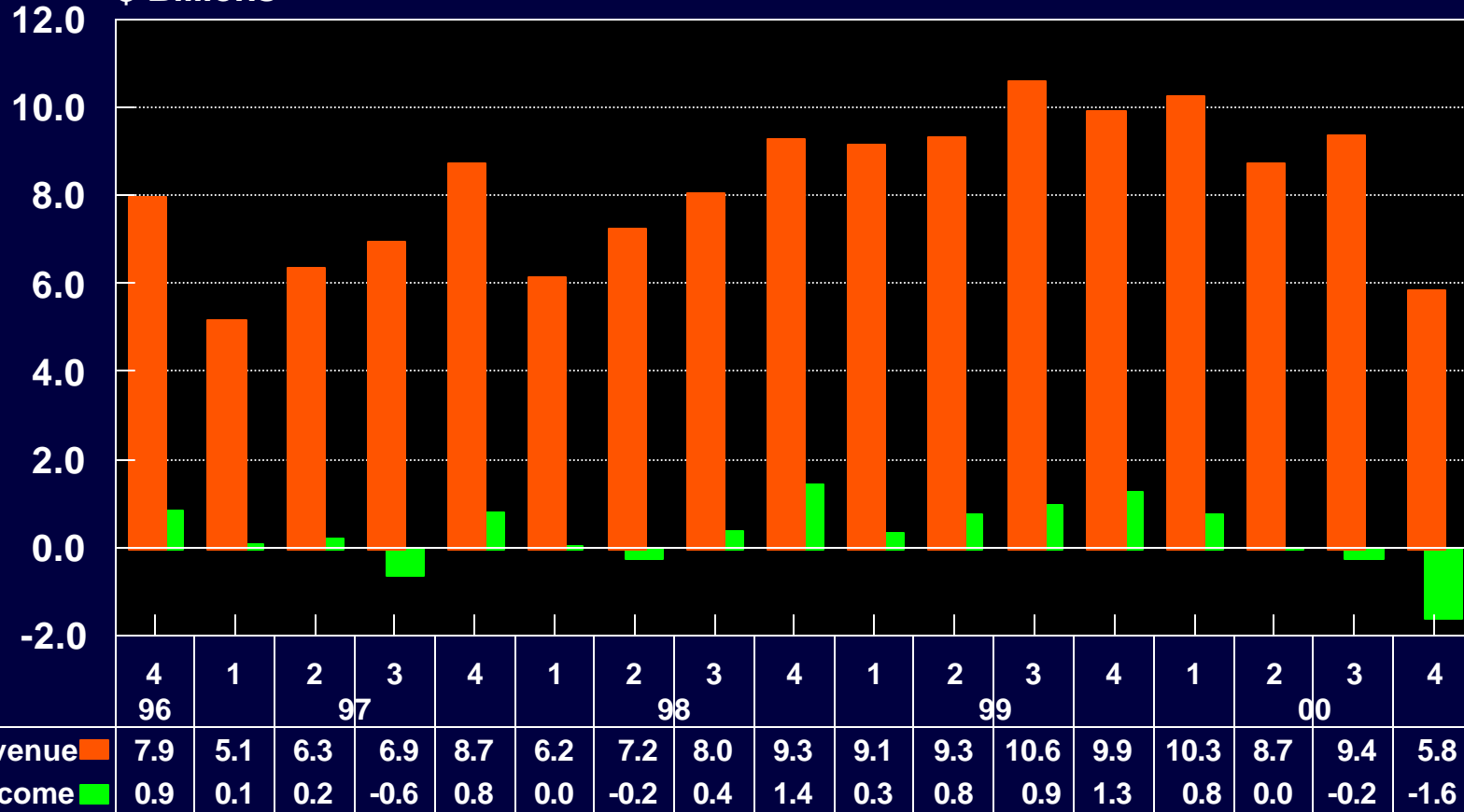
*** Alcatel 1999 figure re-established to exclude components business

Dataquest 2/2001

Lucent Technologies

Revenue & Net Income

\$ Billions



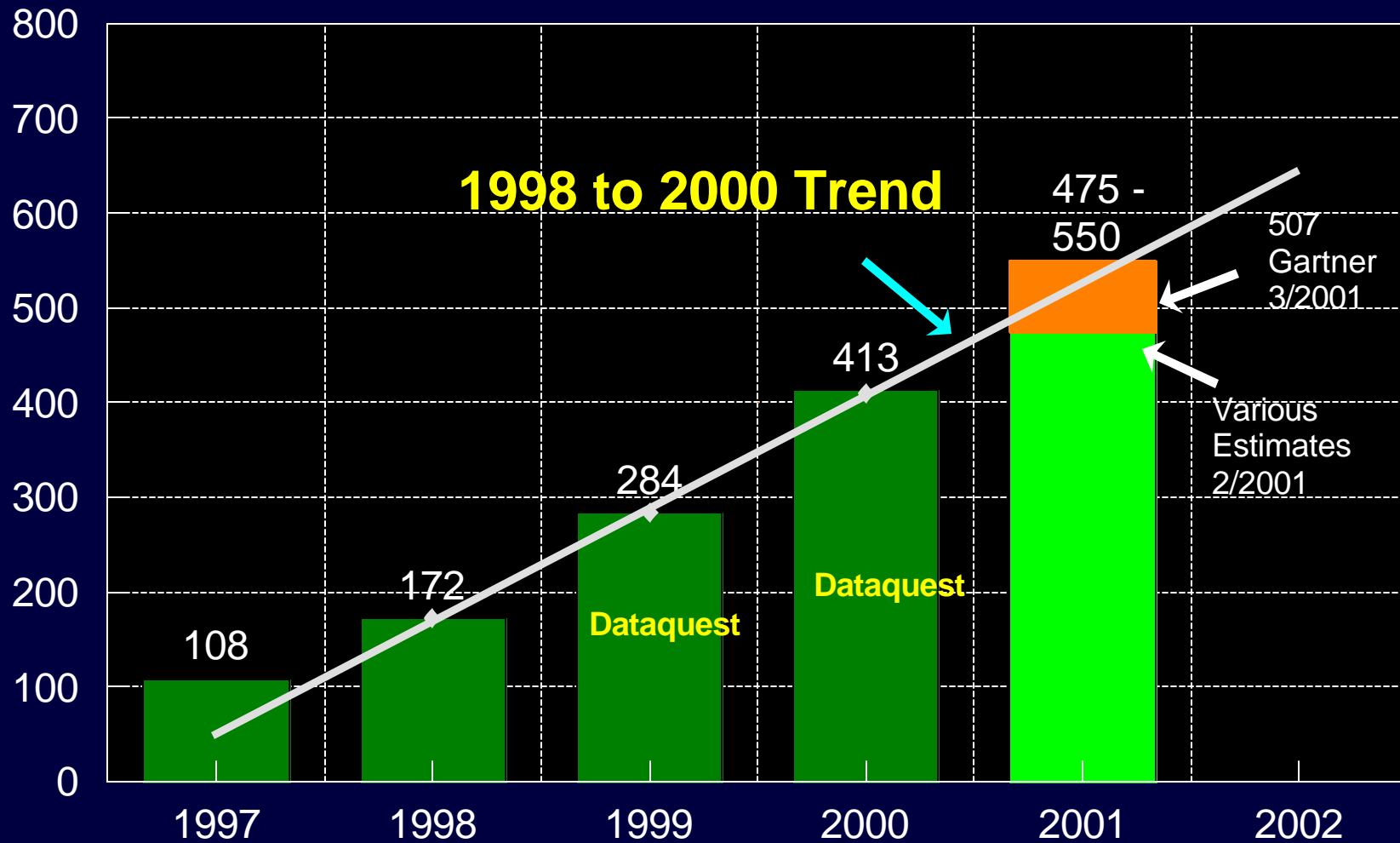
CY

FY ends September

LU

WORLD CELLULAR PHONE GROWTH

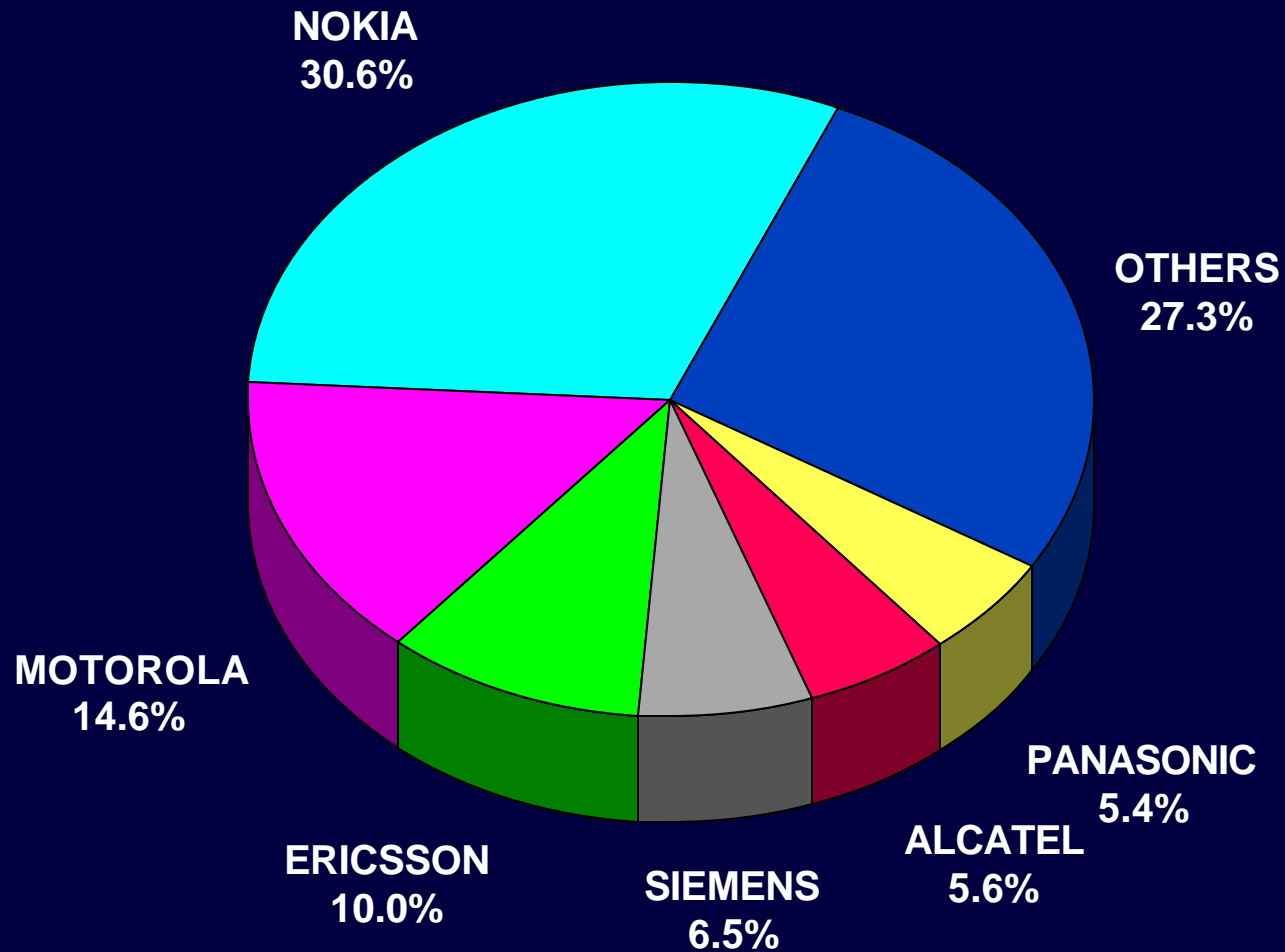
TOTAL SALES - ANALOG & DIGITAL



Dataquest 2/2000 & 2/2001; Nokia, Ericsson & others 2/2001, Gartner 3/2001

WORLD CELLULAR PHONE SALES

2000



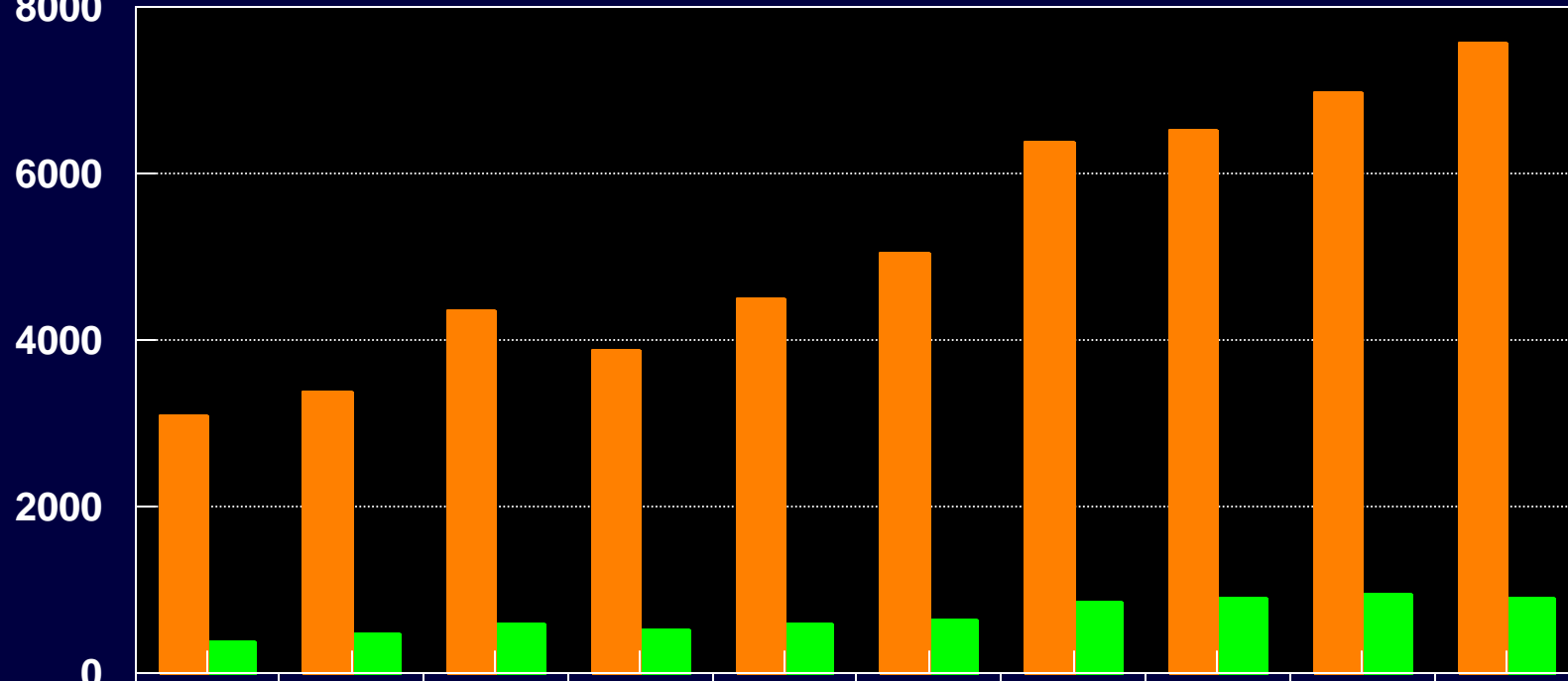
Dataquest 2/2001

TOTAL: 413 MILLION UNITS

Nokia

Revenue & Net Income

euro (millions)



Revenue ■
Income ■

	6	9	12	1	2	3	4	1	2	3
	98		99		00		01		03	
Revenue	3098	3375	4352	3870	4493	5037	6372	6537	6980	7575
Income	365	464	585	505	581	638	853	891	951	892

