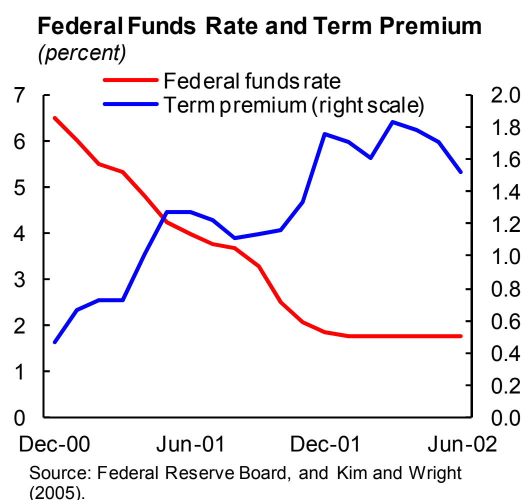
Appendix 1: Spillovers and Synchronicity in the United States and the Euro Area: Developments During Selected Monetary Policy Cycles

The easing cycle in 2001–03 is an example of synchronous real and monetary conditions in the United States and the euro area:

- After years of rapid expansion, economic activity in the United States peaked in 2000:Q2, with annualized year-over-year growth reaching 5¼ percent. By end-2000, growth had collapsed to less than 3 percent, and the economy continued to decelerate in 2001, reaching a cyclical low toward the end of the year. The recovery was rather bumpy until mid-2003 but consolidated by early 2004. Despite the sharp deceleration in the second half of 2000, the Federal Reserve kept the policy rate constant until December and began a gradual easing in January 2001. The slow monetary easing and a surprising sharp increase in the term premium—from less than 0.4 percent in January 2001 to about 1.7 percent by the summer of 2002 (see chart on the right)—likely prevented monetary conditions to ease as warranted by cyclical developments (Figure A1.2, panels 1, 3, and 5). The downward pressure from domestic real shocks to U.S. yields point to negative surprises on economic activity throughout 2001 (dark red of panel 3, Figure A1.2)—with somewhat volatile perceptions, likely associated with volatility in underlying data, as noted above. The framework also captures the slow reaction by the Federal Reserve and the increase in the term premium as a positive contribution of money shocks to yields. 1



Source: Federal Reserve Board, and Kim and Wright (2005).

- The euro area economy had also experienced a rapid recovery starting in late 1998, with the economy peaking during the first quarter of 2001 (at an annualized year-over-year rate of 5½ percent). However, growth turned around in the second quarter and bottomed out in early 2002. Activity remained subdued until mid-2003, when a recovery began to take place. The ECB began a monetary easing cycle in early 2001, but it interrupted it in November of that year, keeping the policy interest rate constant for a year despite weak economic activity

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(Figure A1.2, panels 2, 4, and 6). The negative contribution of domestic real shocks to euro area yields reflect persistent negative surprises on the economic outlook throughout 2001, which became larger during 2002 and early 2003. Panel 6 points to increasing upward pressure on yields from money shocks in late 2001, likely reflecting the interruption of monetary policy easing by the ECB. The positive contribution of domestic money shocks stabilized in late 2002, however, as the ECB resumed its loosening of monetary policy. This period was characterized by large spillovers from the United States to the euro area: money spillovers were large (light blue bars of panel 6, Figure A1.2), and real spillovers were smaller but significant (light red bars in panel 4, Figure A1.2). Spillovers from the euro area to the United States were more modest: considerable in size for real shocks (Figure A1.2, light red bars in panel 3) and negligible for money shocks (Figure A1.2, light blue bars in panel 5).

The easing cycle in 2007–09 is an example of asynchronous real and monetary conditions in the United States and the euro area:

- As the U.S. subprime crisis unraveled with larger-than-expected adverse effects on the real economy, domestic real shocks started to put downward pressure on U.S. 10-year yields (dark red bars in panel 3, Figure A1.3). The negative contribution of these shocks increased in the first quarter of 2008, as fears of a deeper-than-anticipated recession emerged, when the Federal Reserve provided an emergency loan to Bear Stearns to avert a sudden collapse of the company. In the second half of 2008, another wave of domestic real shocks in the United States started to drive yields down, this time reflecting negative growth surprises associated with the placement of Fannie Mae and Freddie Mac into conservatorship, the collapse of Lehman Brothers, and the bailout of AIG. Indeed, U.S. economic activity contracted sharply during this period, with average quarterly growth rates between 2007:Q3 and 2008:Q3 falling to virtually zero. The contribution of domestic U.S. money shocks was initially negative but very small, likely reflecting the fast and sharp easing of monetary policy stance at the onset of the crisis (dark blue bars in panel 5, Figure A1.3). However, toward the second half of 2008, domestic money surprises started to push U.S. 10-year yields up, possibly capturing the liquidity squeeze in financial markets around the collapse of Lehman Brothers, as well as market participants' misperceptions (or incomplete information) about the strategies authorities would follow toward stressed financial institutions.
- In 2007, growth held up relatively well in the euro area, as captured by the positive contribution of real domestic shocks to euro area yields (dark red bars in panel 4, Figure A1.3). However, output growth fell sharply in the second half of 2008, as the recession in the US generated negative growth spillovers to the euro area (light red bars in panel 4, Figure A1.3). Notwithstanding the deterioration in economic activity, the ECB kept its policy rate on hold through 2008:Q3. Market participants likely perceived the monetary policy stance as being "too tight" given the weak cyclical position, a phenomenon which our model captures

