

## The Seasonal Cycle and the Business Cycle

Since 1984, the variance of U.S. output growth has decreased about 75 percent compared with the postwar period ending in 1983. This change and its potential causes have received an enormous amount of attention, and several hypotheses have been proposed. One major hypothesis is that a fundamental structural change took place in the U.S. economy in the 1980s. A leading example of the structural-change hypothesis, proposed by Kahn, McConnell, and Perez-Quiros (2001), argues that improvements in information technology and inventory management are the chief source of the volatility reduction. Key pieces of evidence in support of this argument are the sharp decline in the inventory-to-sales ratio since 1984 and the corresponding sharp decline in the variance of production relative to the variance of sales. Stock and Watson (2002), however, challenge this IT revolution hypothesis. They conclude, on the basis of detailed analysis of a broad set of variables, that there is no strong evidence to show that the inventory-to-sales ratio has declined since 1984 at the business-cycle frequency. Stock and Watson instead attribute most of the reduction in GDP volatility to “good luck”—that is, reductions in the variance of shocks hitting the U.S. economy.

Macroeconomists typically use seasonally adjusted data, under the assumption that the business cycle and the seasonal cycle are unrelated, or that seasonal fluctuations are fully anticipated.<sup>1</sup> Hence the volatility reduction in the U.S. economy since the early 1980s has so far been confirmed only by the use of seasonally adjusted data. However, about 99 percent of the variance in quarterly GDP growth comes from seasonal fluctuations. Aggregate output can grow rapidly in the fourth quarter at an annual rate of more than 19 percent and decline sharply in the first quarter at an annual rate of –32 percent. These quarterly growth rates vary tremendously from one year to another and are largely driven by Christmas spending. In sharp contrast to seasonal fluctuations, the average drop in GDP during a business cycle is only about 3 percent since World War II. It is therefore intriguing to consider whether output volatility has also changed at the seasonal frequency in seasonally unadjusted data. The result could shed new light on the underlying causes of the reduction of output volatility in the U.S. economy.

The attached chart, which shows the seasonal component of U.S. GDP growth for the period between 1947:Q1 and 2005:Q4, clearly indicates a volatility reduction in output growth at the seasonal frequency since 1979. The seasonal component is extracted by a band-pass filter. The variance of output growth at the seasonal frequency has decreased about 67 percent com-

pared with that over the previous period ending in 1979, suggesting that the output volatility reduction found at the business-cycle frequency may be closely related to the volatility reduction at the seasonal-cycle frequency. However, the break point for the structural change is about 4 to 5 years earlier than the break point found at the business-cycle frequency. Also, the seasonal cycle becomes much more uniform after 1979, suggesting less unpredictability in the magnitude of the seasonal cycle. In my view, the marked reduction in seasonal variation is consistent with “structural” hypotheses; it would be consistent with the “good luck” hypothesis only if one believes that we just happened to experience a marked and persistent reduction in seasonal shocks, as well as in business cycle shocks.<sup>2</sup>

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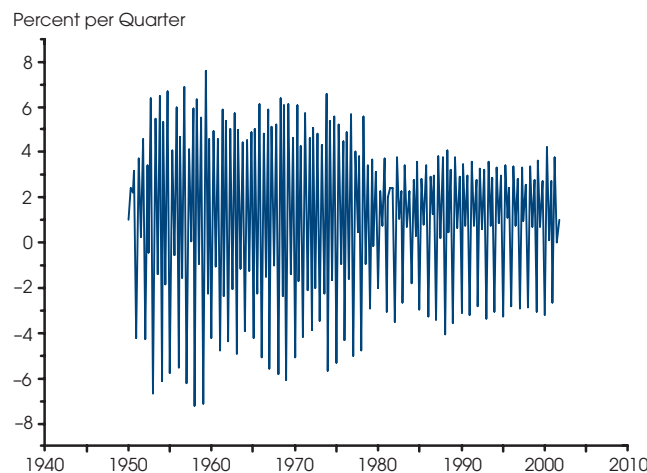
Kahn, James A.; McConnell, Margaret M. and Perez-Quiros, Gabriel. “Inventories and the Information Revolution: Implications for Output Volatility.” Unpublished manuscript, Federal Reserve Bank of New York, 2001.

Stock, James H. and Watson, Mark W. “Has the Business Cycle Changed and Why?” Working Paper 9127, National Bureau of Economic Research, 2002.

<sup>1</sup> In fact, the magnitude of the seasonal cycle is as unpredictable as the business cycle, although the timing of the seasonal cycle is perfectly predictable.

<sup>2</sup> Given that movements at the business-cycle frequency account for only about 1 percent of total variance in output growth, a lack of large business-cycle shocks, even if it could completely eliminate the variance of output at the business-cycle frequency, can hardly cause a significant change in the variance of output at the seasonal frequency.

### Seasonal Component of Output Growth Rate



Views expressed do not necessarily reflect official positions of the Federal Reserve System.