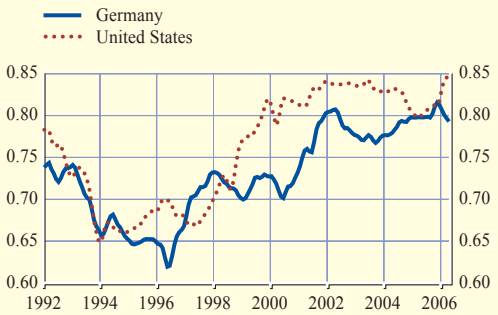
Box 2

THE DEVELOPMENT OF INTERNATIONAL LINKAGES BETWEEN GOVERNMENT BOND YIELD CURVES IN THE EURO AREA AND THE UNITED STATES

Increasing economic globalisation manifests itself in the fact that goods and financial markets are generally becoming more deeply integrated at the international level. As a rule, deeper international economic and financial integration also raises the degree of economic interdependence between the countries concerned. This, in turn, has inevitable implications for

Chart A Percentage of the variation in the level of the domestic yield curve explained by the international factor

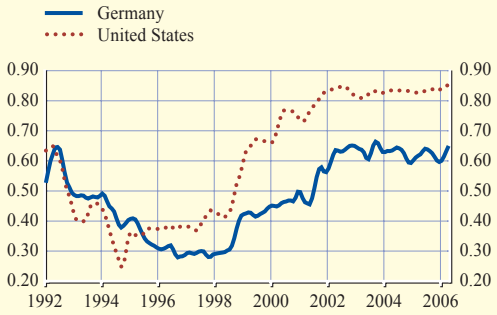
(monthly data in first differences; percentage per six-year period; six-year rolling calculations; January 1986-May 2006)



Sources: BIS and ECB calculations.
Notes: The method used to calculate the domestic (level) factors is outlined by Diebold and Li. The international (level) factor is the first principal component of the domestic (level) factors. A variance decomposition of the domestic (level) factors shows the percentage of the variance in the domestic (level) factor, explained by the international (level) factor. A rolling estimation of the above parameters (six-year window) delivers the data points for Chart A.

Chart B Percentage of the variation in the slope of the domestic yield curve explained by the international factor

(monthly data in first differences; percentage per six-year period; six-year rolling calculations; January 1986-May 2006)



Sources: BIS and ECB calculations.
Notes: The method used to calculate the domestic (slope) factors is outlined by Diebold and Li. The international (slope) factor is the first principal component of the domestic (slope) factors. A variance decomposition of the domestic (slope) factors shows the percentage of the variance in the domestic (slope) factor, explained by the international (slope) factor. A rolling estimation of the above parameters (six-year window) delivers the data points for Chart B.

economic policy, as economic variables might be less influenced by domestic causes and therefore less responsive to domestic policies.

Against this background, this box assesses recent developments in the international linkages between government bond yield curves in the euro area (represented by Germany) and in the United States. The degree to which domestic bond yields depend on developments abroad affects the monetary policy transmission process and is therefore of particular interest to central banks. International linkages between the term structure of government bond yields (one to ten years of maturity) in Germany and the United States are measured on the basis of specific common factors that are extracted in a two-step procedure. First, three unobserved domestic factors are extracted from each term structure, capturing the level, slope and curvature of each country's yield curve.[1] Second, the common (international) factors related to the international level, slope and curvature are extracted from the respective domestic factors.[2]

The time-varying importance of the international factors in explaining domestic yield curve developments is shown in Charts A and B. Both charts show, for each country, the percentage contribution of the international factor to the variation in the domestic level and slope factors over a moving six-year window. Results for the domestic curvature factor are not reported since it explains relatively little of the variation in the domestic yield curves. It can be inferred from

1 Nelson and Siegel propose a three component polynomial function as an approximation to the yield curve. Diebold and Li suggest that this functional form is very flexible and capable of accommodating several stylised facts on the term structure of interest rates and its dynamics. In particular, the parameters of the Nelson and Siegel model can be interpreted as the latent dynamic factors for the level, the slope and the curvature of the yield curve. They estimate the parameters, at each point in time, by least squares using the cross section of domestic yields of different maturities. Repeating the estimating at each point in time provides a time series for the three factors. See Nelson, C. R., and Siegel, A. F., "Parsimonious modelling of yield curve", *Journal of Business,* 1987, pp. 473-489, and Diebold, F. X., and Li, C., "Forecasting the Term Structure of Government Bond Yields," *Journal of Econometrics,* 2006, pp. 337-364.

2 The general idea of this approach for modelling international yield curves follows Diebold, F. X., Li, C. and Yue, V. "Global Yield Curve Dynamics and Interactions: A Generalized Nelson-Siegel Approach," manuscript, Department of Economics, University of Pennsylvania, 2006.

the charts that, throughout the observation period (January 1986 to May 2006), the international factors played an ever increasing role in developments in the level and slope of bond yield curves in both Germany and the United States.

Overall, it appears that changes in bond yields in these two countries have been subject to a growing number of common influences (shocks). It is instructive, however, to identify the driving forces behind the behaviour of the level and slope factors. For example, the level of the domestic yield curve appears to be closely associated with the level of monetary policy rates in each country. A more dominant international factor may therefore to some extent reflect the increased level of homogeneity in monetary policies – particularly with respect to the goal of price stability – in Germany, i.e. the euro area, and the United States over the past two decades. Furthermore, the slope of the domestic yield curve appears to be driven to a large extent by the state of the business cycle. An increasingly important international slope factor might, therefore, suggest a greater synchronisation of the business cycles in the two countries. In addition, it seems as if bond market risk premia have also become more strongly synchronised across the major markets. There is indeed evidence that strong declines in term premia, in particular at longer maturities, contributed markedly to the sharp flattening of the slope of the yield curves in both the euro area and the United States, especially over the past three years.[3] A stronger international factor in term premia could have resulted from investors' perception that euro area and US government bonds may have become closer substitutes to each other. Such a perception, in turn, could reflect the above-mentioned process of increasing international integration of goods and financial markets and the correspondingly smaller role for domestic and exchange rate risks in the pricing of bonds.

Generally, the empirical evidence provided suggests that there is a strong international factor driving yield curves in the euro area and the United States, which seems to have gained importance over time, most likely reflecting the growing levels of economic and financial market integration across national boundaries. Furthermore, the degree of measured international interest rate linkages may also have strengthened recently on a temporary basis, on account of, for example, both economies reacting symmetrically to external global shocks, such as recent oil price developments.

3 See the box entitled "The recent flattening of the euro area yield curve: what role was played by risk premia?" in the December 2006 issue of the Monthly Bulletin.