

## **Prefatory Note**

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JUNE 21, 2007

# MONETARY POLICY ALTERNATIVES

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PREPARED FOR THE FEDERAL OPEN MARKET COMMITTEE  
BY THE STAFF OF THE BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

## MONETARY POLICY ALTERNATIVES

### Recent Developments

(1) The anticipated path of the federal funds rate embedded in financial market prices rotated up sharply over the intermeeting period (Chart 1). Only a small portion of this change, however, was posted on the heels of the May 9<sup>th</sup> FOMC meeting. The decision to leave the federal funds rate target unchanged at 5¼ percent accorded with market expectations, but some market participants were reportedly surprised by the retention of the assessment that inflation was “somewhat elevated.”<sup>1</sup> There was little market response to the publication of the minutes of the meeting. Over the intermeeting period, however, investors seemed to reappraise their beliefs that the economic expansion would slow and that monetary policy easing would be forthcoming, based in part on monetary policy communications and the release of some more-favorable-than-expected economic data in the United States and abroad.

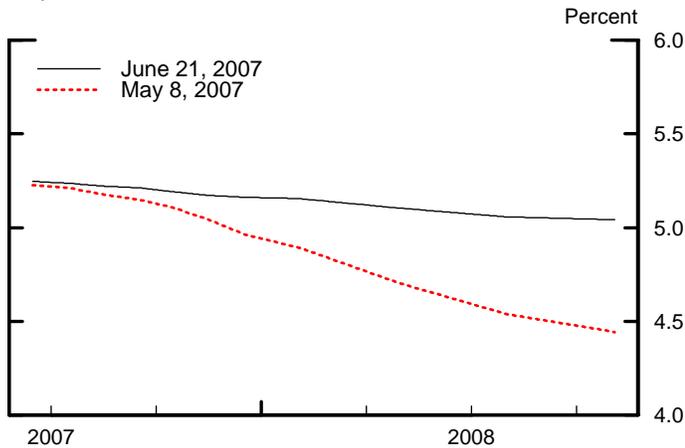
(2) Futures quotes indicate that market participants now expect the FOMC to leave the target federal funds rate unchanged through the end of this year and see only about 25 basis points of easing by the end of 2008, about 60 basis points less than at the time of the May FOMC meeting. As indicated in the Desk’s recent survey, primary dealers also envision policy being on hold for some time, with a number of firms abandoning their forecasts for rate cuts this year. These revisions were associated with a marked decline in the weight attached to lower interest rates in the option-implied distributions of future federal funds rates, and measures of uncertainty about the near-term path of policy narrowed to historical lows.

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<sup>1</sup> The effective federal funds rate averaged 5.25 percent over the intermeeting period. During the period, System holdings of Treasury securities were unchanged. The volume of outstanding long-term RPs decreased by \$1 billion, to \$11 billion.

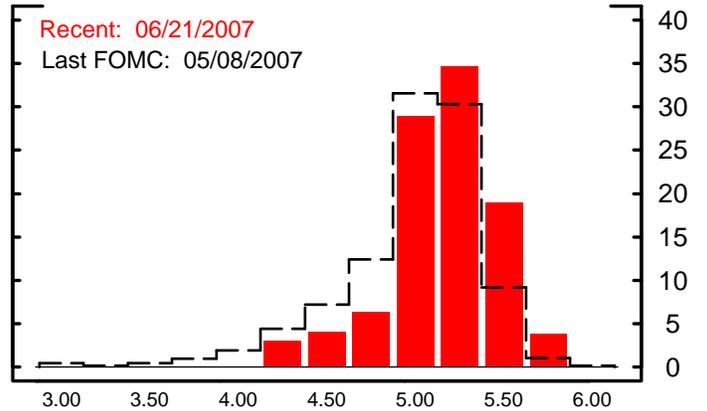
### Chart 1 Interest Rate Developments

Expected Federal Funds Rates\*



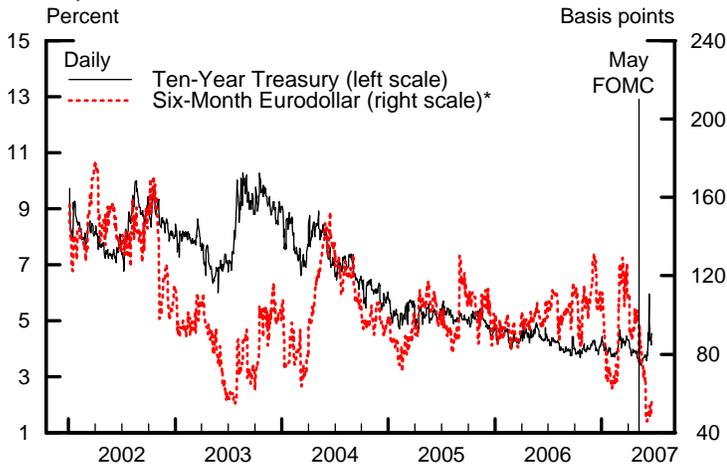
\*Estimates from federal funds and Eurodollar futures, with an allowance for term premiums and other adjustments.

Implied Distribution of Federal Funds Rate Six Months Ahead\*



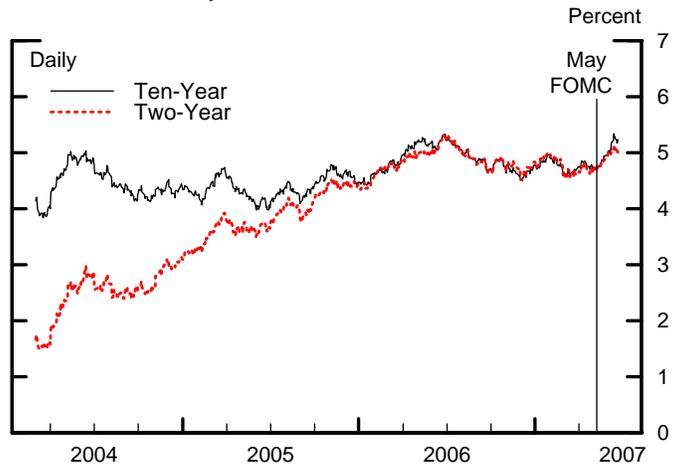
\*Derived from options on Eurodollar futures contracts, with term premium and other adjustments to estimate expectations for the federal funds rate.

Implied Volatilities



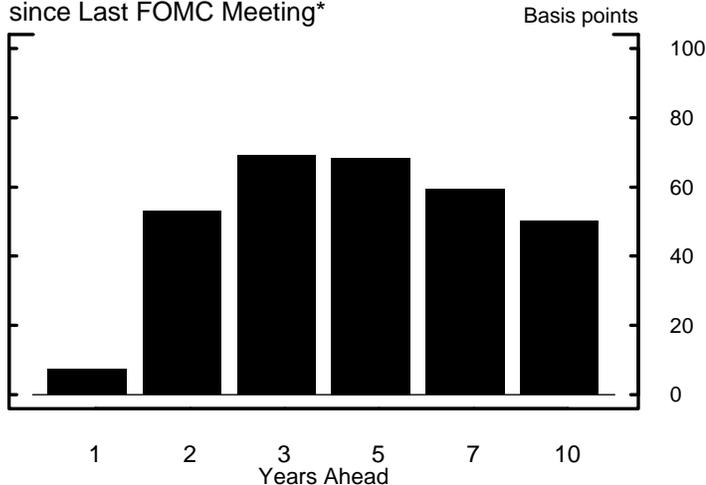
\*Width of a 90 percent confidence interval estimated from the term structures for the expected federal funds rate and implied volatility.

Nominal Treasury Yields\*



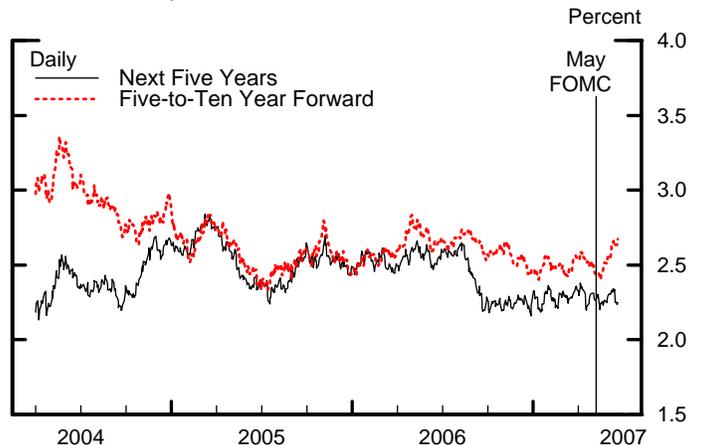
\*Par yields from a smoothed nominal off-the-run Treasury yield curve.

Change in Implied One-Year Forward Treasury Rates since Last FOMC Meeting\*



\*Forward rates are the one-year rates maturing at the end of the year shown on the horizontal axis that are implied by the smoothed Treasury yield curve.

Inflation Compensation\*



\*Estimates based on smoothed nominal and inflation-indexed Treasury yield curves and adjusted for the indexation-lag (carry) effect.

Note: Vertical lines indicate May 8, 2007. Last daily observations are for June 21, 2007.

(3) Yields on nominal Treasury securities rose sharply over the intermeeting period, with two-year rates increasing 30 basis points and ten-year rates gaining about 55 basis points. This upward shift in the term structure reflected increases in one-year forward rates across the yield curve, with the most pronounced gains posted in forward rates three to five years ahead. Real rates accounted for the bulk of the increase. TIPS-based inflation compensation for the next five years edged lower on net, but five-to-ten-year-ahead inflation compensation rose about 20 basis points. Survey measures of inflation expectations posted mixed changes. According to staff models, the pickup in real yields at distant horizons owed primarily to increases in real term premiums, while about half of the increase in inflation compensation at the long end of the curve reflected increases in inflation expectations. (See box entitled “More on Recent Interest Rate Developments.”)

(4) Equity markets were volatile at times during the intermeeting period, but broad stock price indexes gained about 1 percent, on net, as the boost from largely favorable news on the economy and announcements of mergers and acquisitions outweighed the drag of higher bond yields (Chart 2). The implied volatility of the S&P 500 edged up on net, but remained low by historical standards. Yields on investment-grade corporate bonds increased about in line with those on nominal Treasury securities of comparable maturity. In contrast, yields on speculative-grade corporate bonds rose less, leaving risk spreads about 20 basis points narrower. Corporate credit quality remained solid, with realized and expected default rates staying very low.

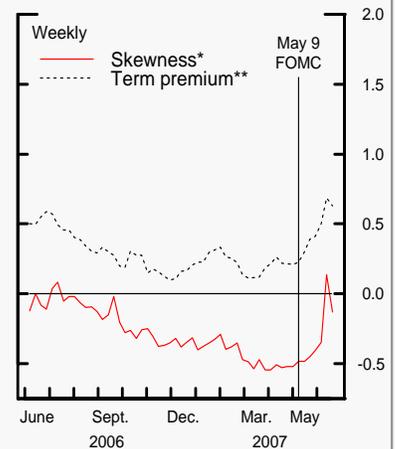
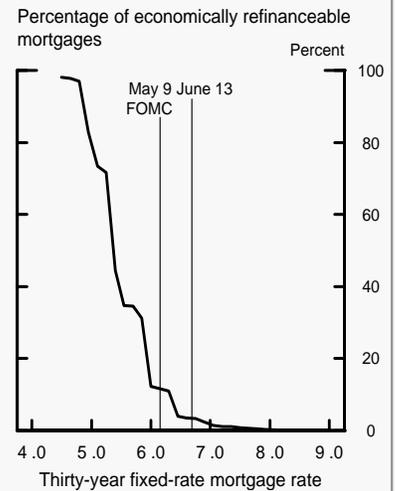
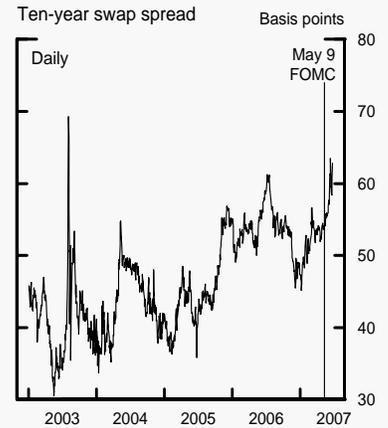
(5) Despite the substantial declines in bond prices posted over the intermeeting period, fixed-income markets generally functioned smoothly, with elevated Treasury trading volumes and normal bid-asked spreads. However, credit conditions in markets for assets backed by subprime mortgages deteriorated notably in some cases. For example, spreads on indexes of subprime credit default swaps rose steadily, and

### More on Recent Interest Rate Developments

The increase in shorter-term Treasury yields over the intermeeting period appeared to reflect a revised outlook for monetary policy. About half of the 30 basis point move in two-year yields occurred in the narrow windows bracketing FOMC communications and economic data releases. Apparently in response to incoming news, as well as a more general change in sentiment, most of the remaining primary dealers who had been predicting policy easing this year threw in the towel and now forecast policy to be on hold for some time. Short-term yields around the globe also increased, as data pointed to somewhat stronger growth and higher inflation in a number of countries, and some foreign central banks either tightened policy or signaled increased concern about inflationary pressures.

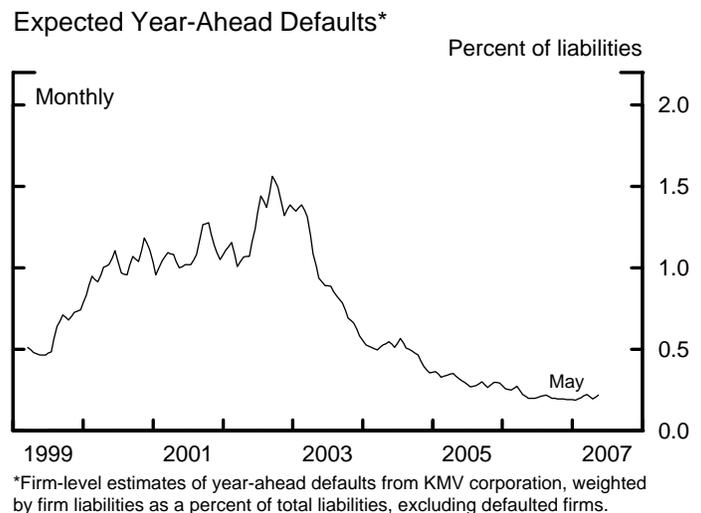
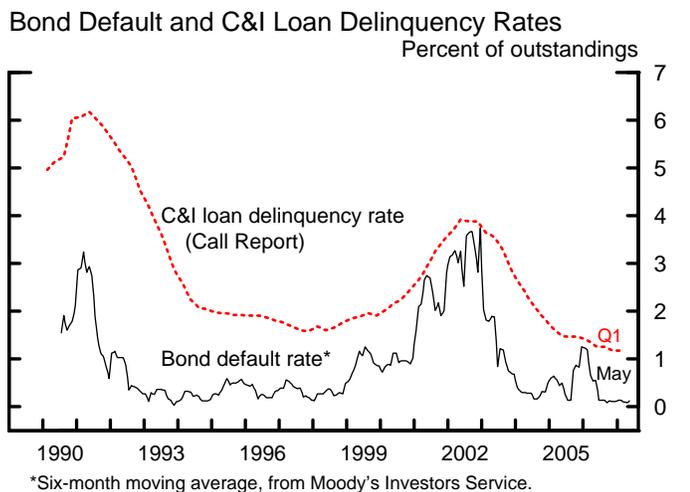
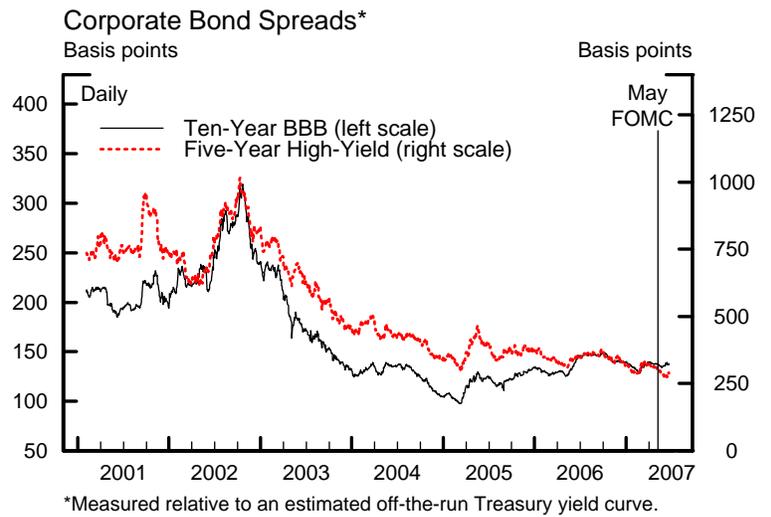
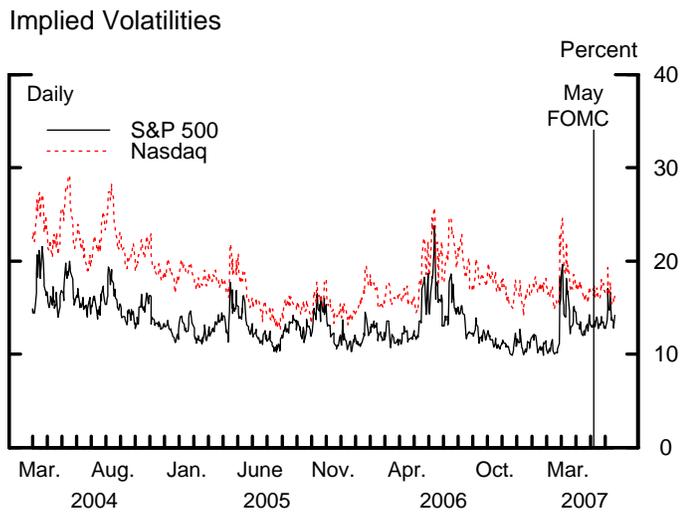
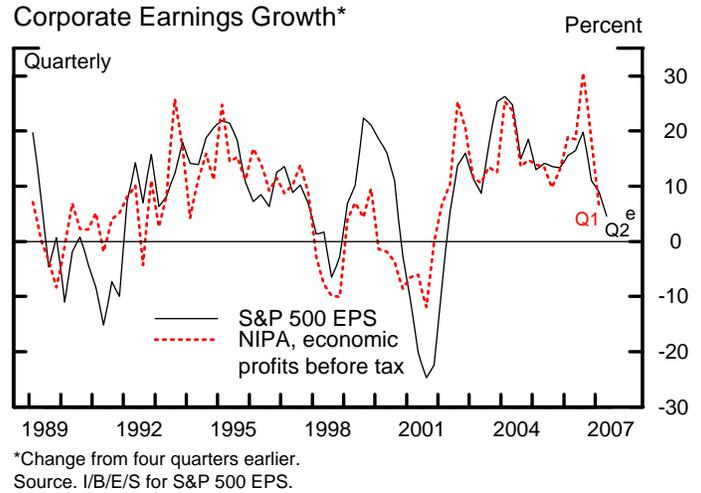
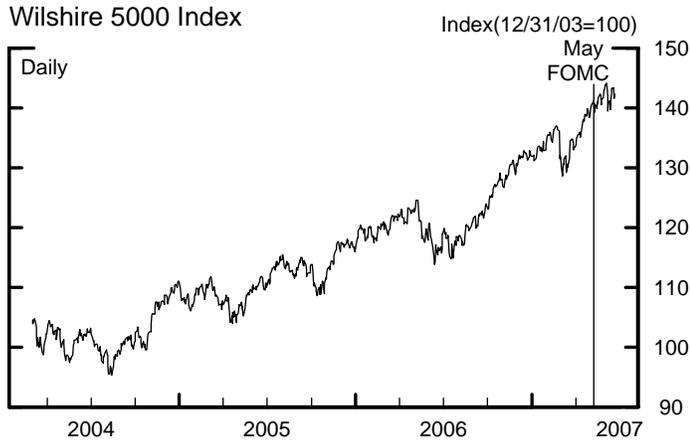
The shift in the economic outlook was likely the prime mover of longer-term rates as well, but mortgage convexity hedging flows reportedly amplified these upward movements in rates. Swap spreads widened and swaption-implied volatility rose, as investors sought to trim longer-dated exposures when the effective duration of their mortgage holdings lengthened. However, the rise in swap rates was considerably smaller than during past episodes when convexity hedging likely played a significant role. Moreover, the staff estimates that only a small amount of mortgages was economically refinaneable even before the rise in mortgage rates.

