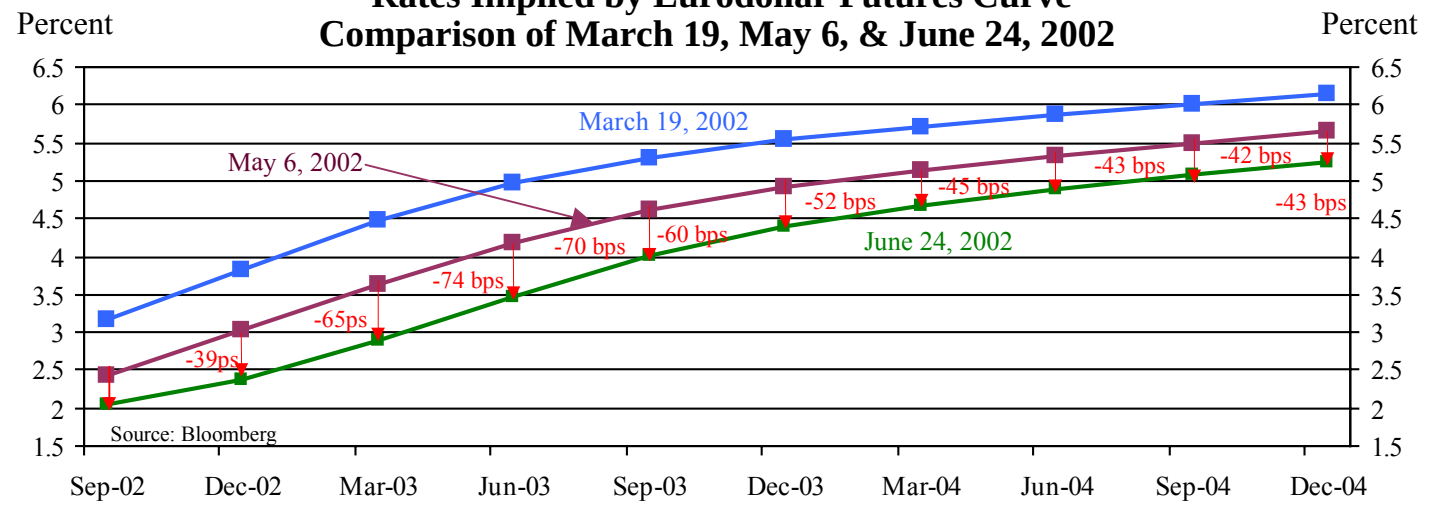
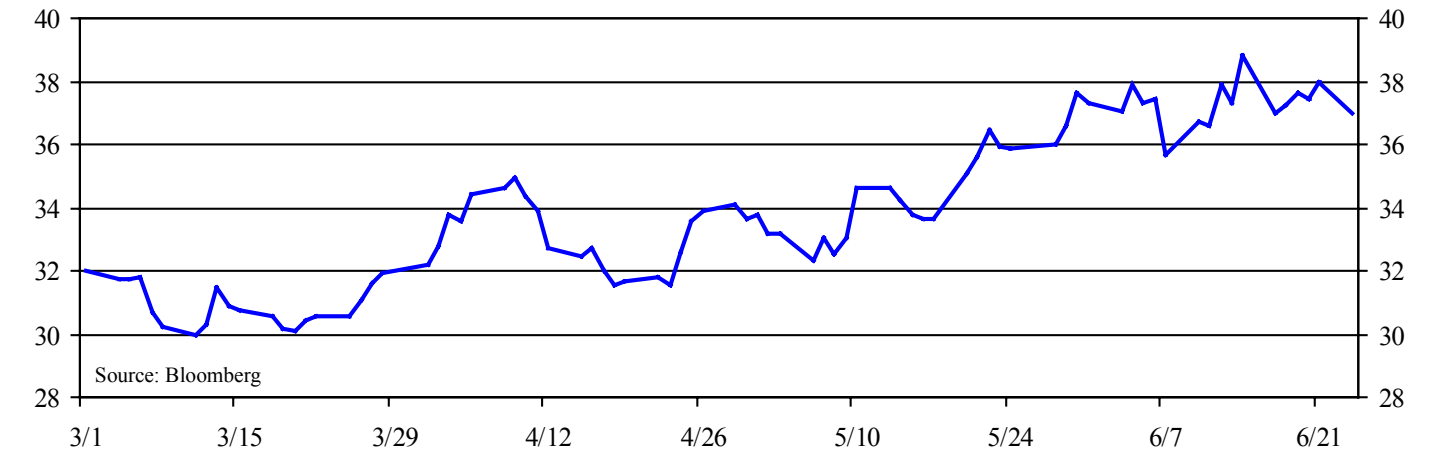
Appendix 1: Materials used by Mr. Kos

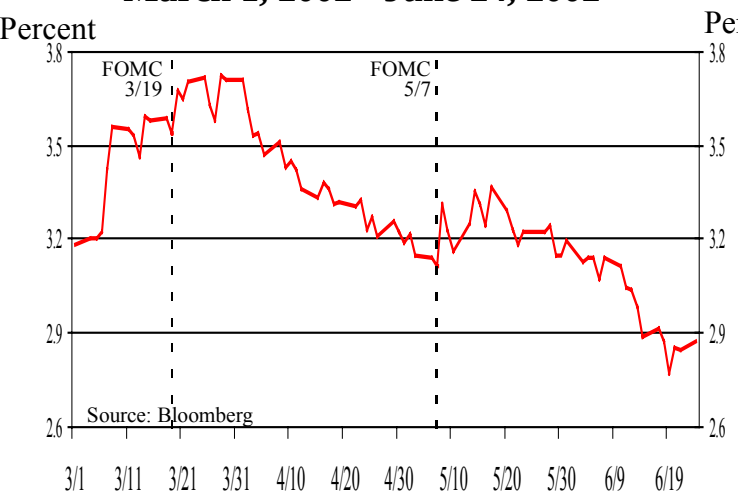
Rates Implied by Eurodollar Futures Curve
Comparison of March 19, May 6, & June 24, 2002



