



OPINION



Software's New Economic Drivers

The maturation of the technology industry means software vendors can watch macro economic measures - as well as IT market developments - as indicators of future growth, valuation and stock performance. Here are the trends to watch.

Rick Sherlund, Goldman Sachs

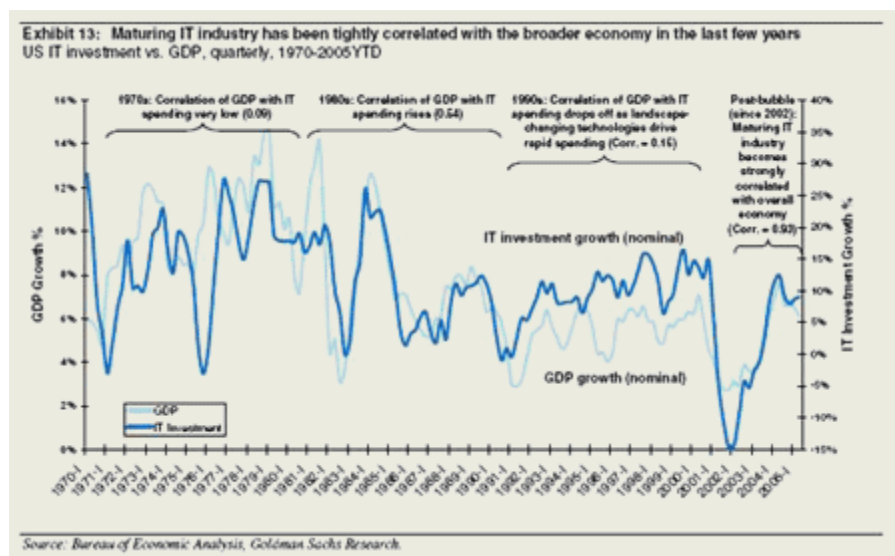
Sep 30, 05

The macroeconomic influence on tech is greater than ever as tech has grown to become the single largest component of corporate capital spending - now almost 40% of the total.

IT spending was able to well outpace economic growth as it grew as a proportion of GDP from 1.5% in 1970 to almost 5% in 2000. Since settling in at less than 4% in recent years, tech is likely to resume growing as a percentage of the economy, but not nearly at the rate of decades past.

Not surprisingly then, the correlation of IT with the broader economy has jumped from less than 0.1 in the 1970s to over 0.9 in recent years as the industry has matured.

While tech continues to benefit from "mini-waves" of technology shifts (e.g., wireless), there are not the rapid, landscape-changing shifts that drove feverish growth in the 90s. In addition, many of today's technology trends actually serve to reduce aggregate IT spending.



Because it is a greater proportion of overall capital spending, IT spending is typically better correlated with capital spending than with GDP. Capital spending



growth tends to lag GDP by one or two quarters.

Semiconductor sales tend to lead IT spending by a quarter or two.

Both GDP and capital spending growth appear to have peaked in recent quarters, which may mean decelerating IT spending growth ahead. In addition, semiconductor sales growth has decelerated significantly in recent quarters. Such a move has historically preceded a slowdown in IT investment.

GS Wavefronts trading strategies indicate sector sensitivities to macro moves

The Goldman Sachs Equity Trading Strategies research team has developed proprietary quantitative models- GS Wavefronts - to estimate sub-sector sensitivities to moves in an assortment of key macroeconomic indicators.

Sensitivities to each macro indicator below are based on estimated impact to the various components of the Dupont valuation model (i.e., the component parts of ROE such as net margin, asset turnover, and leverage) that ultimately affect stock prices.

The GS Wavefronts model indicates that semiconductors, semiconductor capital equipment, and communications equipment have the highest sensitivities to measures closely related to economic growth - GDP, consumer spending, capital spending, and foreign growth. Of these indicators, the model suggests that GDP growth has the highest impact on sector value, while the other three above-listed indicators have a moderate impact.

Additional macro indicators that tend to have an impact on the semiconductor, semiconductor equipment, and communications equipment sectors disproportionately are short-term interest rates and oil prices. Of these two indicators, oil prices tend to have a high impact on value, while short-term rates have a low impact.

Two other macro variables - 10-year rates and the dollar - affect the hardware, services, and Internet sectors disproportionately rather than the semiconductor, semiconductor equipment, and communications equipment sectors.

None of the macro variables below have a significant impact on software sector value, according to the Wavefronts model.