Over this intermeeting period, changes in option-based measures of interest rate uncertainty have been mixed, as implied volatilities on short-term rates declined and those on longer-term rates rose. However, the reduced skew of the implied distributions of expected funds rates in the near term may go some way in helping to explain movements in term premiums. Market participants now evidently see the risks to the outlook for short-term interest rates as more symmetric, as opposed to tilted sharply to the downside, and borrowers may be willing to pay a higher term premium to avoid the risk of having to roll over debt at higher short-term rates in the future.



\*Skewness of Eurodollar implied distribution, 6 months ahead. \*\*10-year zero-coupon term premium derived from an arbitrage-free model.

## Chart 2 Asset Market Developments



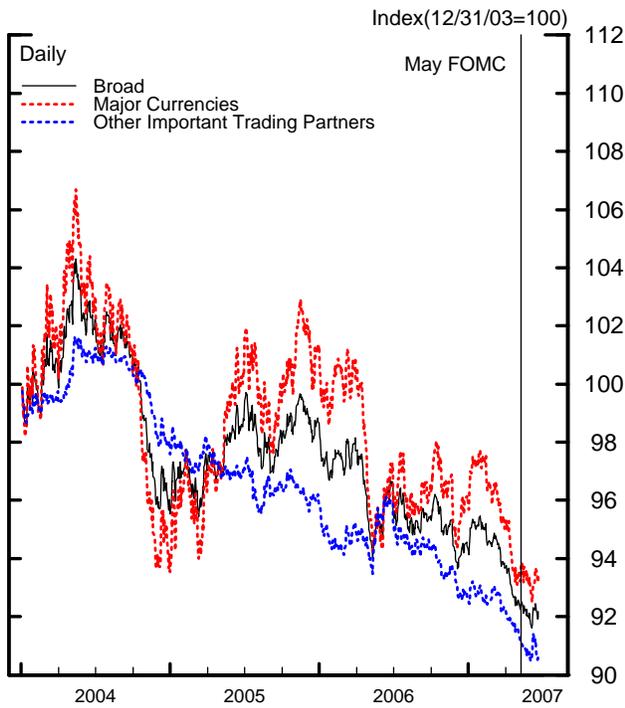
Note: Vertical lines indicate May 8, 2007. Last daily observations are for June 21, 2007.

some of the indexes reached new highs. Reflecting the weakness in these markets, and perhaps reinforcing them as well, were the well-publicized difficulties at two medium-sized hedge funds managed by Bear Stearns Asset Management. The funds were positioned to gain from an improvement in subprime credit quality, and when the market worsened instead, the resulting losses led to massive liquidity pressures on at least one of the two funds. Following unsuccessful negotiations to reach a workout, some counterparties moved to take collateral and close out positions. Actual and anticipated sales of fund assets raised concerns that the resulting downward pressure on prices could lead to significant losses among market participants. These concerns were exacerbated by the high degree of uncertainty about the valuation of subprime assets, particularly CDOs. Spillover effects of the funds' difficulties have apparently been modest thus far, although spreads on some lower-quality corporate credit derivative indexes also widened this week. Market participants report no other sizable hedge funds with similar problems. Credit exposures to the two funds are widely dispersed, and CDS spreads for the creditor firms have generally moved up only a few basis points. Bear Stearns's CDS spread has risen more, but it remains near the peak it reached during the period of volatility in late February and early March.

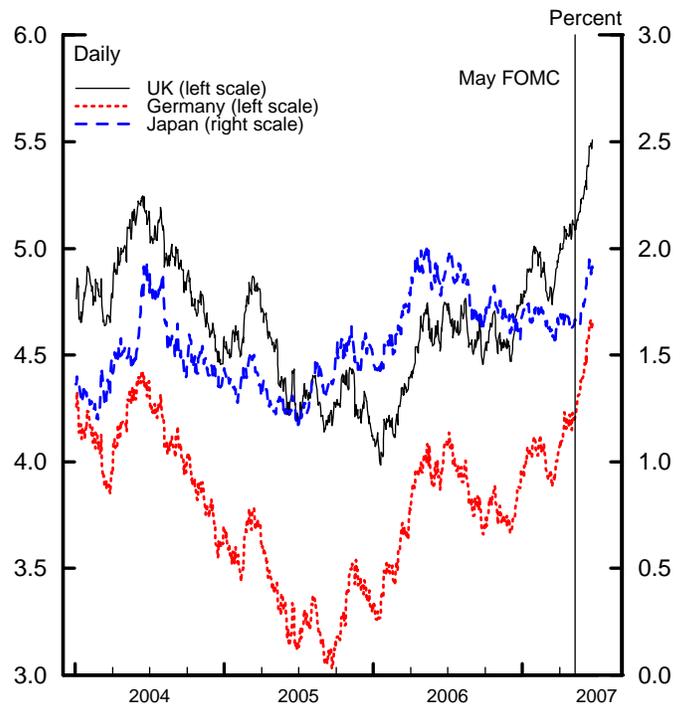
(6) The foreign exchange value of the dollar was little changed on balance over the intermeeting period against a trade-weighted index of major foreign currencies (Chart 3). The dollar fell 3 percent against the Canadian dollar, but rose 3 percent against the Japanese yen and by smaller amounts against most other major currencies. Day-to-day movements in foreign government bond yields were highly correlated with fluctuations in U.S. longer-term rates, with yields abroad increasing 25 to 50 basis points, on net, somewhat less than in the United States. As in the United States, most of the increases in foreign nominal yields reflected changes in real yields, which were boosted by stronger-than-expected indicators of economic growth and prospects for

### Chart 3 International Financial Indicators

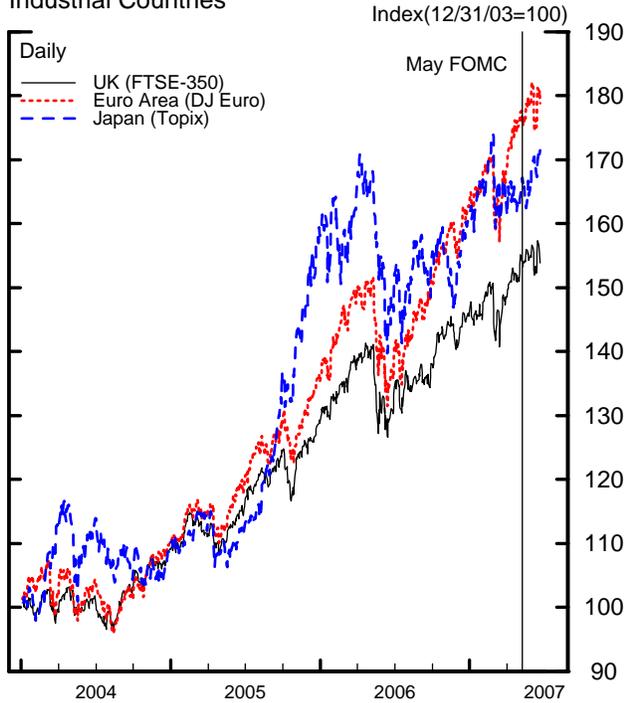
Nominal Trade-Weighted Dollar Indexes



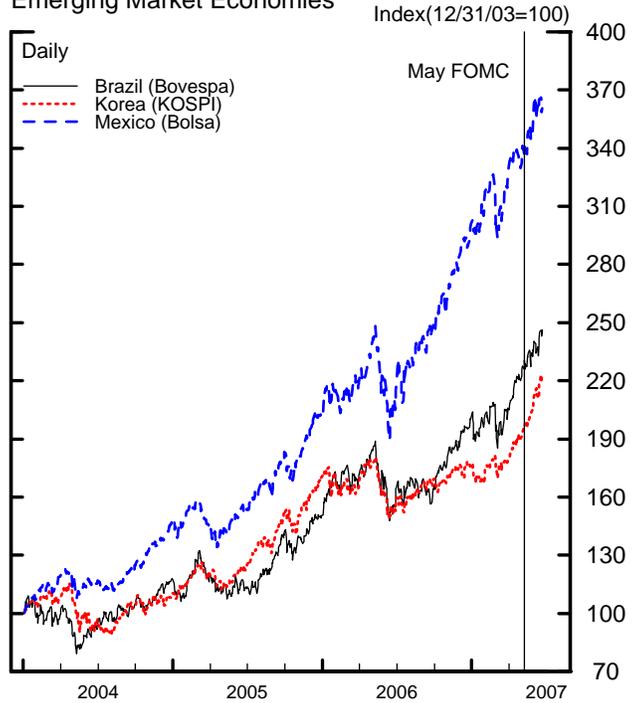
Ten-Year Government Bond Yields (Nominal)



Stock Price Indexes  
Industrial Countries



Stock Price Indexes  
Emerging Market Economies



Note: Vertical lines indicate May 9, 2007. Last daily observations are for June 21, 2007.

tighter monetary policy. Major foreign stock markets posted modest gains. As was widely expected, the Bank of England and the European Central Bank raised their policy rates 25 basis points. In contrast, the Bank of Canada and the Bank of Japan left their policy rates unchanged during the intermeeting period. However, strong data releases and a hawkish policy statement by the Bank of Canada appeared to buoy the Canadian dollar and fuel the relatively large advance in Canadian bond yields relative to those in other foreign industrial countries.<sup>2</sup>

(7) The value of the dollar was down slightly over the intermeeting period against an index of currencies of our other important trading partners, led by a 5 percent decline against the Brazilian *real* and a 1 percent fall against the Chinese renminbi. Local-currency bond yields rose 30 to 60 basis points in emerging Asia and Eastern Europe. Spreads on dollar-denominated issues in emerging markets, much like those in U.S. speculative-grade markets, declined slightly. Stock prices in most emerging-market countries recorded solid gains over the period, including in China despite a sharp drop at the end of May related to the increase of a tax on equity transactions.

(8) The debt of domestic nonfinancial sectors appears to be expanding at a 6½ percent annual rate in the second quarter, off a little from the 7¼ percent pace registered in the first quarter (Chart 4). The slowdown is primarily attributable to a decline in debt growth for the federal government, which has resulted from more-than-seasonally strong tax receipts. Business debt is estimated to be rising at a robust 10 percent rate, boosted by financing of a large volume of mergers and acquisitions. Both bond issuance and growth in business loans have been brisk. Bank lending standards and terms remain quite accommodative, with information from the

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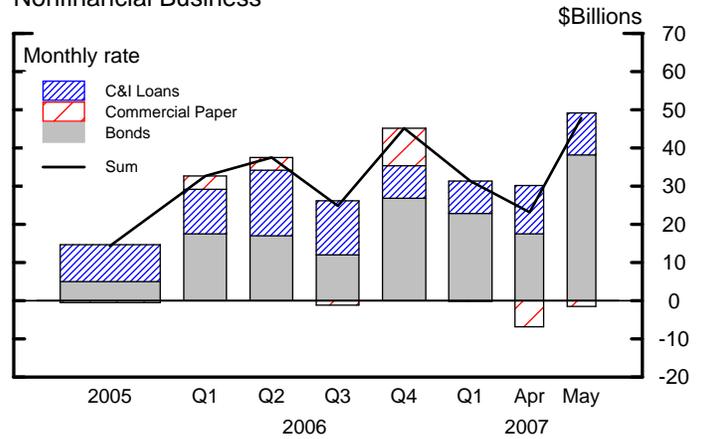
### Chart 4 Debt and Money

Growth of Debt of Nonfinancial Sectors

Percent, s.a.a.r.	Total	Business	Household
2006	8.1	9.6	8.7
Q1	8.9	10.0	9.3
Q2	7.5	8.8	9.2
Q3	6.9	7.0	7.9
Q4	8.2	11.4	7.2
2007			
Q1	7.3	9.0	6.0
Q2e	6.5	10.3	5.9

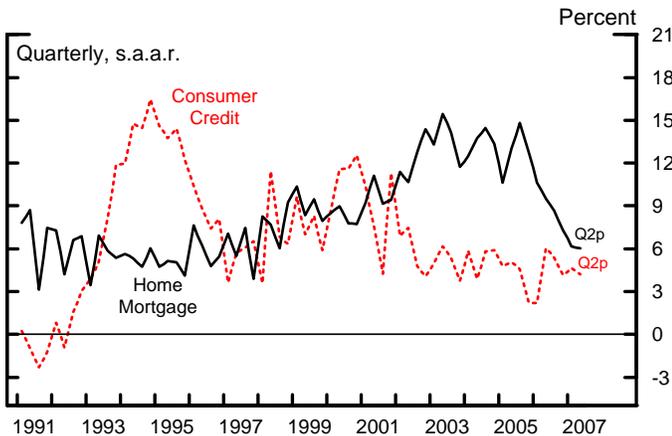
e Estimated.

Changes in Selected Components of Debt of Nonfinancial Business\*



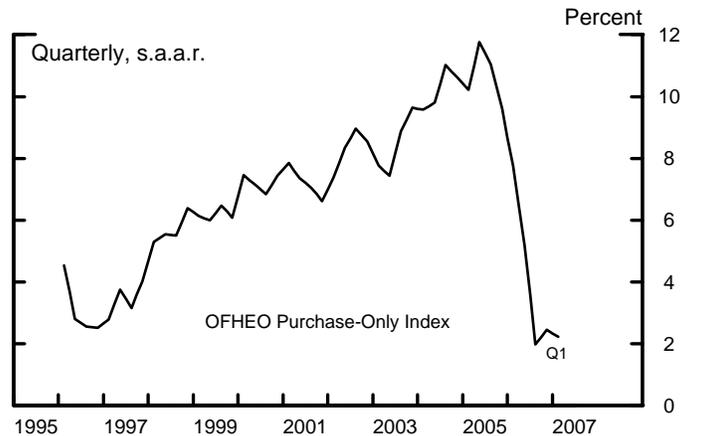
\*Commercial paper and C&I loans are seasonally adjusted, bonds are not.

Growth of Debt of Household Sector

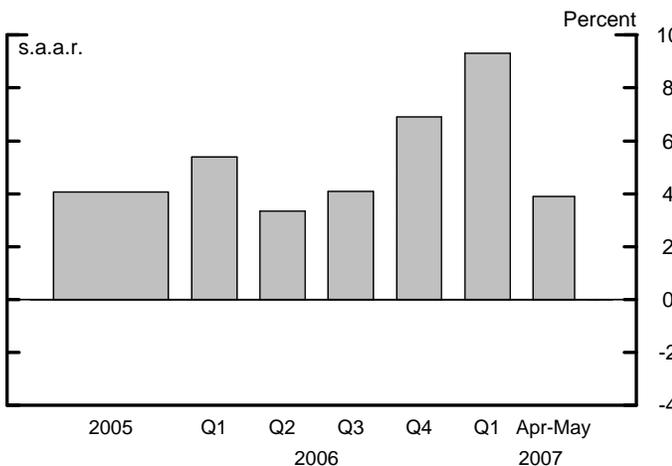


p Projected.

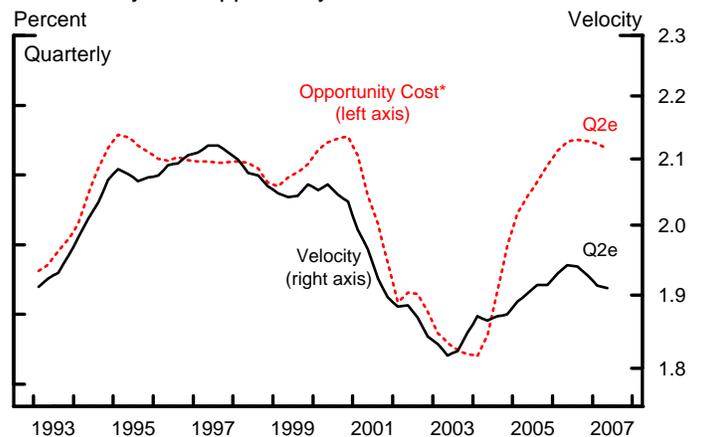
Growth of House Prices



Growth of M2



M2 Velocity and Opportunity Cost



\*Two-quarter moving average.

e Estimated.

syndicated loan market indicating narrow spreads, high leverage, and an erosion in loan covenants. With house prices continuing to be soft, home sales sluggish, and mortgage rates moving higher, growth of home mortgage debt is estimated to be slowing slightly to a 6 percent annual rate in the second quarter, while the overall expansion of consumer credit appears modest at a 4 $\frac{1}{4}$  percent rate.

(9) Smoothing through tax-related fluctuations, M2 grew at a 6 percent average annual rate in April and May, following surprisingly strong expansion in the first quarter. The moderation was broad-based and led by a decline in liquid deposit growth to a pace more in line with that of nominal income. Retail money market mutual funds and small time deposits also decelerated. Currency growth continued to be modest, likely reflecting weak foreign demand.

### **Economic Outlook through 2008**

(10) In response to incoming data over the intermeeting period, the staff marked up its assessment of the pace of growth in the second quarter but changed the broad contours of the forecast thereafter relatively little from those in the May Greenbook. Smoothing through volatile quarterly readings, real GDP is now seen as expanding at around a 2 percent annualized rate in the first half of this year; the pace of real GDP growth is forecast to pick up to 2 $\frac{1}{4}$  percent in the remainder of 2007 and 2 $\frac{1}{2}$  percent in 2008. As a consequence, the labor market is expected to be slightly tighter than in the previous Greenbook, with the unemployment rate predicted to rise slowly, but to remain below 5 percent—the staff's estimate of the NAIRU—throughout the forecast period. The staff forecast continues to be predicated on the assumption that the federal funds rate will be held at 5 $\frac{1}{4}$  percent until the end of 2008. Following the substantial upward shift in investors' policy expectations over the intermeeting period, this trajectory is now very similar to that implied by money market futures quotes. Consequently, with little expected change in term premiums, longer-term interest rates

are projected to remain near their current higher levels. Equity prices are expected to rise at a rate sufficient to generate risk-adjusted returns comparable to those on fixed-income investments. The foreign exchange value of the dollar is assumed to depreciate 2 percent per year—a somewhat faster pace than in the May forecast. Spot oil prices are still expected to move somewhat higher, as informed by futures market quotes. Recent favorable inflation readings led the staff to lower the core inflation forecast slightly. The staff now expects core PCE inflation to average 2 percent both this year and next. Total PCE inflation is projected to be nearly 3 percent this year, boosted by higher energy and other commodity prices, before falling back to 2 percent in 2008.