CY

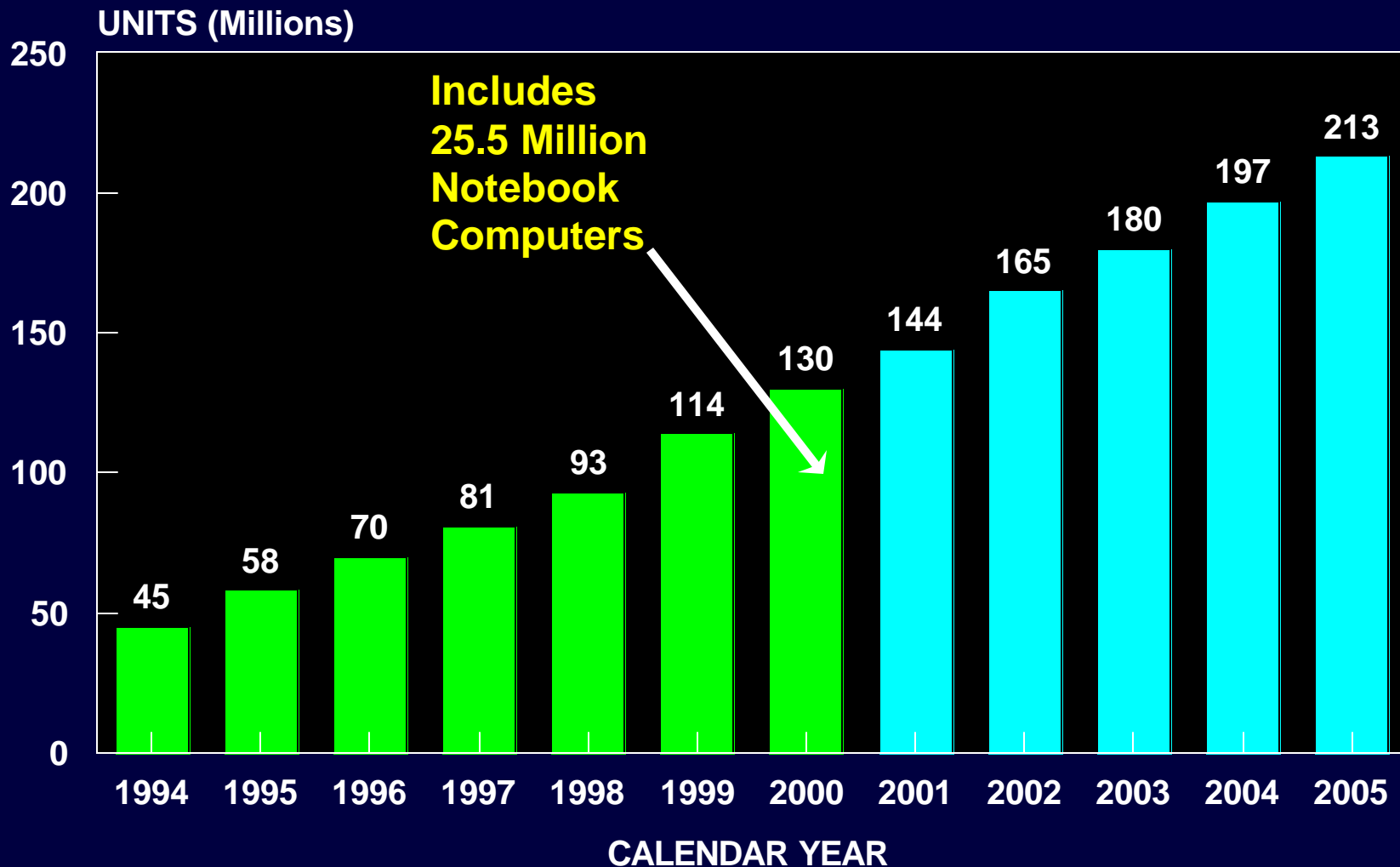
NOK

FY=CY

Computer & Office Equipment

PERSONAL COMPUTER GROWTH

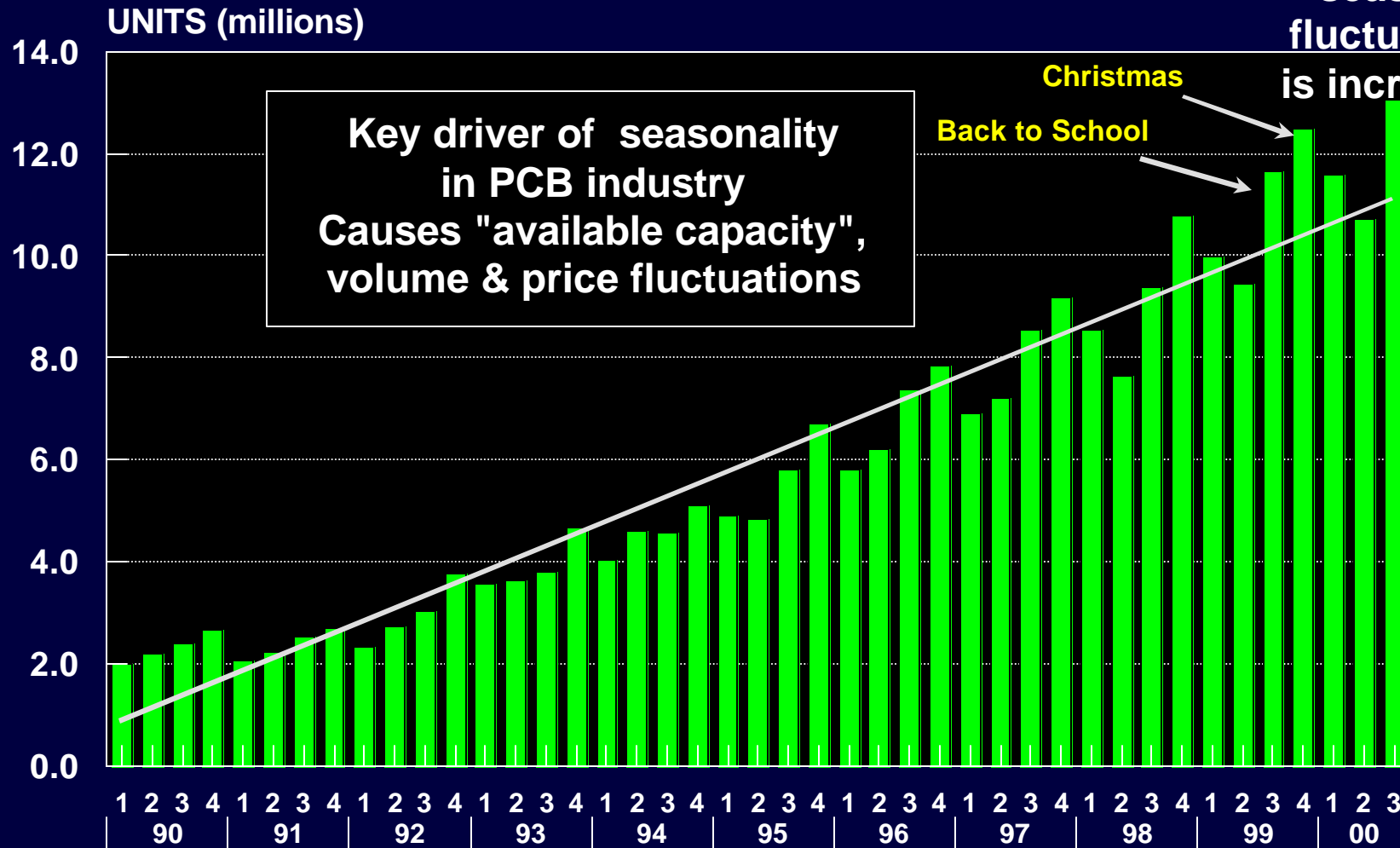
GLOBAL SALES



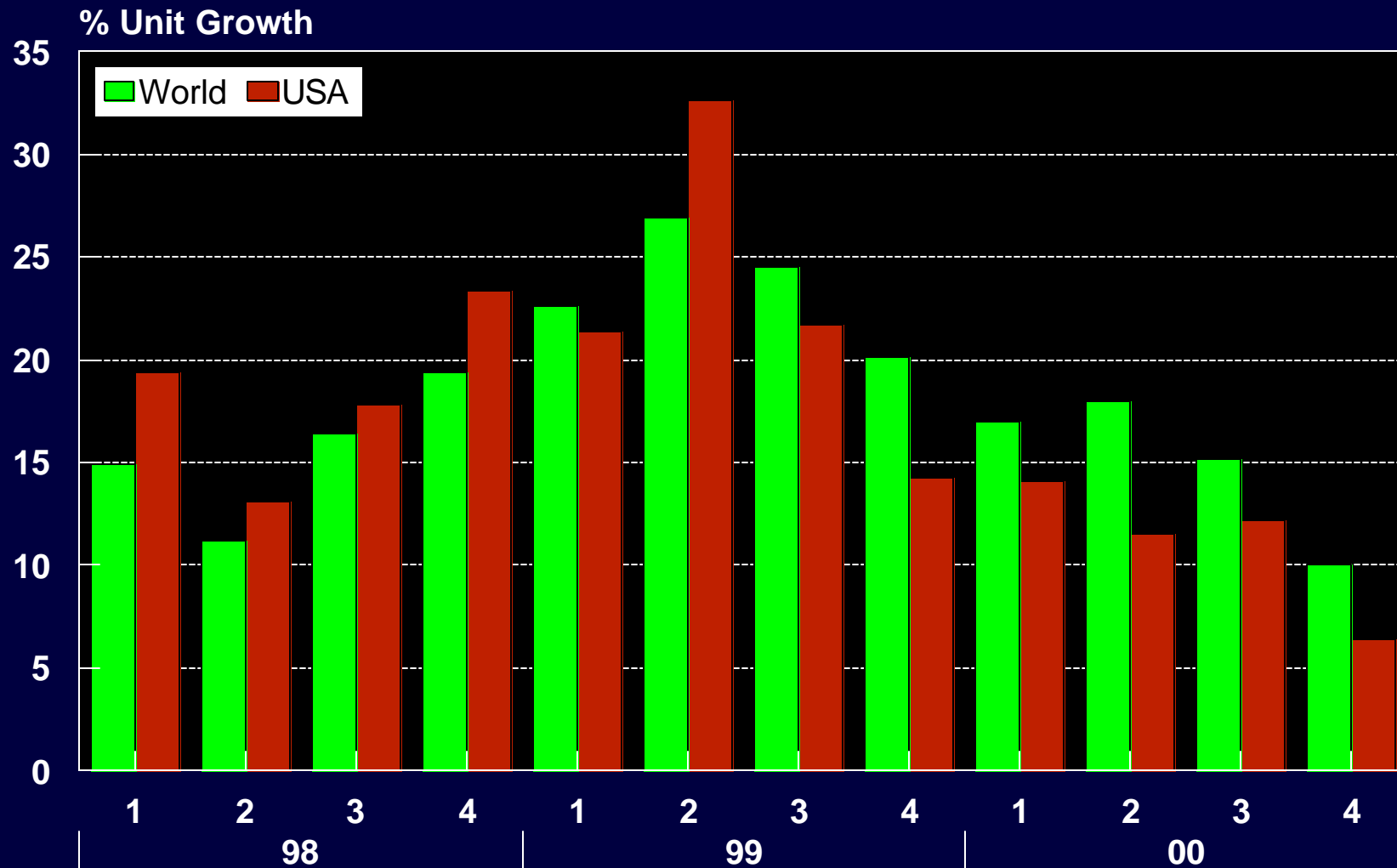
EBN:IDC, John Peedie Assoc 8/97, Dataquest 3/2001
Desktops, Notebooks, Ultraportables - does not include Servers

MICROCOMPUTER SHIPMENTS TO THE U.S.

Magnitude of seasonal fluctuations is increasing

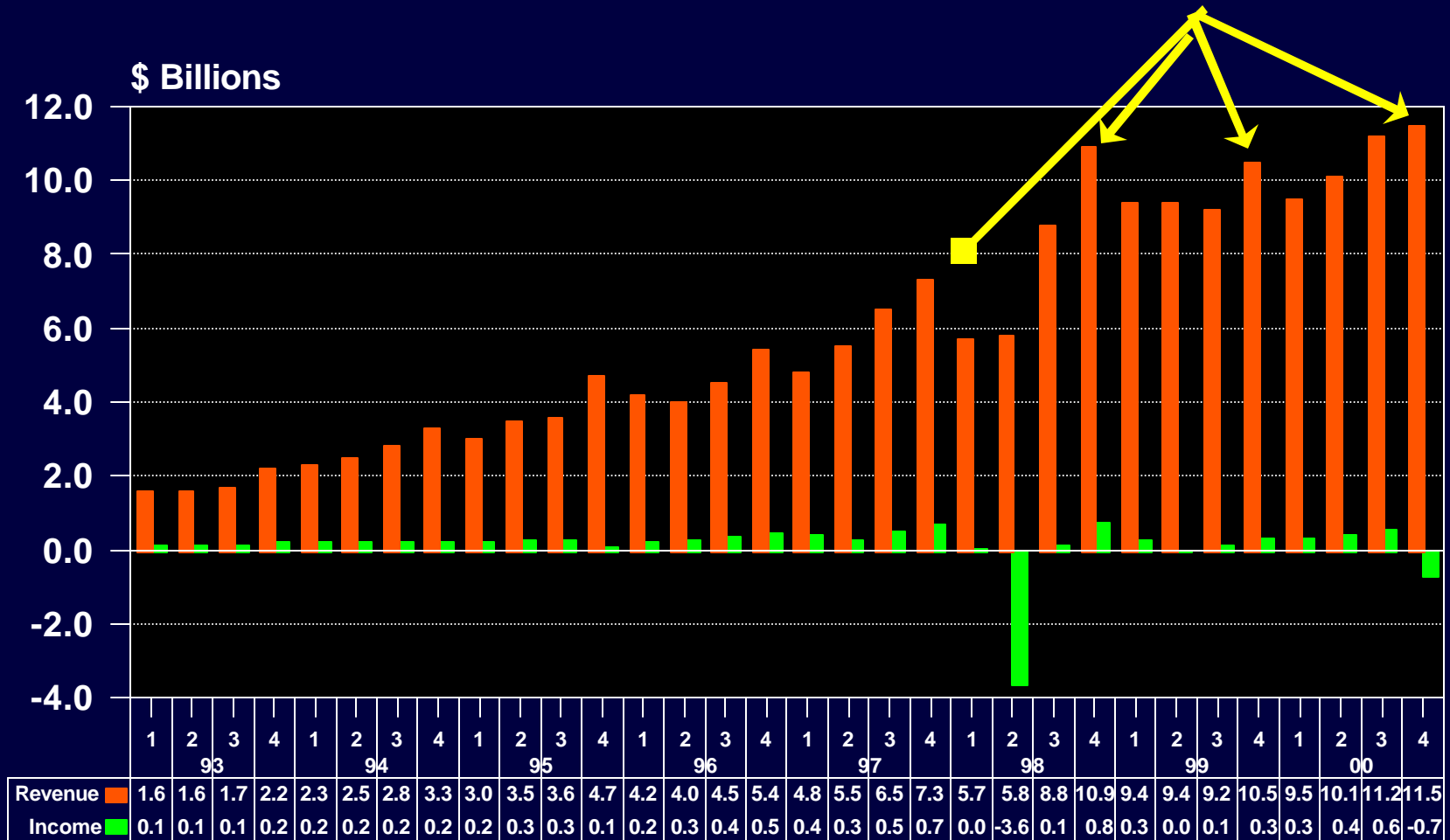


Personal Computer Market Growth World & USA



DataQuest 1/2001

Compaq Computer Revenue & Net Income



CY

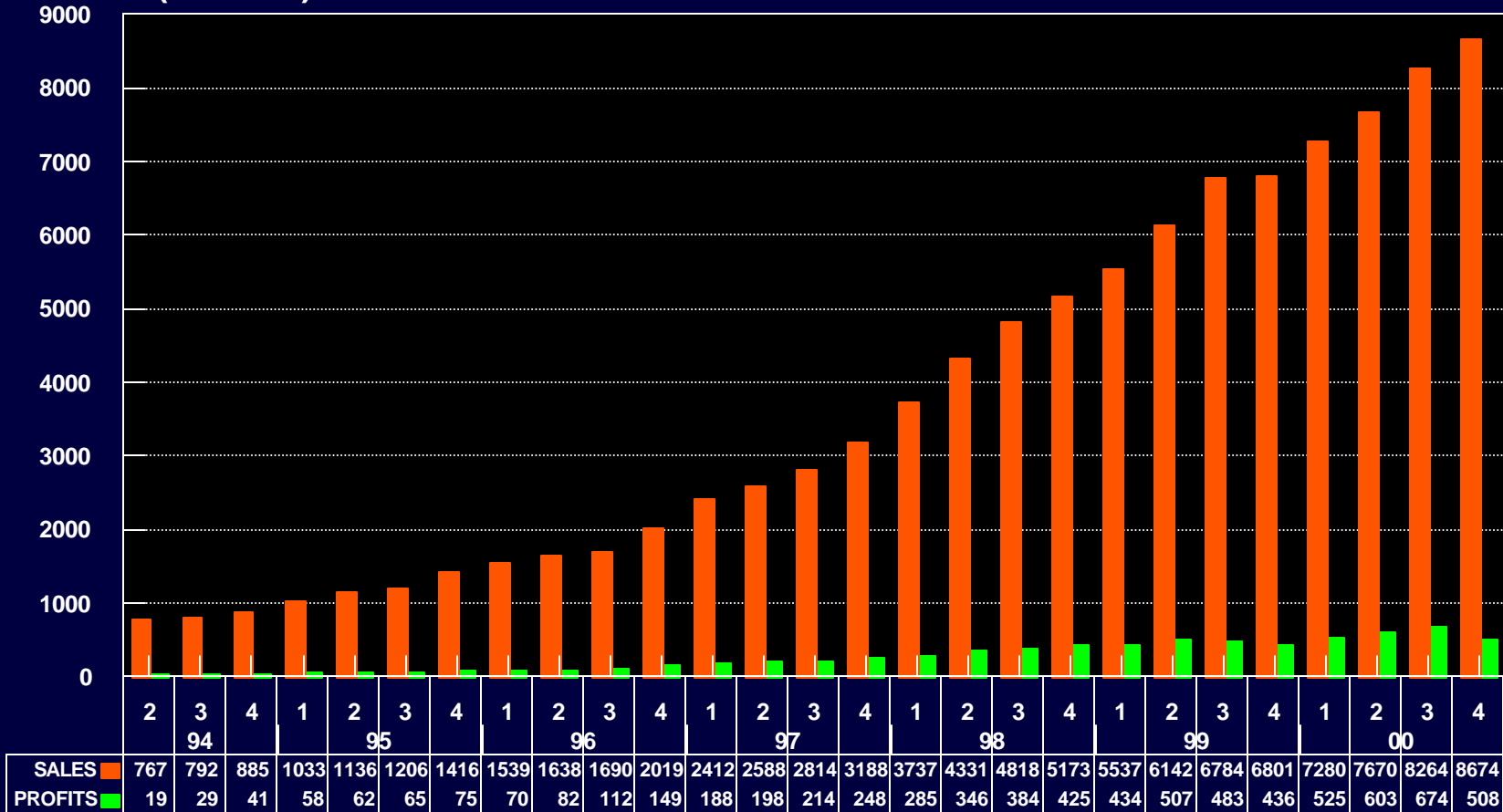
FY=CY

CPQ

DELL COMPUTER

Revenue & Net Income

\$ (Millions)