Based on swelling oil prices and potential near-term risk to consumer spending, the GS Wavefronts model would suggest that the semiconductor, semiconductor equipment, and communications equipment sectors are currently the most at risk from macro factors, although the specific timing of any value impact on financial results and stock prices is uncertain.

Exhibit 16: Goldman Sachs Wavefronts models isolate macro variable impact on particular tech sub-sectors

Sector	Rising indicator has positive impact on value				Rising indicator has negative impact on value			
	GDP ▲	Consumer Spend. ▲	Capital Spend. ▲	Foreign Growth ▲	Int.-Term (10-Yr) Rates ▲	US Dollar ▲ Int. Rates ▲	S-T Oil Prices ▲	
Hardware	Lowest	Lowest	Lowest	Lowest	Highest	Highest	Lowest	Lowest
Software	Lowest	Lowest	Lowest	Lowest	Highest	Highest	Lowest	Lowest
IT Services	Lowest	Lowest	Lowest	Lowest	Highest	Highest	Lowest	Lowest
Communications Equipment	Highest	Highest	Highest	Highest	Lowest	Lowest	Highest	Highest
Semiconductors	Highest	Highest	Highest	Highest	Lowest	Lowest	Highest	Highest
Sem. Capital Equipment	Highest	Highest	Highest	Highest	Lowest	Lowest	Highest	Highest
Internet	Lowest	Lowest	Lowest	Lowest	Highest	Highest		
Dispersion between Highest and Lowest impact:								
	High	Moderate	Moderate	Moderate	Low	Moderate	Low	High

Source: Goldman Sachs Equity Trading Strategies Research.

Tech margins have trended upward, but at peak levels

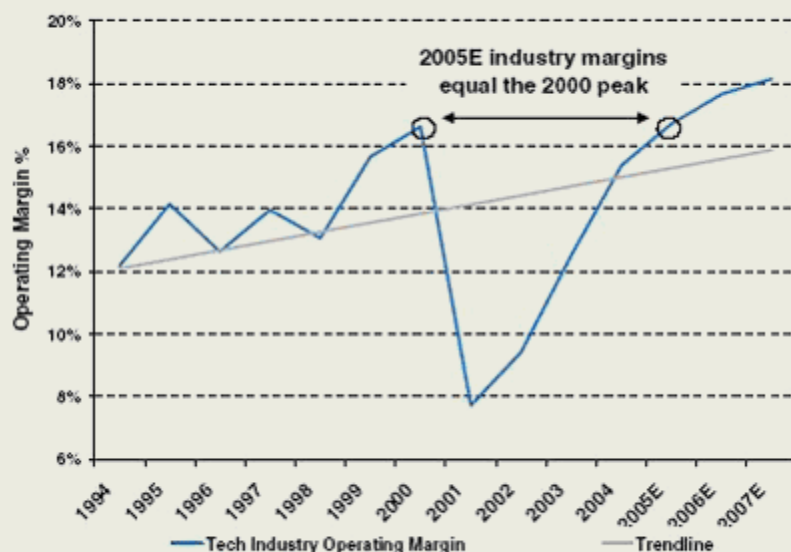
Despite the post-bubble downturn, tech margins have trended generally upward. Vendor consolidation has aided margins as many price-aggressive competitors have vanished and as customers have become increasingly reliant on fewer strategic vendors.



That said, above-trend margins are a risk, particularly for capital-intensive sectors of tech.

For industries not typically viewed as cyclical (i.e., software, services, and Internet), we believe above-trend margins pose less of a risk. However, margins in these sectors cannot keep rising forever and must eventually flatten out at a minimum.

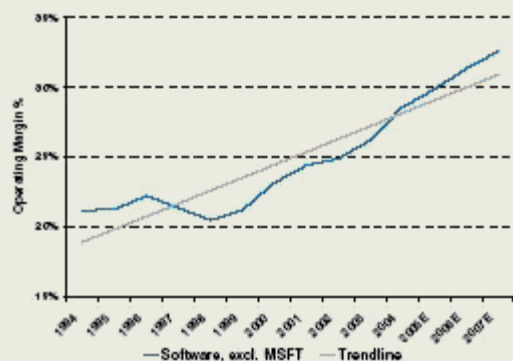
Exhibit 17: Tech industry margins have trended upward, but are currently above peak tech industry margins, 1994-2007E



Source: Goldman Sachs Research.