(11) In the survey of economic projections taken for the May meeting, the central tendency of FOMC participants' forecasts for real GDP growth was 2 to 2.5 percent in 2007 and 2.5 to 2.8 percent in 2008. The central tendency of the forecasts for core PCE inflation was 2.1 to 2.3 percent this year and 1.8 to 2.1 percent next year. The May Greenbook projection was at the bottom of the central tendency of FOMC participants' forecasts for growth and the top of the central tendency of their forecasts for inflation.

## **Medium-Term Strategies**

(12) To provide a longer-term perspective on the economic outlook and possible monetary policy strategies, optimal control simulations of the FRB/US model were conducted using the staff's extension of the Greenbook forecast beyond 2008.<sup>3</sup> These simulations employ a new benchmark specification of the model equation that determines the evolution of the long-run inflation expectations of wage and price setters, which are now assumed to respond not only to movements in actual

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<sup>3</sup> More information on the extended outlook is provided in the memo to the Committee by Thomas Laubach, "Extended Greenbook Forecast," June 20, 2007.

inflation—as in previous Bluebooks—but also to shifts in the nominal federal funds rate and the output gap.<sup>4</sup> Because long-run inflation expectations in the previous specification responded quite slowly to changes in actual inflation, disinflation came at a relatively high cost in terms of cumulative labor market slack. In contrast, the new specification implies that a shift in monetary policy directly affects the public’s perception of the central bank’s inflation goal and hence their long-run inflation expectations. As a result, the costs of a policy-induced disinflation in FRB/US are lower than presented in previous Bluebooks and are now in closer alignment with the staff’s judgmental assessment.<sup>5</sup>

(13) Chart 5 shows optimal control simulations of the FRB/US model in which policymakers’ inflation goal is either 1½ percent or 2 percent.<sup>6</sup> For an inflation goal of 2 percent (the right-hand set of charts), the optimal control simulation prescribes a federal funds rate path that remains close to 5¼ percent through early 2009 and then declines gradually to just above 4 percent by the end of 2012; from late 2008 forward, the unemployment rate is near the 5 percent NAIRU, and core inflation is close to the 2 percent goal (solid lines). This optimal policy outcome is similar to that shown in the May Bluebook (dotted lines); furthermore, the change to the

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<sup>4</sup> For further details, see the memo to the Committee by Michael Kiley, “Changes to the evolution of long-run inflation expectations in the FRB/US model and their implications for FRB/US properties and optimal control simulations,” June 11, 2007.

<sup>5</sup> In spirit, the new specification is broadly consistent with private agents learning about the Committee’s inflation goal from policy surprises—as in the scenario dubbed *learning from policy actions* that was discussed in the March Bluebook box, “Inflation Expectations and Optimal Control Policies.” An extreme version of learning is the *immediate-recognition* scenario of the March Bluebook in which wage and price setters match their long-run inflation expectations to the announced setting of the policymakers’ goal.

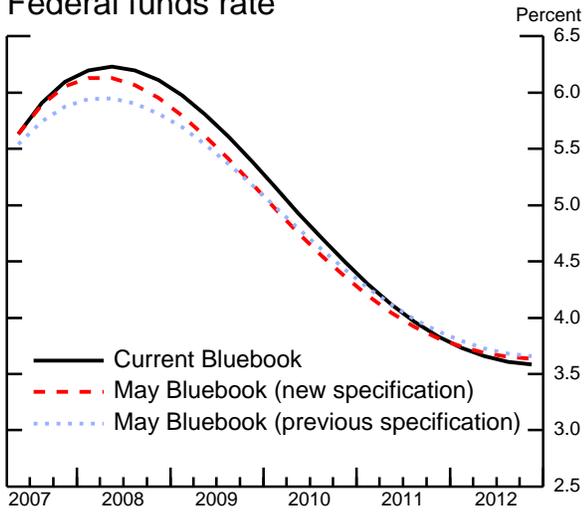
<sup>6</sup> Policymakers are assumed to place equal weight on three stabilization objectives: limiting deviations of core PCE inflation from a specified goal, limiting deviations of unemployment from the long-run NAIRU, and limiting changes in the nominal funds rate. It is also assumed that policymakers and participants in financial markets fully understand the forces shaping the economic outlook whereas the expectations of households and firms are formed using more limited information.

### Chart 5

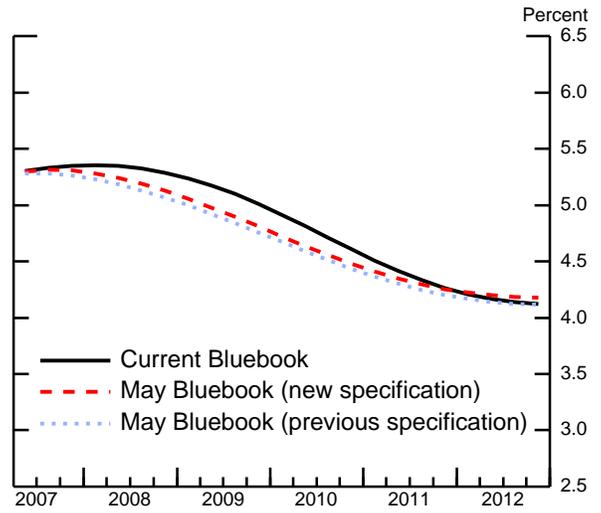
### Optimal Policy Under Alternative Inflation Goals

#### 1½ Percent Inflation Goal

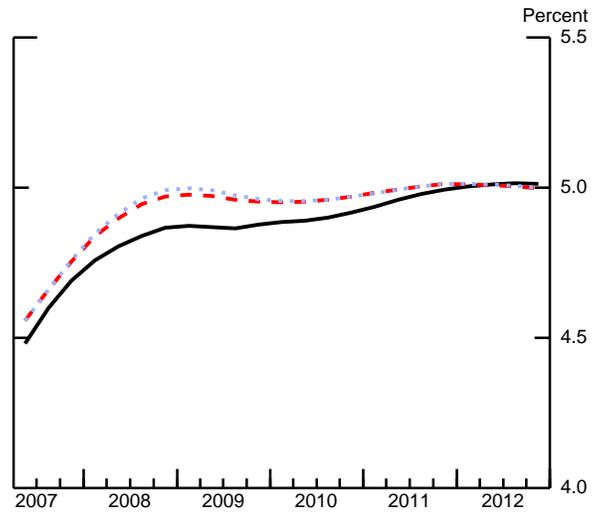
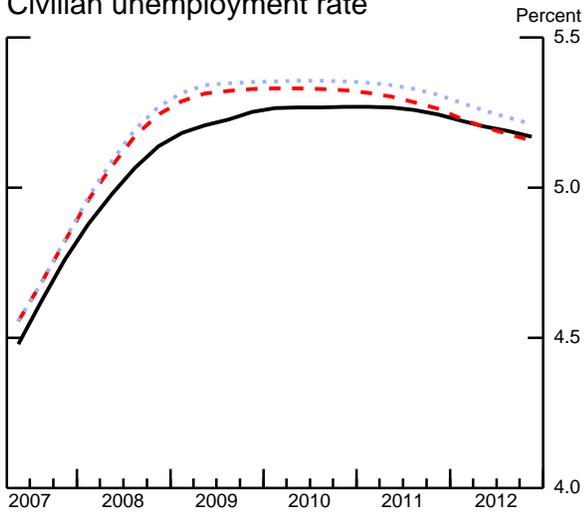
#### Federal funds rate



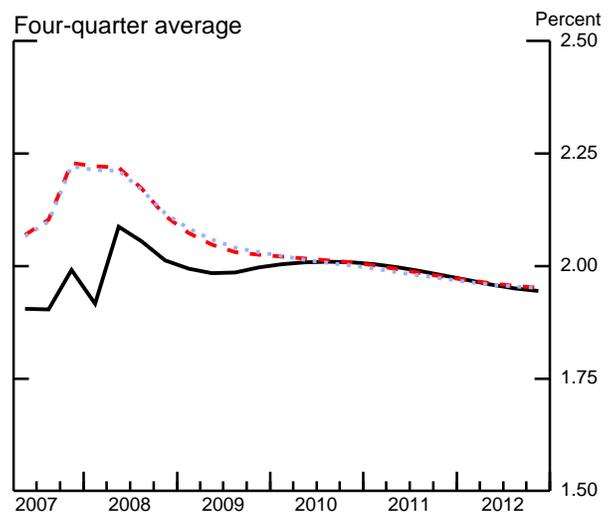
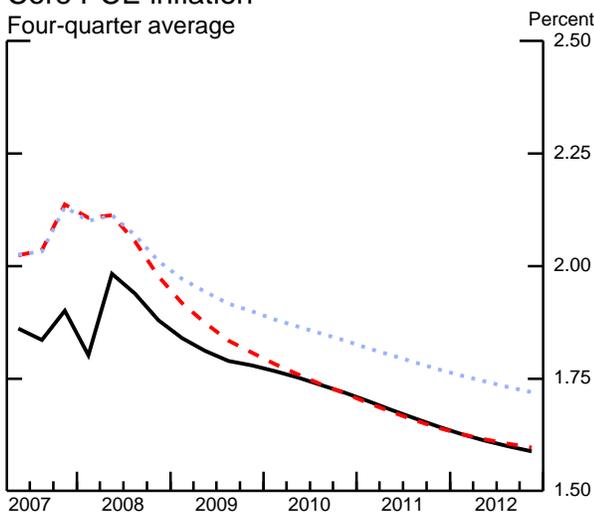
#### 2 Percent Inflation Goal



#### Civilian unemployment rate



#### Core PCE inflation Four-quarter average



model's specification is of little consequence in this case because long-run inflation expectations are already aligned with both actual inflation and the inflation goal, as they were in the May extended Greenbook baseline. By contrast, with an inflation goal of 1½ percent (the left-hand set of charts), the optimal funds rate rises to above 6 percent over the next few quarters and then declines to just above 3½ percent by 2012. Core inflation beyond 2008 stays lower than in the May Bluebook, but this difference is mainly due to the revised specification of the FRB/US model. In particular, if the May optimal-control policy is re-computed using the new model specification reflecting more rapid adjustment in long-run inflation expectations (dashed lines), core inflation descends more quickly toward the 1½ percent goal than was shown in the May Bluebook, accompanied by a virtually identical path for the unemployment rate. Another factor influencing inflation dynamics, the degree of global integration in product markets, is discussed in the box on "International Dimensions of Monetary Policy."

(14) As shown in Chart 6, the current level of the real funds rate, 3.3 percent, is identical to the Greenbook-consistent estimate of short-run  $r^*$ —the value of the real federal funds rate that would put the level of real GDP at that of its potential twelve quarters ahead—and 100 basis points or more higher than the three model-based estimates of short-run  $r^*$ . The Greenbook-consistent and model-based  $r^*$  differ because the former incorporates the staff's judgment on current-quarter data and forces not captured in the three models—including staff projections of conditioning factors that differ from the automated projections used by the three models. The Greenbook-consistent measure has been marked up about 20 basis points over the intermeeting period, largely in response to incoming data pointing to somewhat stronger consumption, business fixed investment, and net exports. Model-based estimates of medium-run  $r^*$ —the value of the real funds rate consistent with keeping

## International Dimensions of Monetary Policy

A number of channels have been suggested through which the increased mobility of goods, capital, and labor may alter the economic landscape in which monetary policy operates, and the staff routinely takes these considerations into account in its current analysis and projections. As an example of such a channel, in a more open economy, imports may better serve as a “release valve” for excess aggregate demand, damping its effects on output and inflation.

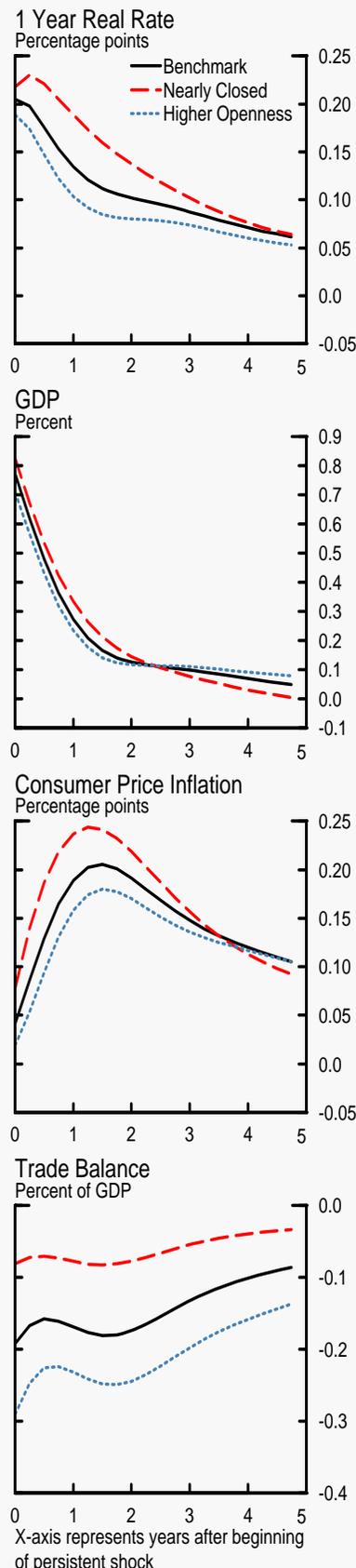
This box explores these issues using SIGMA, a multi-country dynamic stochastic general equilibrium model used for policy analysis developed in the Division of International Finance. SIGMA is sufficiently rich in behavioral and sectoral detail to encompass a variety of mechanisms through which increased global integration can alter the dynamic properties of the macroeconomy. Based on work by Erceg, Gust, and Lopez-Salido, this box presents an analysis of how greater openness in product markets can alter the effects of domestic and foreign aggregate demand shocks on the U.S. economy and highlights the implications of these changes for the conduct of monetary policy.<sup>1</sup>

Consider the macroeconomic effects of a persistent 1 percent autonomous rise in domestic aggregate demand in alternative specifications of the model that differ only in the degree of trade openness. In each of the four panels to the right, the benchmark specification (solid line) corresponds to a trade share—the average of exports and imports—calibrated in the model to 14 percent of output, roughly in line with current U.S. data. In contrast, in the nearly closed scenario (dashed red line) trade accounts for only 5 percent of domestic output, close to the U.S. trade share of about forty years ago. Finally, under the specification with higher openness (dotted blue line) this share climbs to 25 percent, roughly around the recent experience of the United Kingdom and, conceivably, the degree of U.S. trade openness in a few decades if global integration continues its post-World War II pace.

In all three specifications, increased domestic spending prompts monetary policy to tighten, causing real interest rates to rise (first panel). The combination of higher real interest rates and an induced appreciation of the dollar (not shown) limits the initial expansion of output and helps bring it back to baseline, in part through a decline in the trade balance (fourth panel). However, consumer price inflation rises (third panel) because the Taylor rule employed in these simulations does not tighten policy enough to keep output (second panel) from expanding above potential.

(continued on next page)

Effects of a domestic aggregate demand shock (deviations from baseline)



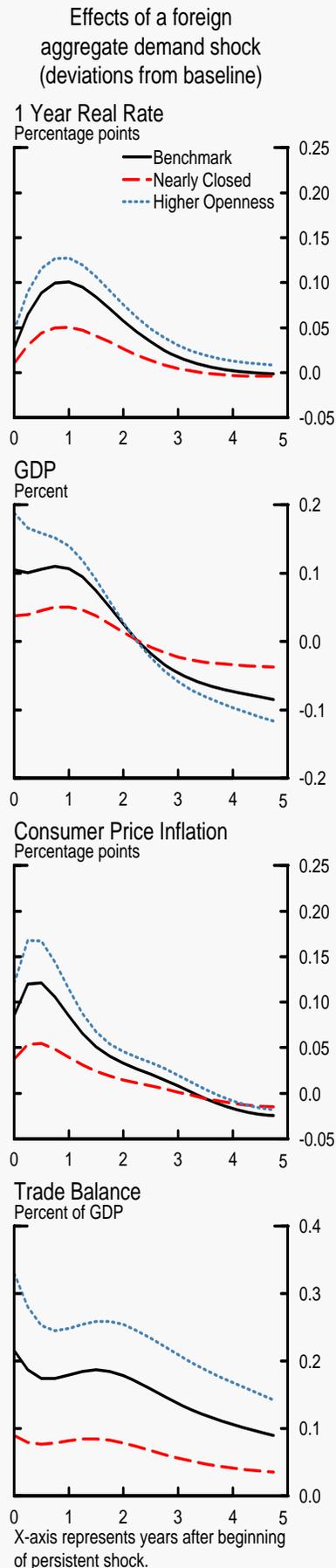
<sup>1</sup> “The Transmission of Domestic Shocks in Open Economies,” presented at an NBER conference in Barcelona, June 11-13, 2007

### International Dimensions of Monetary Policy (continued)

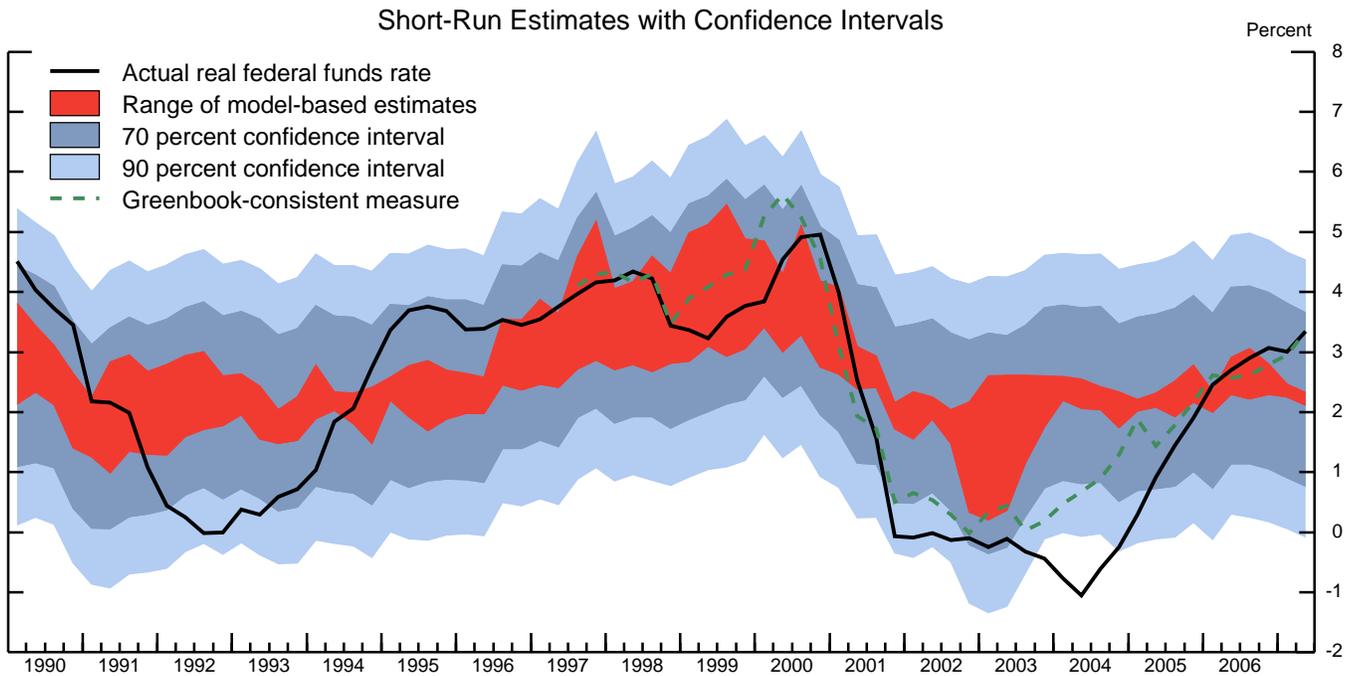
As can be seen in the comparison of these three specifications in the previous page, the degree of openness affects the magnitude of the U.S. economy's response to domestic shocks. With greater openness, more of the increase in aggregate demand is satisfied through higher imports, implying a larger deterioration in the trade balance, a smaller increase in GDP, and less pressure on domestic resources. Furthermore, the appreciation of the dollar reduces U.S. import prices, and with a larger share of trade in output, the resulting downward pressure on domestic prices is magnified. Accordingly, increased global integration of product markets helps monetary policy to stabilize the economy in the face of domestic spending shocks, as smaller hikes in interest rates are needed to keep output close to potential and to contain inflationary pressures.