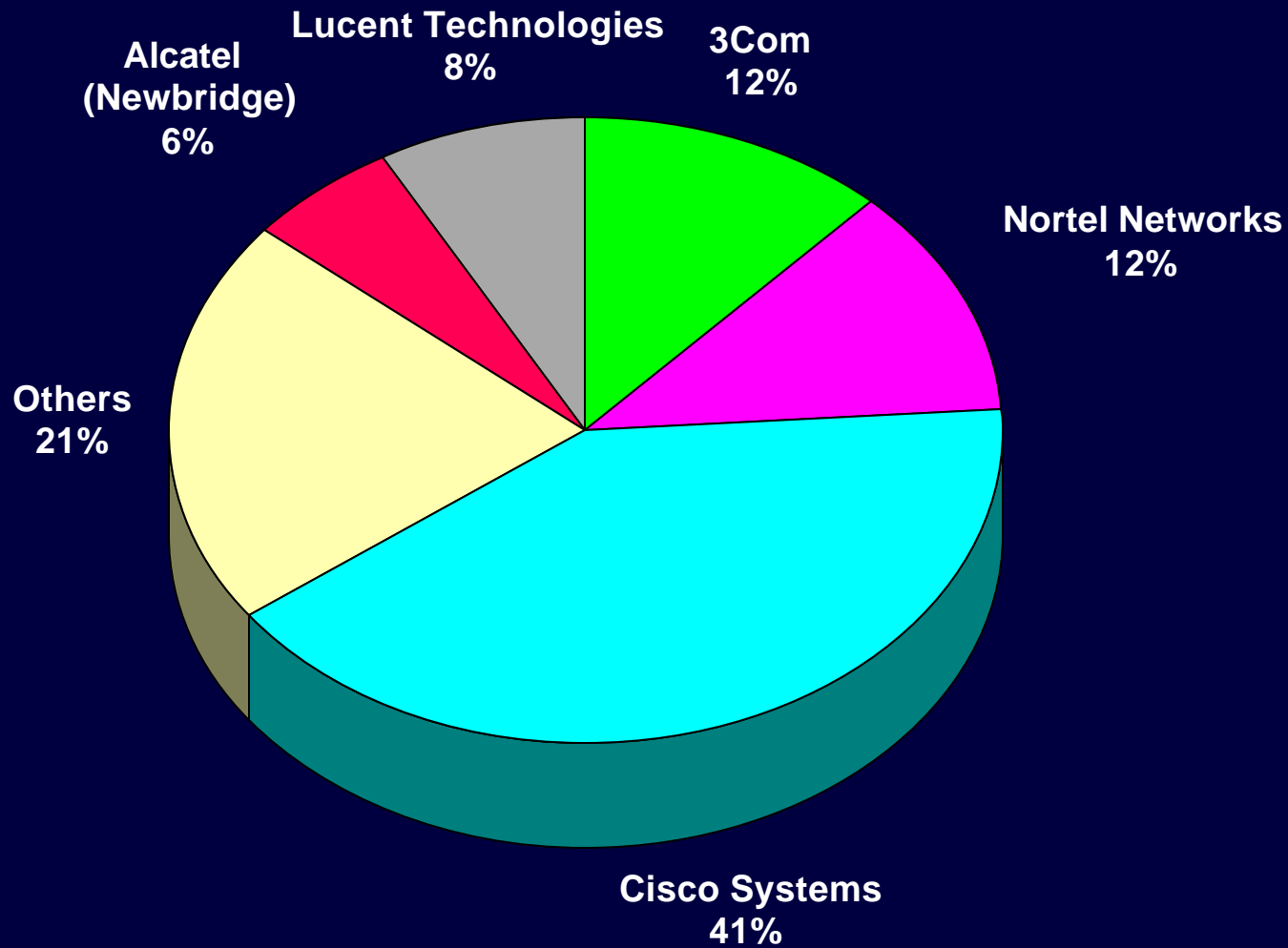
CY

FY ends October

DELL

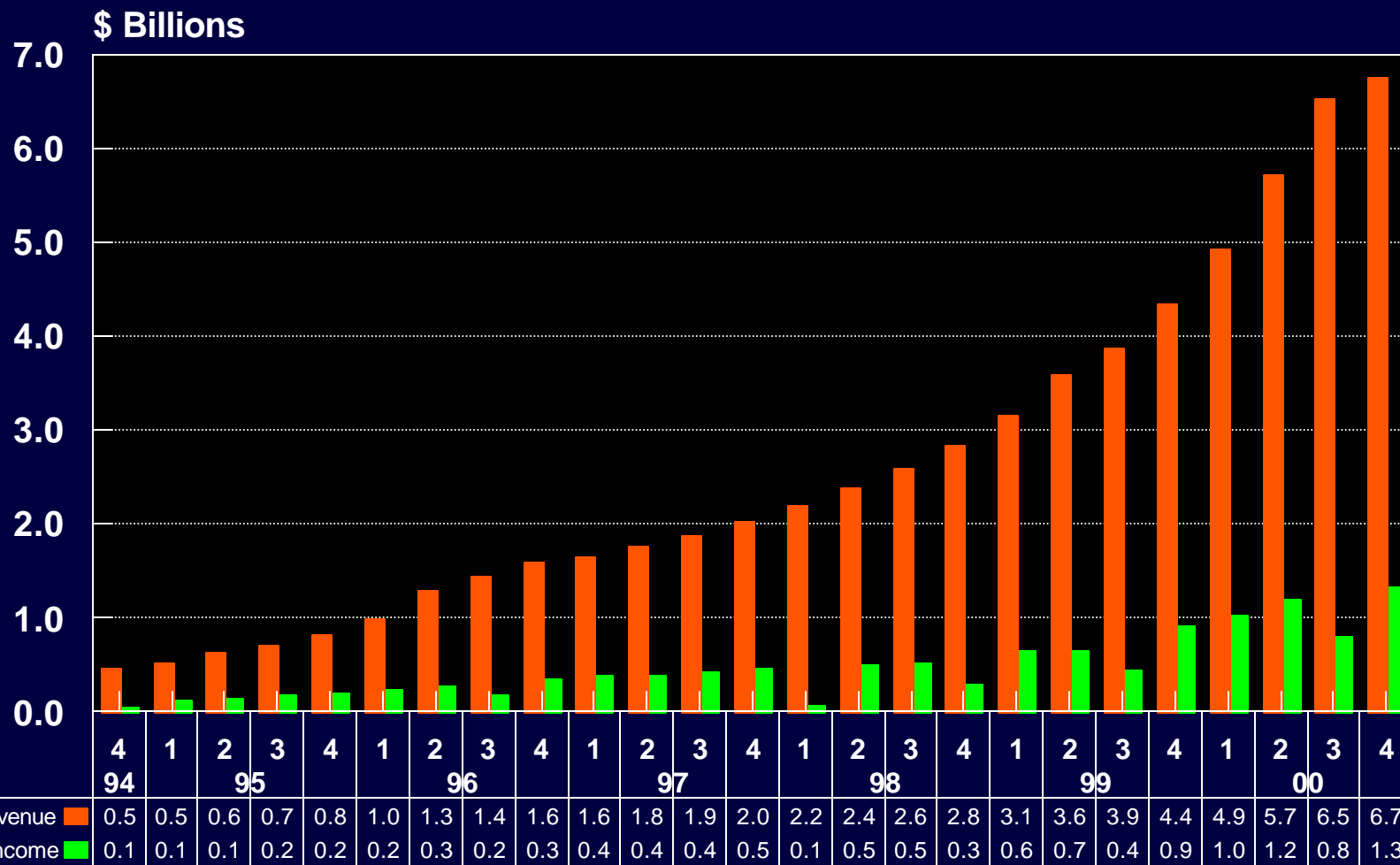
Networking Equipment Sales

1Q 2000



CISCO SYSTEMS

Revenue & Net Income

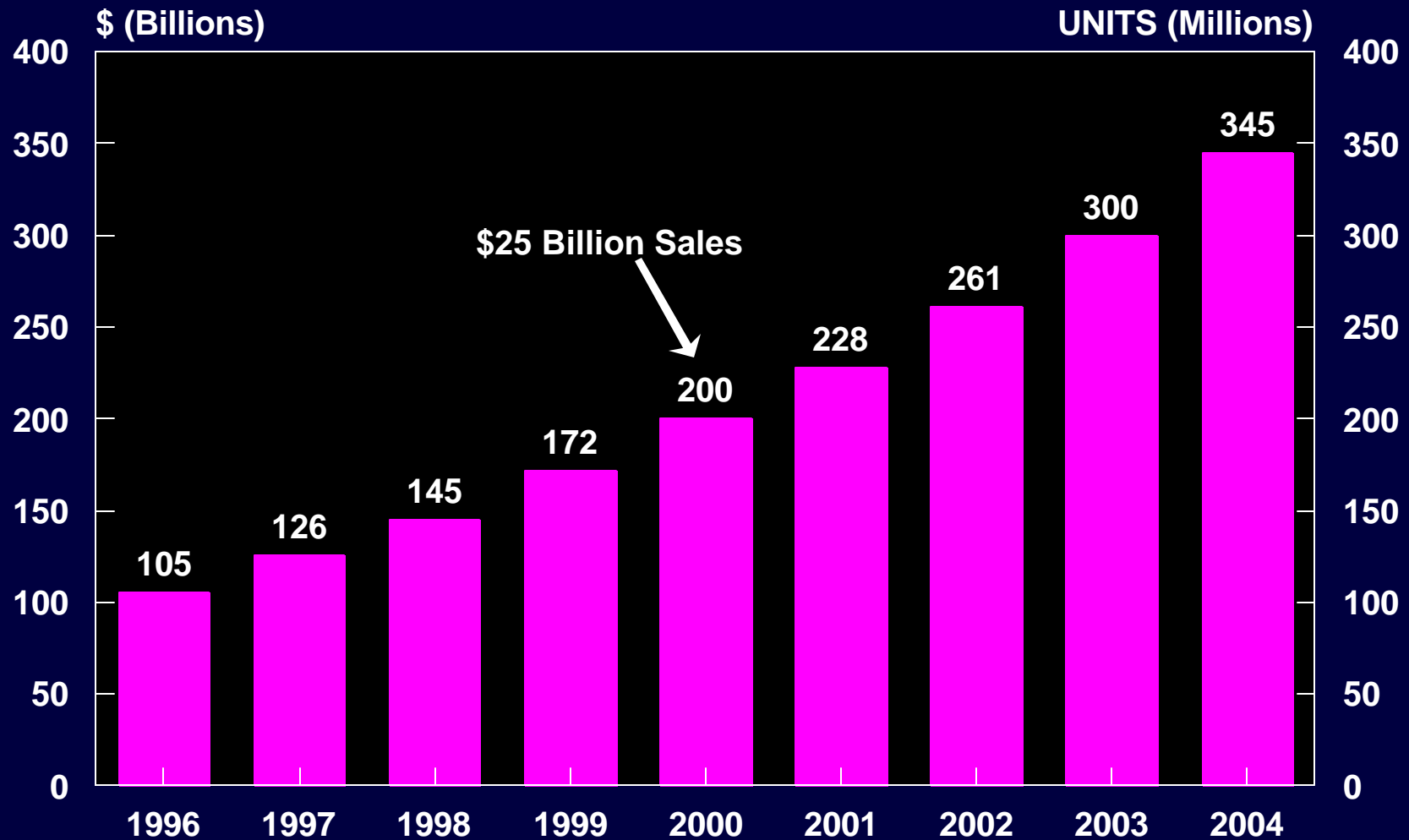


CY

CSCO

RIGID DISK DRIVES

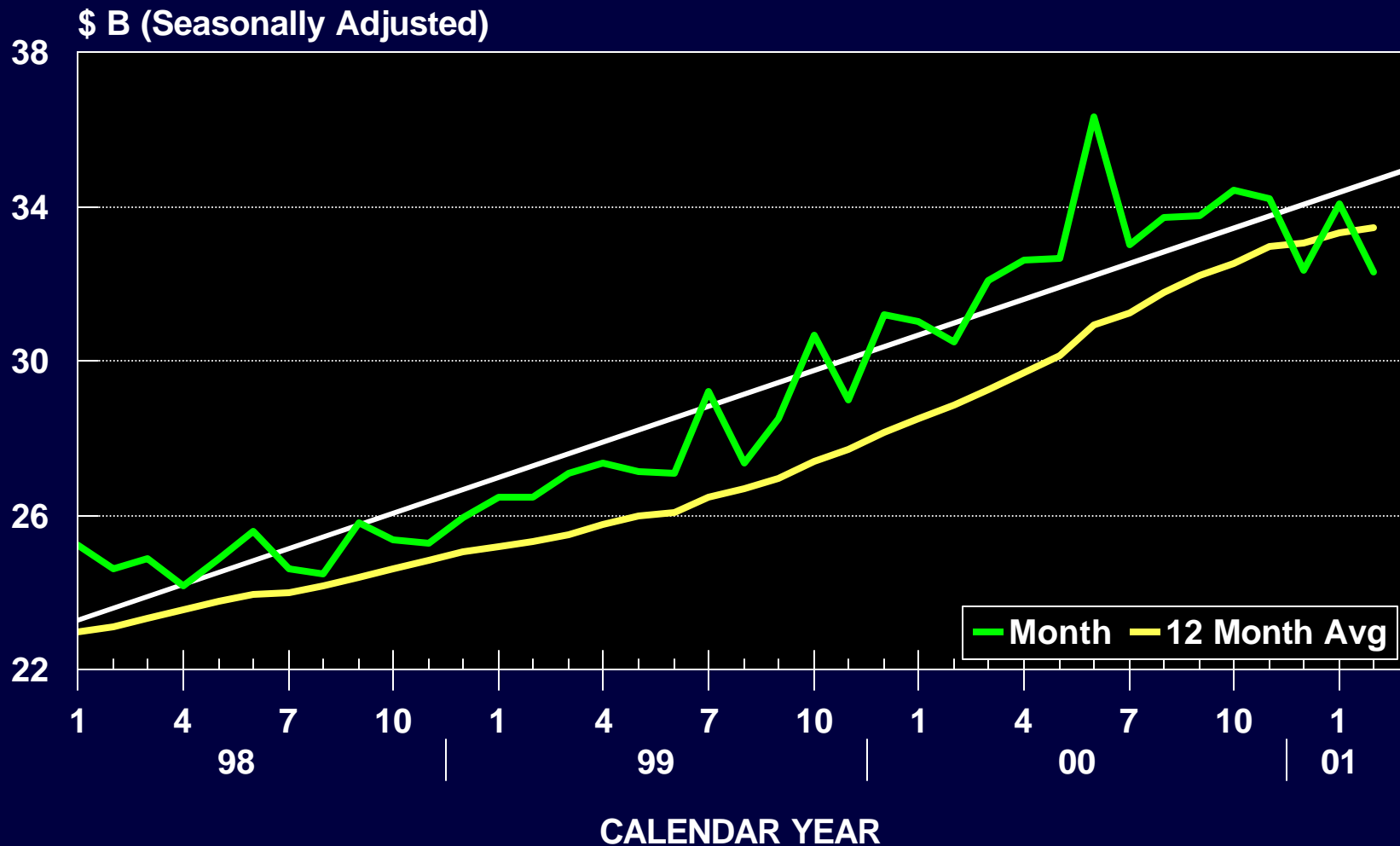
WORLDWIDE UNIT SHIPMENTS



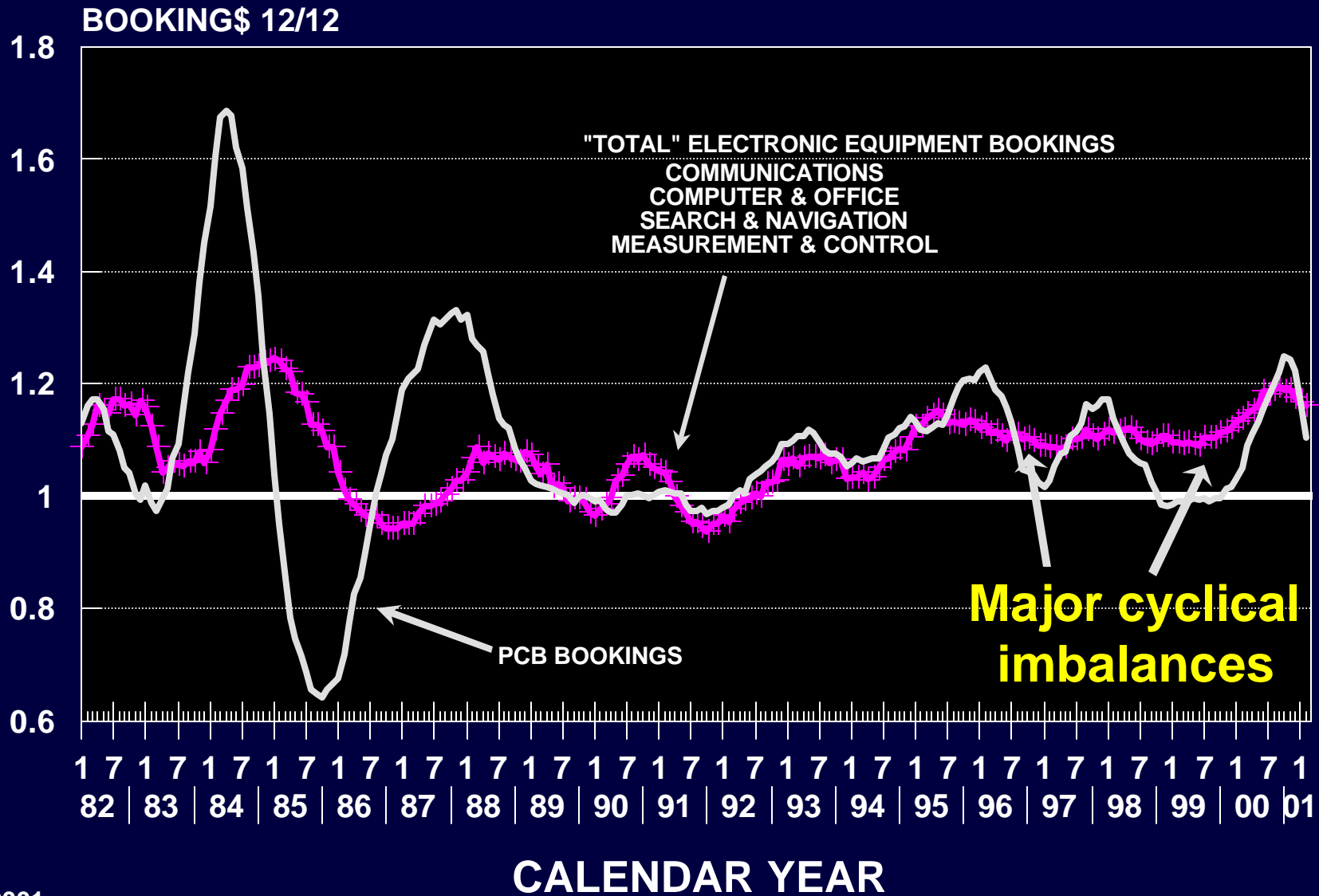
DISK/TREND 6/98, TrendFocus 2/99, Forward Concepts 4/2000, IDC 11/2000