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as a positive contribution to yields from domestic money shock (dark blue bars in positive territory of panel 6, Figure A1.3.). Subsequently, as the euro area economy fell into recession following the collapse of Lehman Brothers, the ECB started an easing cycle, cutting its policy rate aggressively by more than 400 bps between September 2008 and May 2009. These actions helped reduce euro area 10-year yields (dark blue bars in negative territory of panel 6, Figure A1.3.).

- Investor risk-aversion increased sharply with news about the vulnerabilities of large U.S. financial institutions (Bear Stearns, Lehman Brothers, etc.), pushing yields down ("risk-off") in both the United States and euro area (yellow bars in panels 1 and 2, Figure A1.3).
- This period was characterized by important real spillovers from the United States to the euro area, notably in the second half of 2008. In contrast, real spillovers from the euro area to the United States were small. As regards to money shocks, there were significant two-way spillovers between the two economies, which were mostly asynchronous. Therefore, external money shocks tended to dampen the effects of domestic ones on the economy's own yields.

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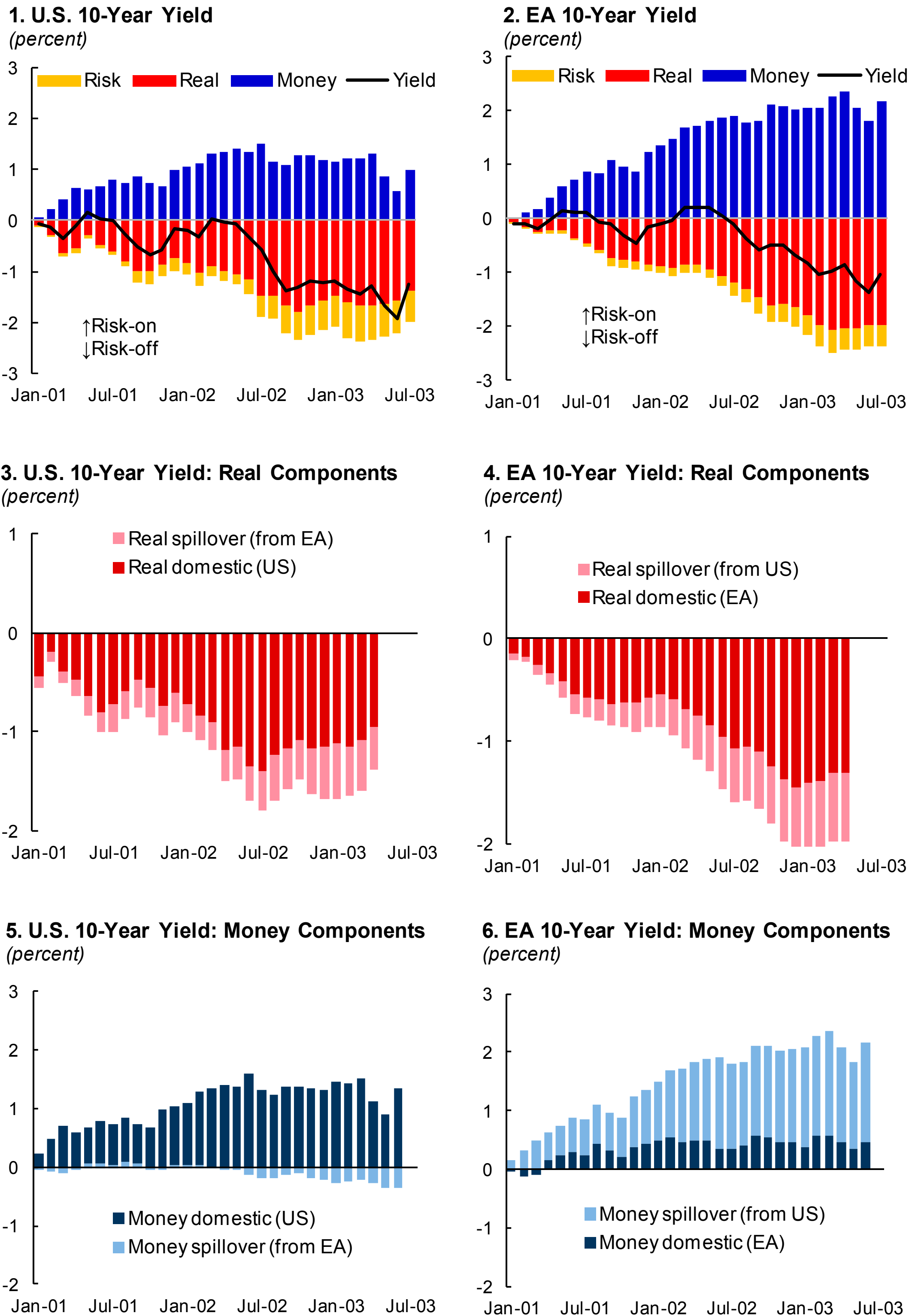