Increased openness, however, may also make the economy more vulnerable to external shocks. The response to a 1 percent autonomous increase in foreign aggregate demand is shown in the four panels on this page. Under all three calibrations, the combination of higher foreign activity and an induced depreciation of the dollar (as foreign interest rates rise relative to U.S. rates) stimulate U.S. real net exports, causing both U.S. output and inflation to rise. The boost in exports is clearly more substantial the greater the openness of the economy, which also amplifies the effect of higher import prices on aggregate inflation. Thus, not surprisingly, greater openness magnifies the effects on the domestic economy of an expansion in foreign aggregate demand, and requires a tighter monetary policy stance to keep inflation contained.

Overall, these model simulations suggest that increased trade openness is likely to have modest, though noticeable, implications for how domestic shocks affect U.S. real activity and inflation. These simulations also highlight the extent to which openness increases the susceptibility of the economy to foreign developments.



### Chart 6 Equilibrium Real Federal Funds Rate



### Short-Run and Medium-Run Measures

	Current Estimate	<i>Previous Bluebook</i>
<b>Short-Run Measures</b>		
Single-equation model	2.3	2.3
Small structural model	2.2	2.2
Large model (FRB/US)	2.1	2.3
Confidence intervals for three model-based estimates		
70 percent confidence interval	0.8 - 3.7	
90 percent confidence interval	-0.1 - 4.5	
Greenbook-consistent measure	3.3	3.1
<b>Medium-Run Measures</b>		
Single-equation model	2.4	2.3
Small structural model	2.2	2.2
Confidence intervals for two model-based estimates		
70 percent confidence interval	1.4 - 3.2	
90 percent confidence interval	0.8 - 3.9	
TIPS-based factor model	2.1	2.1
<b>Memo</b>		
Actual real federal funds rate	3.3	3.2

Note: Appendix A provides background information regarding the construction of these measures and confidence intervals.

output at potential at a seven-year horizon—are both around 2¼ percent, just above the TIPS-based measure of about 2.1 percent.

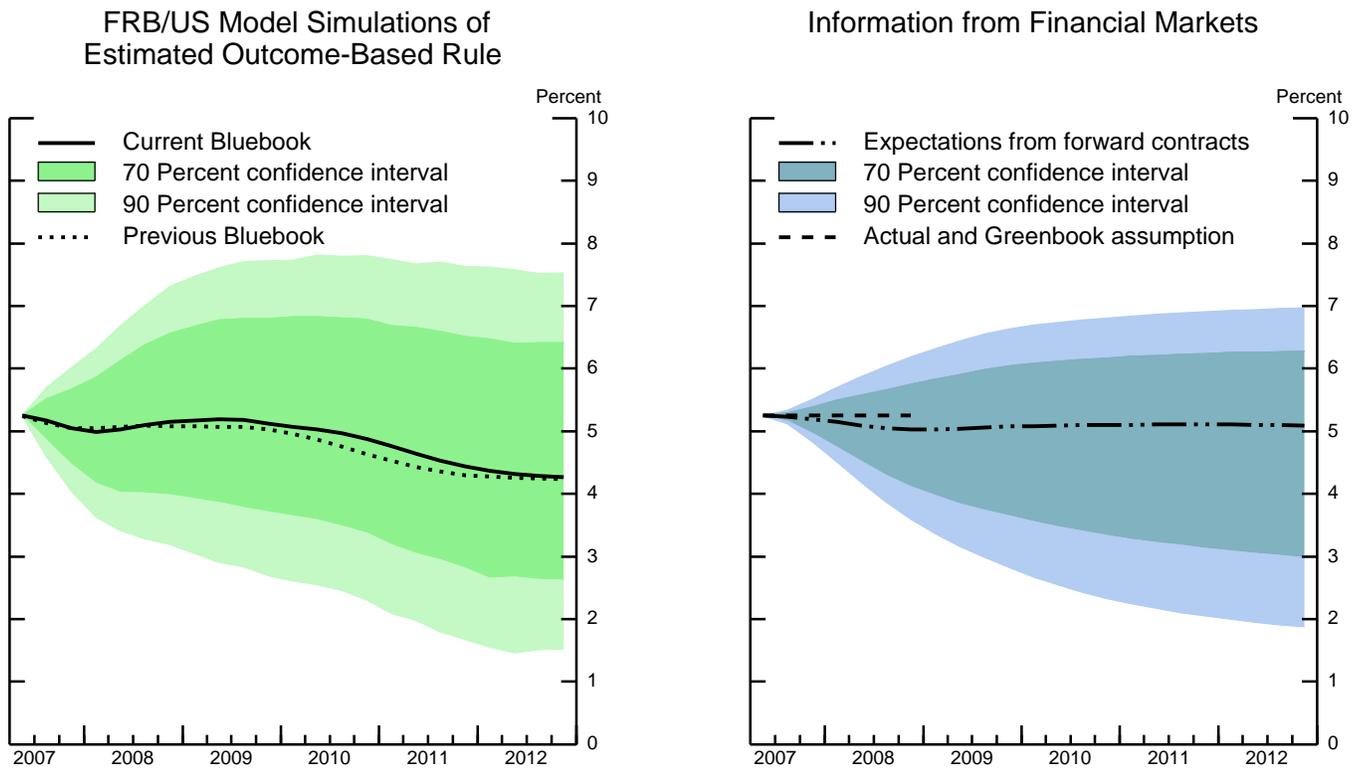
(15) The upper panels of Chart 7 depict model- and market-based assessments of the monetary policy outlook through the end of 2012. In the absence of shocks, the estimated outcome-based policy rule prescribes a funds rate path that declines gradually to about 4 percent. Stochastic simulations of the FRB/US model indicate a 70 percent probability that the prescriptions of the outcome-based rule will fall in a range between 2½ and 6½ percent during 2012. Relative to these simulations, information from both in- and out-of-the-money interest rate caps suggests that investors see less uncertainty but more downside skewness regarding the prospective path of policy at longer horizons (see box entitled “Assessing the Implied Distribution of Funds Rates at Longer Horizons using Interest Rate Caps”). In contrast to the outcome-based rule, Taylor rules prescribe a lower funds rate path for the near term than in the May Bluebook, reflecting a decrease in the forecast of the core PCE inflation rate for the current quarter.

### **Short-Run Policy Alternatives**

(16) This Bluebook presents three policy alternatives for the Committee’s consideration, summarized in Table 1. Under Alternative A, the Committee lowers the target federal funds rate 25 basis points to 5 percent. Alternative B maintains the target for the federal funds rate at 5¼ percent. Alternative C envisions the Committee tightening by 25 basis points, to bring the target rate to 5½ percent. As for the wording of the statement, economic growth appears to have rebounded in the second quarter from its anemic first-quarter pace. Accordingly, the reference in the previous statement indicating that “economic growth slowed in the first part of the year” is updated in all three alternatives to indicate that the economy appears to have expanded at a moderate pace so far this year. This assessment is intended to smooth

### Chart 7

## The Policy Outlook in an Uncertain Environment



### Near-Term Prescriptions of Simple Policy Rules

	1½ Percent Inflation Objective		2 Percent Inflation Objective	
	2007Q2	2007Q3	2007Q2	2007Q3
Taylor (1993) rule	4.4	4.4	4.1	4.1
<i>Previous Bluebook</i>	4.6	4.6	4.4	4.3
Taylor (1999) rule	4.6	4.6	4.3	4.3
<i>Previous Bluebook</i>	4.8	4.7	4.6	4.5
Taylor (1999) rule with higher r*	5.3	5.3	5.1	5.1
<i>Previous Bluebook</i>	5.6	5.5	5.3	5.2
First-difference rule	5.5	5.7	5.2	5.2
<i>Previous Bluebook</i>	5.5	5.7	5.2	5.2
<b>Memo</b>				
Estimated outcome-based rule	5.2	5.2		
Estimated forecast-based rule	5.2	5.1		
Greenbook assumption	5.3	5.3		
Market expectations	5.2	5.2		

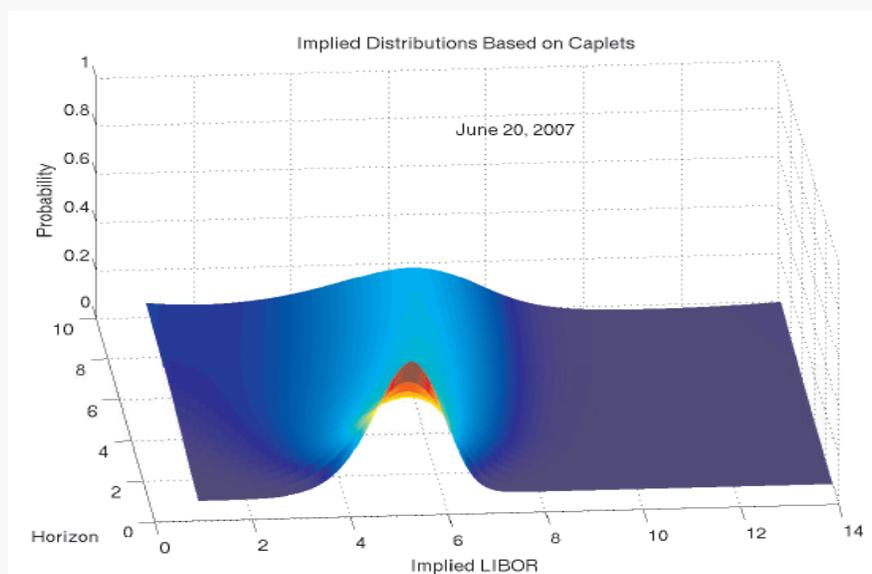
Note: Appendix B provides background information regarding the specification of each rule and the methodology used in constructing confidence intervals and near-term prescriptions.

## Assessing the Implied Distribution of Funds Rates at Longer Horizons using Interest Rate Caps

The degree of uncertainty around the expected path of the federal funds rate can be assessed using implied volatilities derived from interest rate options. Beginning with the January Bluebook, prices on interest rate caps, which are sequences of call options on three-month LIBOR, have been used to construct the confidence intervals for the funds rate shown through 2012 in Chart 7.<sup>1</sup> Until this Bluebook, those estimates have been based solely on price quotes for at-the-money options, and following convention, it was assumed that interest rates were log-normally distributed. By construction, the estimated distribution of interest rates was skewed somewhat toward higher rates.

Recently, Board staff have analyzed in- and out-of-the-money interest rate caps to obtain information on the possible skew in the distribution of short-term interest rates.<sup>2</sup> This analysis is broadly similar to the construction of the distribution of the expected federal funds rate six months ahead derived from options on Eurodollar futures that is shown in Chart 1. Based on interest rate caps, the staff can now calculate risk-neutral, non-parametric probability density functions of future short-term rates from the near term to very distant horizons and monitor the width and skew of these distributions.

These estimates generally suggest that the assumption that interest rates are log-normally distributed results in an underestimation of the weight market participants put on very low rates. Over the last two years, the lower bound of the 90 percent confidence band about six years hence based on these density functions has been about 70 basis points below that derived from confidence intervals under the log-normal assumption.



<sup>1</sup> For more information on the interest rate caps, see the box in the January 25, 2007 Bluebook, "Assessing Policy Uncertainty at Longer Horizons using Interest Rate Caps."

<sup>2</sup> For further information regarding methodology, see the May 30, 2007 memo by Benson Durham, "Implied Distributions of Expected Federal Funds Rates from Interest Rate Caps."

Table 1: Alternative Language for the June 2007 FOMC Announcement				
	May FOMC	Alternative A	Alternative B	Alternative C
<b>Policy Decision</b>	1. The Federal Open Market Committee decided today to keep its target for the federal funds rate at 5¼ percent.	The Federal Open Market Committee decided today to <b>lower</b> its target for the federal funds rate <b>25 basis points to 5</b> percent.	The Federal Open Market Committee decided today to keep its target for the federal funds rate at 5¼ percent.	The Federal Open Market Committee decided today to <b>raise</b> its target for the federal funds rate <b>25 basis points to 5½</b> percent.
<b>Rationale</b>	2. Economic growth slowed in the first part of the year and the adjustment in the housing sector is ongoing. Nevertheless, the economy seems likely to expand at a moderate pace over coming quarters.	<b>So far this year, the economy appears to have grown at a moderate pace and seems likely to continue to do so over coming quarters. But ongoing weakness in the housing sector implies a significant risk that economic activity might grow more slowly than anticipated.</b>	<b>So far this year, the economy appears to have grown at a moderate pace despite the ongoing adjustment in the housing sector. The economy seems likely to continue to expand at a moderate pace over coming quarters.</b>	<b>Despite the ongoing adjustment in the housing sector, the economy appears to have grown at a moderate pace so far this year. The economy seems likely to continue to expand at a moderate pace over coming quarters.</b>
	3. Core inflation remains somewhat elevated. Although inflation pressures seem likely to moderate over time, the high level of resource utilization has the potential to sustain those pressures.	<b>Core inflation has edged lower in recent months and is expected to remain moderate over the next year or so. However, the high level of resource utilization has the potential to add to inflation pressures going forward.</b>	<b>Readings on core inflation have improved modestly in recent months. However, the high level of resource utilization has the potential to sustain inflation pressures.</b>	<b>Although readings on core inflation have improved modestly in recent months, core inflation remains somewhat elevated. Inflation pressures seem likely to moderate over time, but considerable uncertainty surrounds that judgment. Moreover, the high level of resource utilization, in combination with earlier increases in the prices of energy and other commodities, has the potential to sustain those pressures.</b>
<b>Assessment of Risk</b>	4. In these circumstances, the Committee’s predominant policy concern remains the risk that inflation will fail to moderate as expected. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.	<b>With this policy action, the Committee judges that the downside risk to economic growth now roughly balances the upside risk to inflation.</b> Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.	In these circumstances, the Committee’s predominant policy concern <b>is</b> the risk that <b>the moderation in</b> inflation will fail to <b>be sustained.</b> Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.	<b>Even after this action,</b> the Committee’s predominant policy concern remains the risk that inflation will fail to moderate as expected. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.

through the quarterly variation that has largely been driven by transitory factors. Core inflation data for recent months have been benign, with the twelve-month change in the core PCE deflator dropping to 2 percent in April for the first time since March of last year. The draft language for all three alternatives acknowledges these favorable readings, but the alternatives differ notably in their assessment of inflation going forward. As usual, the Committee could consider combining elements from more than one alternative.

(17) If the Committee continues to view the current policy stance as likely to foster a return of output to potential and sustain the recent moderation of inflation, as in the staff forecast, then it may wish to choose **Alternative B**, under which the federal funds rate is maintained at 5¼ percent. In the staff analysis underlying the Greenbook forecast, the real federal funds rate is seen as near its equilibrium value (Chart 6), suggesting that the current stance of policy is likely to reduce pressures on resources over time. Additionally, the current target for the funds rate is very close to prescriptions for near-term policy obtained from optimal policy simulations with a 2 percent inflation goal (Chart 5) and some of the policy rules shown in Chart 7. While financial conditions tightened substantially over the intermeeting period, Committee members may view this development as merely bringing forward an adjustment they had anticipated would occur before long, suggesting that no policy offset is necessary. The Committee might also judge that maintaining its current policy stance for the time being would provide a reasonable weighting of the risks that weakness in housing could eventually have a more pronounced effect on overall economic activity and that the recent moderation in inflation could prove temporary.

(18) The draft statement accompanying Alternative B reiterates the view that the economy seems likely to expand at a moderate pace over coming quarters. Following benign inflation readings, the draft language drops both the characterization of the level of core inflation as “somewhat elevated” and the prediction that inflation seems

likely to moderate from its current level. Instead, the statement acknowledges the recent favorable information while expressing the view that the high level of resource utilization has the potential to sustain price pressures. This language would be intended to indicate that incoming data point to a slowing in core inflation but, given that monthly inflation readings are noisy, to suggest that the Committee is awaiting more data before being satisfied that the moderation in inflation will be sustained. The statement would conclude by indicating that the Committee's predominant policy concern remains the upside risk to inflation, with the language modified for consistency with the inflation paragraph.

(19) Market participants do not expect a change in the funds rate at this meeting and judging from the Desk's survey of primary dealers, most expect only minor modifications to the text of the accompanying statement. The revisions to the inflation paragraph under Alternative B would likely garner considerable attention. Investors would not overlook the deletion of the "somewhat elevated" language and would probably infer that the Committee believes that its prior expectation for moderating core inflation is on track. Particularly in light of the revisions to the risk assessment, markets might also interpret the overall statement as signaling that the Committee finds 2 percent to be an acceptable level of core inflation. Market participants would most likely mark down their expectations for the path of the federal funds rate. Equities would rally, and the foreign exchange value of the dollar would depreciate. Long-term bond yields might edge lower, but that fall could be tempered, or even reversed, if the statement led investors to mark up their long-run inflation expectations.

(20) The large rise in real yields and the resilience of equity markets over the intermeeting period could be interpreted as an indication that investors have marked up their growth expectations, anticipate greater pressures on resources, and correspondingly expect a more restrictive stance of policy. Indeed, judging from

options on Eurodollar futures, investors now place about one-third odds on monetary policy tightening within the next year. Under this interpretation, there is a risk that if investors come to perceive resource markets as taut and do not see the Committee adopting a more restrictive policy, then inflation expectations could continue to rise. If the Committee is especially concerned by this risk, it might prefer to tighten 25 basis points at this meeting, as in **Alternative C**. Raising the funds rate at this meeting might be seen as the best way to mitigate the risk of an updrift in inflation expectations and reassure markets that the Committee will indeed tighten as necessary to keep inflation contained. Members may also be concerned about the possibility that increases in energy and commodity prices could lead to greater price pressures than currently foreseen by the staff. Moreover, the optimal policy path shown in Chart 5 indicates that policy would need to be tightened about 1 percentage point over the next year should the Committee wish to bring inflation down to 1½ percent.