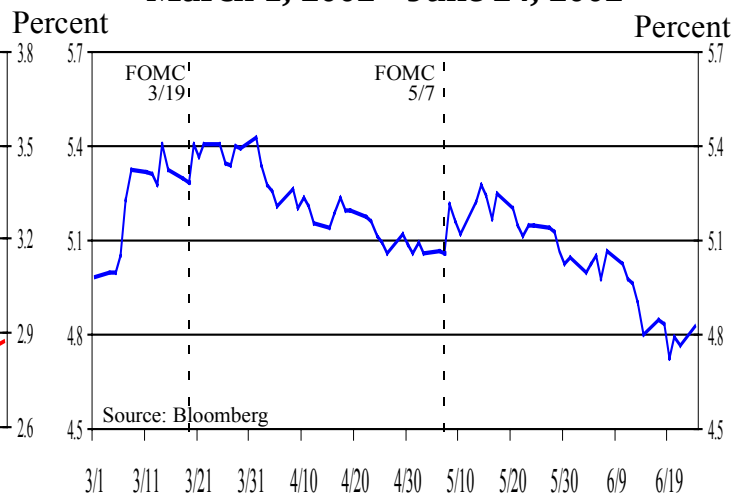
Eurodollar Deposit Futures Implied Volatility (December contract)
March 1, 2002 to June 24, 2002