Electronic Equipment Summary

TOTAL ELECTRONIC EQUIPMENT BOOKINGS



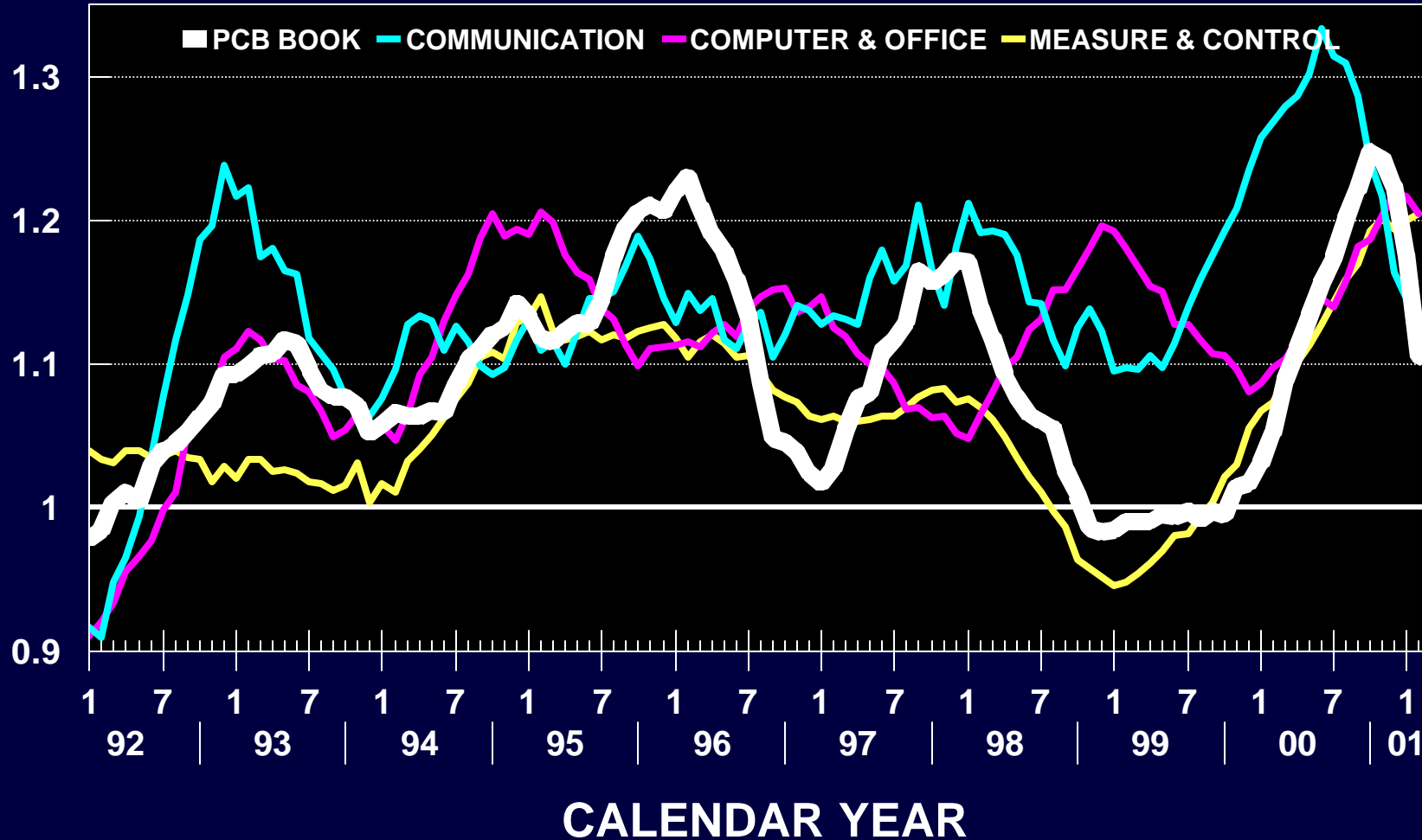
U.S. PCBs vs Total Electronic Equipment



PCBs vs ELECTRONIC EQUIPMENT

BOOKING \$

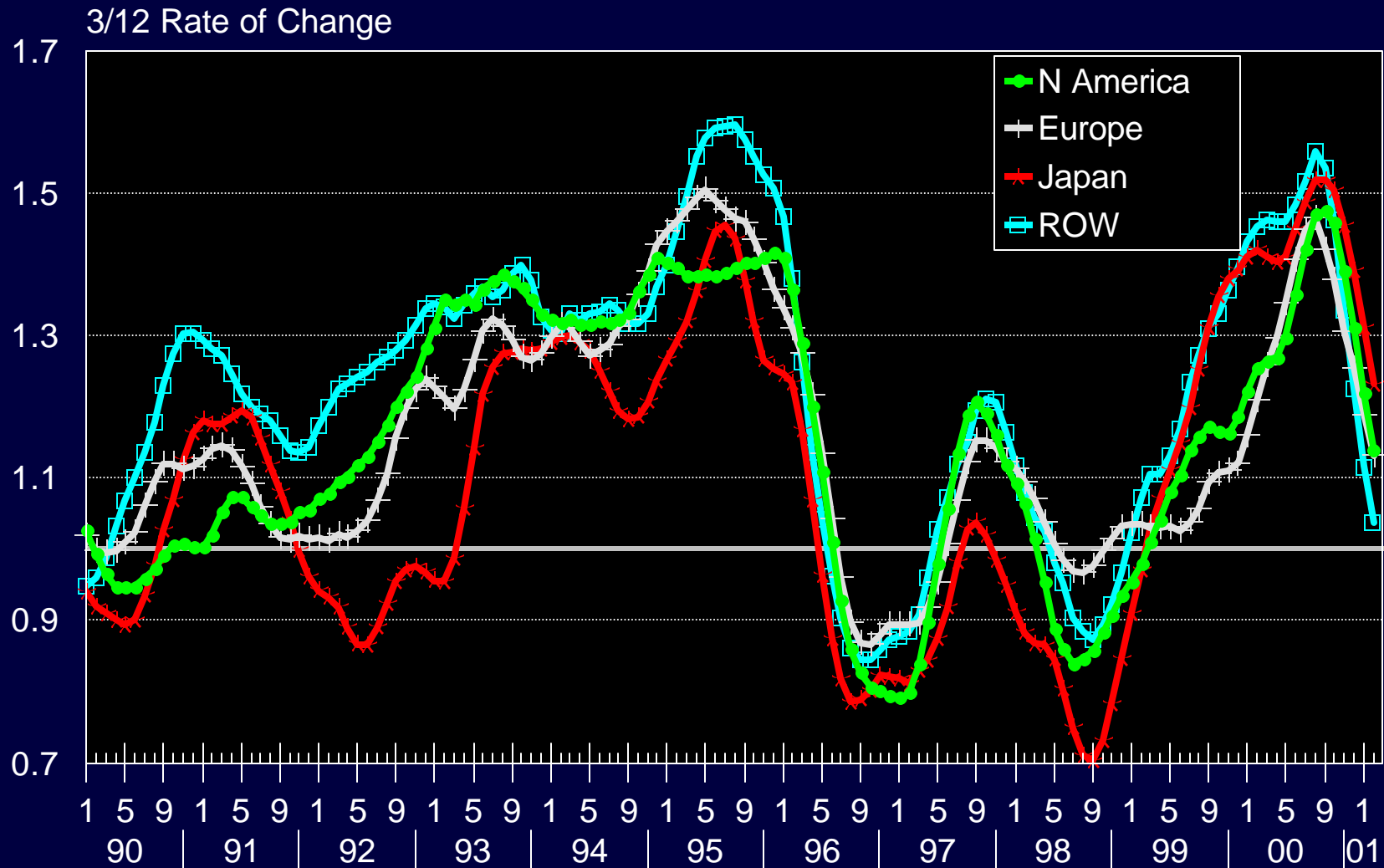
12/12 RATE OF CHANGE



Semiconductors

SEMICONDUCTOR GROWTH RATES

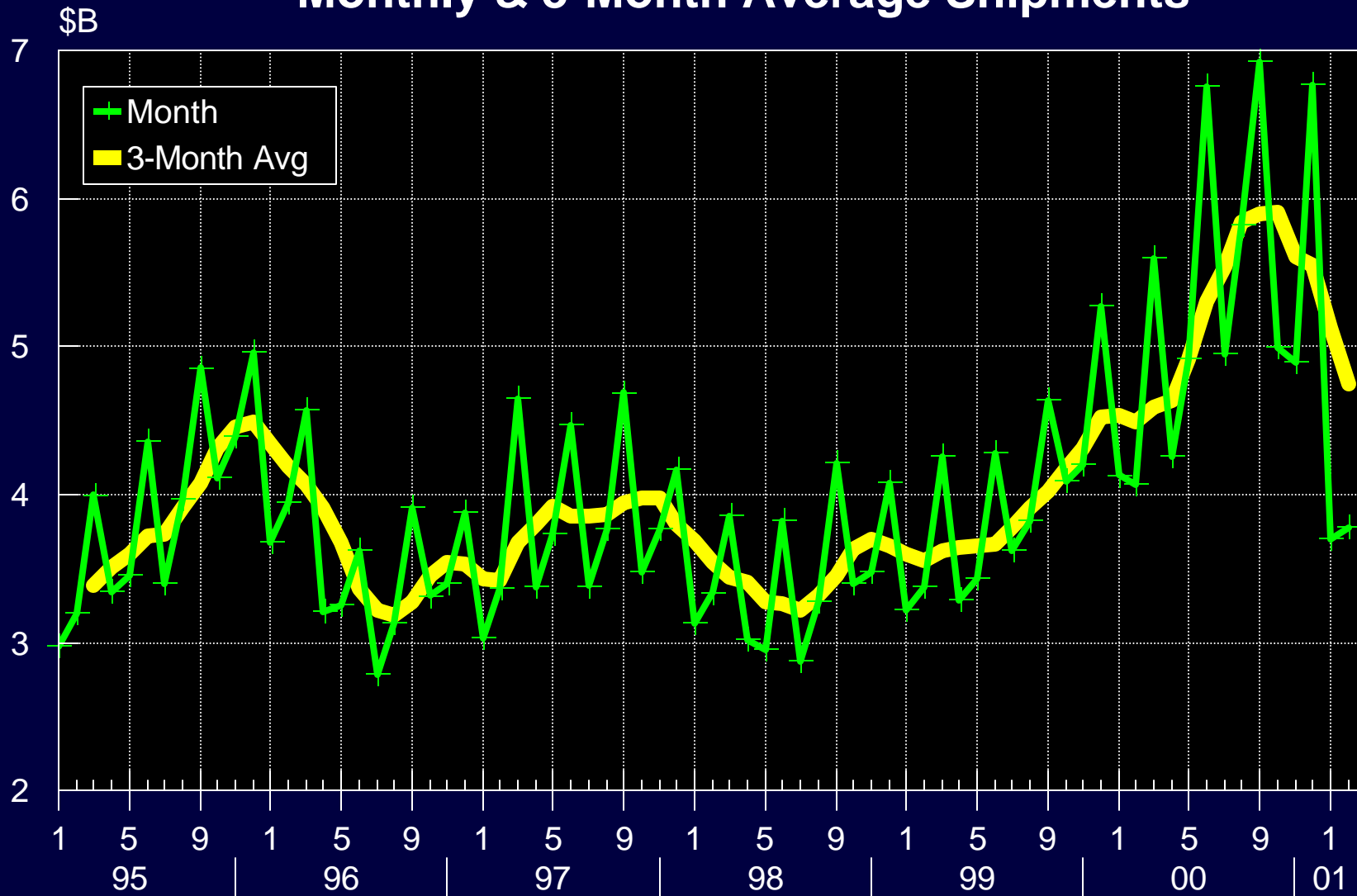
TOTAL \$ SHIPMENTS TO AN AREA



Total \$ Shipments From All Countries To An Area
SIA website: www.semichips.org/

N AMERICAN SEMICONDUCTOR SHIPMENTS

Monthly & 3-Month Average Shipments



SIA website: www.semichips.org/

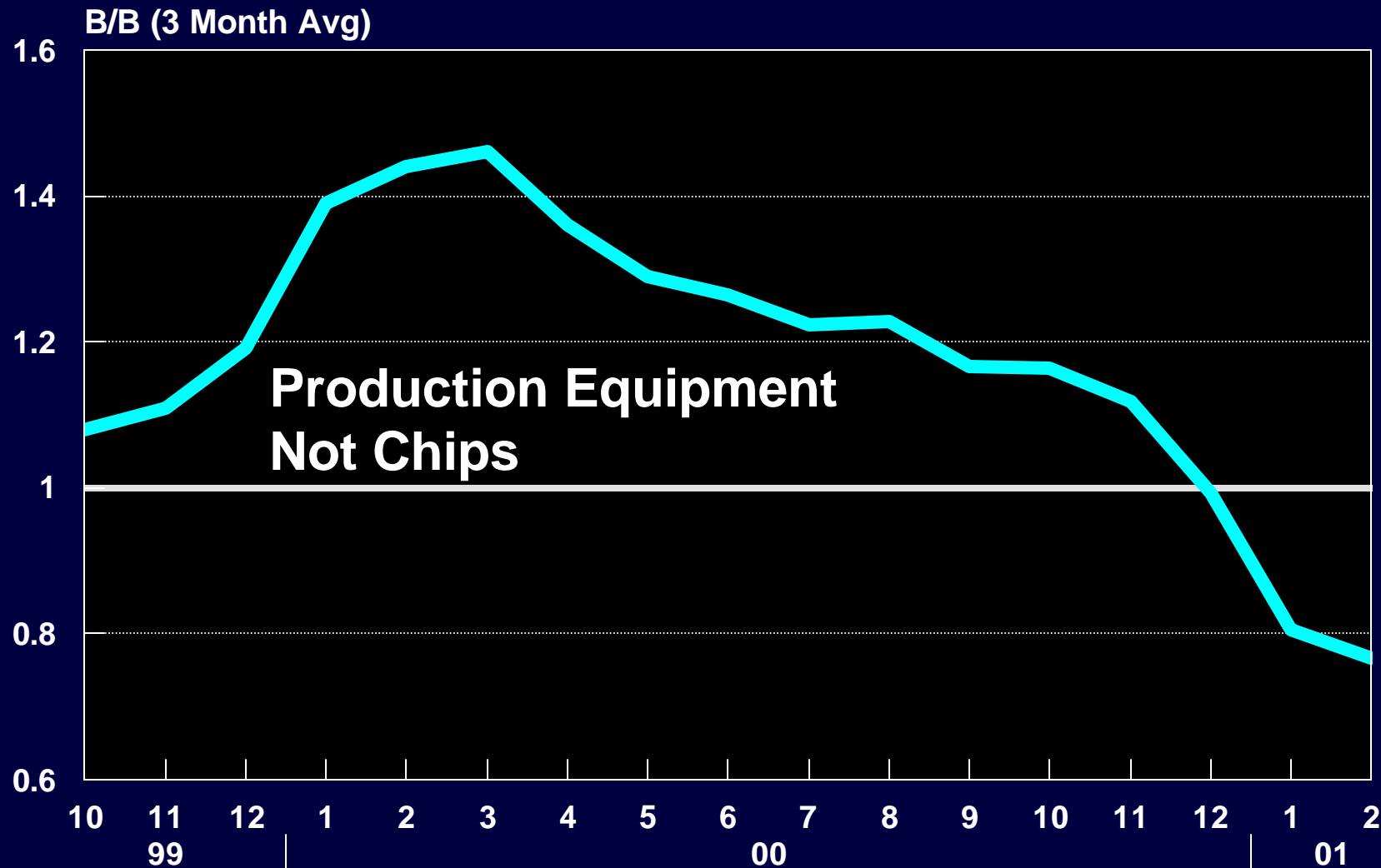
Top 10 Semiconductor Equipment Suppliers

2000 Sales in \$Billion

		<u>2000/1999 % Growth</u>
Applied Materials	10.460	89%
Tokyo Electron Ltd.	5.142	89%
Nikon	2.432	70%
Teradyne	2.044	69%
ASM Lithography	2.016	58%
KLA-Tencor	2.003	91%
Advantest	1.865	95%
Lam Research	1.627	82%
Canon	1.418	90%
Dainippon Screen	1.390	115%

