

SPECIAL REPORT

IS THE INFORMATION REVOLUTION RESPONSIBLE FOR THE PRODUCTIVITY GROWTH SPURT OF THE LATE '90S – AND WILL IT CONTINUE?

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Introduction

Starting in the 1970s, prophets claimed that computers would bring enormous productivity growth to the economy.

But as late as the mid-90s, a debate was raging over whether that was likely to happen. No boost in productivity was discernible—in fact, productivity growth was in a historic slump from 1970 to 1995.

Those who thought the economy would become much more productive because of the information revolution (computing and telecommunications) found themselves squared off against those who merely cited the figures. As the MIT economist, Nobel laureate Robert Solow put it, if the computer is so important, “How come we see the computer revolution everywhere but in the productivity statistics?”

Productivity Takes Off

But then, in 1995-2000, productivity growth finally took off. In those years, productivity grew at 2.8% annually, double the growth rate in 1970-1995.

Can this increase in productivity growth be convincingly linked to the information revolution? And if so, why didn't productivity growth increase before 1995?

Economic researchers have recently tried to answer these questions. Reviewing this effort, Berkeley economics professor Brad DeLong finds sufficient reason to believe that the increased productivity growth was indeed brought about—in large part—by the information revolution. Furthermore, the data explain why information technology did not spur much growth before 1995.

The Information Technology Sector and its Growth

The fact is—in spite of all the hypes and hopes—the IT sector remained a small part of the economy until recently.

In the 1980s, according to DeLong, information technology capital (computer hardware, software, and communications equipment) accounted for only 3.3% of all income earned in the economy. This capital was growing at a rate of 14% per year. DeLong multiplies these two numbers to get 0.5%, the contribution of the IT sector to economic growth in the '80s.

Today, by contrast, IT capital accounts for 7.0% of income earned, and its growth rate has increased to 20% per year. Multiply these two together and you get 1.4%—nearly three times as much annual growth due to the IT sector as in the '80s.

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Will the Trend Continue?

DeLong argues that because the Information Technology sector continues to become a larger part of the economy, and because IT tends to bring accelerated growth wherever it is properly used, increased growth due to information technology is likely to continue for at least ten years. It has also been argued that such rules as Moore's Law, which says that computing power will double every 18 months, are likely to hold good for another ten years.

Therefore, there is good reason to believe—the information revolution not having run its course—that increased economic growth is likely to be with us for some time to come. Though we are experiencing some cyclical downturns in the Information Technology sector today, no one thinks its high rate of growth will not continue over the next decade.

Implications for the Market's Price/Earnings Ratio

Some who continue to be bearish on the market—such as Yale professor Robert Shiller, author of the recent book *Irrational Exuberance*—point to the fact that the market's price/earnings ratio is still much higher than its historical average. Indeed, the S&P 500 index's P/E ratio is 29, roughly twice the historical average since 1929.

Price/earnings ratio—the price of a unit of current earnings—is a simple function of two parameters: the expected future growth rate of earnings; and the future rate of return on investment needed to adequately compensate the investor for the risk taken.

If R is the required rate of return on investment, and G is the anticipated future growth rate of earnings, the P/E ratio is simply the inverse of their difference, $1 \div (R - G)$.

Hence, P/E ratio will be higher when either the anticipated growth rate, G , is higher, or the anticipated return, R , is lower—or both.

Higher Growth, Lower Risk-Premium, or Both?

This brings us to the two things that could be pulling the P/E ratio up.

1) *Anticipated earnings growth rates are higher.* As a matter of record, the market's P/E ratio has done well in the past forecasting higher earnings growth rates. For the years when market P/E ratio was above average, 77% of the time earnings growth over the subsequent ten years was above average too. DeLong's argument seems to provide a good rationale for believing that earnings growth in at least the next decade will be higher than the historical average—perhaps in the same range as the 4% real GDP growth rate we experienced over the years 1995-2000.

2) *The equity risk-premium required by investors is lower.* Numerous academic studies have argued that the equity risk-premium (the return investors received on stocks over and above the return on risk-free securities) has been inexplicably high in the past. The researchers explained it by assuming that investors had an irrational fear of equity investments. That fear seems finally to have dissipated, due to the concerted efforts of investment consultants, 401(k) plans bringing the experience of equity investment to the average American, and the appearance of books like Jeremy Siegel's Stocks for the Long Run.

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Given these developments and the formula for P/E ratio, the numbers add up perfectly. Assume a future inflation rate of 2.5% and a future growth rate of 4%—hence growth of 6.5% unadjusted for inflation. The market's P/E ratio of 29 implies a difference between that growth rate and required investment return of 3.5%—for a total anticipated investment return of 10%, or 7.5% in excess of inflation. This is roughly the same inflation-adjusted return as the historical return over the last two centuries compiled by Jeremy Siegel in Stocks for the Long Run.

Summary

In short, the market's price/earnings ratio is appropriate (that is, stocks as a whole are not overvalued) if: (1) the growth rate of the late '90s continues; and (2) investors continue to perceive stocks as less risky than they used to perceive them. Of course, if these assumptions are incorrect, the market could be either overvalued or undervalued. It is possible not only that future growth rates are overestimated, but that they are underestimated; and it is possible that while equity risk-premiums have declined that they could (as James Glassman and Kevin Hassett argue in Dow 36,000) decline still further. ☺