2 -Year Treasury Yield
March 1, 2002 - June 24, 2002

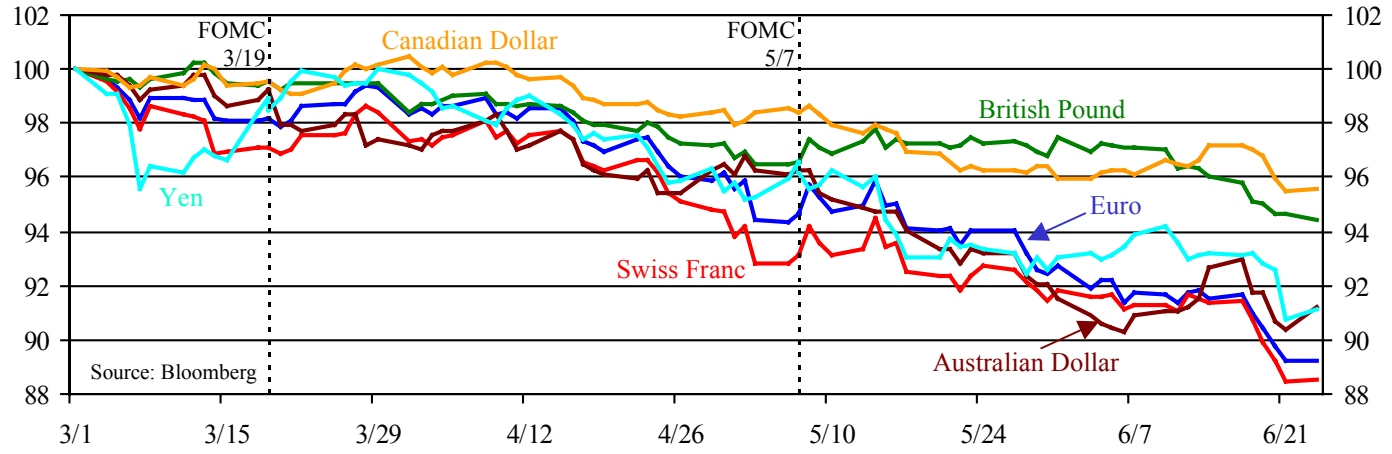


10 -Year Treasury Yield
March 1, 2002 - June 24, 2002

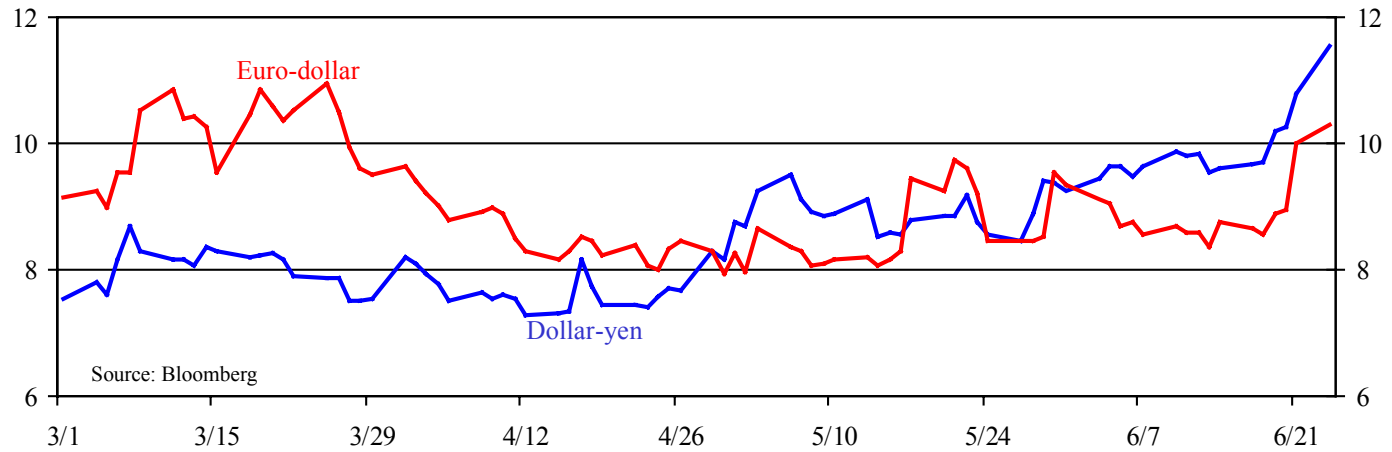


U.S. Dollar Versus Selected Foreign Currencies
March 1, 2002 - June 24, 2002

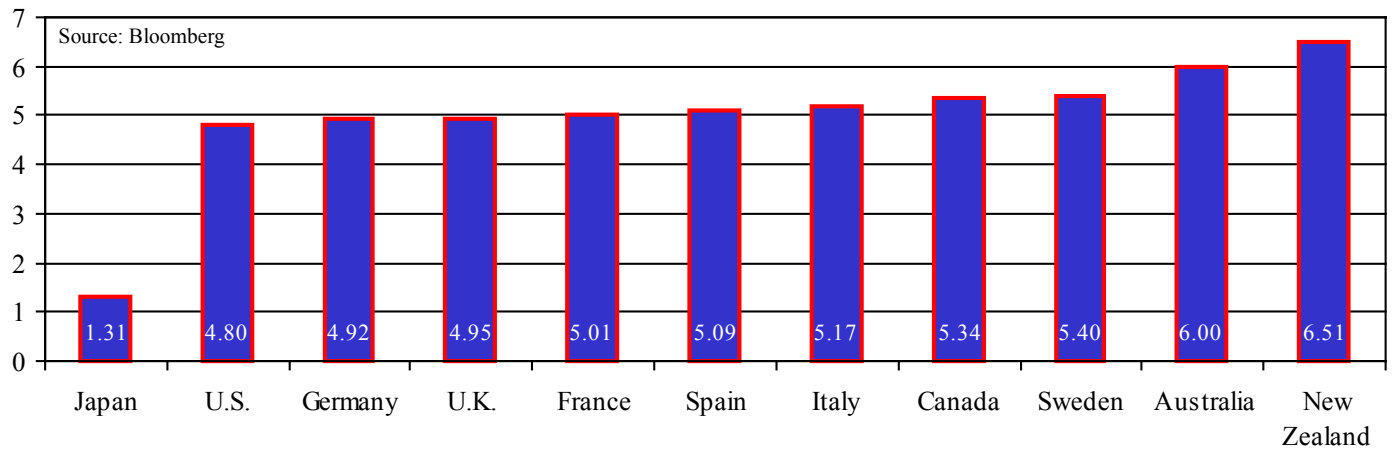
Index 3/1/2002=100 (left and right)



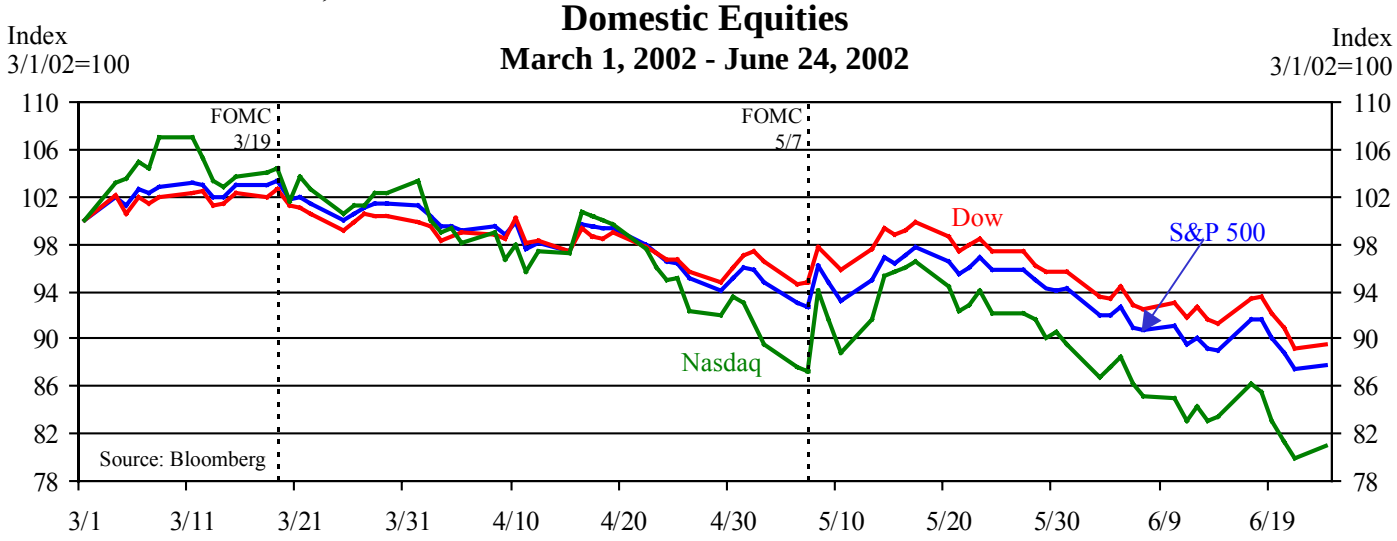
1- month Euro-Dollar and Dollar-Yen Exchange Rate Option Implied Volatility
Percent (left and right)
March 1, 2002 to June 24, 2002



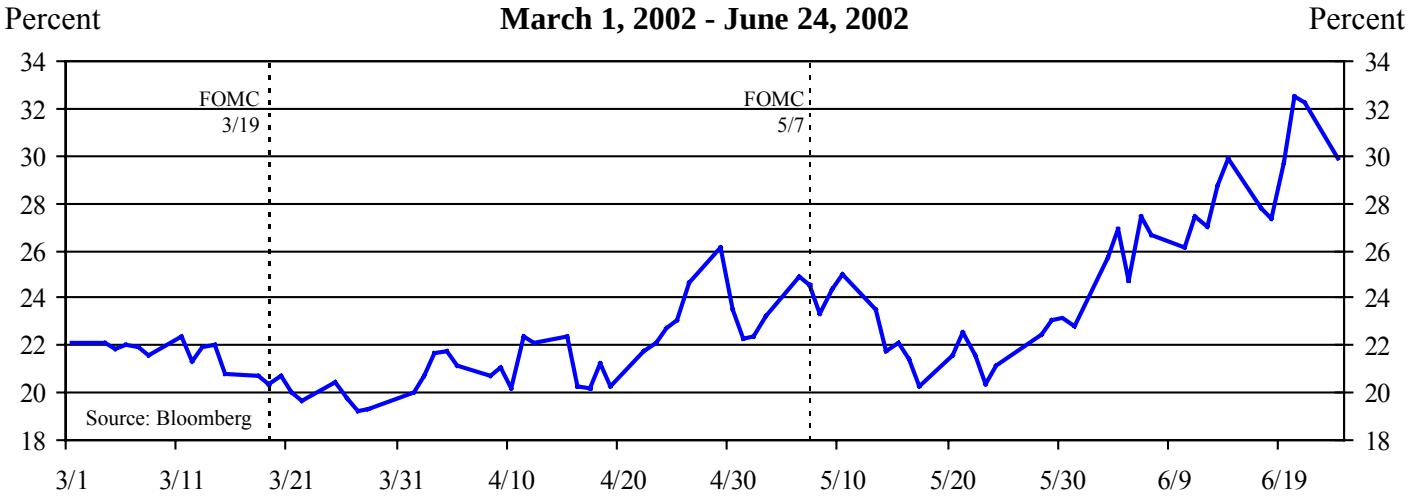
Global 10-yr. Government Bond Yields
Percent (left and right)
As of June 24, 2002



