

# FRBSF ECONOMIC LETTER

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## The Tech Pulse Index: Recent Trends in Tech-Sector Activity

*This Economic Letter introduces the new Tech Pulse Index, a measure that tracks economic activity in the U.S. information technology (IT) sector. The index first appeared under the sponsorship of the Federal Reserve Bank of New York; due to substantial revisions of the econometric model and source data used in the current version, it is not directly comparable to versions released by the New York Fed before August 2008. Starting January 14, 2009, the index will be published every second Wednesday of the month by the San Francisco Fed's CSIP (Center for the Study of Innovation and Productivity). Detailed information about the index's construction, scheduled release dates, and the current as well as historical releases can be found on CSIP's website <http://www.frbsf.org/csip/pulse.php>.*

The Tech Pulse Index tracks the growth of economic activity in the U.S. technology sector by combining information from five main tech-sector indicators on employment, investment, production, shipments, and consumption. The index extracts, on a real-time basis, the main common trend in these indicators and, therefore, tends to provide a clearer picture of trends in the tech sector than the separate indicators themselves.

This *Economic Letter* describes how the index is computed and discusses what it suggests about the current health of the IT sector.

### Recent trends in indicators of activity in the U.S. tech sector

One of the key indicators of sector performance is employment. The growth rate of tech employment during the last expansion peaked in August 2006. Since then, employment growth has slowed and then turned negative in September 2008. As of December 2008, 3.92 million employees were on the payrolls of technology sector firms. This is 2.9% of U.S. nonfarm payroll employment and is 37,500 employees less than at the peak of this business cycle in the tech sector in August 2008.

Declines in high-tech jobs have trailed declines in the overall U.S. job market, because in the first half of 2008 a boost in exports due to a weaker dollar increased foreign demand for U.S. technology goods and services. A reduction in global demand has weakened the outlook for the tech sector since the summer of 2008. In response to this weakening outlook, many industry leaders have announced plans to lay off substantial parts of their U.S. workforce.

The recent course of tech-sector employment is very similar to the trends in the other indicators that are used to construct the Tech Pulse Index: investment, industrial production, shipments, and consumption expenditures.

Investment and industrial production both indicate a marked slowdown in the growth of tech-sector activity beginning in the second half of 2006. This deceleration was temporarily reversed in the first half of 2008. However, since June 2008 growth of both investment in capital goods as well as high-tech industrial production has declined markedly—at an annual rate of 6.4% and 7.2%, respectively, in the third quarter of 2008. These are the first such declines since 2002.

The deteriorating outlook for business conditions will likely induce further cutbacks in firms' IT budgets and spending plans. As a result, further reductions in investment in IT capital goods are to be expected in the coming quarters.

The evidence for shipments follows the same pattern: a slowdown starting in the second half of 2006, a temporary reversal in the second quarter of 2008, and a downturn in recent months. On a month-to-month basis, the shipments data tend to be very volatile. However, the 12-month growth rate, which compares the current level of shipments with that in the same month of last year, was about



### CSIP NOTES

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7% in the year ending August 2006. Thereafter, shipments growth tapered off and turned negative in the second half of 2007. After a short recovery in the spring of 2008, shipments declined sharply in the latter part of 2008, resulting in a 12-month growth rate of -8% in November 2008. This is a bit less of a decline than in overall shipments of U.S. manufacturers over the same period.

In the current recession, unlike the one in 2001, consumer spending is quite weak, and this has disproportionately affected households' purchases of big-ticket items, including personal computers (PCs). Between June 2008 and November 2008, consumer spending on PCs and software declined by more than 2.5%. In terms of the quantity index of personal consumption expenditures used in the Tech Pulse Index, these declines in nominal spending are partly offset by the secular downward trend in the (quality-adjusted) price of computers. As a result, real consumption expenditures on PCs and software declined only in October. Over the 12 months preceding November 2008, real consumption expenditures grew 9.1%. This is the lowest such growth rate since the data started in 1989.

### The Tech Pulse Index

Now we turn from qualitative summaries of the common patterns observed in indicators of tech-sector activity to the Tech Pulse Index for a more formal quantitative measure of these common trends. The Tech Pulse Index not only allows for a comparison of recent months but also for a longer historical perspective with respect to previous business cycles. As described by Hobijn et al. (2003), it is an index of coincident indicators of activity in the U.S. information technology sector, constructed using the methodology proposed by Stock and Watson (1989) and implemented by Clayton-Matthews (2001).