Software and services margins have both grown steadily. Software margins have benefited from a competitive shake-out and benefits to scale as the industry has consolidated. Services margins continue to benefit primarily from fixed-cost leverage among the processors.

Exhibit 20: Software sector margins (excluding MSFT), 1994-2007E



Source: Goldman Sachs Research.

Most of tech's valuation adjustment is behind us

As the tech industry has matured and growth has slowed, multiples have accordingly contracted. Tech valuations relative to the S&P 500 have fallen from



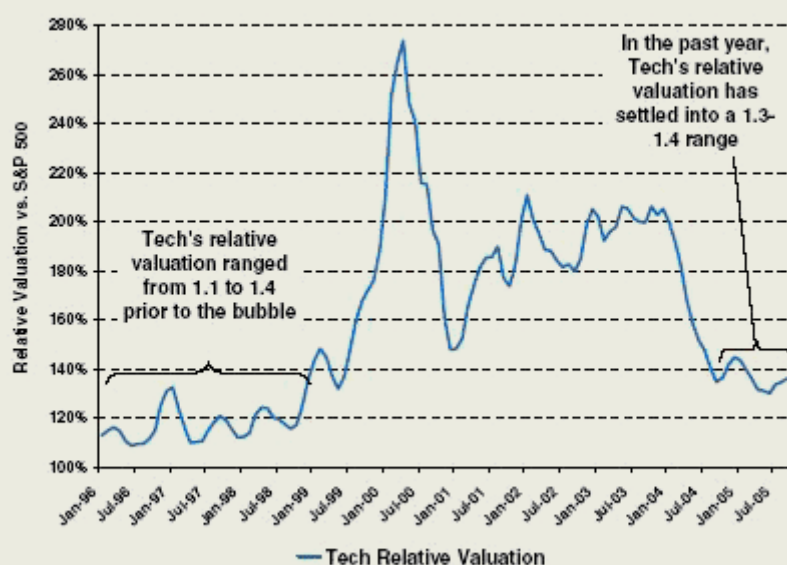
Maurizio Ammannato

2.0 in 2002 to about 1.3-1.4 currently.

Tech's relative valuation has stabilized in a 1.3-1.4 range over the past year. However, the pre-bubble range of 1.1 to 1.4 suggests that some further valuation downside is still a risk.

Still, having contracted 33% since 2003, tech's relative valuation has absorbed the worst of the adjustment already, in our view.

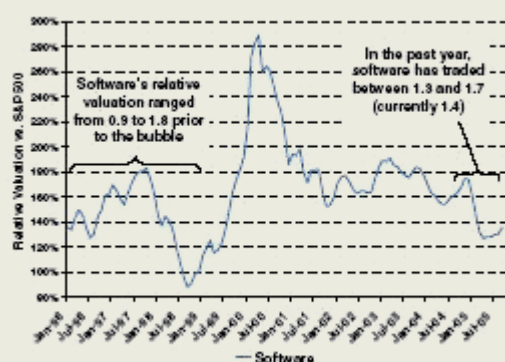
Exhibit 25: Most tech sectors are trading close to trend line, which has been in decline in recent years
tech sector relative valuations (group median NTM P/Es) relative to S&P 500, last 10 years



Source: Goldman Sachs Research.

Hardware and software valuations are currently toward the low end of their last-12-month relative valuation range, although pre-bubble ranges indicate that valuations could potentially trend even lower.

Exhibit 27: Software relative valuation, 1996-2005 YTD



Source: Goldman Sachs Research.

Secular trends a key element in picking technology stocks

A rigorous set of screening characteristics as well as macro and seasonal drivers are all at the heart of our investment framework. Undeniably, however, it still pays to be connected to the right secular sector. As technology has matured, we see fewer earth-moving trends driving growth today. Those that we do see have at their foundation the



reality that technology growth has slowed, and most companies are in the midst of making some sort of business model change.

(1) Of all tech trends, wireless's impact will be broadest

Bottom line: Throughout 2006, mobile data will ignite multiyear demand for select companies across several technology groups, in our view. This will create a major redistribution of handset market share and sustained network equipment demand. However, the current off-radar trends will likely offer even greater growth. Specific opportunities include mobilization of common applications, security, processing power, and memory. Unlike prior false starts, 2006 melds true broadband wireless networks, carrier data focus, low-cost devices and components, and a growing base of high-revenue data customers.