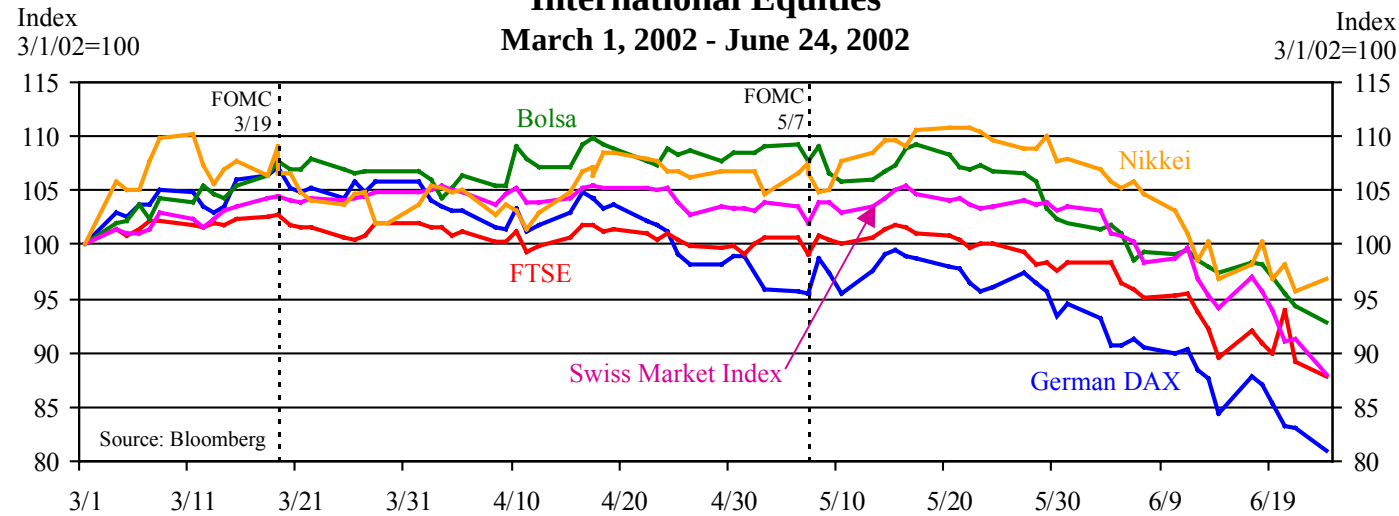
Domestic Equities
March 1, 2002 - June 24, 2002



S&P 100 Volatility Index (VIX)
March 1, 2002 - June 24, 2002

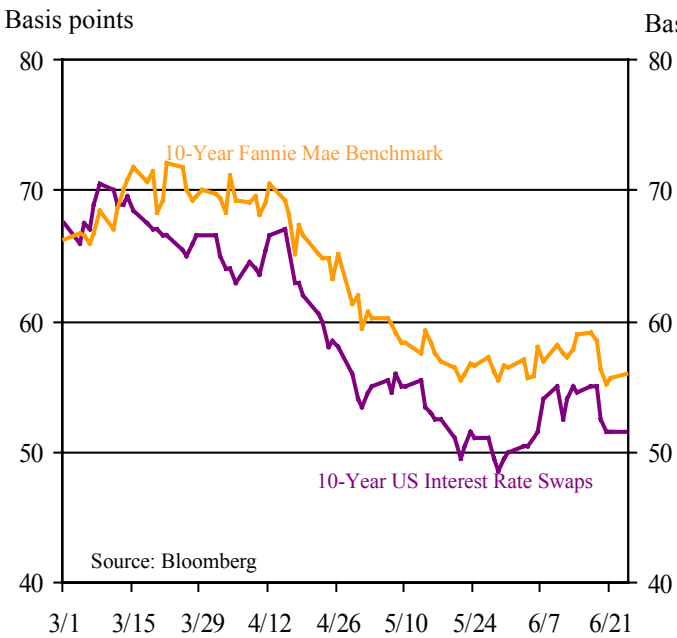


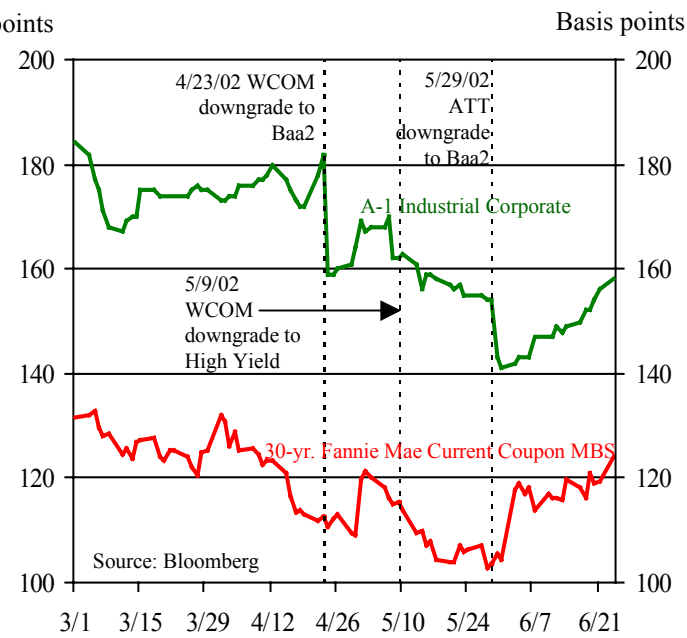
International Equities
March 1, 2002 - June 24, 2002