The method used to construct the index yields an estimate of the growth rate of tech-sector activity in deviation from its historical average. The underlying average growth rate is a weighted average of growth rates of the indicators used in the index and is not relevant for the comparison of current with past growth in the sector. Hence, the emphasis here is on deviations from historical average growth rates.

Shipments and investment get most of the weight in the index, and the resulting index is largely a

smoothed combination of these two time series. While employment and industrial production get lower weights, they do contribute to the identification of the common trend that the index represents. Consumption contributes very little.

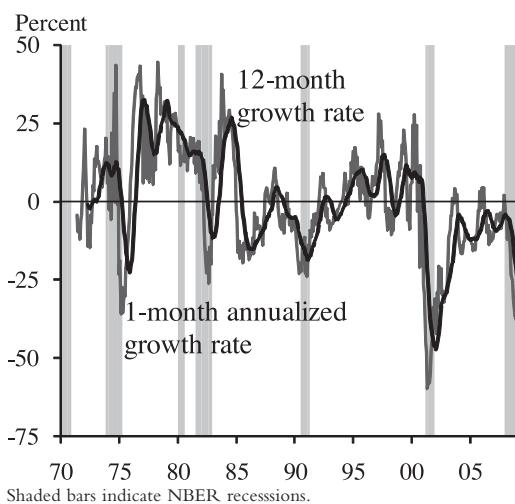
Even though shipments are an important component in the index, the index itself is much smoother than shipments. The reason is that the index combines information on shipments with that contained in the other four indicators. The methodology used to construct the index imputes missing values by using information for indicators for which data are available. This is important in the case of investment, for example, because the data are released on a quarterly basis in the month after the end of the quarter. Hence, looking only at investment in IT capital goods would not allow for a timely analysis of developments in the tech sector in the way the Tech Pulse Index allows.

Figure 1 depicts the historical time series of the Tech Pulse Index in terms of its 12-month growth rate and its annualized 1-month growth rate in deviation from their historical means. This figure shows how the index captures the history of the tech sector: the initial rapid growth in the 1970s after the development of the microprocessor, the acceleration in the first half of the 1980s after the introduction of the PC, a slowdown in the second half of the 1980s when the rate of innovation in the sector decreased, the fast growth in the 1990s after the emergence of the World Wide Web, the tech bust that was at the root of the 2001 recession, and, finally, the below-average growth that followed this bust.

In December 2008, the Tech Pulse Index showed a contraction in activity at an annualized rate of -19.9%, compared to its historical positive average of 15.6%. The 12-month measure is -8.1%. The index closely mimics the common trends in the indicators on which it is based: the deceleration in the second half of 2006, the limited recovery in the first half of 2008, and the drop-off in activity since the summer of 2008.

The historical time series allows us to compare current conditions with previous slumps in activity in the tech sector. Figure 1 reveals that recessions and expansions in the tech sector tend to coincide with those in the overall economy. For example, we saw marked declines in the growth rate of tech-sector activity during the recessions of 1973,

**Figure 1**  
**Growth rate of Tech Pulse Index in deviation from historical average, 1970 to present**



1981, 1990, and, of course, 2001. The current performance of the Tech Pulse Index is at a level comparable to that reached at the troughs of the first three of these four recessions. Given that tech-sector activity has grown faster than the overall economy in the past three and a half decades, the current slowdown in the tech sector causes a much larger drag on overall economic activity than in those three recessions. However, current conditions in the sector are nowhere near as dire as they were in 2001.

Hence, this historical comparison shows that the current economic headwinds buffeting the tech sector are of similar strength to those in most previous economic downturns, except that in 2001. The index, of course, summarizes activity in the sector as a whole. Many tech companies, including some industry leaders, were started in the second half of the 1990s and therefore have histories

shorter than that of the index. For those companies, the current deterioration in business conditions is the second economic downturn that they have faced, and it will be interesting to see which of them are best prepared to weather the storm.

## Conclusion

The most recent version of the Tech Pulse Index suggests that the current downturn in the sector is much less severe than the 2001 slowdown, which was triggered by the dot-com bust. In fact, this tech-sector downturn is of the same order of magnitude as those in 1991, 1983, and 1974. Of course, given the current economic climate, it is unlikely that the most recent numbers reflect the bottom of the current business cycle in the tech sector. We expect growth of the Tech Pulse Index to fall further below its historical average in the months to come.

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