(21) The statement accompanying Alternative C could reiterate the assessment that the economy seems likely to expand at a moderate pace while reordering the clauses in order to underscore the view that the adjustment in the housing sector appears unlikely to derail the economic expansion. The inflation paragraph would de-emphasize the recent monthly price data and retain the explicit acknowledgement that the level of core inflation remains somewhat elevated, which many investors would read as a signal that the Committee prefers a core inflation rate of around 1½ percent. The Committee's concern about the inflation outlook could be stressed by noting that "considerable uncertainty" surrounds the assessment that inflation is likely to moderate and also by expanding the set of factors that could sustain inflation pressures to include the pass-through from higher prices of energy and other commodities. The statement could conclude by noting that, even after the increase in the funds rate, the Committee's predominant policy concern remains the upside risk to inflation.

(22) A tightening of monetary policy at this meeting would take financial markets aback. Short-term interest rates and option-implied volatility of money market rates would surely rise. However, inflation compensation and distant-horizon forward yields could well fall as the announcement would likely lower long-run inflation expectations. The net effect on long-term yields is thus ambiguous. The foreign exchange value of the dollar would probably appreciate, and equity prices would likely decline.

(23) Against the backdrop of the recent sharp rise in interest rates and an already weak housing market and following a number of benign inflation readings, members may feel that the risk of unacceptably sluggish economic growth is now greater than the upside risk to inflation. If so, the Committee might wish to lower the target federal funds rate by 25 basis points as in **Alternative A**. The Committee might view the recent backup in long-term yields as owing mainly to an exogenous rebound in term premiums from an abnormally low level. A rising term premium could dampen consumer and business spending and further weaken the housing market, a possibility explored in the Greenbook alternative simulation “Tighter financial conditions.” In light of this possibility, the Committee may believe that a lower federal funds rate is required to maintain the desired strength of aggregate demand. Furthermore, with low unemployment not clearly boosting labor costs, the Committee might think that the NAIRU could well be lower than currently estimated by the staff—as in the “lower NAIRU” Greenbook alternative scenario. In this case, it may judge that a slightly more accommodative stance of monetary policy would run little risk of stoking inflationary pressures, especially since the real funds rate is now above the range of model-based estimates of its equilibrium.

(24) The statement in Alternative A would continue to note that the economy seems most likely to expand at a moderate pace. But the Committee may perceive the downside risk to that forecast emanating from the housing sector as being greater

than it was in May, owing to the backup in mortgage interest rates. Accordingly, the draft language highlights this risk by placing it in a separate sentence at the end of the second paragraph and by pointing explicitly to “ongoing weakness” in the housing sector rather than “ongoing adjustment.” In the inflation paragraph, the reference to core inflation being elevated would be deleted and replaced by the assessment that core inflation has edged lower and is likely to remain moderate, implicitly placing considerable weight on the recent inflation news. The statement could conclude by noting that even after the 25 basis point easing, the downside risk to the Committee’s growth objective is roughly offset by the upside risk to its inflation objective, and that future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth.

(25) An easing of monetary policy at this meeting would come as a complete surprise to investors, particularly in the wake of the recent jump in policy expectations. Short-term interest rates would fall appreciably and option-implied volatility in fixed-income markets would rise. The effect on longer-term interest rates is less clear. Investors might interpret the announcement as signaling that the economy is weaker than they had previously thought, driving long-term yields down. Alternatively, the announcement might lead investors to mark up their expectations for inflation and to demand a larger inflation risk premium, boosting long-term yields. The effects on equity markets and the foreign-exchange value of the dollar are likewise ambiguous, depending on how investors update their forecasts for inflation and growth in light of the surprise decision.

## **Money and Debt Forecasts**

(26) Under the Greenbook forecast, M2 is projected to expand about 5½ percent this year and 5 percent next year, as in the May forecast. Opportunity costs of holding money are expected to edge down further over the remainder of this

Table 2  
Alternative Growth Rates for M2  
(percent, annual rate)

		25 basis points easing	No change/ Greenbook forecast*	25 basis points tightening
Monthly Growth Rates				
	Jan-07	10.1	10.1	10.1
	Feb-07	4.9	4.9	4.9
	Mar-07	9.3	9.3	9.3
	Apr-07	8.2	8.2	8.2
	May-07	3.9	3.9	3.9
	Jun-07	4.5	4.5	4.5
	Jul-07	3.6	3.2	2.8
	Aug-07	4.0	3.2	2.4
	Sep-07	4.1	3.3	2.5
	Oct-07	4.0	3.3	2.6
	Nov-07	3.7	3.2	2.7
	Dec-07	3.7	3.3	2.9
Quarterly Growth Rates				
	2006 Q2	3.3	3.3	3.3
	2006 Q3	4.1	4.1	4.1
	2006 Q4	6.9	6.9	6.9
	2007 Q1	8.0	8.0	8.0
	2007 Q2	6.7	6.7	6.7
	2007 Q3	4.0	3.6	3.2
	2007 Q4	3.9	3.3	2.6
Annual Growth Rates				
	2006	5.0	5.0	5.0
	2007	5.8	5.5	5.2
	2008	5.1	5.0	4.8
Growth From	To			
Jun-07	Sep-07	3.9	3.2	2.6
Jun-07	Dec-07	3.9	3.3	2.7

\* This forecast is consistent with nominal GDP and interest rates in the Greenbook forecast.

year, as deposit rates continue to catch up with earlier increases in short-term interest rates, and accordingly M2 grows a little faster than nominal GDP. In the forecast, ongoing rapid growth in retail money funds offsets more sluggish expansion in small time deposits and currency.

(27) The growth rate of domestic nonfinancial sector debt is projected to fall from 8 percent last year to  $6\frac{3}{4}$  percent in 2007 and  $5\frac{3}{4}$  percent in 2008. Corporate borrowing is predicted to slow later this year. In the household sector, flat house prices, rising interest rates, and tightening credit standards are all expected to weigh on mortgage borrowing.

## Directive and Balance of Risks Statement

(28) Draft language for the directive and draft risk assessments identical to those presented in Table 1 are provided below.

### *Directive Wording*

The Federal Open Market Committee seeks monetary and financial conditions that will foster price stability and promote sustainable growth in output. To further its long-run objectives, the Committee in the immediate future seeks conditions in reserve markets consistent with maintaining/INCREASING/REDUCING the federal funds rate at/TO an average of around \_\_\_\_\_ ~~5~~<sup>1</sup>/<sub>4</sub> percent.

### *Risk Assessments*

- A. With this policy action, the Committee judges that the downside risk to economic growth now roughly balances the upside risk to inflation. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.
- B. In these circumstances, the Committee's predominant policy concern is the risk that the moderation in inflation will fail to be sustained. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.
- C. Even after this action, the Committee's predominant policy concern remains the risk that inflation will fail to moderate as expected. Future policy adjustments will depend on the evolution of the outlook for both inflation and economic growth, as implied by incoming information.

## Appendix A: Measures of the Equilibrium Real Rate

The equilibrium real rate is the real federal funds rate that, if maintained, would be projected to return output to its potential level over time. The short-run equilibrium rate is defined as the rate that would close the output gap in twelve quarters given the corresponding model's projection of the economy. The medium-run concept is the value of the real federal funds rate projected to keep output at potential in seven years, under the assumption that monetary policy acts to bring actual and potential output into line in the short run and then keeps them equal thereafter. The TIPS-based factor model measure provides an estimate of market expectations for the real federal funds rate seven years ahead.

The actual real federal funds rate is constructed as the difference between the nominal rate and realized inflation, where the nominal rate is measured as the quarterly average of the observed federal funds rate, and realized inflation is given by the log difference between the core PCE price index and its lagged value four quarters earlier. For the current quarter, the nominal rate is specified as the target federal funds rate on the Bluebook publication date. For the current quarter and the previous quarter, the inflation rate is computed using the staff's estimate of the core PCE price index.

Confidence intervals reflect uncertainties about model specification, coefficients, and the level of potential output. The final column of the table indicates the values published in the previous Bluebook.

Measure	Description
<b>Single-equation Model</b>	The measure of the equilibrium real rate in the single-equation model is based on an estimated aggregate-demand relationship between the current value of the output gap and its lagged values as well as the lagged values of the real federal funds rate.
<b>Small Structural Model</b>	The small-scale model of the economy consists of equations for five variables: the output gap, the equity premium, the federal budget surplus, the trend growth rate of output, and the real bond yield.
<b>Large Model (FRB/US)</b>	Estimates of the equilibrium real rate using FRB/US—the staff's large-scale econometric model of the U.S. economy—depend on a very broad array of economic factors, some of which take the form of projected values of the model's exogenous variables.
<b>Greenbook-consistent</b>	The FRB/US model is used in conjunction with an extended version of the Greenbook forecast to derive a Greenbook-consistent measure. FRB/US is first add-factored so that its simulation matches the extended Greenbook forecast, and then a second simulation is run off this baseline to determine the value of the real federal funds rate that closes the output gap.
<b>TIPS-based Factor Model</b>	Yields on TIPS (Treasury Inflation-Protected Securities) reflect investors' expectations of the future path of real interest rates, but also include term and liquidity premiums. The TIPS-based measure of the equilibrium real rate is constructed using the seven-year-ahead instantaneous real forward rate derived from TIPS yields as of the Bluebook publication date. This forward rate is adjusted to remove estimates of the term and liquidity premiums based on a three-factor arbitrage-free term-structure model applied to TIPS yields, nominal yields, and inflation. Because TIPS indexation is based on the total CPI, this measure is also adjusted for the medium-term difference—projected at 40 basis points—between total CPI inflation and core PCE inflation.

## Appendix B: Analysis of Policy Paths and Confidence Intervals

**Rule Specifications:** For the following rules,  $i_t$  denotes the federal funds rate for quarter  $t$ , while the explanatory variables include the staff's projection of trailing four-quarter core PCE inflation ( $\pi_t$ ), inflation two and three quarters ahead ( $\pi_{t+2|t}$  and  $\pi_{t+3|t}$ ), the output gap in the current period and one quarter ahead ( $y_t - y_t^*$  and  $y_{t+1|t} - y_{t+1|t}^*$ ), and the three-quarter-ahead forecast of annual average GDP growth relative to potential ( $\Delta^4 y_{t+3|t} - \Delta^4 y_{t+3|t}^*$ ), and  $\pi^*$  denotes an assumed value of policymakers' long-run inflation objective. The outcome-based and forecast-based rules were estimated using real-time data over the sample 1988:1-2006:4; each specification was chosen using the Bayesian information criterion. Each rule incorporates a 75 basis point shift in the intercept, specified as a sequence of 25 basis point increments during the first three quarters of 1998. The first two simple rules were proposed by Taylor (1993, 1999), while the third is a variant of the Taylor (1999) rule—introduced in the August Bluebook—with a higher value of  $r^*$ . The prescriptions of the first-difference rule do not depend on assumptions regarding  $r^*$  or the level of the output gap; see Orphanides (2003).

<b>Outcome-based rule</b>	$i_t = 1.20i_{t-1} - 0.39i_{t-2} + 0.19[1.17 + 1.73\pi_t + 3.66(y_t - y_t^*) - 2.72(y_{t-1} - y_{t-1}^*)]$
<b>Forecast-based rule</b>	$i_t = 1.18i_{t-1} - 0.38i_{t-2} + 0.20[0.98 + 1.72\pi_{t+2 t} + 2.29(y_{t+1 t} - y_{t+1 t}^*) - 1.37(y_{t-1} - y_{t-1}^*)]$
<b>Taylor (1993) rule</b>	$i_t = 2 + \pi_t + 0.5(\pi_t - \pi^*) + 0.5(y_t - y_t^*)$
<b>Taylor (1999) rule</b>	$i_t = 2 + \pi_t + 0.5(\pi_t - \pi^*) + (y_t - y_t^*)$
<b>Taylor (1999) rule with higher <math>r^*</math></b>	$i_t = 2.75 + \pi_t + 0.5(\pi_t - \pi^*) + (y_t - y_t^*)$
<b>First-difference rule</b>	$i_t = i_{t-1} + 0.5(\pi_{t+3 t} - \pi^*) + 0.5(\Delta^4 y_{t+3 t} - \Delta^4 y_{t+3 t}^*)$

**FRB/US Model Simulations:** Prescriptions from the two empirical rules are computed using dynamic simulations of the FRB/US model, implemented as though the rule were followed starting at this FOMC meeting. The dotted line labeled “Previous Bluebook” is based on the current specification of the policy rule, applied to the previous Greenbook projection. Confidence intervals are based on stochastic simulations of the FRB/US model with shocks drawn from the estimated residuals over 1986-2005.

**Information from Financial Markets:** The expected funds rate path is based on forward rate agreements, and the confidence intervals for this path are constructed using prices of interest rate caps.

**Near-Term Prescriptions of Simple Policy Rules:** These prescriptions are calculated using Greenbook projections for inflation and the output gap. Because the first-difference rule involves the lagged funds rate, the value labeled “Previous Bluebook” for the current quarter is computed using the actual value of the lagged funds rate, and the one-quarter-ahead prescriptions are based on this rule's prescription for the current quarter.

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Orphanides, Athanasios (2003). “Historical Monetary Policy Analysis and the Taylor Rule,” *Journal of Monetary Economics*, vol. 50 (July), pp. 983-1022.

**Selected Interest Rates  
(Percent)**

	Short-term						Long-term									
	Federal funds	Treasury bills secondary market			CDs secondary market	Comm. paper	Off-the-run Treasury yields				Indexed yields		Moody's Baa	Municipal Bond Buyer	Conventional home mortgages primary market	
		4-week	3-month	6-month	3-month	1-month	2-year	5-year	10-year	20-year	5-year	10-year			Fixed-rate	ARM
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
06 -- High	5.34	5.27	5.13	5.33	5.50	5.32	5.32	5.20	5.32	5.45	2.63	2.68	6.94	5.31	6.80	5.83
06 -- Low	4.22	3.91	4.17	4.37	4.50	4.22	4.34	4.28	4.42	4.59	1.82	1.94	6.08	4.52	6.10	5.15
07 -- High	5.41	5.27	5.19	5.19	5.33	5.27	5.12	5.16	5.33	5.44	2.77	2.81	6.86	4.77	6.74	5.75
07 -- Low	5.19	4.15	4.55	4.86	5.28	5.18	4.56	4.40	4.58	4.74	1.97	2.15	6.09	4.38	6.14	5.40
Monthly																
Jun 06	4.99	4.71	4.92	5.18	5.35	5.12	5.15	5.04	5.18	5.30	2.41	2.54	6.78	5.24	6.68	5.71
Jul 06	5.24	4.89	5.08	5.27	5.46	5.24	5.15	5.02	5.15	5.26	2.43	2.52	6.76	5.21	6.76	5.79
Aug 06	5.25	5.17	5.09	5.17	5.38	5.22	4.93	4.79	4.94	5.09	2.24	2.32	6.59	4.98	6.52	5.64
Sep 06	5.25	4.76	4.93	5.08	5.34	5.21	4.78	4.64	4.80	4.94	2.35	2.35	6.43	4.82	6.40	5.56
Oct 06	5.25	4.97	5.05	5.12	5.33	5.20	4.81	4.66	4.80	4.95	2.49	2.43	6.42	4.78	6.36	5.55
Nov 06	5.25	5.22	5.07	5.15	5.32	5.21	4.74	4.54	4.66	4.79	2.39	2.30	6.20	4.59	6.24	5.51
Dec 06	5.24	4.86	4.98	5.07	5.32	5.23	4.68	4.50	4.63	4.79	2.27	2.27	6.22	4.54	6.14	5.45
Jan 07	5.25	4.92	5.11	5.15	5.32	5.22	4.88	4.72	4.83	4.96	2.45	2.45	6.34	4.55	6.22	5.47
Feb 07	5.26	5.18	5.16	5.16	5.31	5.22	4.85	4.68	4.80	4.94	2.33	2.38	6.28	4.53	6.29	5.51
Mar 07	5.26	5.22	5.08	5.10	5.30	5.23	4.62	4.46	4.65	4.83	2.04	2.20	6.27	4.41	6.16	5.44
Apr 07	5.25	4.99	5.01	5.07	5.31	5.23	4.71	4.57	4.77	4.96	2.11	2.28	6.39	4.47	6.18	5.45
May 07	5.25	4.81	4.87	4.98	5.31	5.22	4.79	4.64	4.82	4.99	2.25	2.39	6.39	4.49	6.26	5.52
Weekly																
Apr 20 07	5.24	4.94	5.00	5.06	5.31	5.21	4.71	4.57	4.77	4.94	2.15	2.30	6.37	4.43	6.17	5.45
Apr 27 07	5.23	4.91	4.97	5.03	5.31	5.23	4.67	4.53	4.74	4.94	2.07	2.26	6.35	4.45	6.16	5.43
May 4 07	5.25	4.73	4.91	5.02	5.31	5.22	4.69	4.52	4.72	4.90	2.06	2.25	6.31	4.45	6.16	5.42
May 11 07	5.24	4.75	4.88	4.98	5.31	5.21	4.73	4.54	4.72	4.91	2.14	2.29	6.31	4.44	6.15	5.48
May 18 07	5.26	4.76	4.82	4.92	5.31	5.23	4.79	4.64	4.81	4.99	2.26	2.40	6.38	4.46	6.21	5.48
May 25 07	5.25	4.97	4.90	5.00	5.31	5.23	4.86	4.74	4.91	5.08	2.38	2.49	6.47	4.55	6.37	5.64
Jun 1 07	5.27	4.88	4.82	4.98	5.32	5.24	4.94	4.83	4.97	5.12	2.49	2.54	6.51	4.57	6.42	5.57
Jun 8 07	5.24	4.77	4.80	4.97	5.32	5.22	5.01	4.96	5.09	5.21	2.60	2.63	6.62	4.69	6.53	5.65
Jun 15 07	5.26	4.59	4.66	4.93	5.33	5.26	5.08	5.10	5.27	5.38	2.73	2.76	6.79	4.77	6.74	5.75
Jun 22 07	--	4.37	4.68	4.94	5.33	5.25	5.01	5.02	5.21	5.34	2.69	2.72	--	--	6.69	5.66
Daily																
Jun 5 07	5.19	4.75	4.84	4.99	5.32	5.24	5.02	4.93	5.05	5.17	2.58	2.60	6.55	--	--	--
Jun 6 07	5.25	4.78	4.80	4.95	5.32	5.21	4.98	4.91	5.04	5.18	2.56	2.59	6.57	--	--	--
Jun 7 07	5.25	4.80	4.80	4.97	5.32	5.23	5.04	5.03	5.18	5.30	2.66	2.69	6.71	--	--	--
Jun 8 07	5.26	4.76	4.77	4.93	5.32	5.22	5.04	5.03	5.19	5.31	2.69	2.71	6.74	--	--	--
Jun 11 07	5.27	4.70	4.73	4.96	5.32	--	5.03	5.04	5.21	5.33	2.68	2.72	6.75	--	--	--
Jun 12 07	5.26	4.65	4.72	4.97	5.33	5.24	5.10	5.16	5.33	5.44	2.77	2.81	6.86	--	--	--
Jun 13 07	5.26	4.62	4.66	4.94	5.33	5.27	5.09	5.11	5.27	5.37	2.73	2.75	6.78	--	--	--
Jun 14 07	5.28	4.51	4.65	4.93	5.33	5.27	5.12	5.14	5.30	5.40	2.74	2.77	6.80	--	--	--
Jun 15 07	5.26	4.46	4.55	4.87	5.33	5.27	5.06	5.07	5.24	5.35	2.71	2.74	6.76	--	--	--
Jun 18 07	5.23	4.46	4.64	4.93	5.33	5.24	5.04	5.05	5.22	5.35	2.70	2.73	6.75	--	--	--
Jun 19 07	5.21	4.44	4.65	4.91	5.32	5.25	4.98	4.98	5.16	5.29	2.65	2.69	6.69	--	--	--
Jun 20 07	5.27	4.42	4.74	4.97	5.33	5.25	5.02	5.03	5.21	5.33	2.69	2.72	6.71	--	--	--
Jun 21 07	5.25 <sup>p</sup>	4.15	4.70	4.96	5.33	--	5.01	5.04	5.24	5.37	2.70	2.74	--	--	--	--