Domestic Credit Spreads to Comparable Treasuries

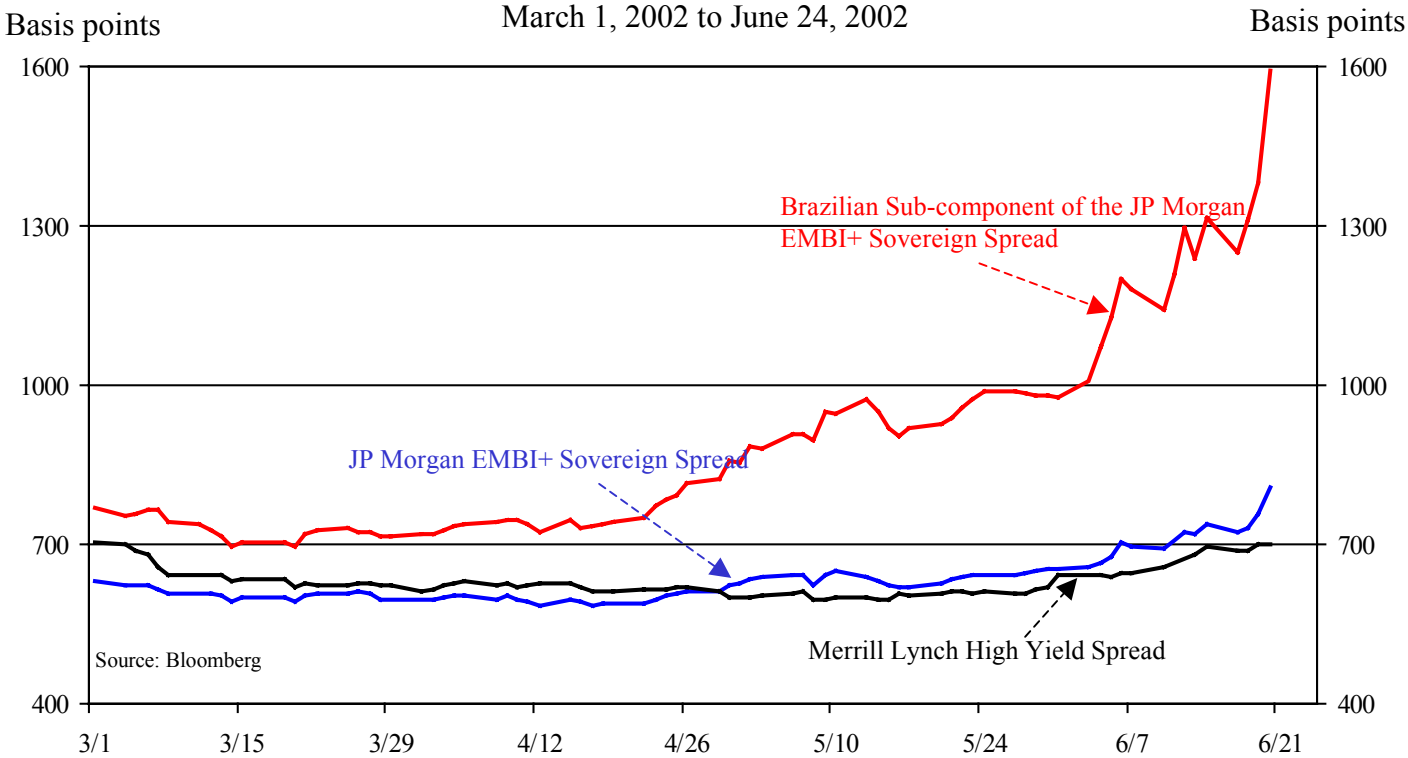
March 1, 2002 to June 24, 2002





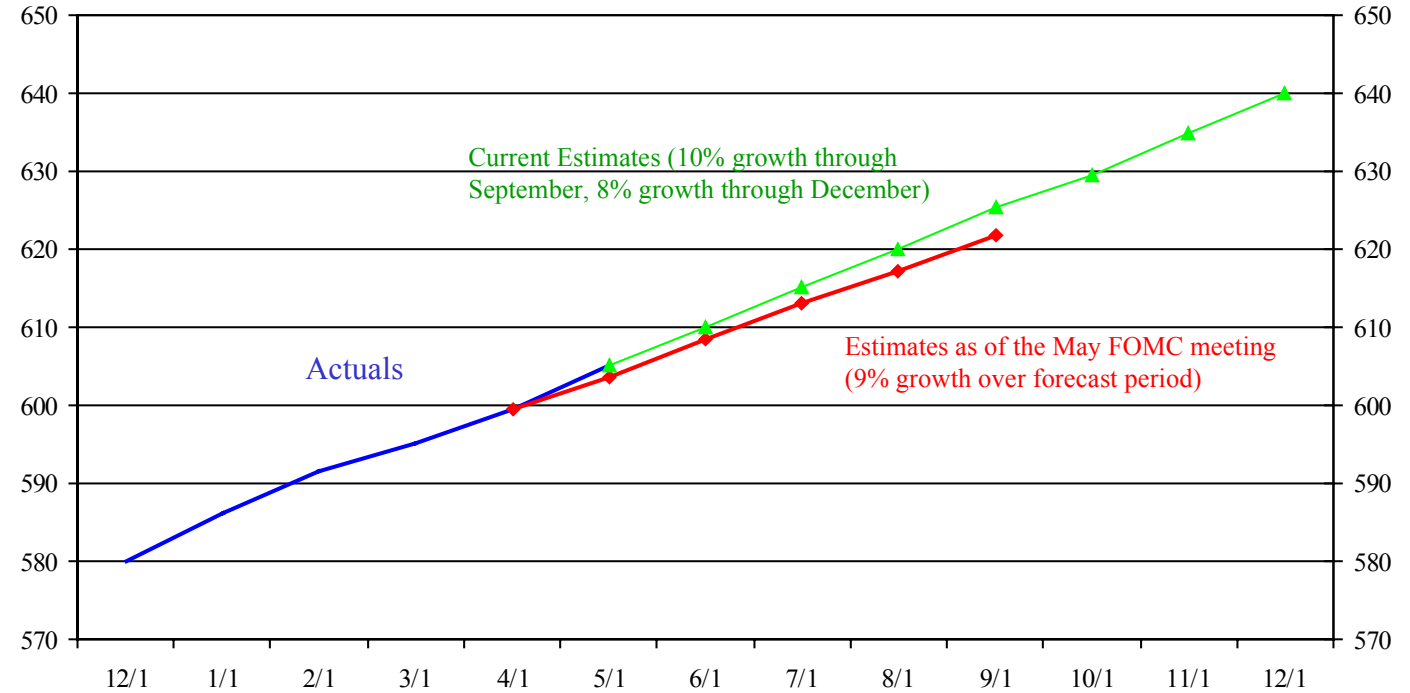
U.S. Corporate High Yield, EMBI+ and the Brazilian Sub-Component