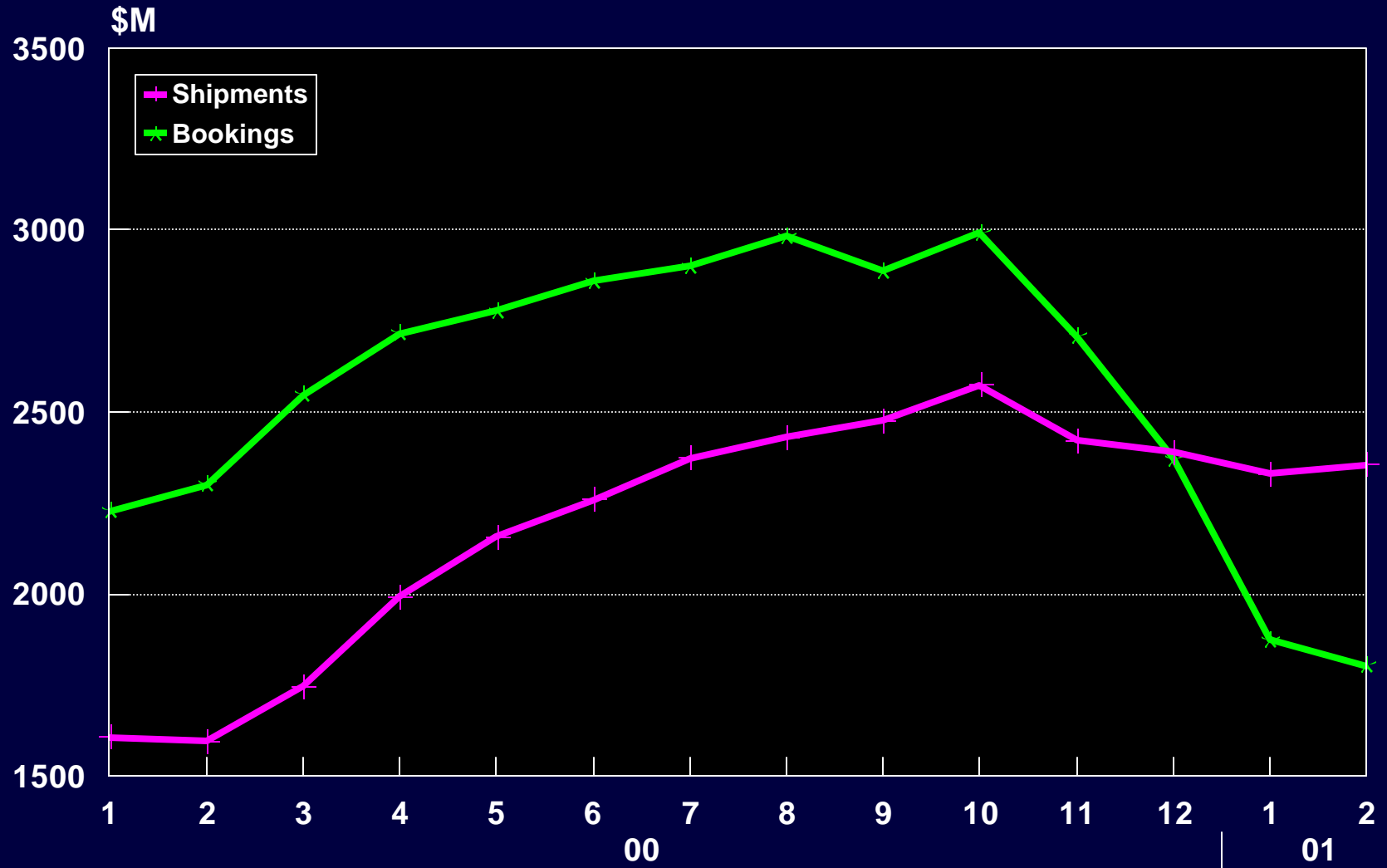
Source: VLSI Research Inc. 2/2001

N American Semiconductor Equipment Industry Book/Bill Ratio



SOURCE Semiconductor Equipment and Materials International
<http://www.semi.org>

N American Semiconductor Equipment Industry Shipments & Orders

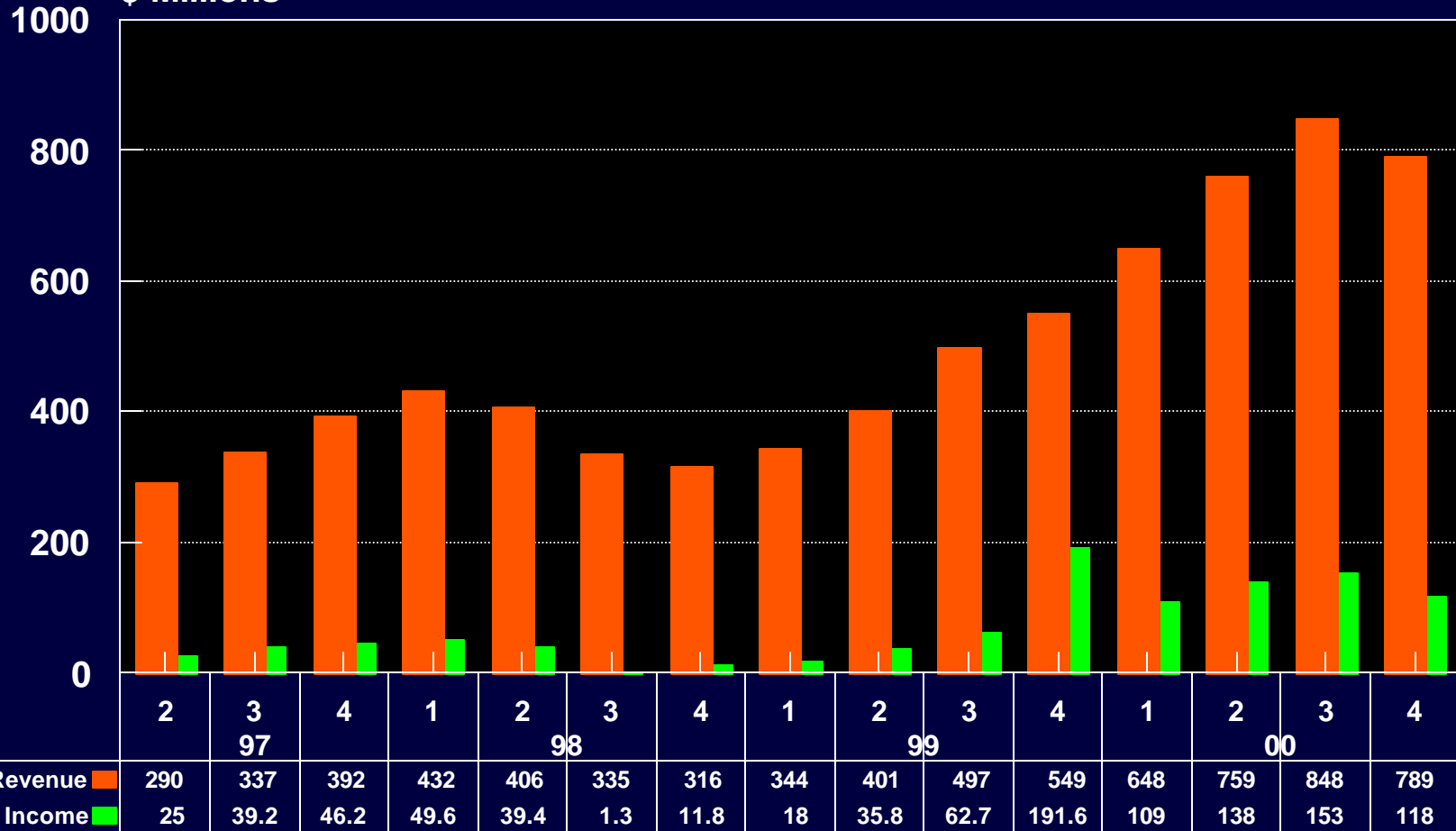


SOURCE Semiconductor Equipment and Materials International
<http://www.semi.org>

Teradyne

Revenue & Net Income

\$ Millions

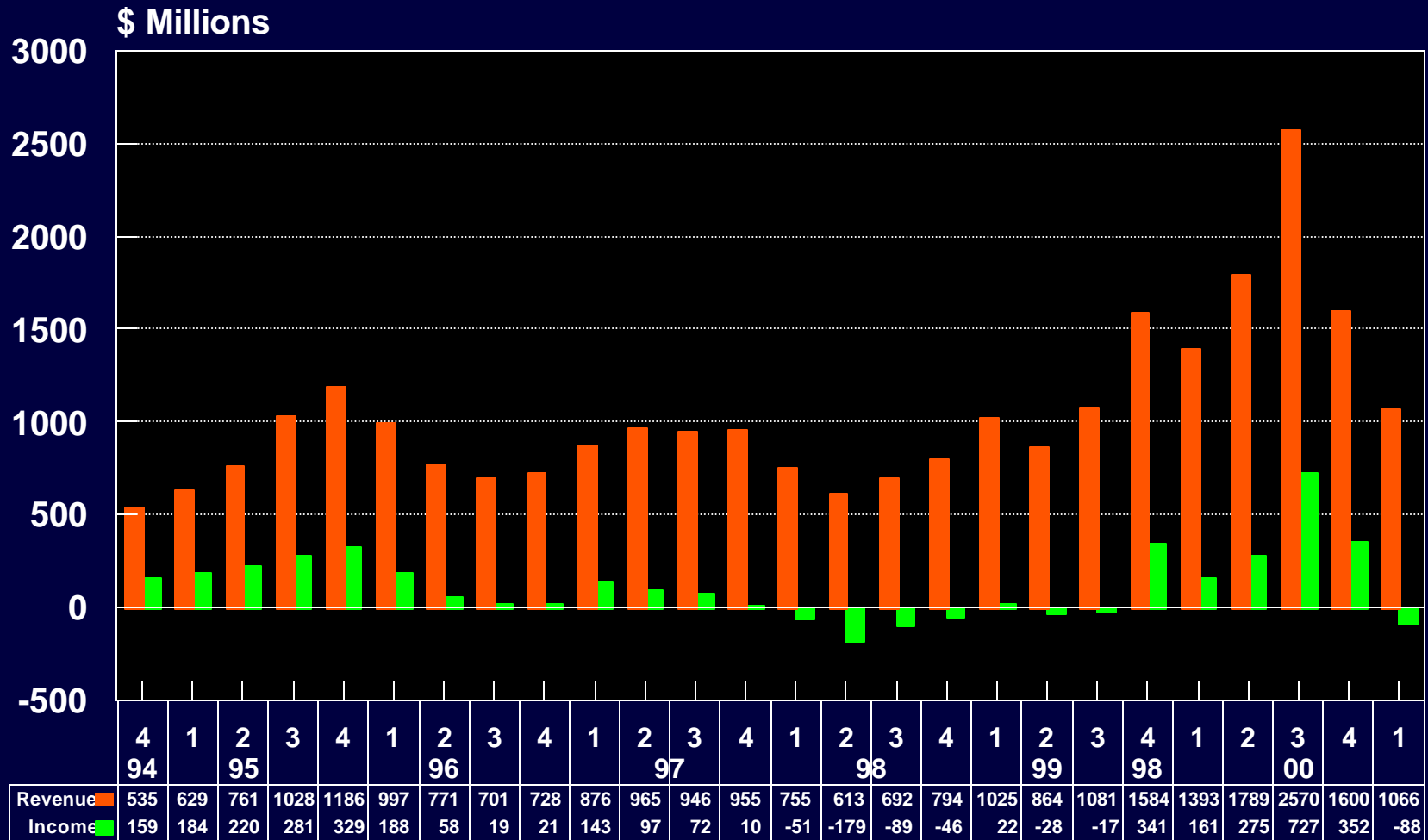


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TER

MICRON TECHNOLOGY

Revenue & Net Income

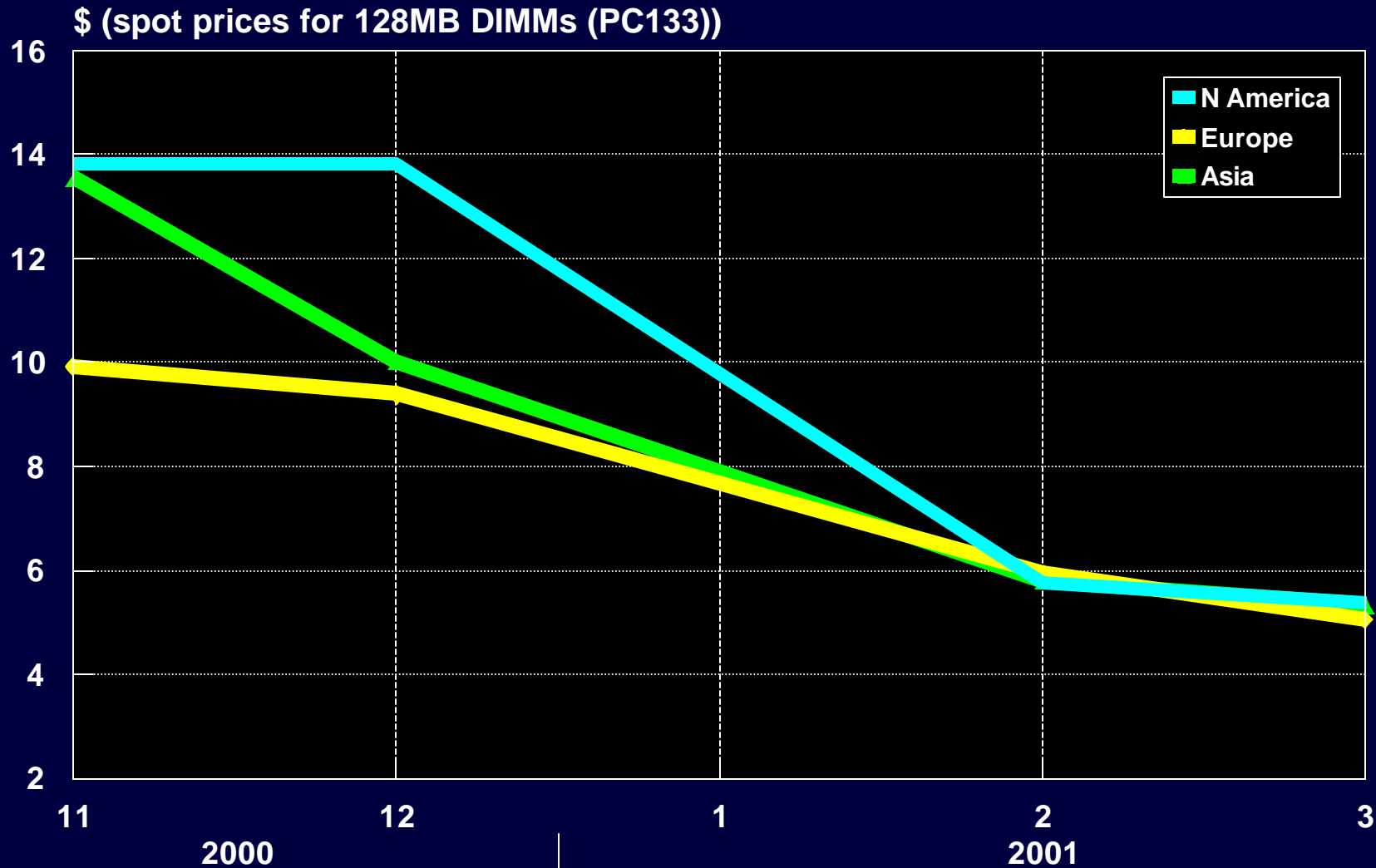


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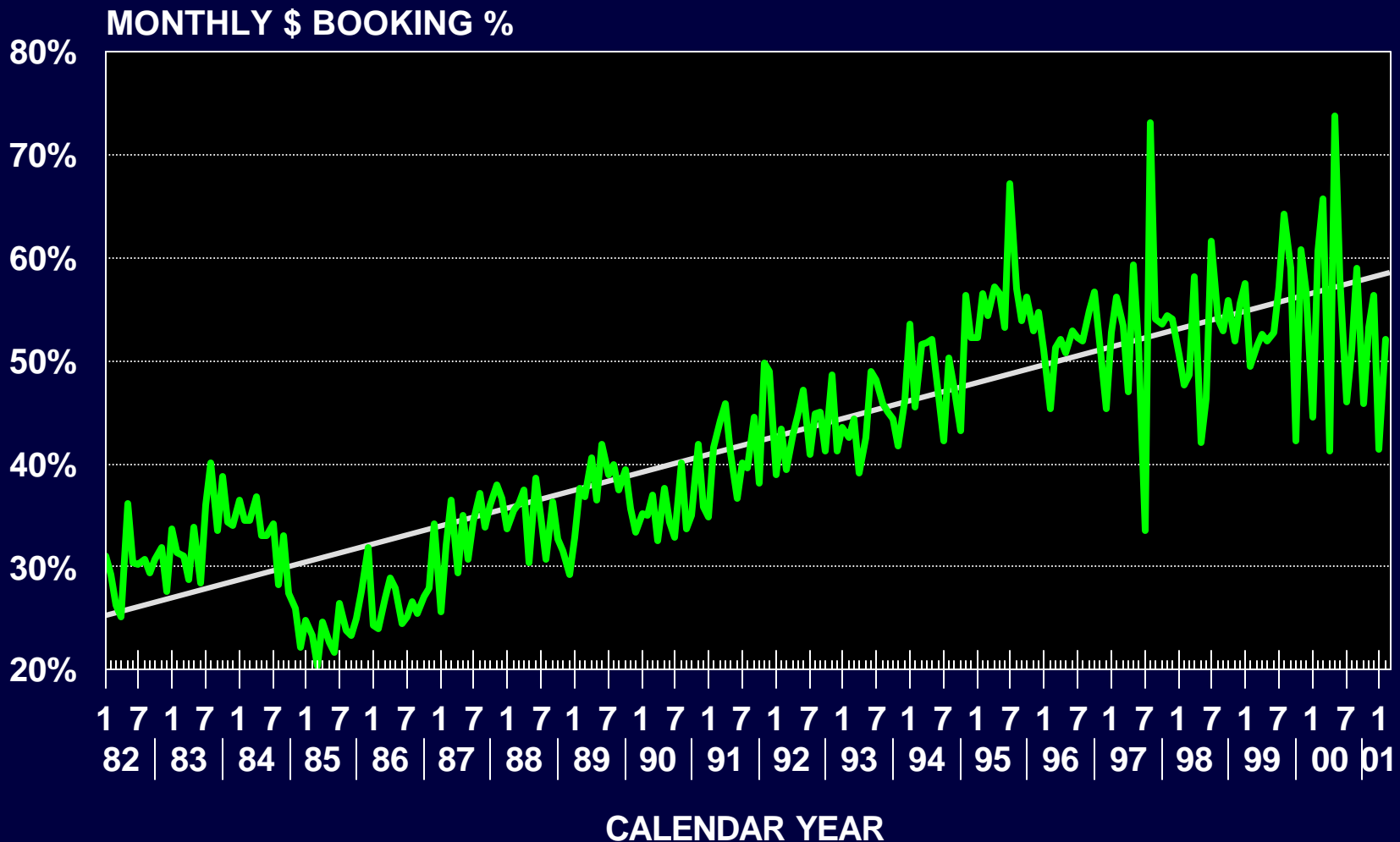
MU

DRAM Prices

30-Day Rolling Averages of 128Mb DRAMs (PC133, 16M x 8)



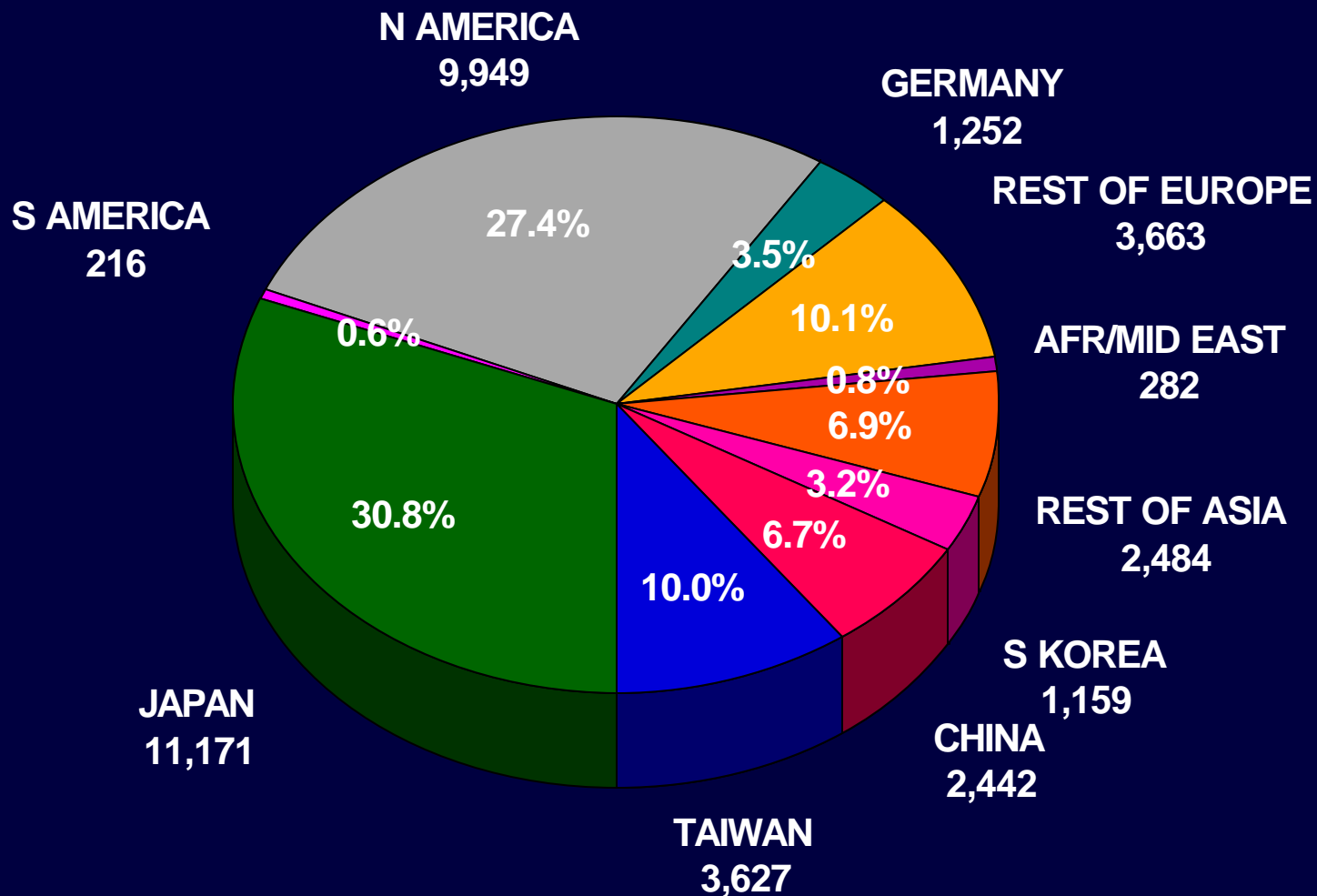
ELECTRONIC COMPONENT "PERCENTAGE" OF ELECTRONIC EQUIPMENT



PCB Fabrication

1999 WORLD RIGID & FLEX PCB PRODUCTION

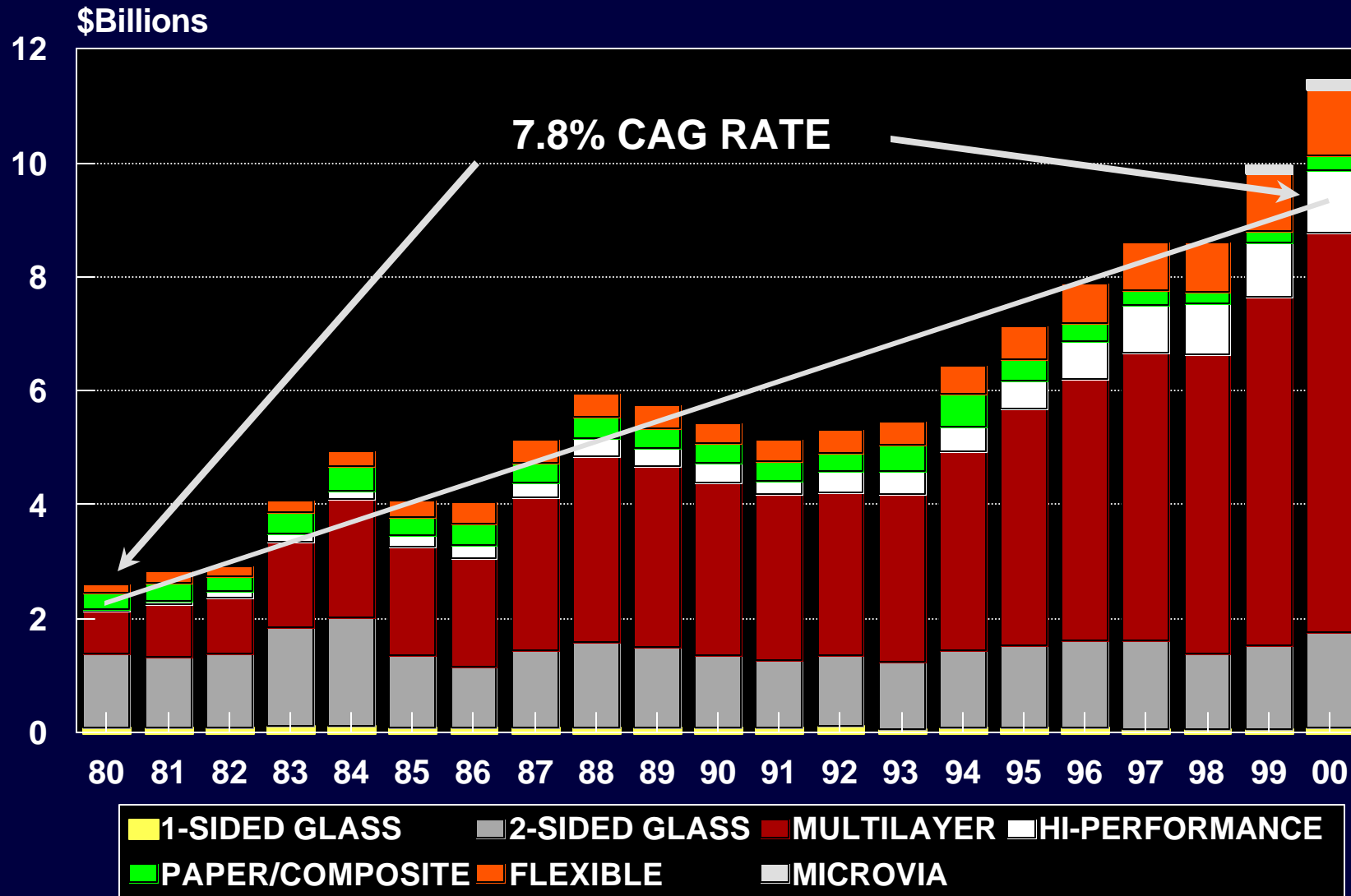
BY GEOGRAPHICAL AREA (\$M)



Total: \$36.2 Billion

IPC T/MRC 6/2000 (includes Buildup PCBs)