NOTE: Weekly data for columns 1 through 13 are week-ending averages. Columns 2 through 4 are on a coupon equivalent basis. Data in column 6 are interpolated from data on certain commercial paper trades settled by the Depository Trust Company. Column 14 is the Bond Buyer revenue index, which is a 1-day quote for Thursday. Column 15 is the average contract rate on new commitments for fixed-rate mortgages (FRMs) with 80 percent loan-to-value ratios at major institutional lenders. Column 16 is the average initial contract rate on new commitments for 1-year, adjustable-rate mortgages (ARMs) at major institutional lenders offering both FRMs and ARMs with the same number of discount points.

p - preliminary data

Appendix C Table 2  
**Money Aggregates**  
 Seasonally Adjusted

Period	M1	M2	Nontransactions Components in M2
	1	2	3
<u>Annual growth rates (%):</u>			
Annually (Q4 to Q4)			
2004	5.4	5.3	5.3
2005	0.3	4.1	5.1
2006	-0.4	5.0	6.4
Quarterly (average)			
2006-Q2	0.6	3.3	4.1
Q3	-3.5	4.1	6.0
Q4	0.0	6.9	8.6
2007-Q1	-0.6	8.0	10.1
Monthly			
2006-May	6.3	1.9	0.8
June	-10.1	4.5	8.3
July	-3.8	4.2	6.2
Aug.	0.4	4.6	5.7
Sep.	-6.6	3.9	6.5
Oct.	4.8	9.2	10.3
Nov.	1.3	7.0	8.4
Dec.	-4.1	7.8	10.7
2007-Jan.	4.9	10.1	11.3
Feb.	-10.4	4.9	8.6
Mar.	7.5	9.3	9.7
Apr.	7.5	8.2	8.3
May p	-0.9	3.9	5.0
<u>Levels (\$billions):</u>			
Monthly			
2007-Jan.	1371.8	7086.2	5714.4
Feb.	1359.9	7115.2	5755.2
Mar.	1368.4	7170.3	5801.9
Apr.	1376.9	7219.0	5842.1
May p	1375.9	7242.3	5866.5
Weekly			
2007-Apr. 30	1383.2	7211.6	5828.4
May 7	1372.3	7228.6	5856.4
14	1366.6	7225.6	5859.0
21	1367.3	7244.7	5877.4
28	1374.7	7241.5	5866.8
June 4p	1402.8	7240.1	5837.3
11p	1377.4	7247.6	5870.2

p preliminary

**Appendix C Table 3**  
**Changes in System Holdings of Securities <sup>1</sup>**  
**(Millions of dollars, not seasonally adjusted)**

June 21, 2007

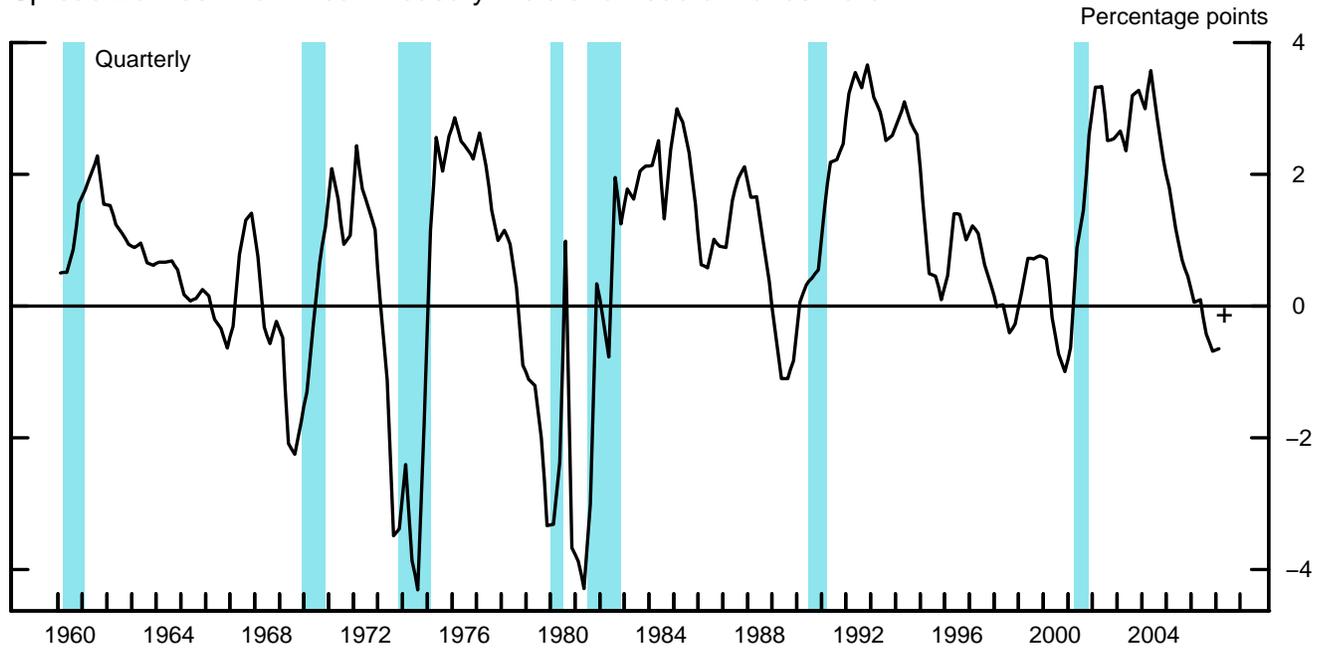
	Treasury Bills			Treasury Coupons						Federal Agency Redemptions (-)	Net change total outright holdings <sup>4</sup>	Net RPs <sup>5</sup>		
	Net Purchases <sup>2</sup>	Redemptions (-)	Net Change	Net Purchases <sup>3</sup>				Redemptions (-)	Net Change			Short-Term <sup>6</sup>	Long-Term <sup>7</sup>	Net Change
				< 1	1-5	5-10	Over 10							
2004	18,138	---	18,138	7,994	17,249	5,763	1,364	---	32,370	---	50,507	-2,522	-331	-2,853
2005	8,300	---	8,300	2,894	11,309	3,626	2,007	2,795	17,041	---	25,341	-2,415	-192	-2,607
2006	5,748	---	5,748	4,967	26,354	4,322	3,299	10,552	28,390	---	34,138	-2,062	-556	-2,618
2006 QI	4,099	---	4,099	1,200	7,443	1,704	1,219	1,321	10,245	---	14,345	793	1,839	2,631
QII	---	---	---	1,375	6,063	1,181	---	1,217	7,402	---	7,402	-627	-4,413	-5,040
QIII	1,649	---	1,649	415	3,323	548	228	3,931	583	---	2,232	-3,229	-839	-4,068
QIV	---	---	---	1,977	9,525	889	1,852	4,084	10,159	---	10,159	-2,379	4,848	2,469
2007 QI	---	---	---	817	1,061	---	---	---	1,878	---	1,878	-2,815	1,059	-1,755
2006 Oct	---	---	---	1,757	1,395	33	---	3,749	-564	---	-564	-2,037	1,195	-842
Nov	---	---	---	220	3,151	411	780	335	4,227	---	4,227	-1,370	7,639	6,268
Dec	---	---	---	---	4,979	445	1,072	---	6,496	---	6,496	2,851	-155	2,696
2007 Jan	---	---	---	---	---	---	---	---	---	---	---	-428	-3,806	-4,234
Feb	---	---	---	817	1,061	---	---	---	1,878	---	1,878	-6,853	3,911	-2,941
Mar	---	---	---	---	---	---	---	---	---	---	---	1,965	-492	1,473
Apr	---	---	---	1,394	3,742	290	640	---	6,066	---	6,066	1,250	-2,425	-1,174
May	---	---	---	---	2,736	---	---	---	2,736	---	2,736	2,165	-4,930	-2,765
2007 Mar 28	---	---	---	---	---	---	---	---	---	---	---	8,221	-6,000	2,221
Apr 4	---	---	---	---	---	---	---	---	---	---	---	-3,153	4,000	847
Apr 11	---	---	---	---	941	265	640	---	1,846	---	1,846	-6,416	4,000	-2,416
Apr 18	---	---	---	---	---	---	---	---	---	---	---	3,243	-1,000	2,243
Apr 25	---	---	---	1,394	2,801	25	---	---	4,220	---	4,220	477	-5,000	-4,523
May 2	---	---	---	---	---	---	---	---	---	---	---	13,754	-6,000	7,754
May 9	---	---	---	---	2,736	---	---	---	2,736	---	2,736	-12,836	1,000	-11,836
May 16	---	---	---	---	---	---	---	---	---	---	---	-3,065	2,000	-1,065
May 23	---	---	---	---	---	---	---	---	---	---	---	6,119	-2,000	4,119
May 30	---	---	---	---	---	---	---	---	---	---	---	-2,764	6,000	3,236
Jun 6	---	---	---	---	---	---	---	---	---	---	---	3,241	-1,000	2,241
Jun 13	---	---	---	---	---	---	---	---	---	---	---	-3,578	-3,000	-6,578
Jun 20	---	---	---	---	---	---	---	---	---	---	---	2,201	---	2,201
2007 Jun 21	---	---	---	---	---	---	---	---	---	---	---	893	-3,000	-2,107
Intermeeting Period	---	---	---	---	---	---	---	---	---	---	---	2,227	-1,000	1,227
May 9-Jun 21	---	---	---	---	---	---	---	---	---	---	---	2,227	-1,000	1,227
Memo: LEVEL (bil. \$)	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Jun 21	---	---	277.0	123.2	233.4	74.5	82.3	---	513.4	---	790.4	-22.5	11.0	-11.5

1. Change from end-of-period to end-of-period. Excludes changes in compensation for the effects of inflation on the principal of inflation-indexed securities.  
2. Outright purchases less outright sales (in market and with foreign accounts).  
3. Outright purchases less outright sales (in market and with foreign accounts). Includes short-term notes acquired in exchange for maturing bills. Excludes maturity shifts and rollovers of maturing issues, except the rollover of inflation compensation.

4. Includes redemptions (-) of Treasury and agency securities.  
5. RPs outstanding less reverse RPs.  
6. Original maturity of 13 days or less.  
7. Original maturity of 14 to 90 days.

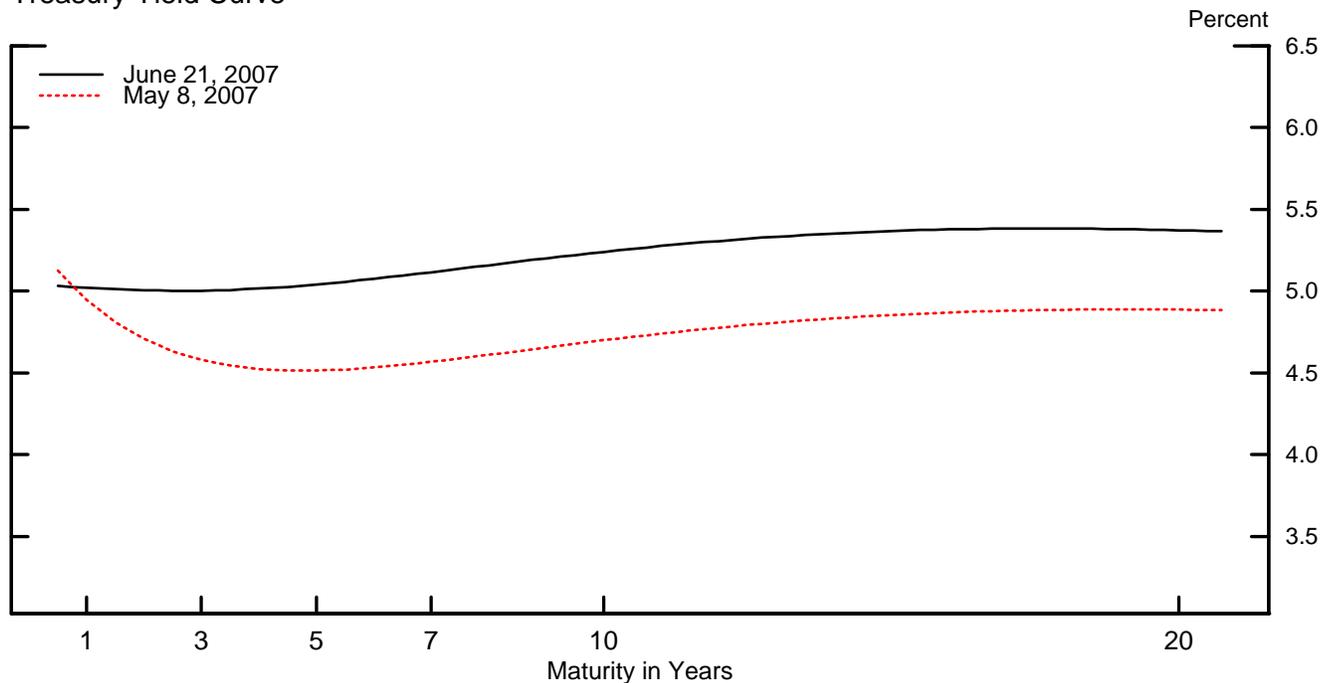
# Treasury Yield Curve

### Spread Between Ten-Year Treasury Yield and Federal Funds Rate



+ Denotes most recent weekly value.  
Note. Blue shaded regions denote NBER-dated recessions.

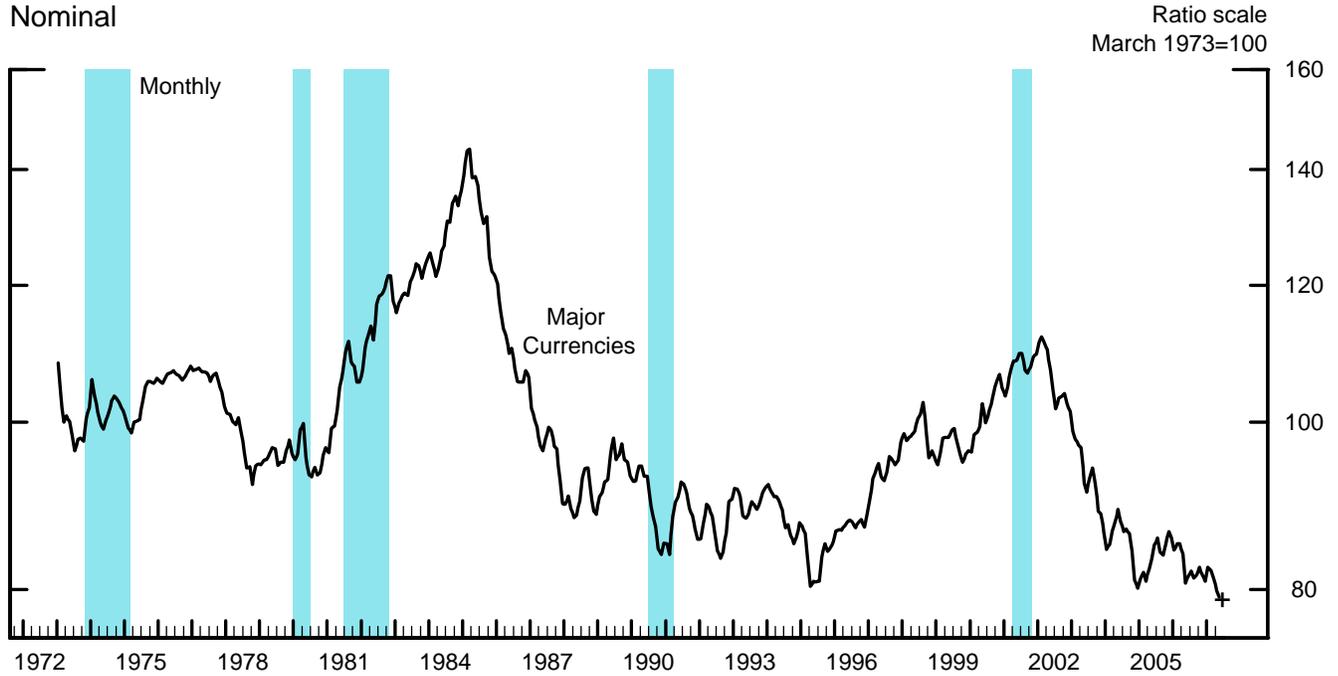
### Treasury Yield Curve\*



\*Smoothed yield curve estimated from off-the-run Treasury coupon securities. Yields shown are those on notional par Treasury securities with semi-annual coupons.