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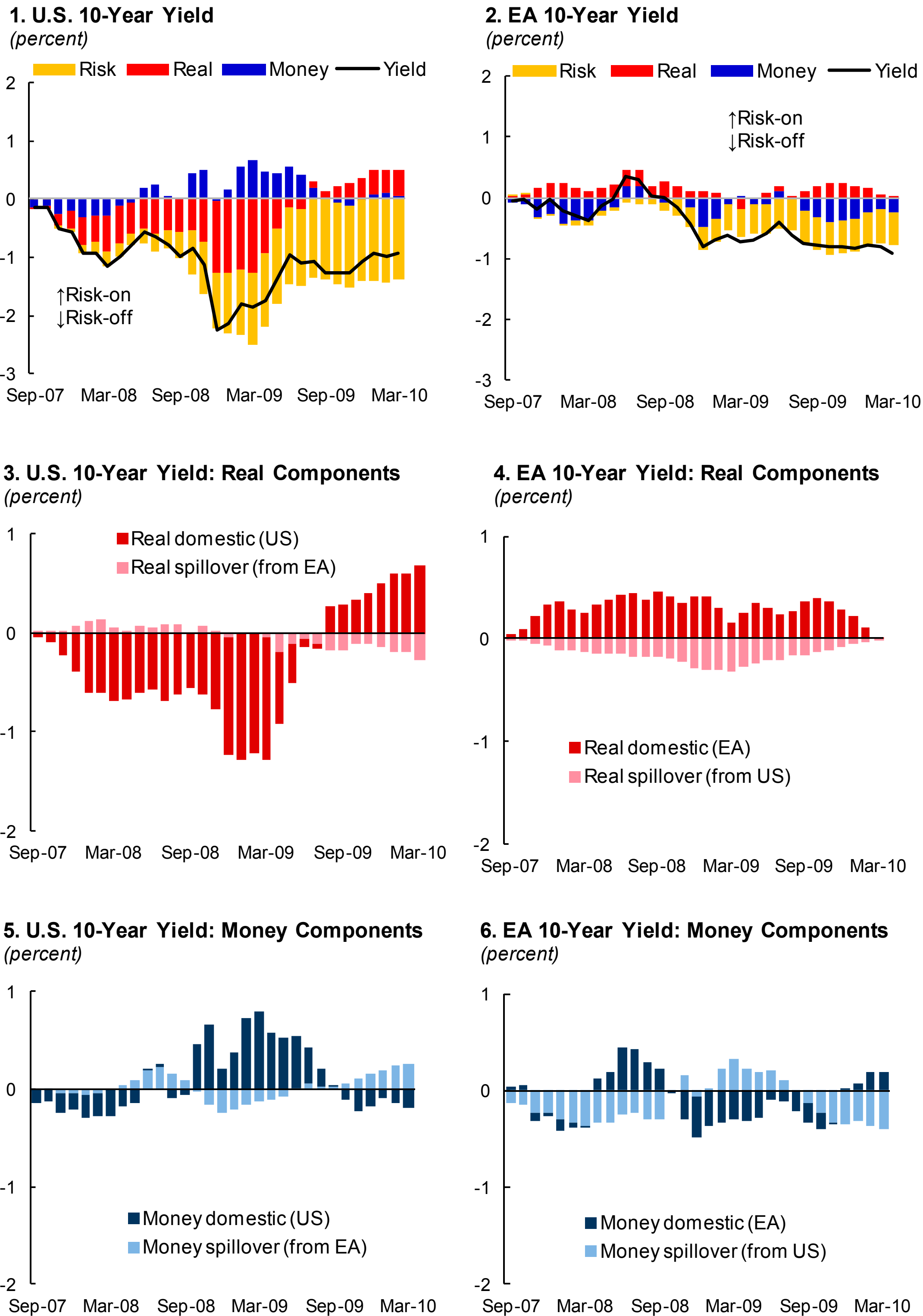
Figure A1.3. United States and euro area 10-Year Yield Decomposition in the 2007 Federal Reserve Easing *(cumulative change)*



Sources: Bloomberg L.P.; and IMF staff estimates.
Note: U.S.=United States; EA=euro area.

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