March 1, 2002 to June 24, 2002



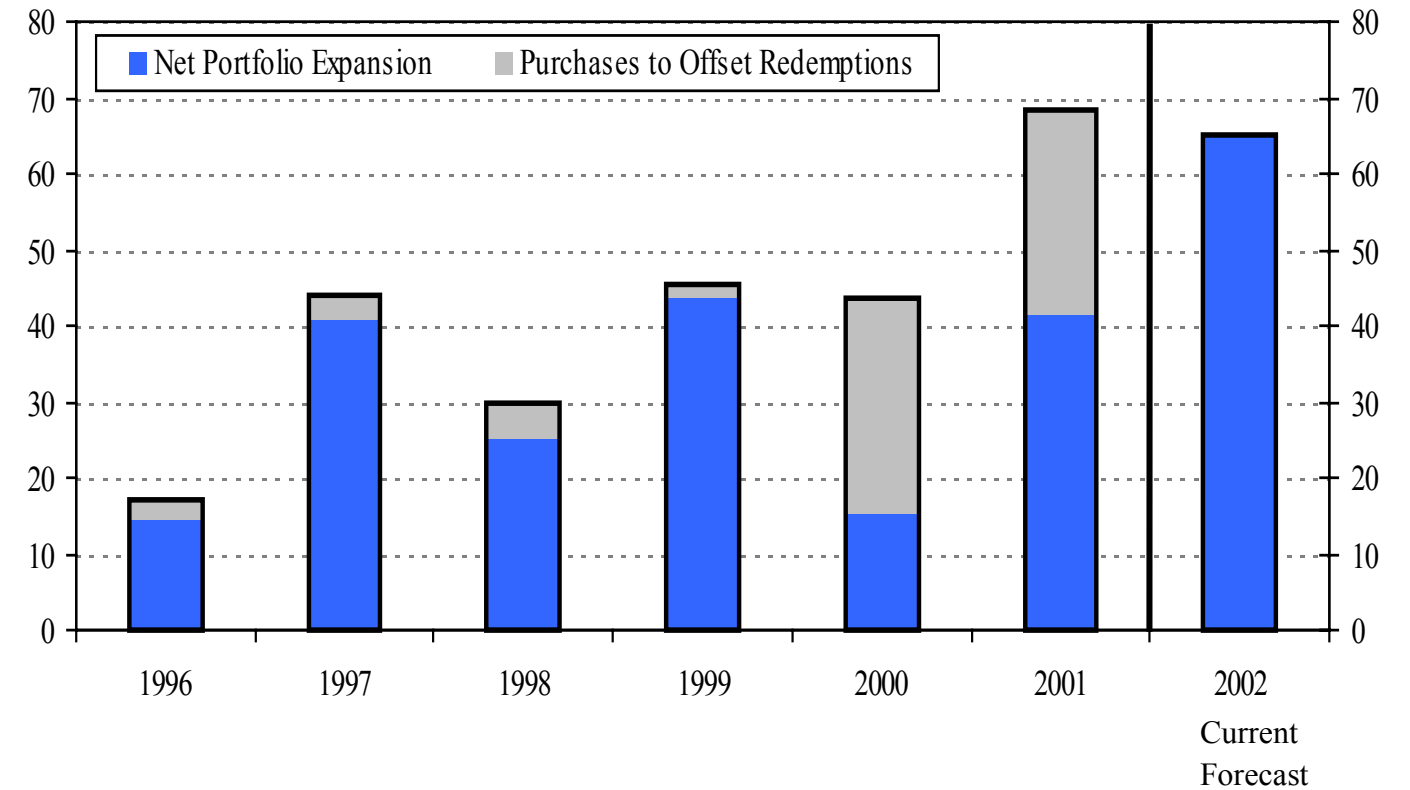
Currency Component of M1 (excludes vault cash) Seasonally Adjusted

$ Billions **December 2001 - December 2002** $ Billions



Total Outright Purchases and Net Soma Expansion

$ Billions 1996 - 2002 $ Billions



Appendix 2: Materials used by Mr. Rolnick

Are Phillips Curves Useful for Forecasting Inflation? 40 years of debate

June 25, 2002
FOMC
Arthur J. Rolnick

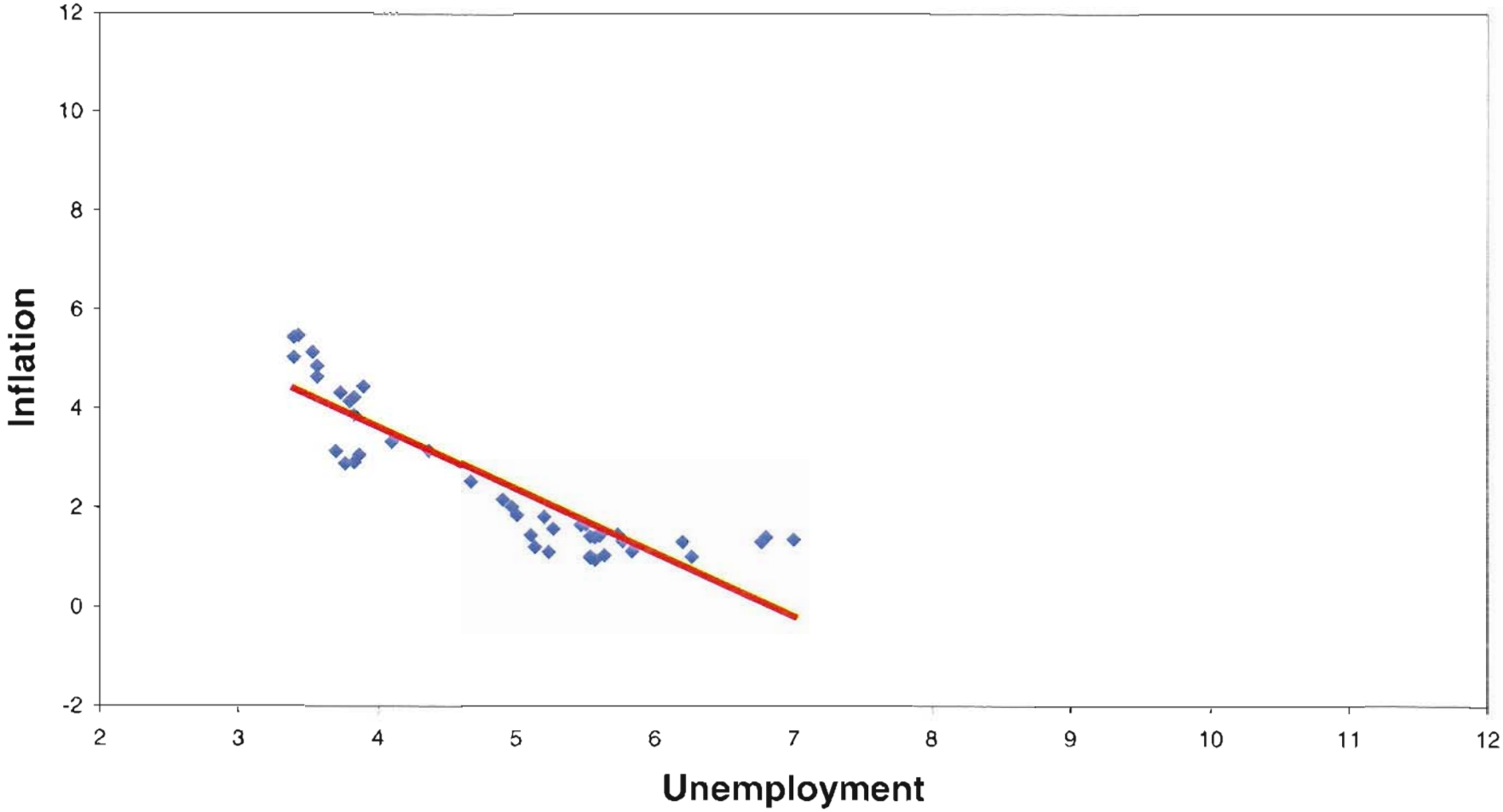
1. The Phillips Curve has not been stable.