N. AMERICAN PCB SHIPMENTS

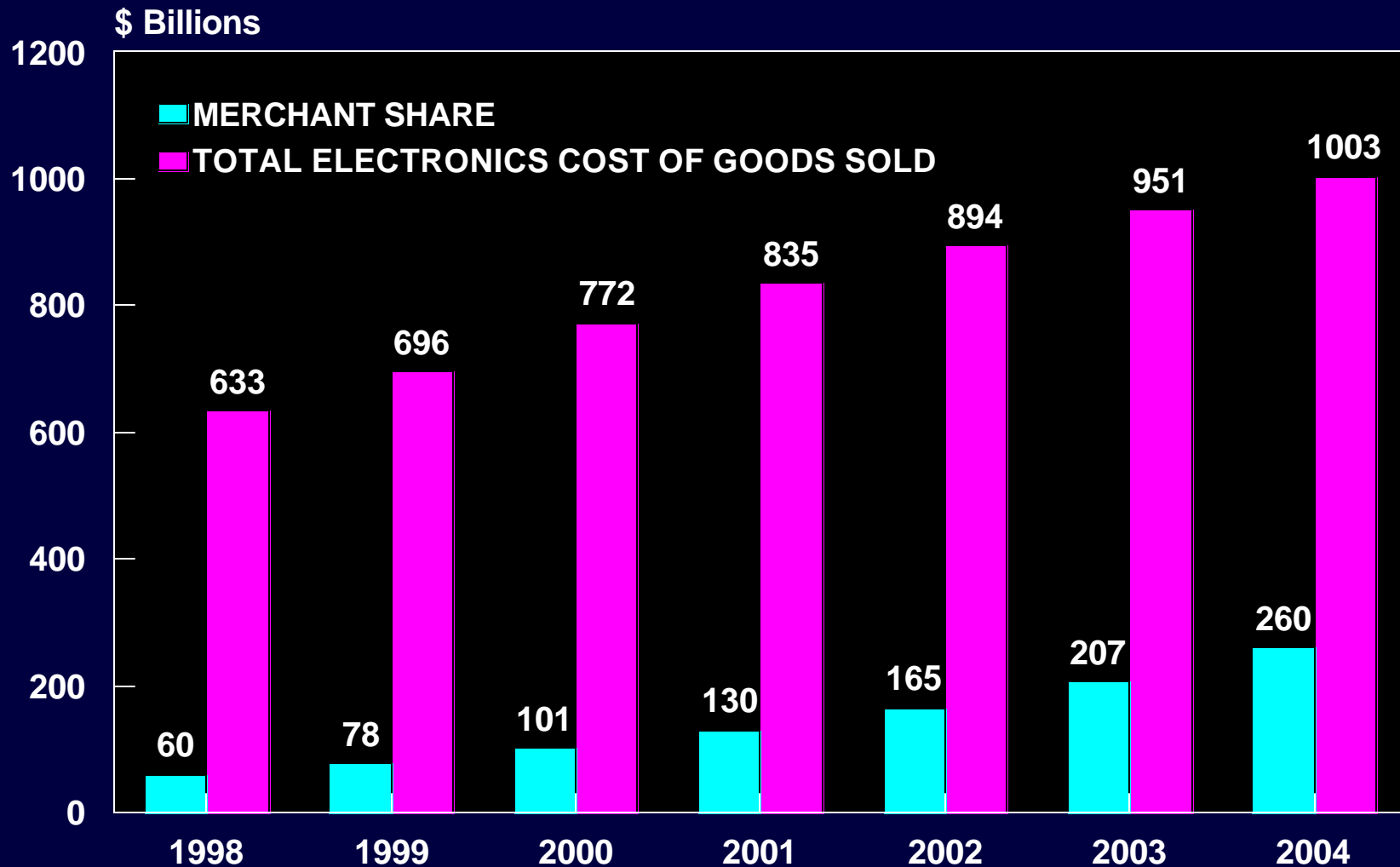


IPC T/MRC 6/2000 + Custer Forecast 10/2000

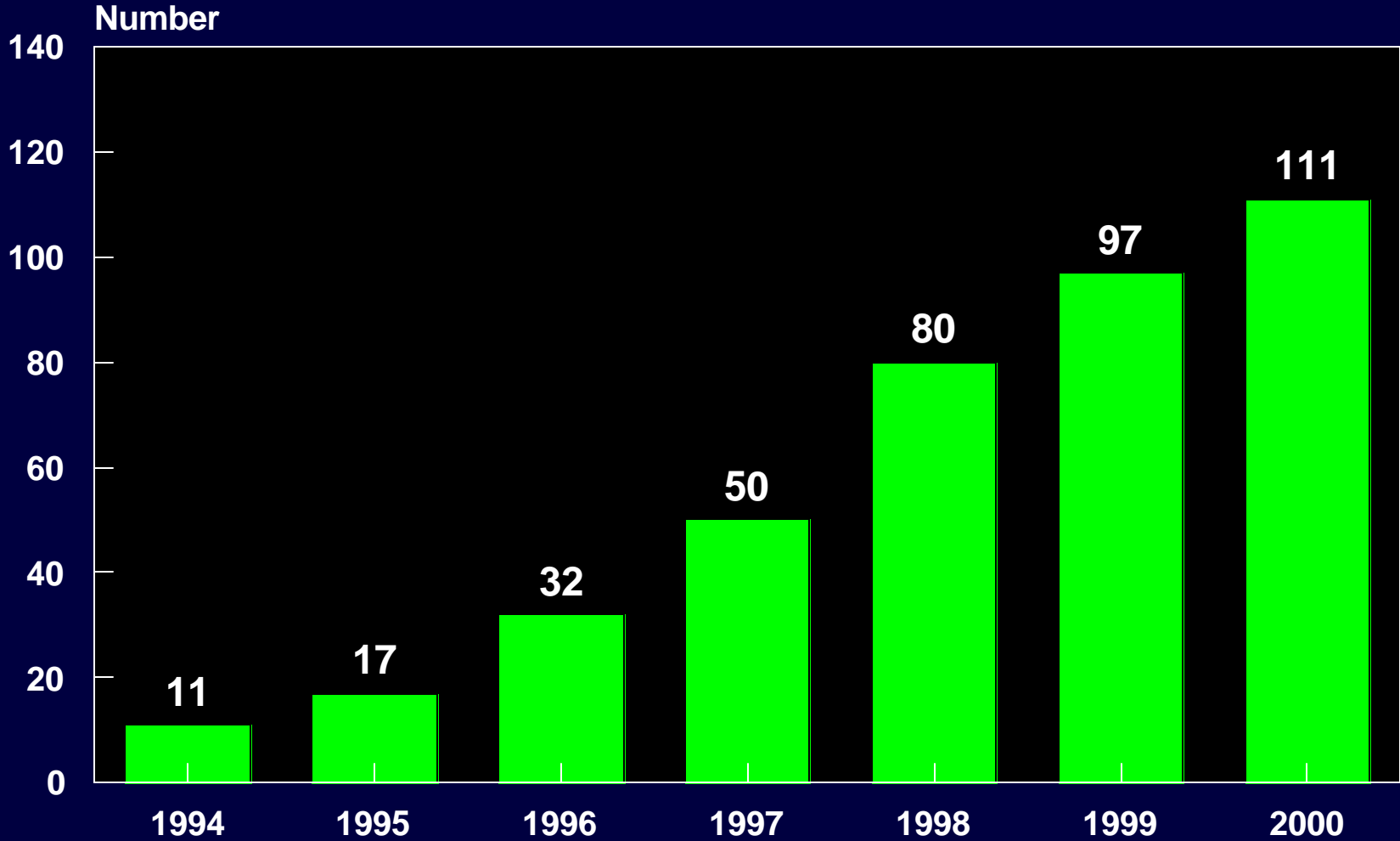
PCB ASSEMBLY

CONTRACT ELECTRONIC MANUFACTURERS PICKING UP A LARGER SHARE

MERCHANT MARKET SHARE OF WORLD ELECTRONICS MARKET



EMS Industry Mergers & Acquisitions

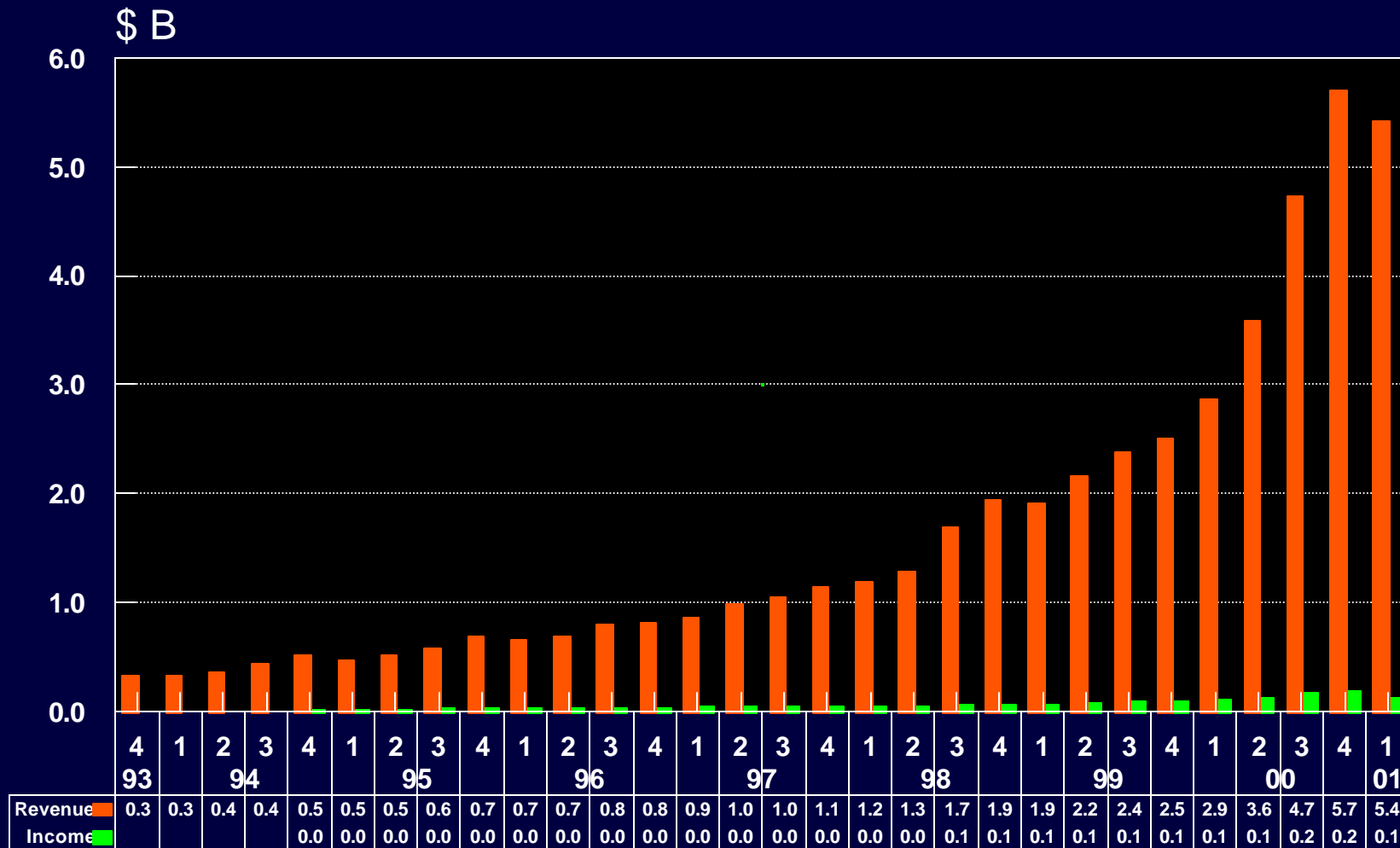


TOP CONTRACT MANUFACTURERS - 1999

	<u>\$ Sales</u>	<u>99/98 Growth %</u>
Solectron	8,948	47
SCI Systems	7,225	10
Celestica	5,297	63
Flextronics Intl	3,219	79
Jabil Circuit	2,433	53
NatSteel Electronics	1,824	29
SYNNEX Information Tech	1,482	65
Sanmina	1,217	34
Universal Scientific	932	55
Dovatron Intl	923	57
Manufacturers' Services	921	10
Benchmark Electronics	878	67
C-MAC Industries	791	133
Elcoteq Network	752	91
ACT Manufacturing	696	18
Venture Manufacturing	576	32
JIT Holdings	529	55
Plexus	492	5

SOLECTRON

Revenue & Net Income



FY ends in August

SLR

PCB Fabrication

(more info)

TOP WORLD PCB MANUFACTURERS

PCB Fab - 2000 ESTIMATE (\$M)

Sanmina	USA	1,500
Viasystems	USA	1,250
CMK	Japan	1,227
Ibiden	Japan	1,093
Hitachi	Japan	964
Nippon Mektron	Japan	835
Compeq	Taiwan	800
Multek	USA	780
Fujitsu	Japan	686
Tyco	USA	600
Matsushita	Japan	490
Daeduck	Korea	480
IBM	USA	450
DDi	USA	450
Nanya PCB	Taiwan	430
Mitsubishi Gas	Japan	410
Photocircuits	USA	405
WWEI	Taiwan	402
Samsung	Korea	400
Wus	Taiwan	375
Shinko Elec	Japan	370
Allied ACI	USA	360
LG Electronics	Korea	340
Toppan Electric	Japan	325
Elec & Eltek	China	320

TOP N AMERICAN PCB MANUFACTURERS

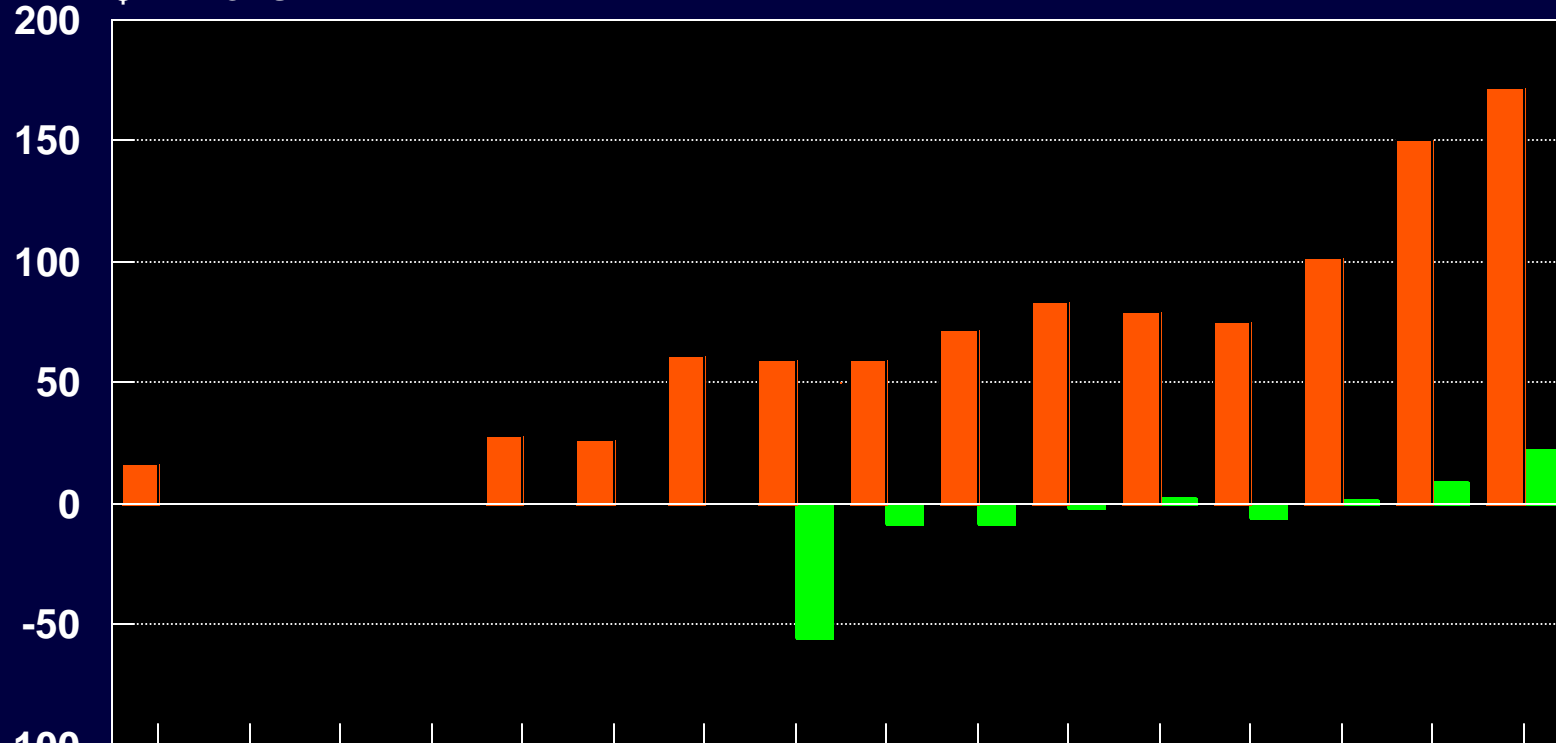
PCB FAB - 2000 ESTIMATE (\$M)

	PCB \$M
SANMINA	1,500
VIASYSTEMS	1,250
MULTEK	780
TYCO	600
DDi	450
IBM	450
PHOTOCIRCUITS	405
ALLIED (ACI)	360
3M	200
MERIX	197
TTM TECHNOLOGIES	195
TERADYNE (w/HERCO)	180
INNOVEX	138
PARLEX	132
SHELDAHL	131
LITTON	102
TOPPAN WEST	85
BUREAU ELECTRONICS	75
CIRCUIT-WISE	70

DDi Corp

Revenue & Net Income

\$ Millions



	1	2	3	4	1	2	3	4	1	2	3	4				
	97				98				99				00			
Revenue	16.3				28.2	26.3	61.2	59.1	59.2	71.7	82.9	78.7	75.3	101.5	150	171.3
Income								-55.6	-8.6	-8.4	-1.9	2.5	-5.7	1.8	9	21.8

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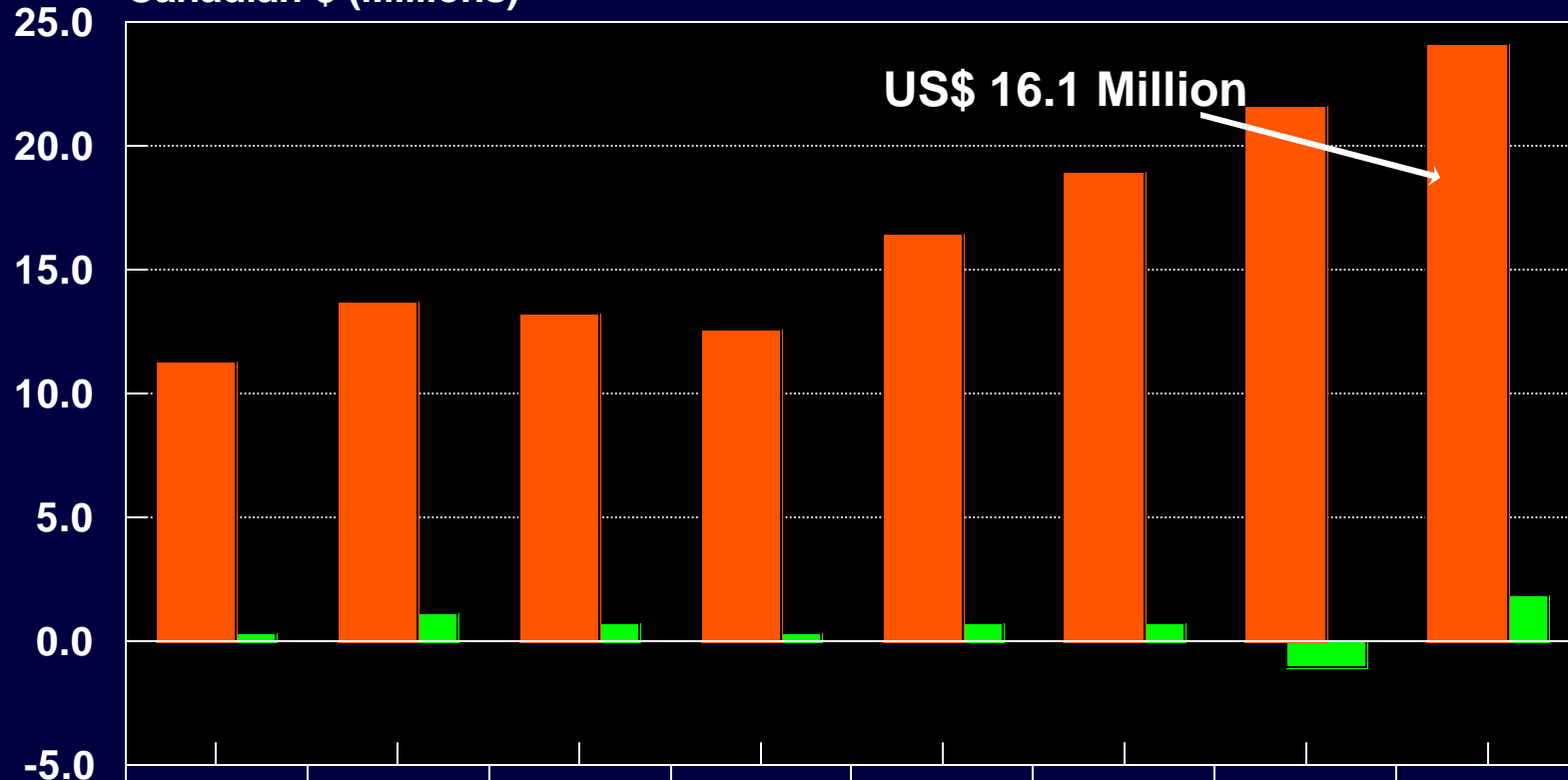
DDIC

FY=CY

Coretec Inc

Revenue & Net Income

Canadian \$ (Millions)



	99				00			
	1	2	3	4	1	2	3	4
Revenue	11.3	13.7	13.2	12.6	16.4	18.9	21.6	24.1
Income	0.3	1.1	0.7	0.3	0.7	0.7	-1.0	1.9

FY=CY

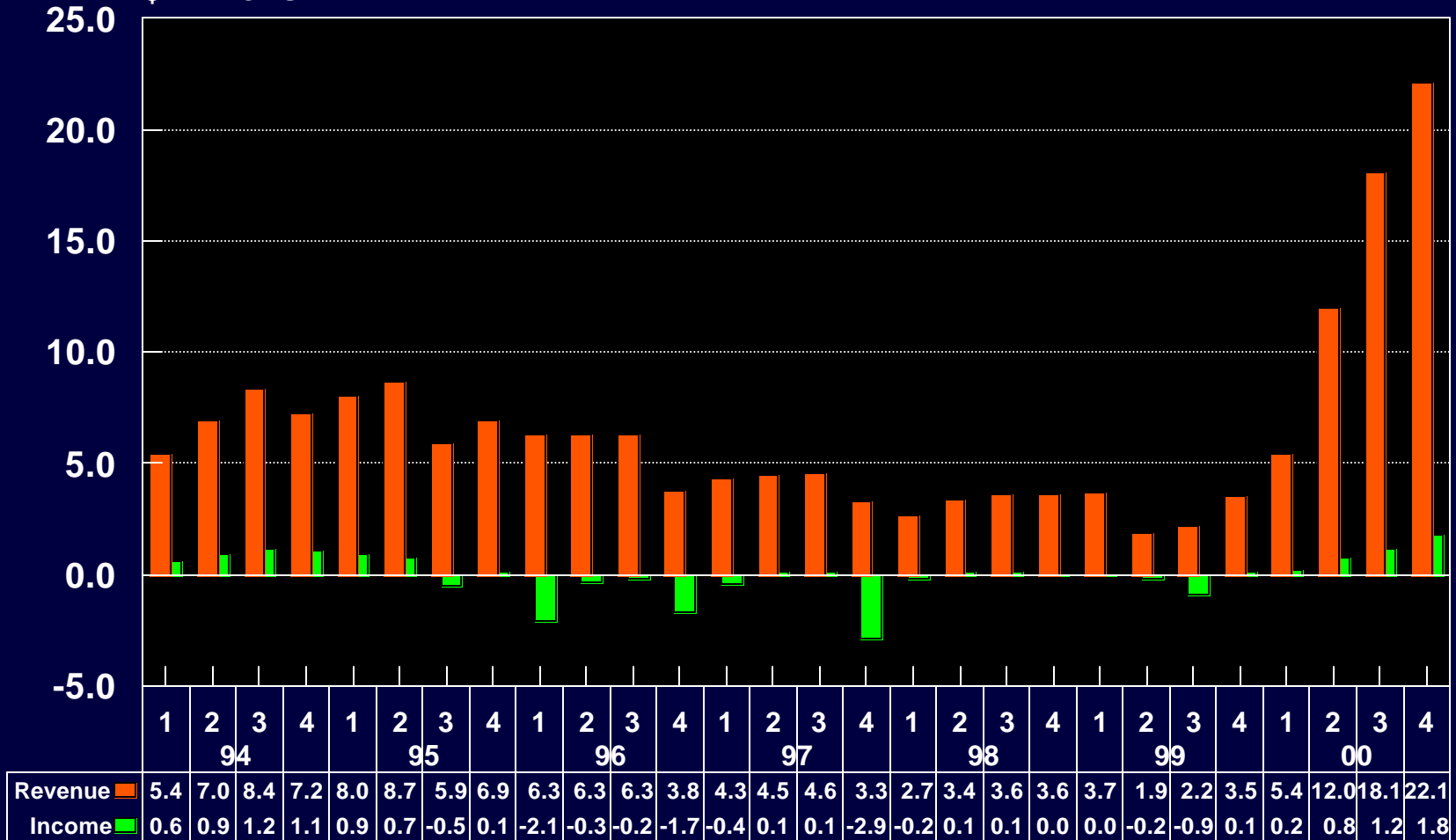
1 US\$ = 1.49 Cn \$

T:CY

M-WAV

Revenue & Net Income

\$ Millions

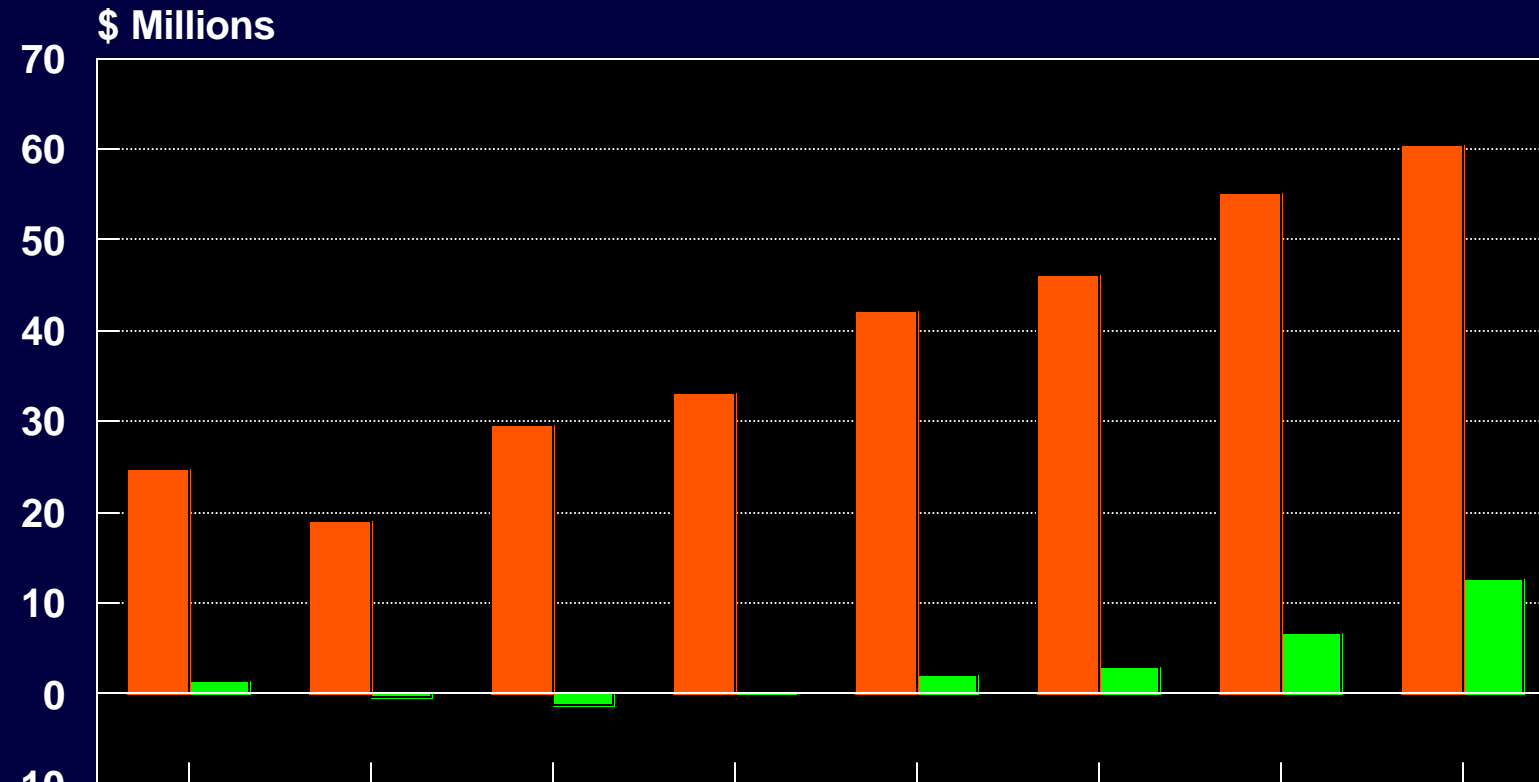


FY = CY

MWAV

TTM Technologies

Revenue & Net Income



	1	2	3	4	1	2	3	4
Revenue	24.8	19	29.6	33.1	42.1	46.1	55.1	60.5
Income	1.3	-0.4	-1.3	0.1	2.1	3	6.8	12.7