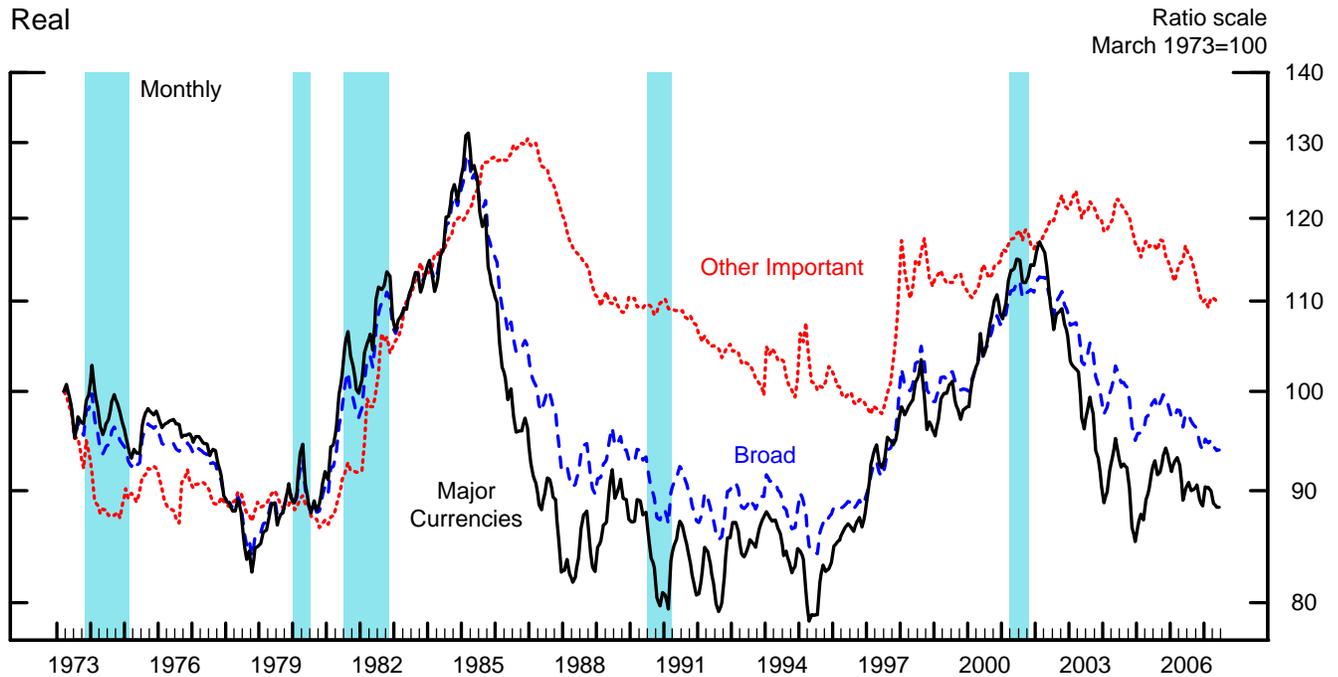
# Dollar Exchange Rate Indexes

Nominal



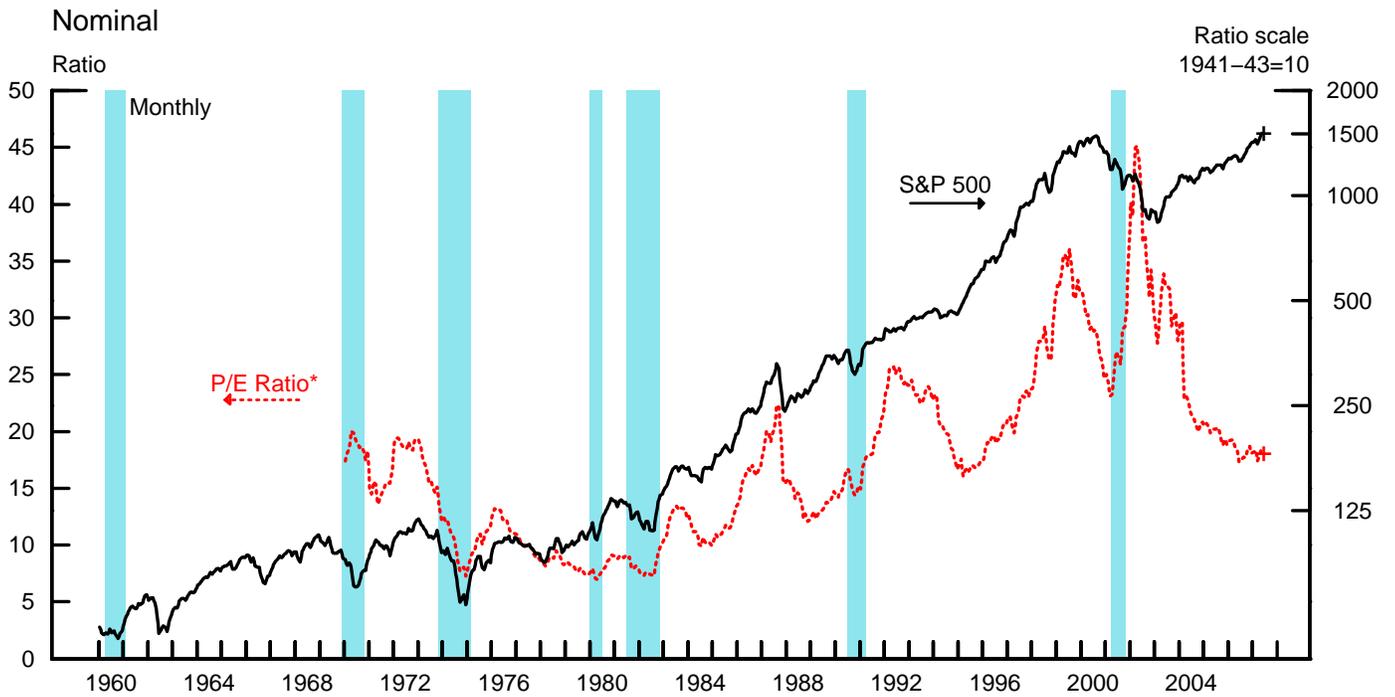
+ Denotes most recent weekly value.

Real

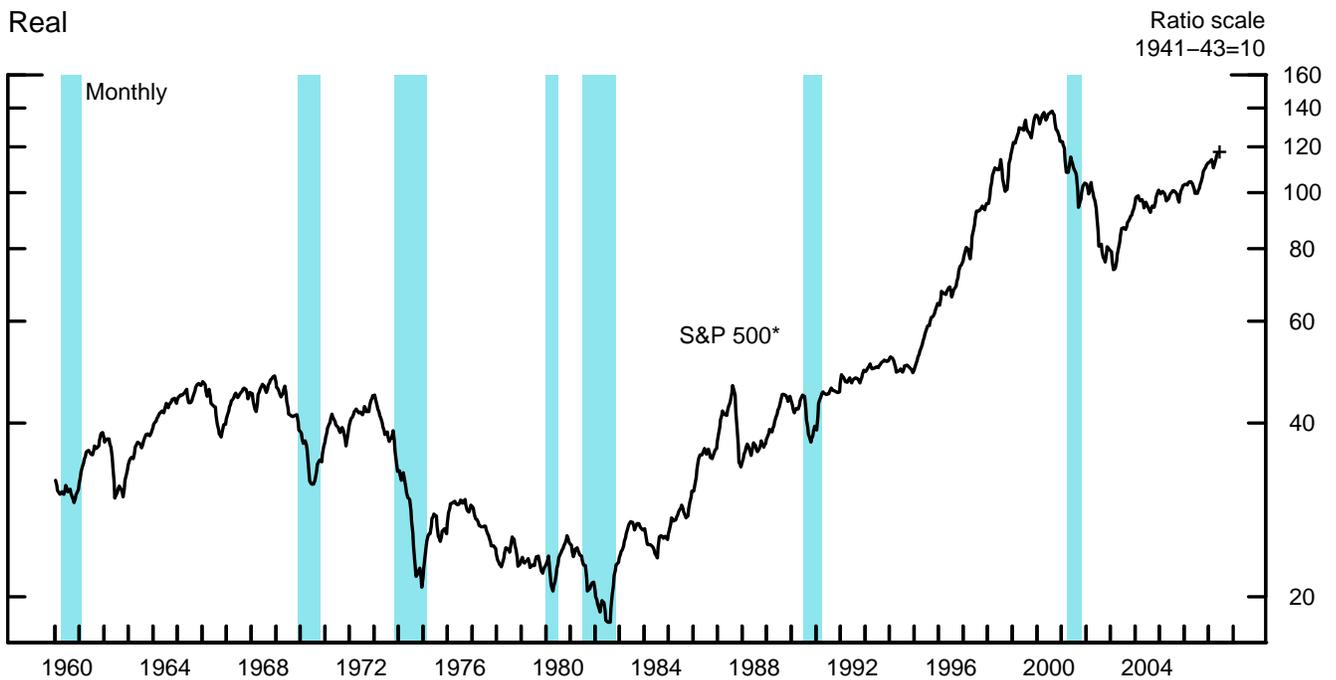


Note. The major currencies index is the trade-weighted average of currencies of the euro area, Canada, Japan, the U.K., Switzerland, Australia, and Sweden. The other important trading partners index is the trade-weighted average of currencies of 19 other important trading partners. The Broad index is the trade-weighted average of currencies of all important trading partners. Real indexes have been adjusted for relative changes in U.S. and foreign consumer prices. Blue shaded regions denote NBER-dated recessions. The most recent monthly observations are based on staff forecasts of CPI inflation for those countries where actual data are not yet available.

# Stock Indexes



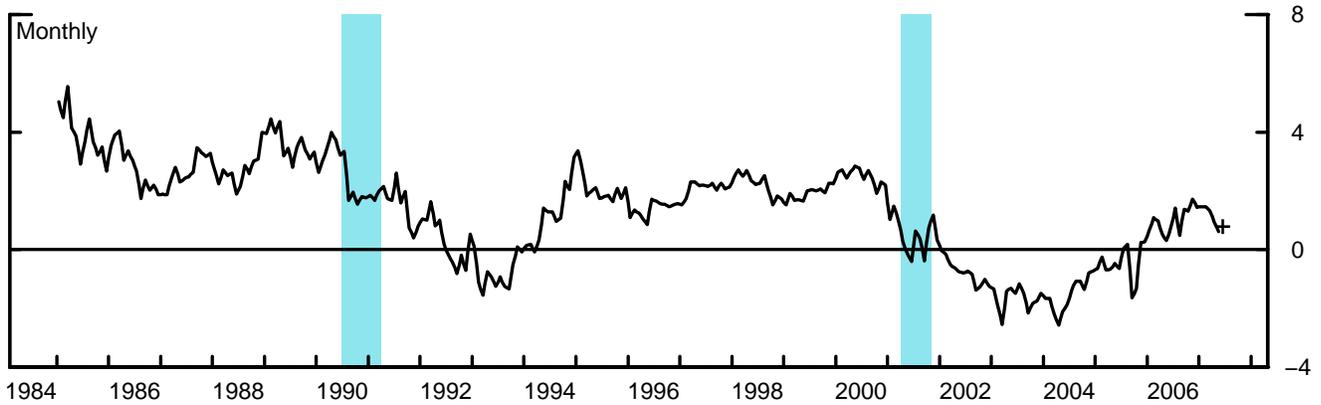
\* Based on trailing four-quarter earnings.  
+ Denotes most recent weekly value.



\* Deflated by the CPI.  
+ Denotes most recent weekly value.  
Note. Blue shaded regions denote NBER-dated recessions.

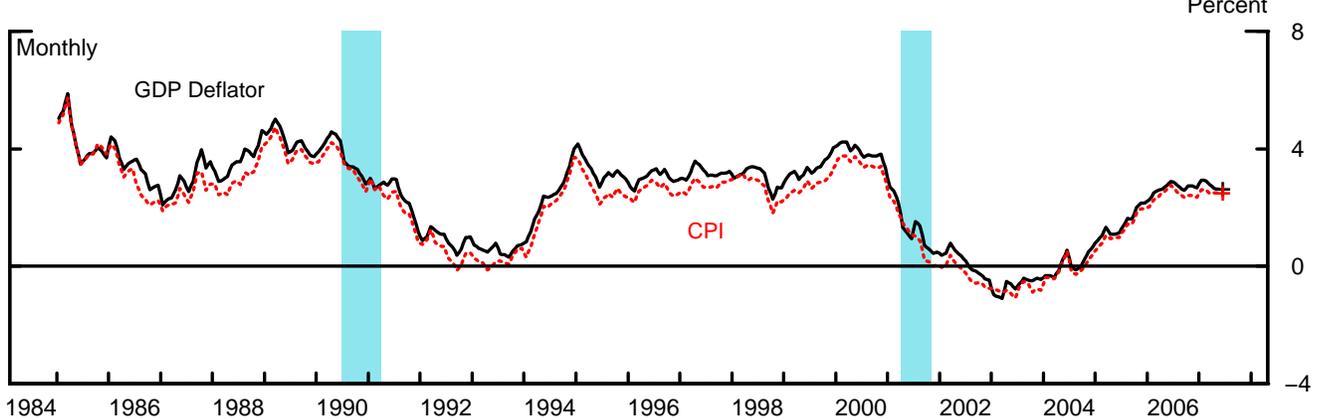
# One-Year Real Interest Rates

One-Year Treasury Constant Maturity Yield Less One-Year Inflation Expectations (Michigan Survey)\*



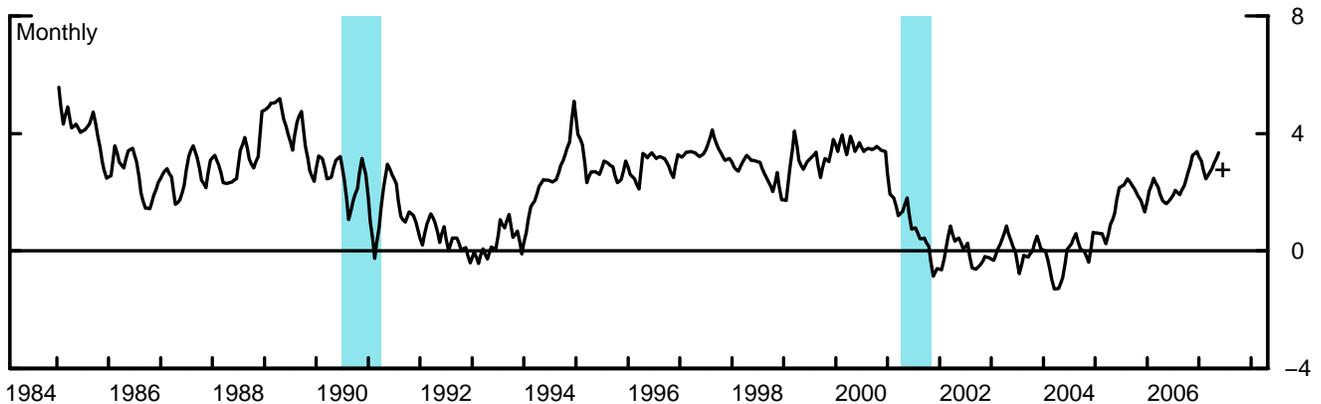
\* Mean value of respondents.

One-Year Treasury Constant Maturity Yield Less One-Year Inflation Expectations (Philadelphia Fed)\*



\* ASA/NBER quarterly survey until 1990:Q1; Philadelphia Federal Reserve Bank Survey of Professional Forecasters thereafter. Median value of respondents.

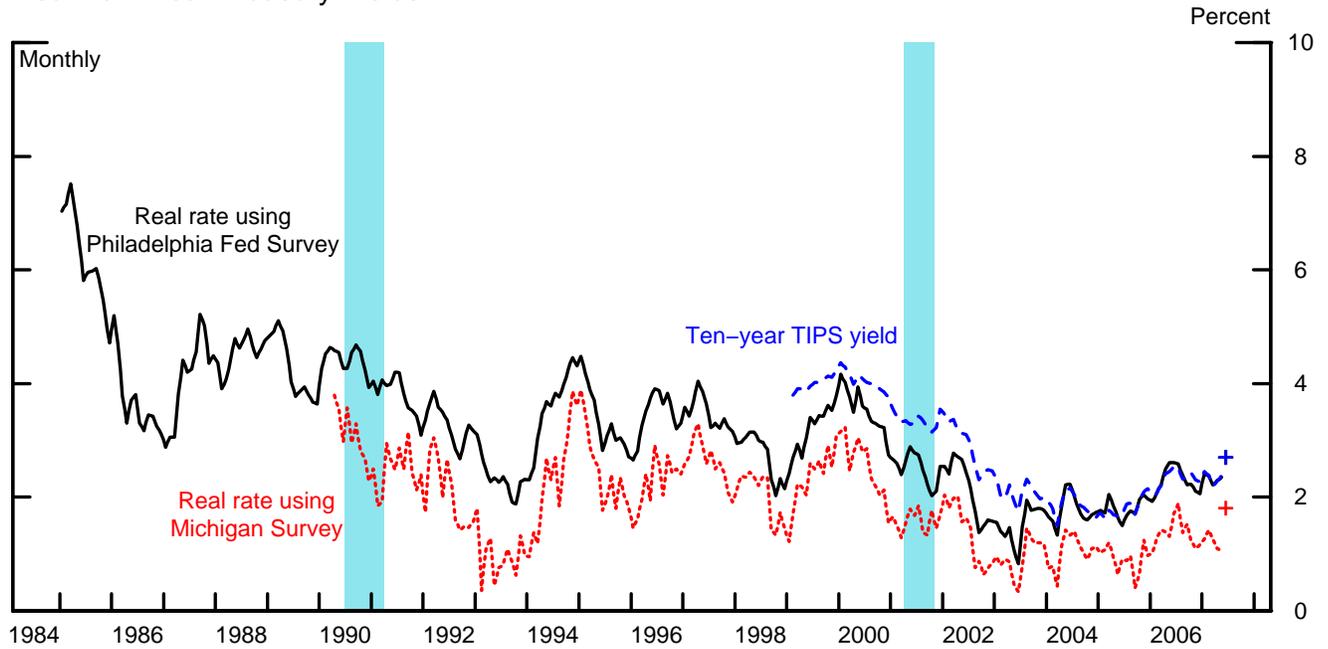
One-Year Treasury Constant Maturity Yield Less Change in the Core CPI from Three Months Prior



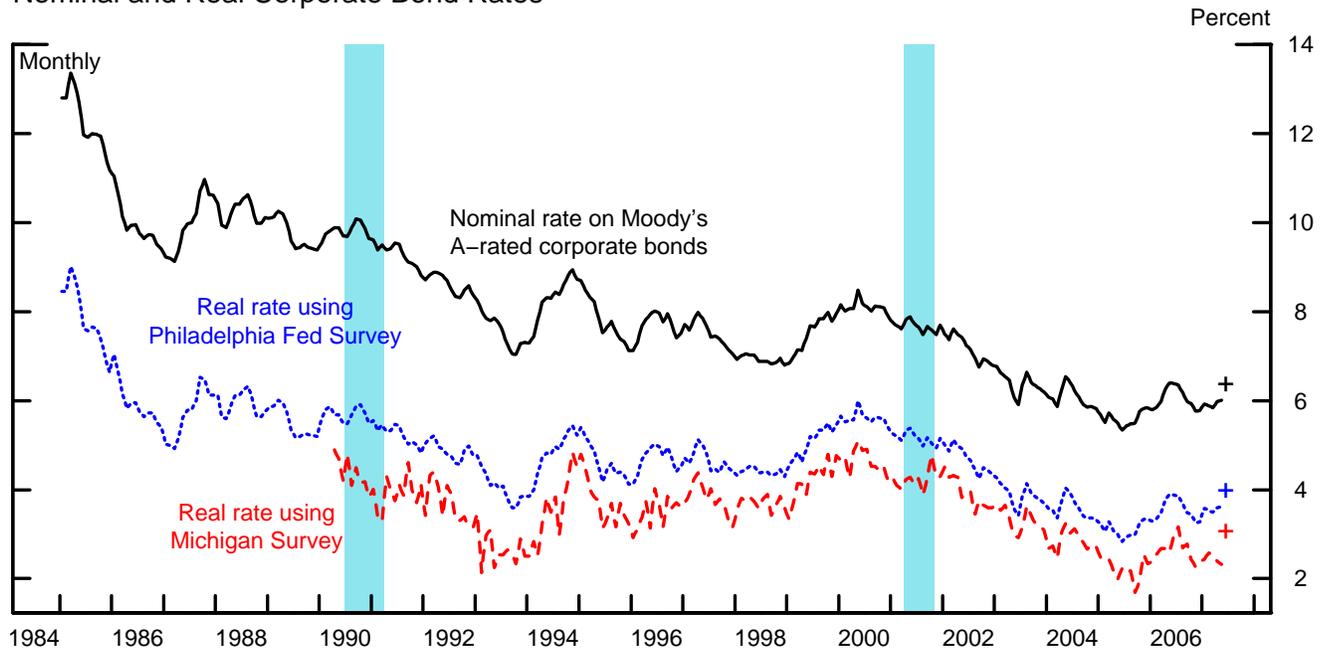
+ Denotes most recent weekly Treasury constant maturity yield less most recent inflation expectation.  
 Note. Blue shaded regions denote NBER-dated recessions.