2. Unemployment is not useful for predicting inflation.

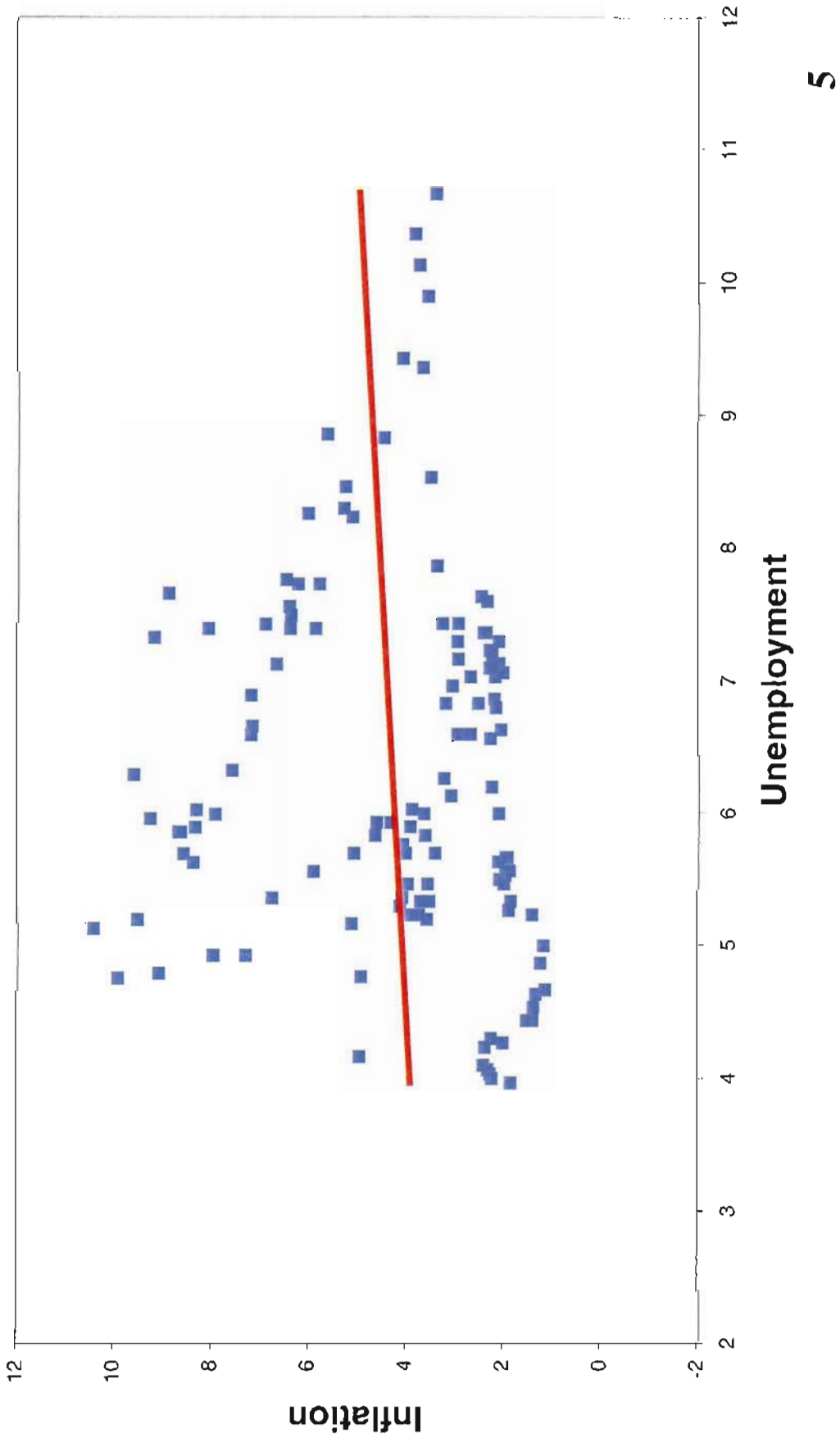
3. In the long run, money growth is a reliable predictor of inflation.

The Phillips Curve: The U.S. Experience 1960-2000

There was a clear negative relationship in 1959-69...