FY=CY

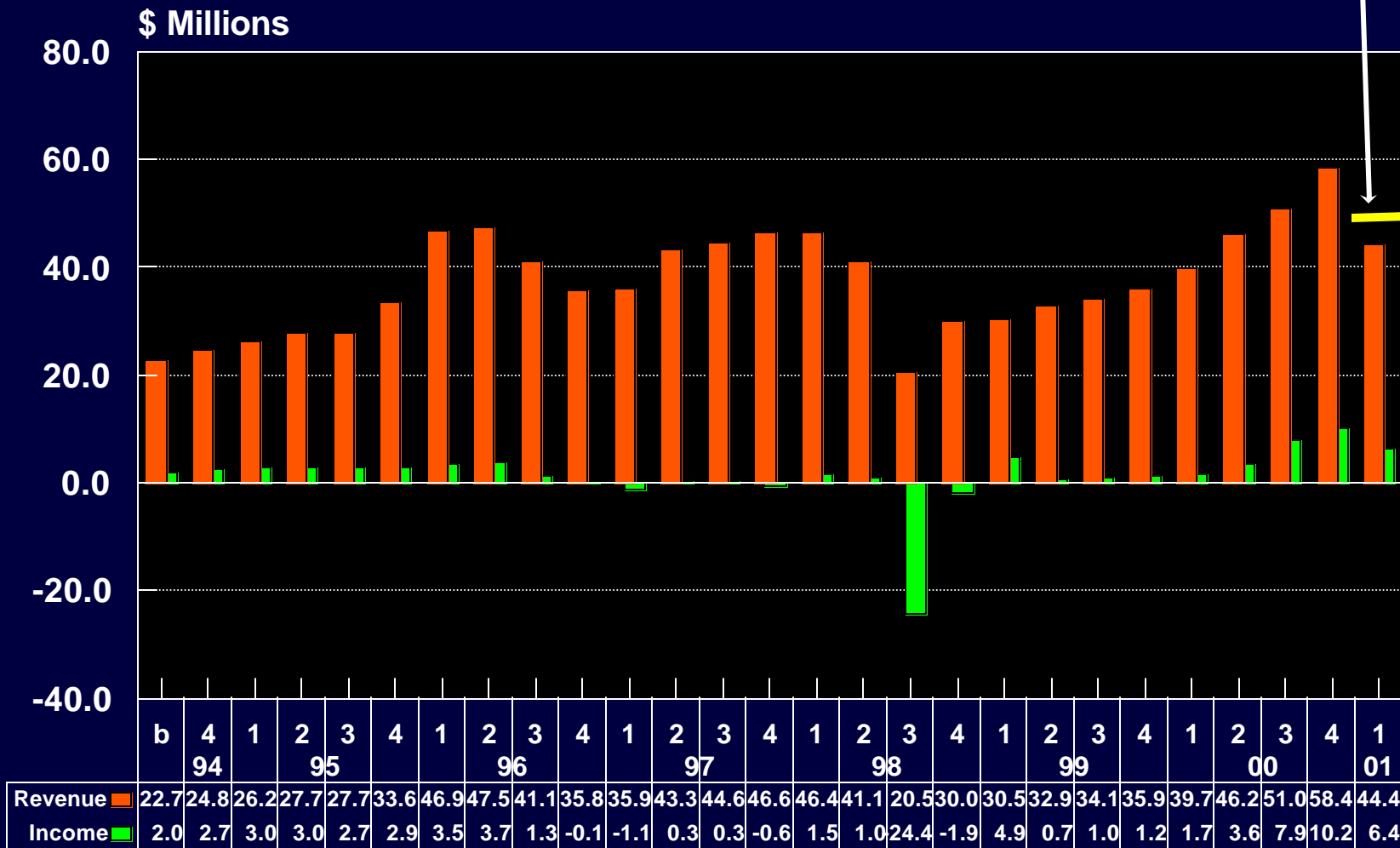
CY

TTMI

MERIX

Revenue & Net Income

Projected
\$49-\$51M

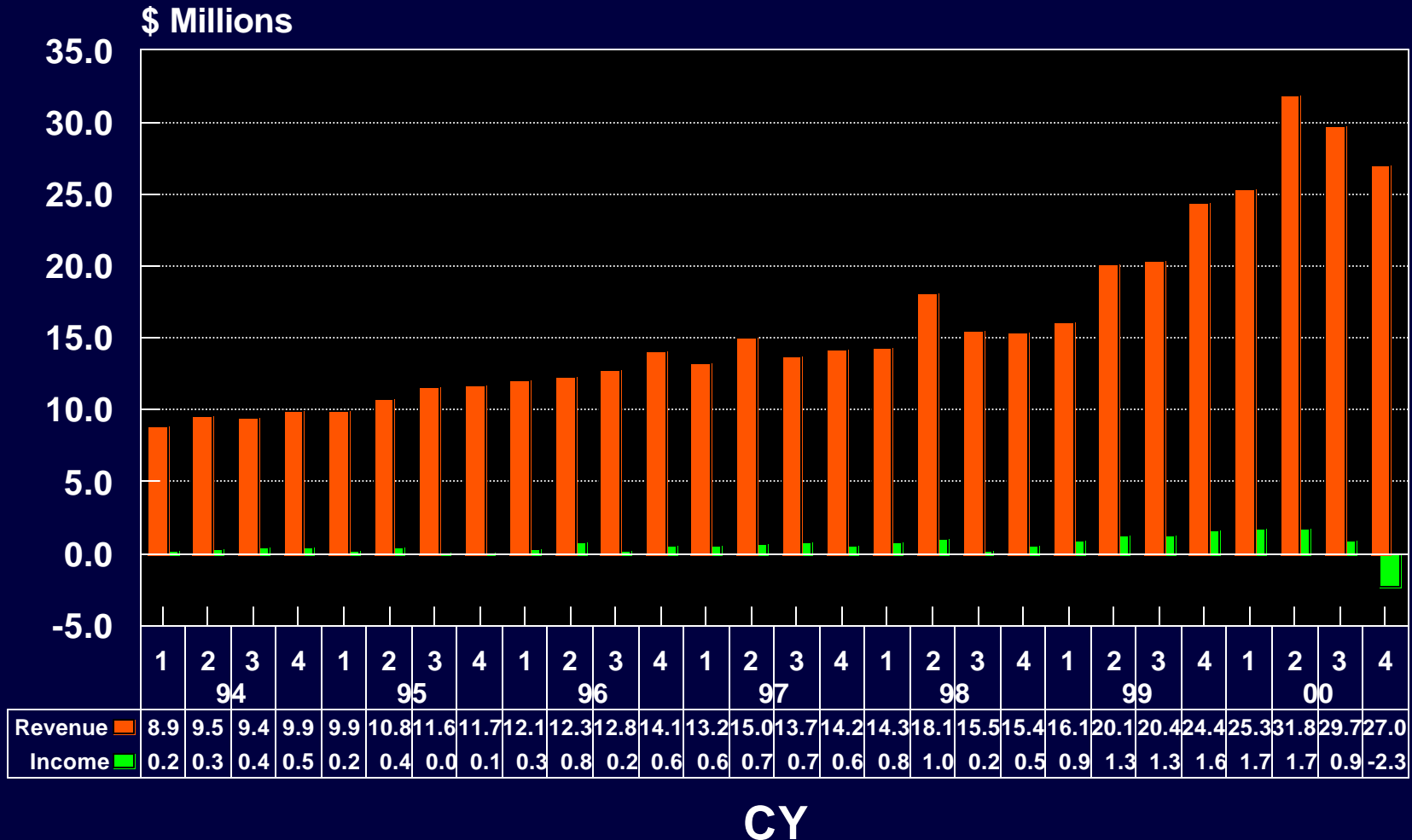


MERIX

FY ends May

PARLEX

Revenue & Net Income



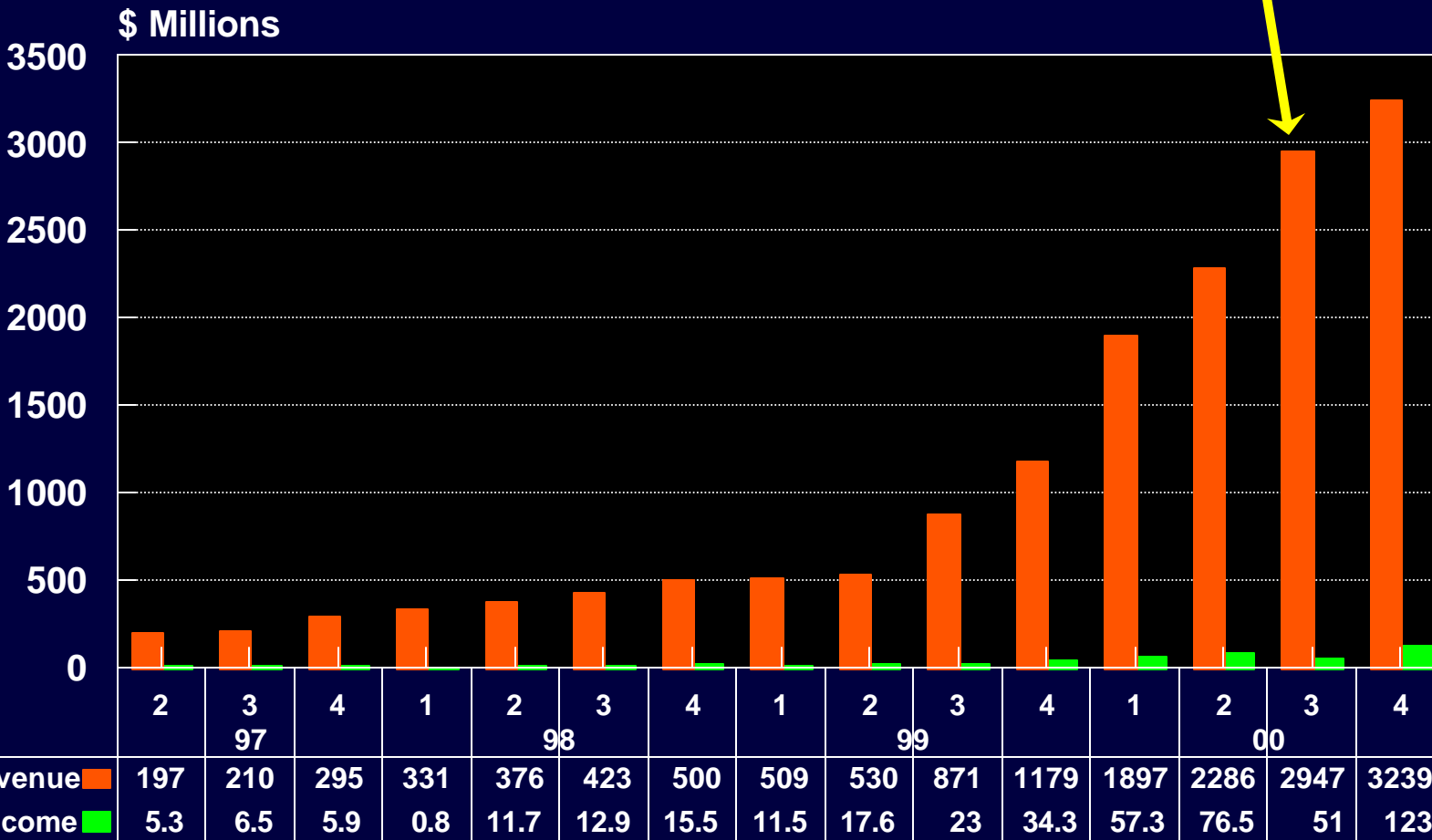
FY ends June 30

PRLX

Flextronics

Revenue & Net Income

PCBs: \$750 million out of \$12 billion annualized sales



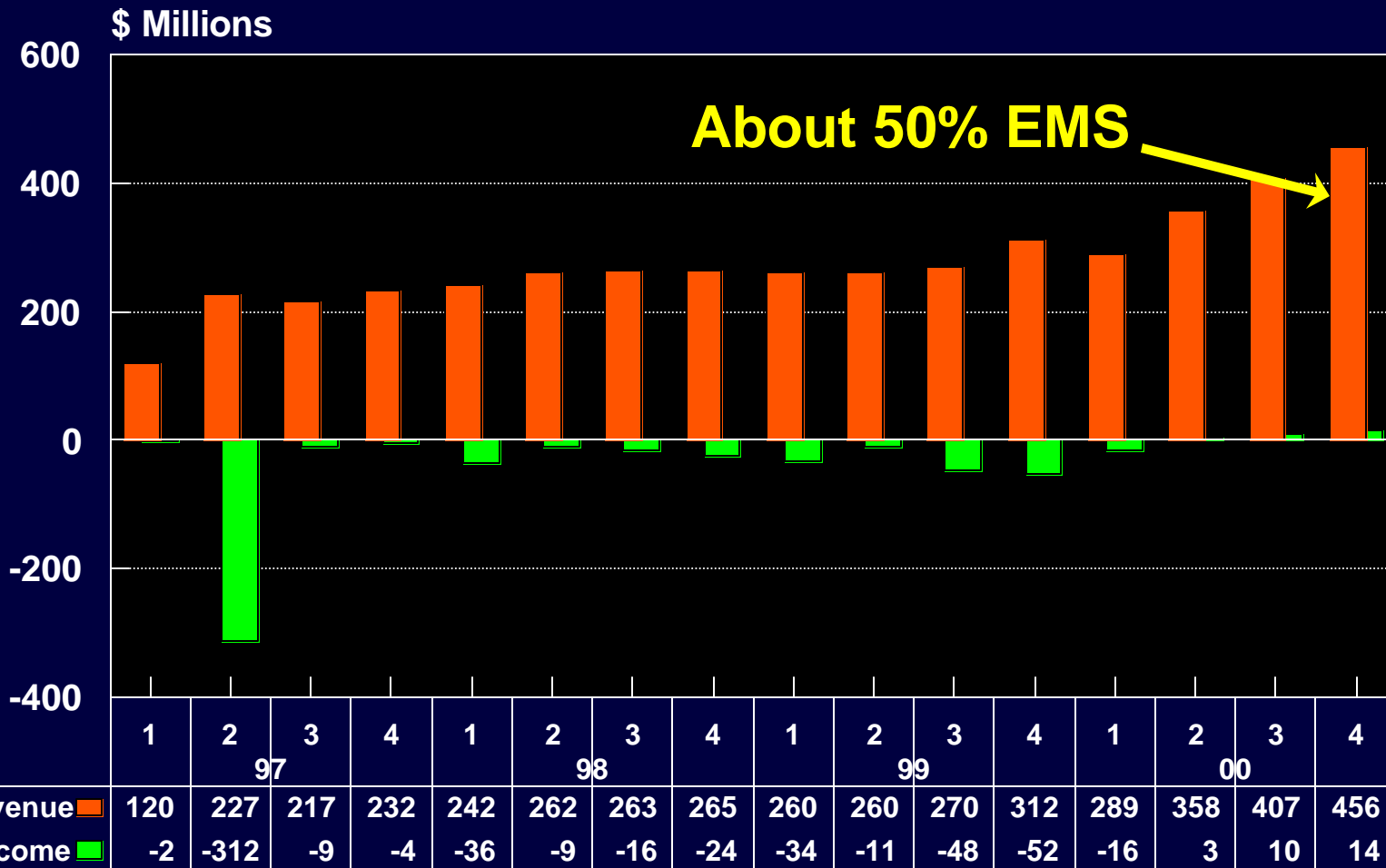
FY ends 3/31

CY

FLEX

VIASYSTEMS

Revenue & Income



CY

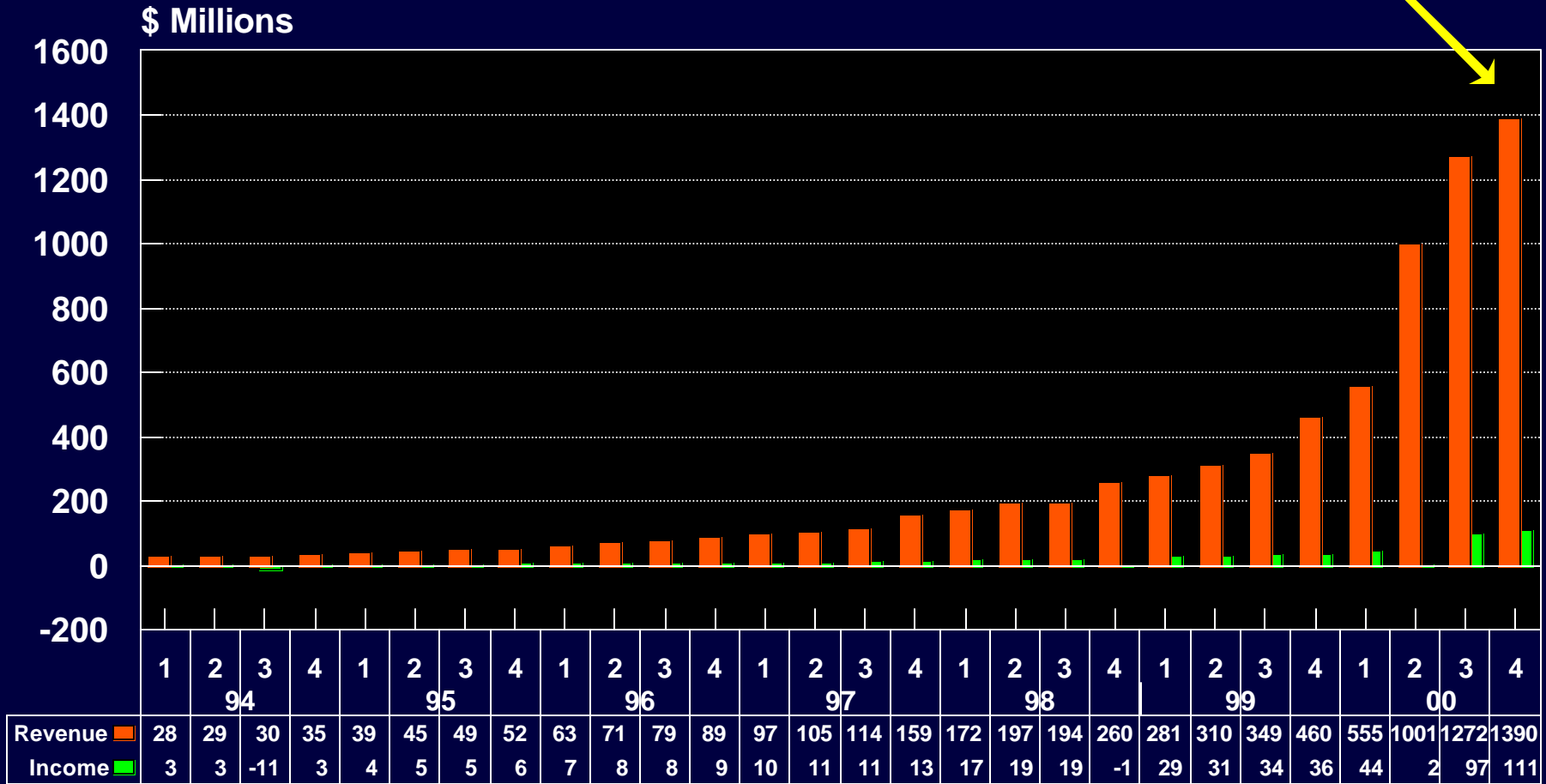
VG

Sources: 10Q & 10K reports and company press releases

SANMINA

Revenue & Net Income

PCBs: \$1.5 billion
out of \$ 5.6 billion
annualized sales

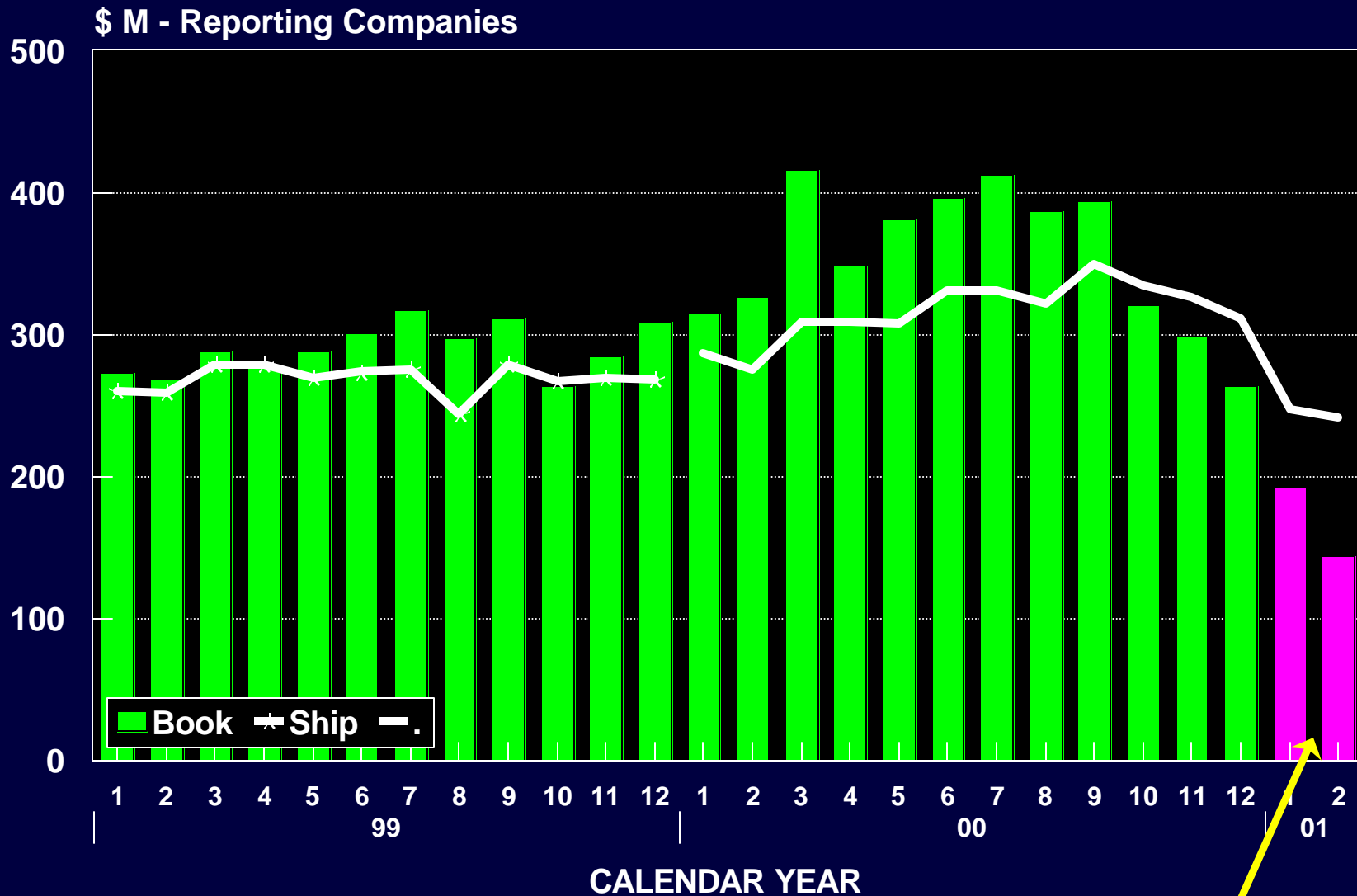


CY

FY ends September 30

SANM

U.S. RIGID PCB BOOKINGS & SHIPMENTS



IPC T/MRC 3/2001

Custer Estimate (new company mix)