# Long-Term Real Interest Rates\*

## Real Ten-Year Treasury Yields



## Nominal and Real Corporate Bond Rates



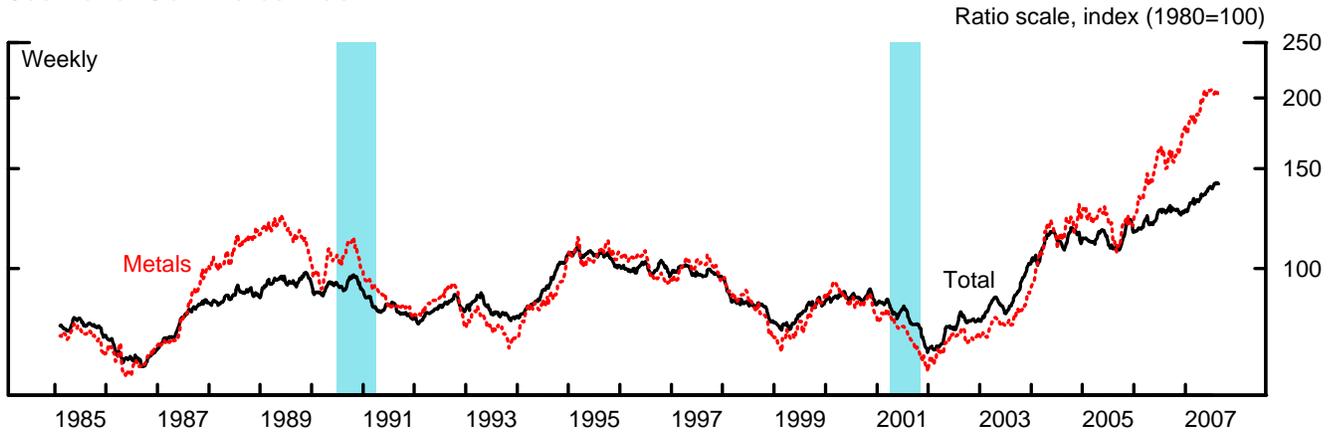
\* For real rates, measures using the Philadelphia Fed Survey employ the ten-year inflation expectations from the Blue Chip Survey until April 1991 and the Philadelphia Federal Reserve Bank Survey of Professional Forecasters thereafter (median value of respondents). Measures using the Michigan Survey employ the five- to ten-year inflation expectations from that survey (mean value of respondents).

+ For TIPS and nominal corporate rate, denotes the most recent weekly value. For other real rate series, denotes the most recent weekly nominal yield less the most recent inflation expectation.

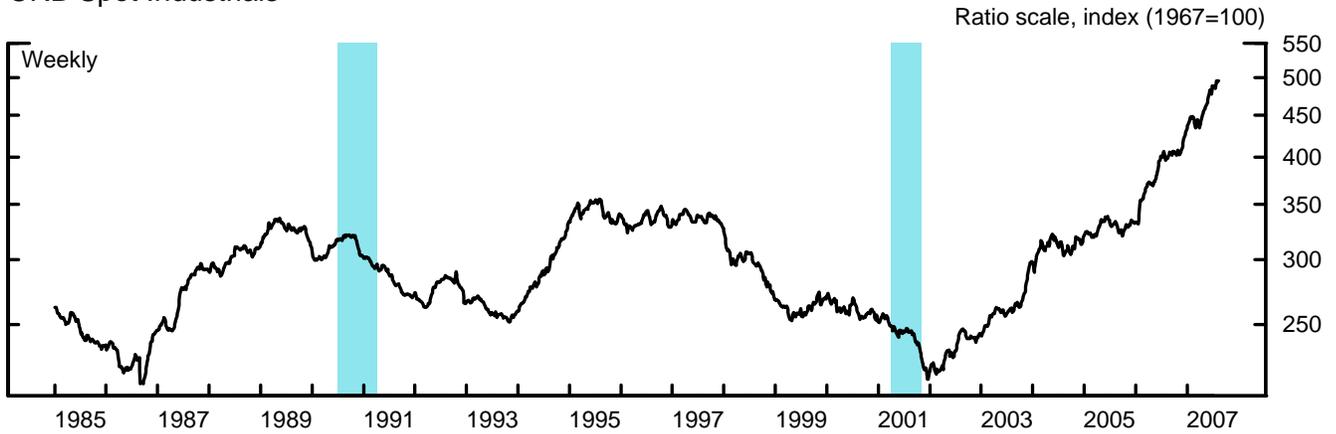
Note. Blue shaded regions denote NBER-dated recessions.

# Commodity Price Measures

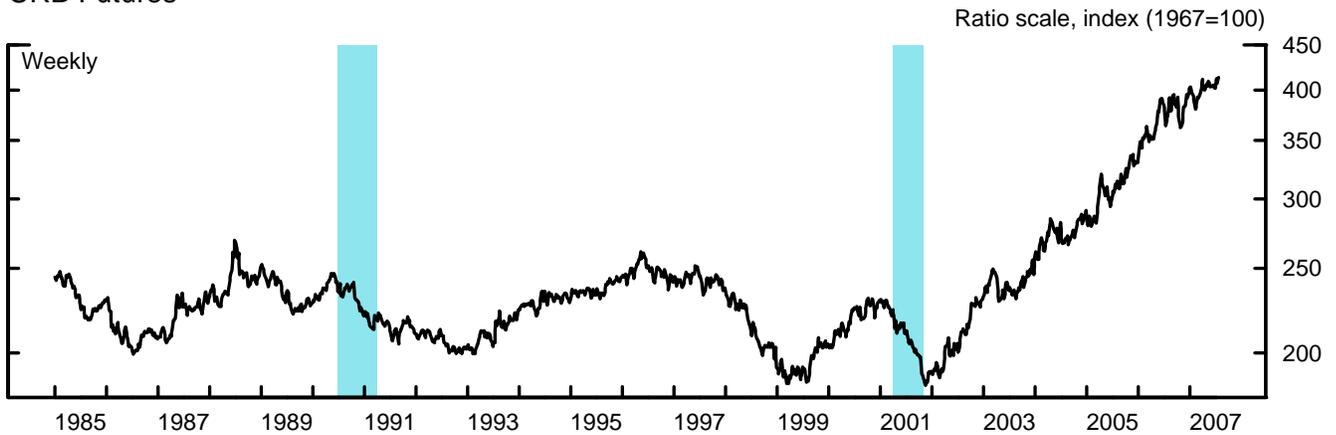
### Journal of Commerce Index



### CRB Spot Industrials



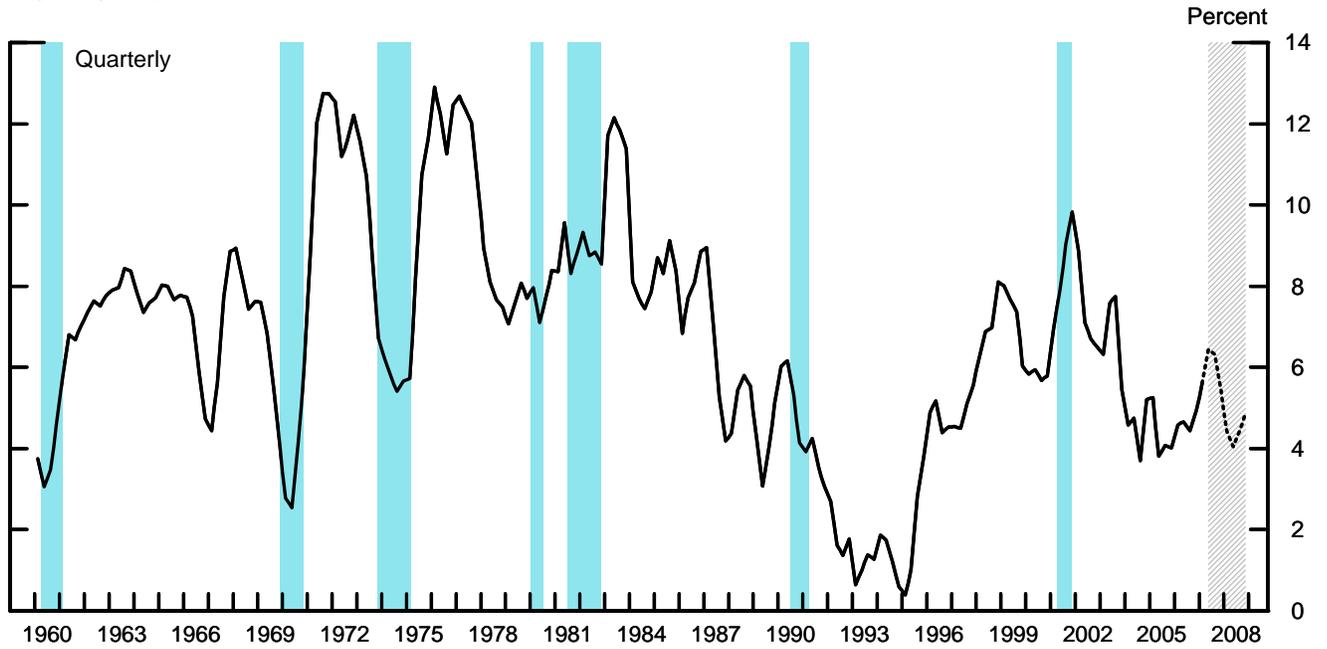
### CRB Futures



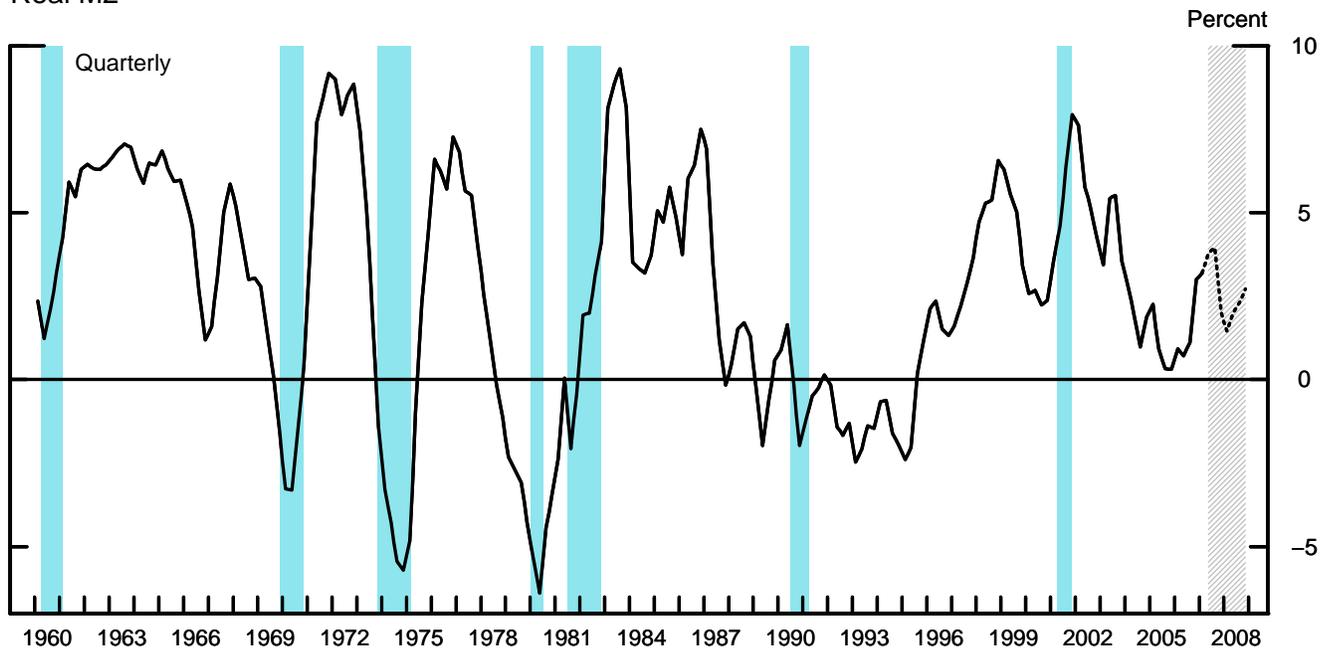
Note. Blue shaded regions denote NBER-dated recessions.

# Growth of M2

## Nominal M2

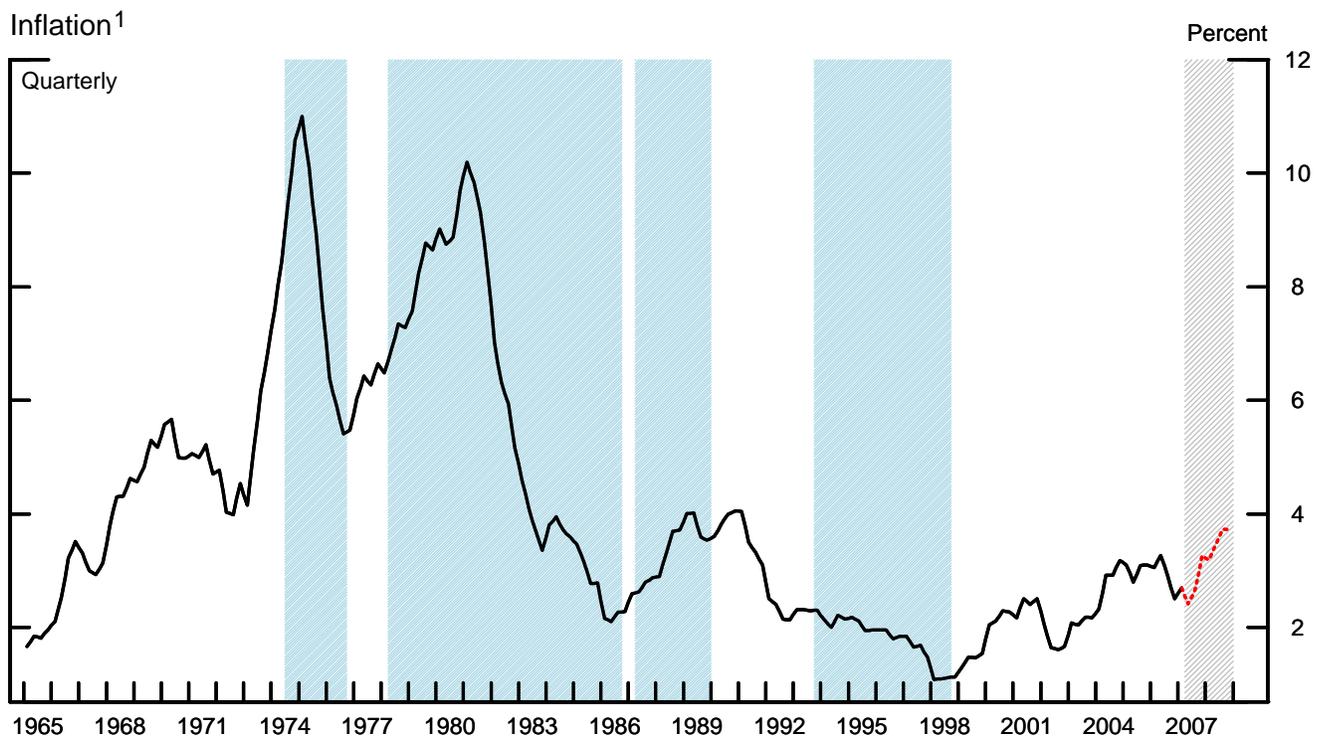
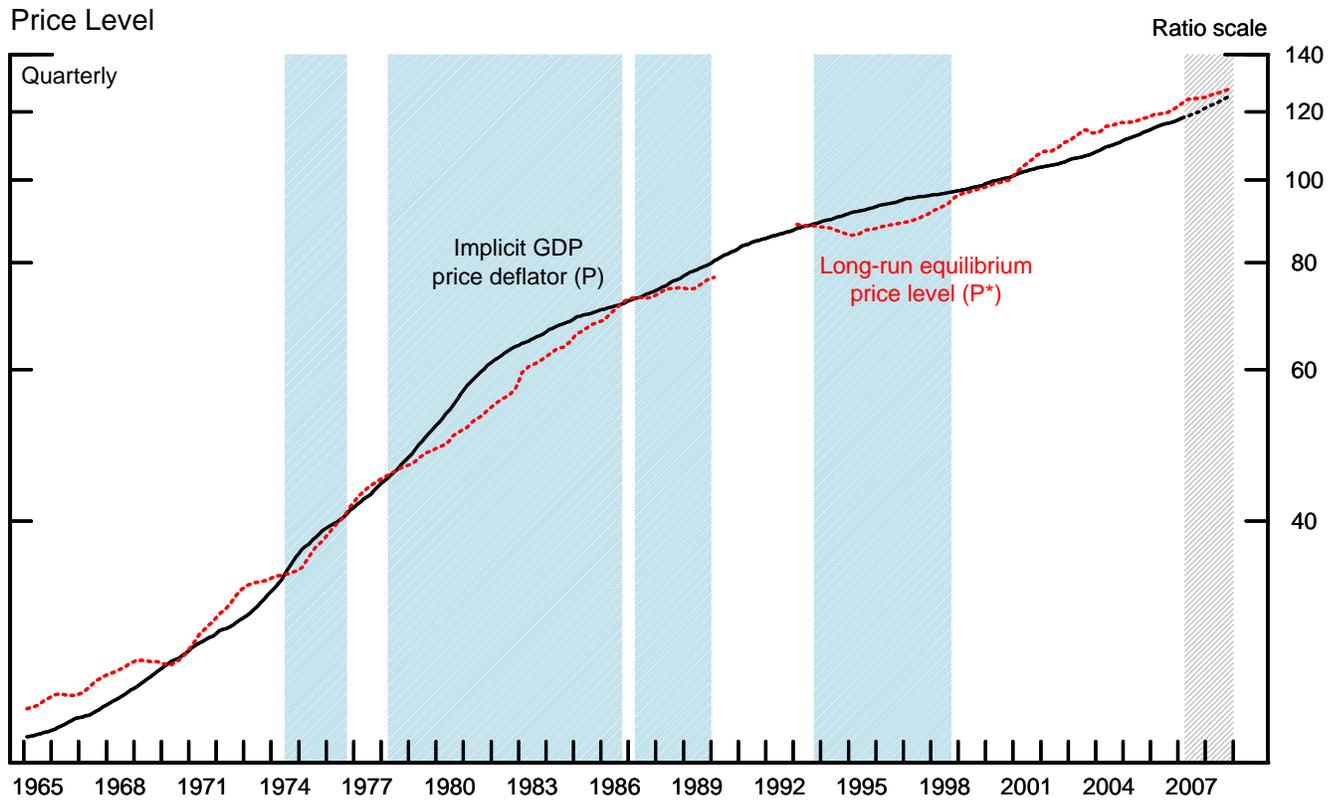


## Real M2



Note. Four-quarter moving average. Blue shaded regions denote NBER-dated recessions. Gray areas denote projection period. Real M2 is deflated by CPI.

### Inflation Indicator Based on M2



1. Change in the implicit GDP price deflator over the previous four quarters.

Note:  $P^*$  is defined to equal M2 times  $V^*$  divided by potential GDP.  $V^*$ , or long-run velocity, is estimated using average velocity over the 1959:Q1-to-1989:Q4 period and then, after a break, over the interval from 1993:Q1 to the present. For the forecast period,  $P^*$  is based on the staff M2 forecast and  $P$  is simulated using a short-run dynamic model relating  $P$  to  $P^*$ . Blue areas indicate periods in which  $P^*$  is notably less than  $P$ . Gray areas denote the projection period.