(2) China and India are altering both supply and demand formulae

Bottom line: As the center of gravity for growth shifts to emerging countries, infrastructure and business model adjustments become technology company imperatives. China and India have become the mecca for both lower-cost manufacturing and lower-cost services, capturing an increasing amount of production and capex. Growth within these emerging economies is high, although consumption is weighted toward lower-priced products, forcing multinational vendors to make tradeoffs between profitability and growth.

(3) The low-end unit epidemic is distorting revenue realities

Bottom line: Strong low-end unit growth still typically rolls up to lower revenue and profitability. This trend toward the lower end is now widespread across the entire technology food chain, driven by both growth in emerging markets, which tend to buy lower ASP items, and by the overall consumerization of tech end markets, with consumer purchases tending to be lower-end than corporate purchases. As a result, across technology, companies have been managing business models to adjust to the impact of more lower-end units on revenue and margins.

(4) With drivers escalating, security is at an earlier stage than the consensus view

Bottom line: Security will disproportionately benefit from any budget allocation. Security is having a broad impact across technology groups. Looking forward, we view it as both an embedded function within technology areas, as well as a stand-alone sector in its own right. With security technologies still under-penetrated, we see spending continuing to escalate. Drivers include an increasingly malicious threat environment, an increased business dependence on IT, more onerous government scrutiny and regulation, and new technologies, such as wireless.

(5) Even at this stage, spending is still consolidating around fewer, larger vendors

Bottom line: It pays to be big, with the number of vendors either being reduced by end users or by continuing M&A. Even after several years of vendor consolidation, customers are continuing the process at the expense of small and mid-sized vendors. Cost concerns and a desire for simpler, more manageable infrastructures continue as the major drivers and, in many areas of technology, "best-of-breed" solutions are losing their appeal as larger vendors offer solutions that are increasingly "good enough."

(6) Internet treasure chest now being unlocked

Bottom line: Internet audiences and activity will be better monetized. Continuing to reduce points of friction in advertising, transacting, paying, and communicating will unlock the value of the existing online audience. Innovative new technologies remain the key focus to eliminate roadblocks that create a gap between audience share and dollar share. Innovations range from new tools for planning, buying, and measuring advertising campaigns to the next wave of web communicating. Closing the gap of activity share to dollar share will drive disproportionate benefits to those with the



biggest audiences.

(7) Open source opening Pandora's box on pricing throughout the IT stack

Bottom line: Open source is causing ongoing commoditization of technology and creating an area of vulnerability for many best-of-breed vendors. Open-source solutions are now spreading far beyond the operating system, through middleware and into applications, negatively affecting pricing and the ability of smaller, niche companies to compete. This is forcing vendors to move up the value-added pyramid and at the same time reinvent their business models to focus on services, away from upfront technology sales.

(8) The true digital home will be longer in coming than expected

Bottom line: More focused, user-friendly devices will yield the biggest benefits over the next 12-18 months. The emergence of new technologies and standards has created a great deal of investor excitement around the concept of an integrated set of applications and hardware that will eventually make up the digital home. Notwithstanding the interest, gradualism is the best way to describe the process, with the earlier leaders being those companies that develop easy-to-use hardware and software for a well-defined set of applications.

(9) SOAs shake up the software industry

Bottom line: SOAs revolutionize how applications are built and deployed, driving a new industry replacement cycle, and shaking up the competitive landscape. Services-oriented architectures (SOAs) allow for faster development of more usable and flexible applications. This shift opens the door to a wider range of potential providers, including systems integrators and new start-ups, while causing today's large-scale software companies to adapt in order to gain a piece of the growth created by this replacement cycle.

Conclusion

Tech investment has grown to become the single largest component of US corporate capital spending at almost 40% of total. With its maturation as an industry have come slower growth rates, tighter correlation with the broader economy, and heightened risks that current above-trend margins may not be sustainable.

The bulk of valuation contraction for tech stocks has largely occurred, with relative multiples sliding from 2.0 in 2003 to the present range of 1.3-1.4. However, the prebubble range of 1.1-1.4 suggests that some additional downside to current valuations is still a risk.

Although strong appreciation since the spring could dampen an end-of-year tech rally, the normally strong fourth quarter catalyst is just around the corner.

*Rick Sherlund leads enterprise application and infrastructure software analysis at **Goldman Sachs**. This article is excerpted from the Sept. 21, 2005 report, "Technology Investment Strategy: An Industry Grows Up."*