FEBRUARY N AMERICAN PCB GROWTH INDICATORS

% GROWTH - Feb 2001 vs Feb 2000

RIGID PCB \$ SHIPMENTS

DOWN 0.4%

RIGID PCB \$ BOOKINGS

DOWN 43.4%

RIGID PCB BOOK/BILL RATIO

3-MONTH AVG 0.76

1-MONTH 0.60

LAMINATE+PREPREG SQ FT SHIPMENTS

DOWN 9.6%

LAMINATE+PREPREG SQ FT BOOKINGS

DOWN 20.5%

FLEX CIRCUIT \$ SHIPMENTS

DOWN 11.2%

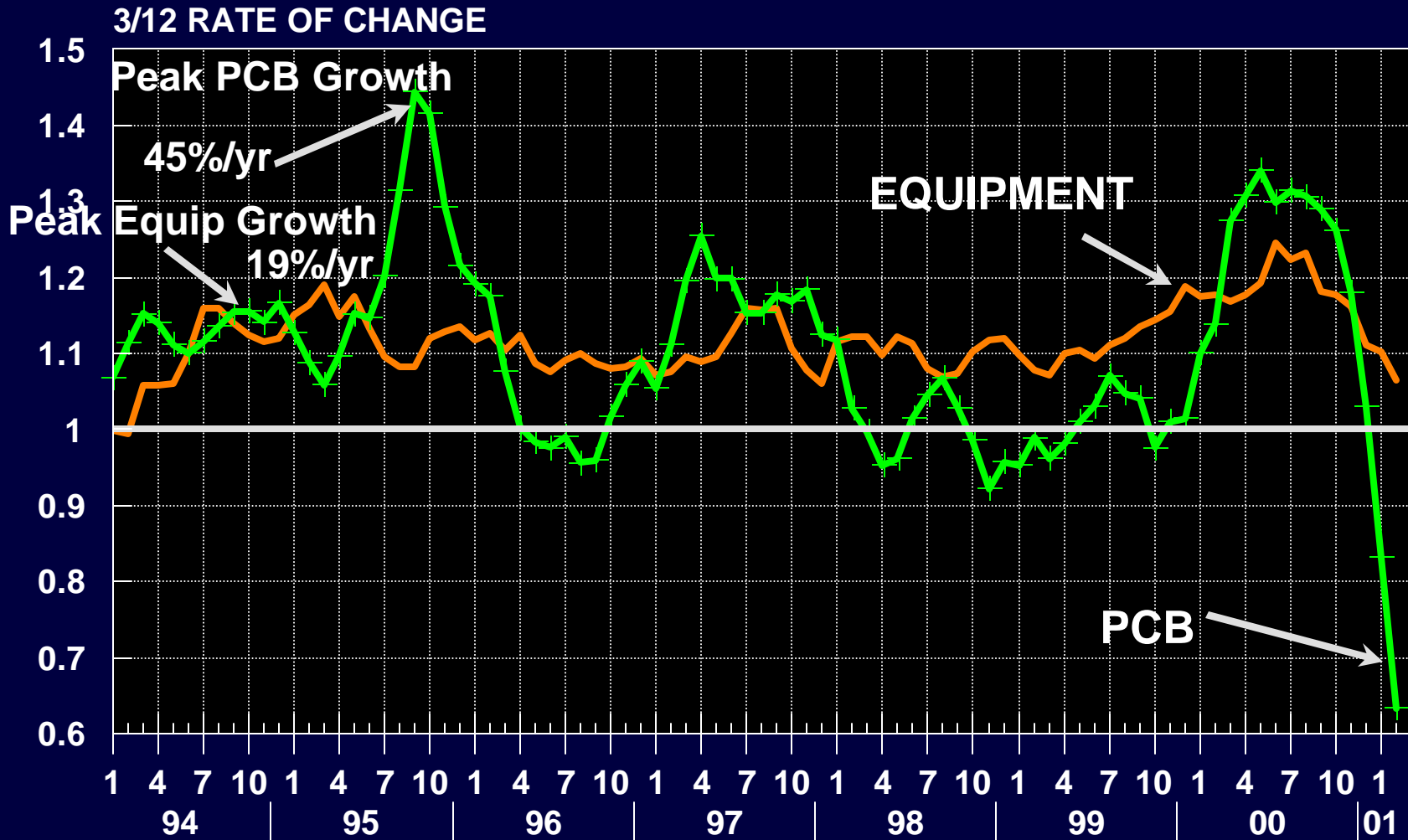
FLEX CIRCUIT \$ BOOKINGS

Down 32.3%

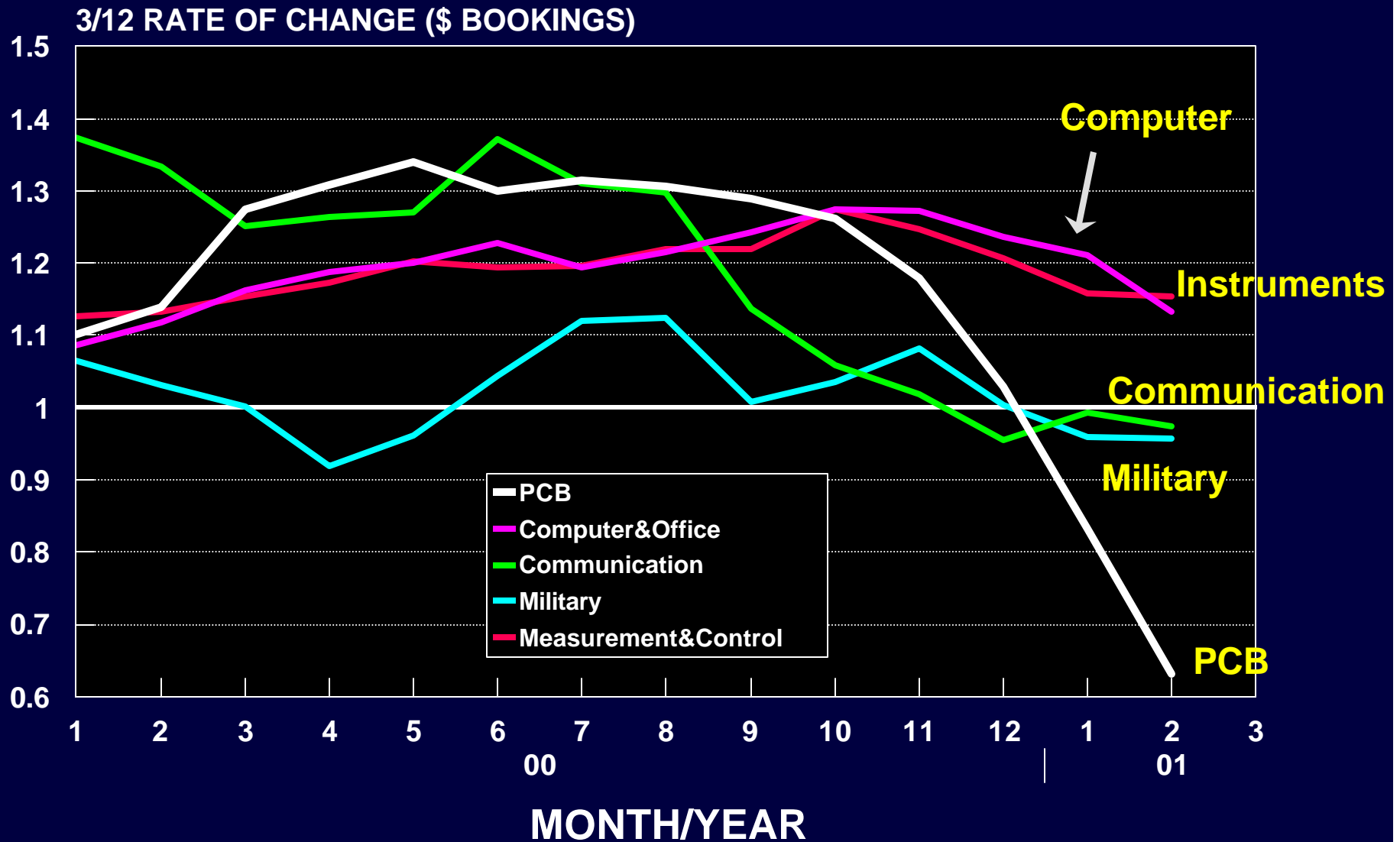
Growth Rates & Future Outlook

U.S. ELECTRONIC EQUIPMENT vs PCBs

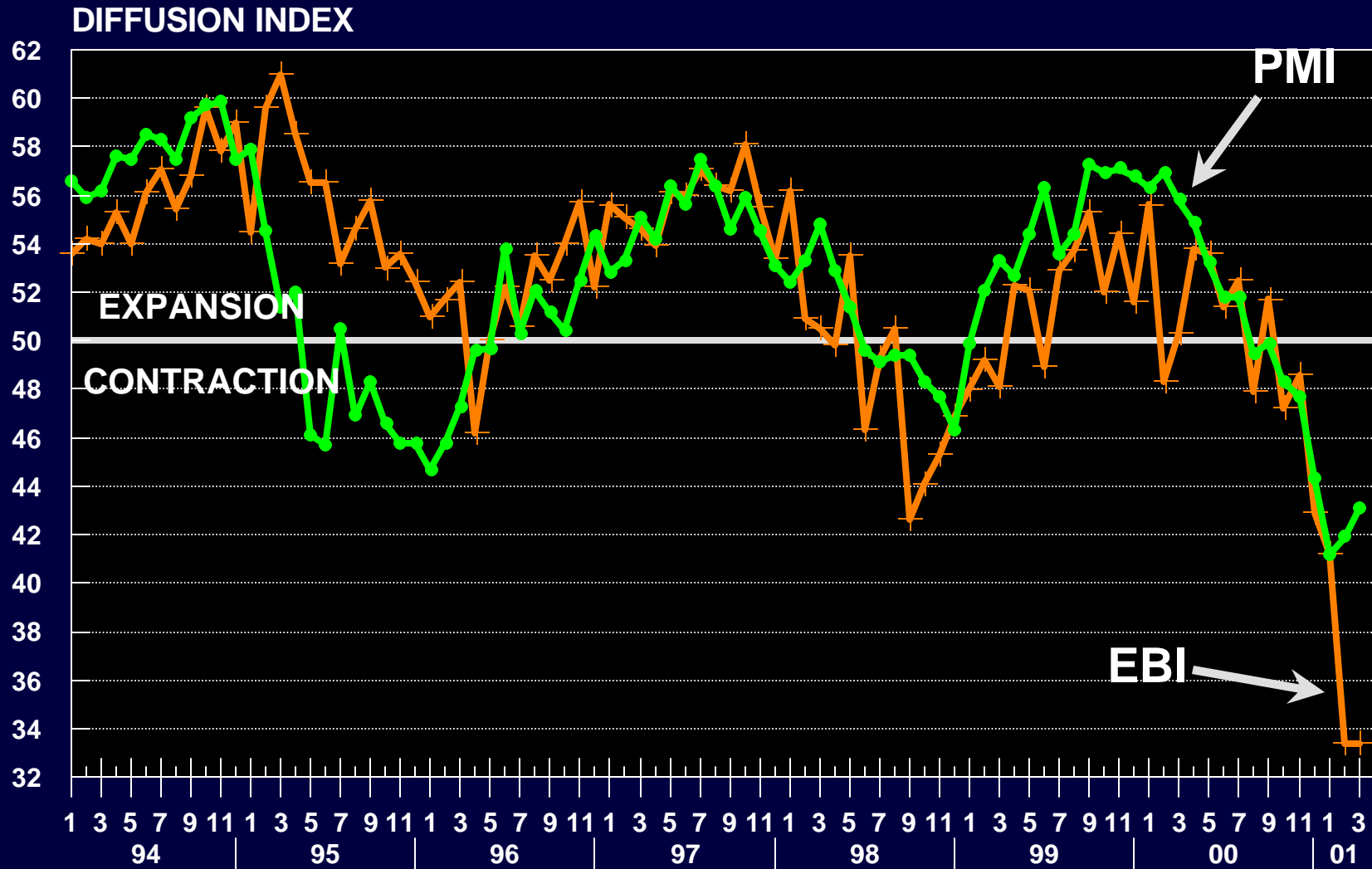
\$ BOOKINGS GROWTH



US RIGID PCB vs ELECTRONIC EQUIPMENT BOOKINGS



PMI vs EBI "QUEST" ELECTRONIC BUYERS' INDEX



**NATIONAL ASSOC of PURCHASING MANAGERS
ELECTRONIC BUYERS NEWS**

PRESENT GROWTH RATES (%)

U.S. ECONOMY & ELECTRONICS INDUSTRY

	LATEST MONTH	ANNUAL GROWTH RATE	3-MONTH GROWTH RATE
RIGID PCB BOOKING \$	2/01	110.5	63.2
RIGID PCB SHIPMENT \$	2/01	116.7	106.9
LAMINATE+PREPREG SHIPMENTS SF	2/01	113.4	106.3
ELECTRONIC COMPONENTS BOOK \$	2/01	114.2	98.3
ELECTRONIC EQUIPMENT BOOKINGS \$			
COMPUTER & OFFICE	2/01	120.4	113.3
COMMUNICATIONS	2/01	112.6	97.5
MEASURE/CONTROL INSTRUMENTS	2/01	120.4	115.3
MILITARY (SEARCH & NAVIG)	2/01	102.7	95.7
TOTAL ELECTRONIC EQUIPMENT	2/01	116.0	106.4
INDUSTRIAL PRODUCTION	2/01	104.9	102.3

NOTE: 3 month growth rates compare most recent
3 months to same 3 months one year earlier

Summary & Conclusions

Summary

- **Component & electronic equipment orders were "too" strong in 2000. Lead times extended and overbooking & inventory buildups occurred.**
- **2001 component orders are now dropping sharply. Shortages are generally now over. Substantial inventories still exist throughout the "food chain."**
- **U.S. Interest rates are being lowered to stimulate the economy. "Low rates" won't stimulate PCBs until 2002.**

Summary

- **Personal computer seasonality continues but growth has slowed significantly. The 2000 Christmas was very disappointing leaving behind large excess retail inventories.**
- **Cell phone growth has slowed. Outsourcing to CEMs is common as cell phone makers seek low cost production.**
- **Semiconductor fab investment has plunged. Fab test & measurement and production equipment which grew 80% in 2000 is now in a downturn.**
- **Military electronics is a bright spot. Automotive is down but "stable."**

Summary

- Domestic rigid PCB shipments grew 18% in CY2000.
- 2001 PCB orders are now plummeting.
- This downturn may be the worst in history with substantially lower new orders, massive inventory reductions and cancellations of existing orders. PCBs are now well "overcorrected" vs. equipment.
- Factory closings, staff reductions, reduced capital spending and even bankruptcies are now occurring.

Summary

- **The first signs of a global recovery (increasing DRAM pricing) suggest possible growth in some sectors in 2H'01. This assumes no global recession.**
- **Recovery in telecom and Internet Infrastructure will take longer. Inventory levels are in the 6-9 month range. Firms such as Nortel, Lucent and Cisco are key.**

Conclusions

Conclusions

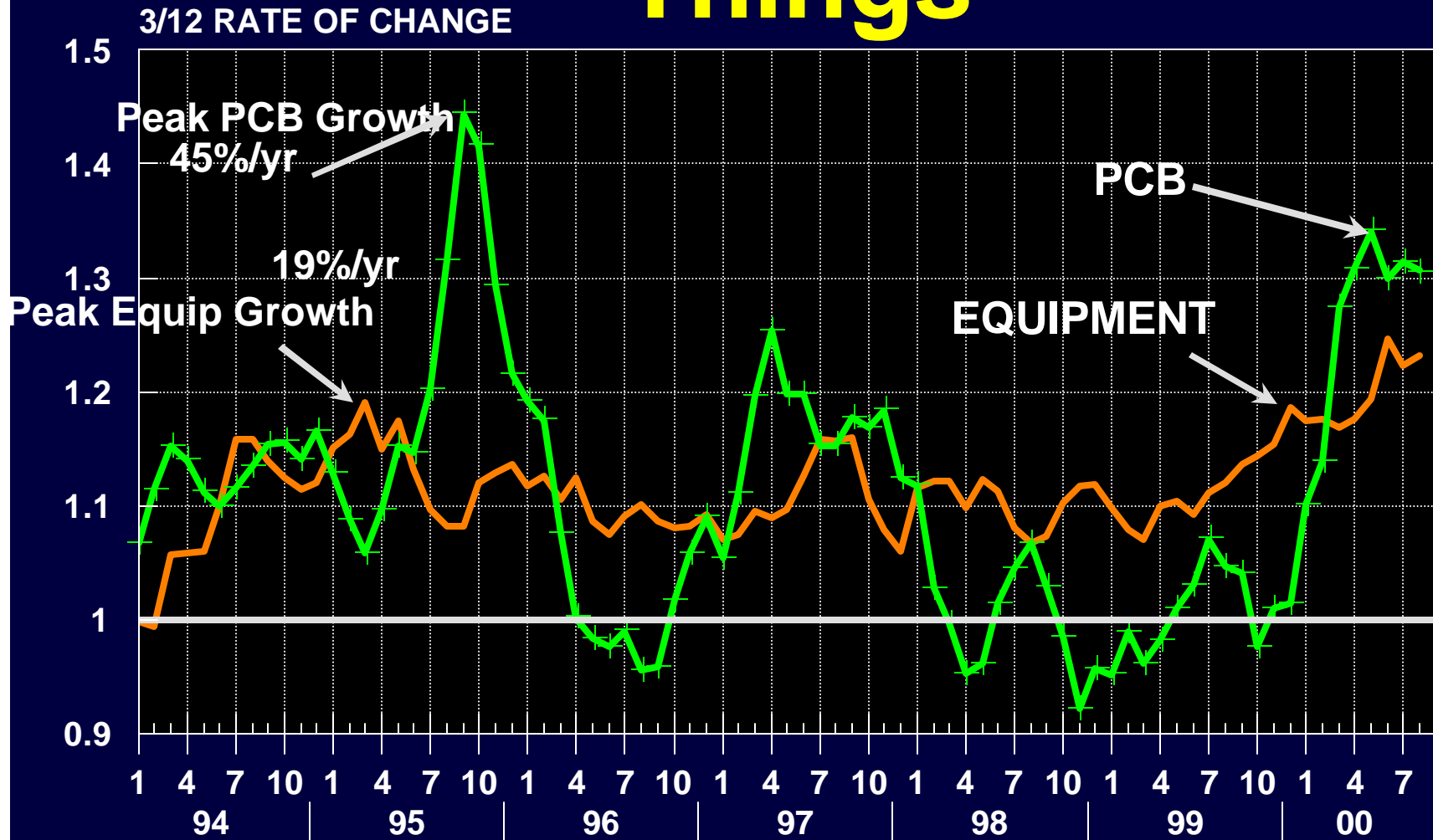
**"Limited Visibility"
but 2001 will be a difficult year.**

**Selective recovery beginning in
2H'01**

**Probable zero total growth in
2001, 4-8% growth in 2002**

**PCB equipment sales will lag
by 2 quarters**

It Is Possible to Predict These Things



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1/2001

Big Time Slowdown or Extended Inventory Correction?

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