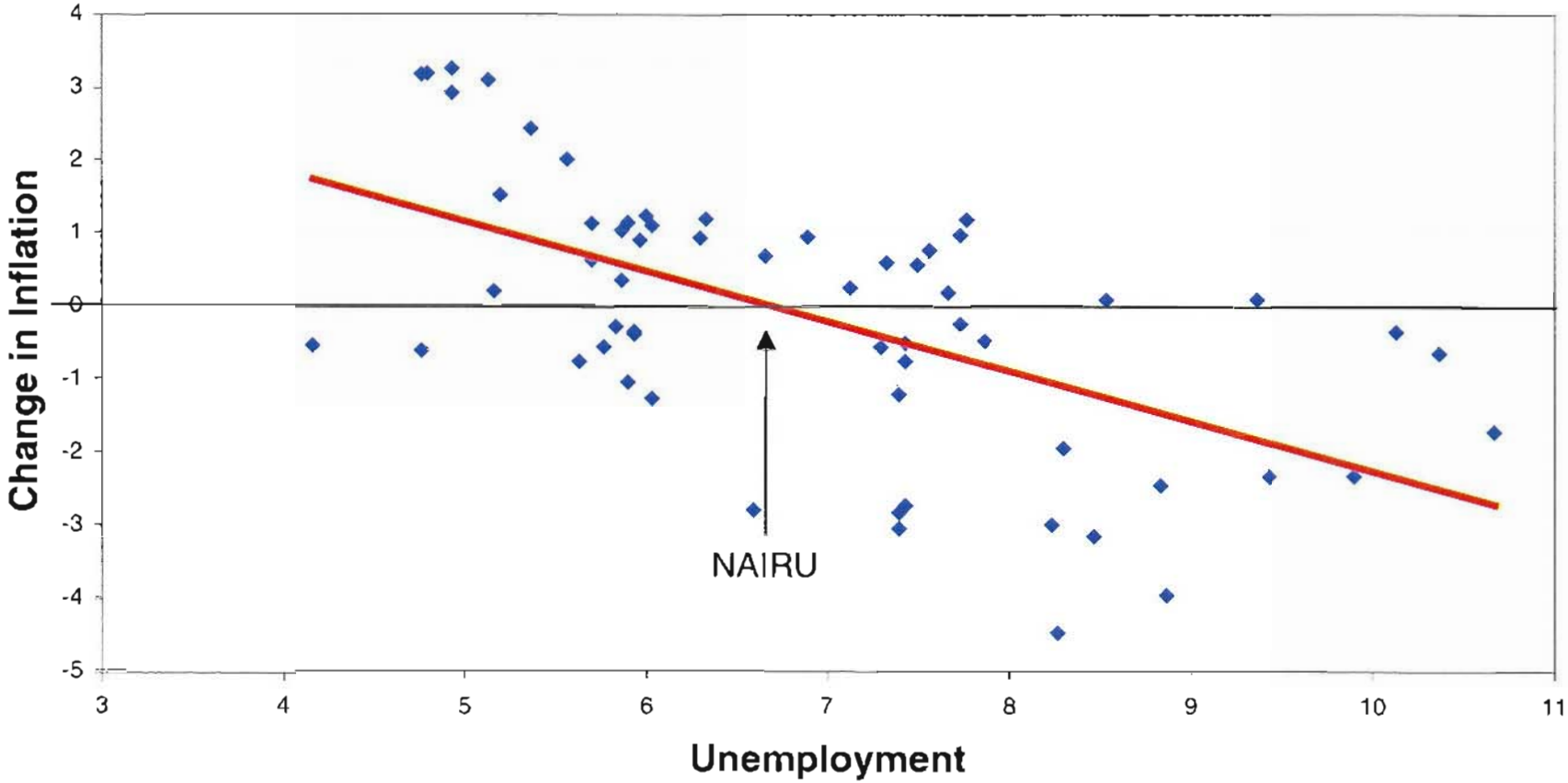


...But it disappeared in 1970-2000...

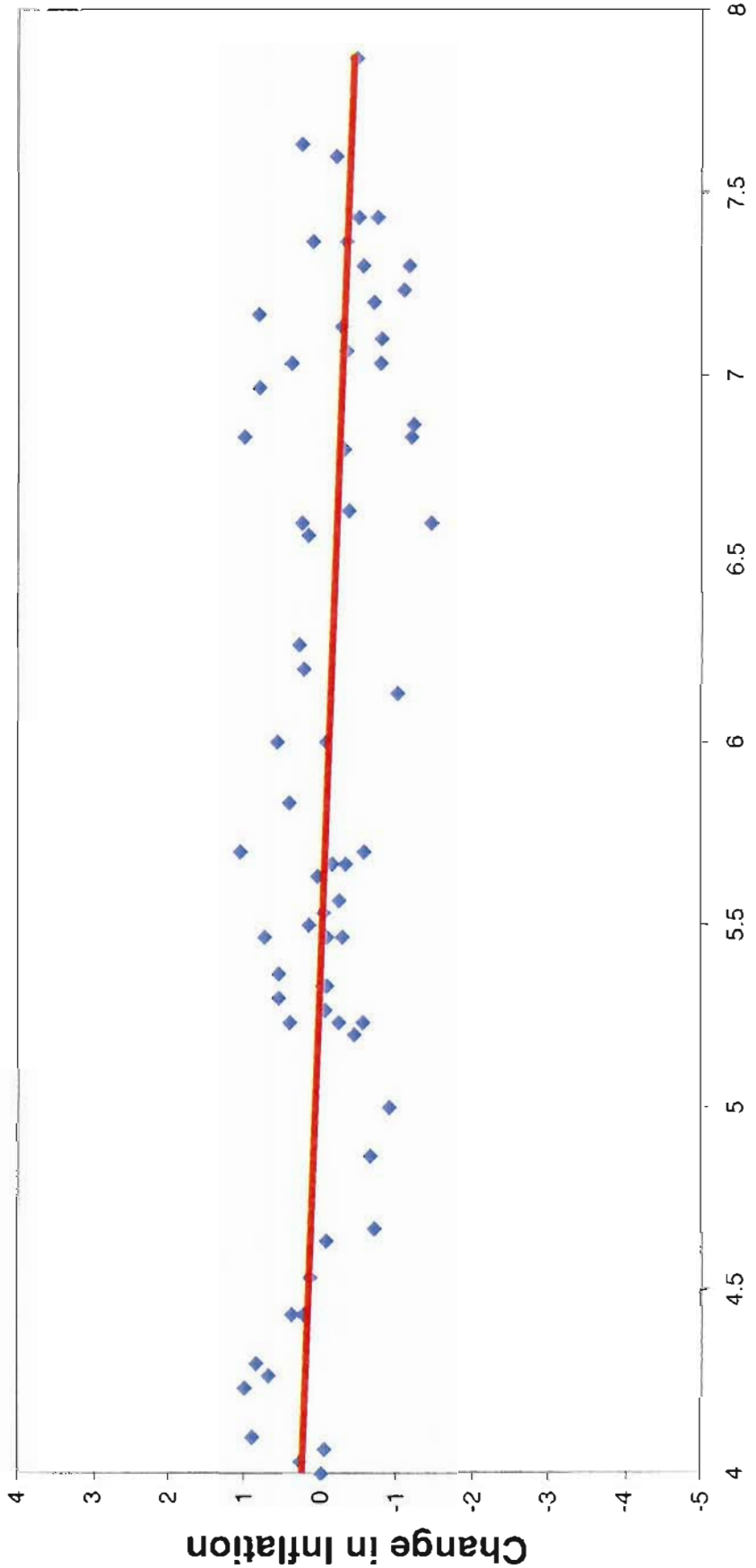


A new Phillips Curve emerged in 1970-84...

Unemployment and Changes in Inflation



…But the new Phillips Curve became less visible (1984-2000)…



8

1. The Phillips Curve has not been stable.

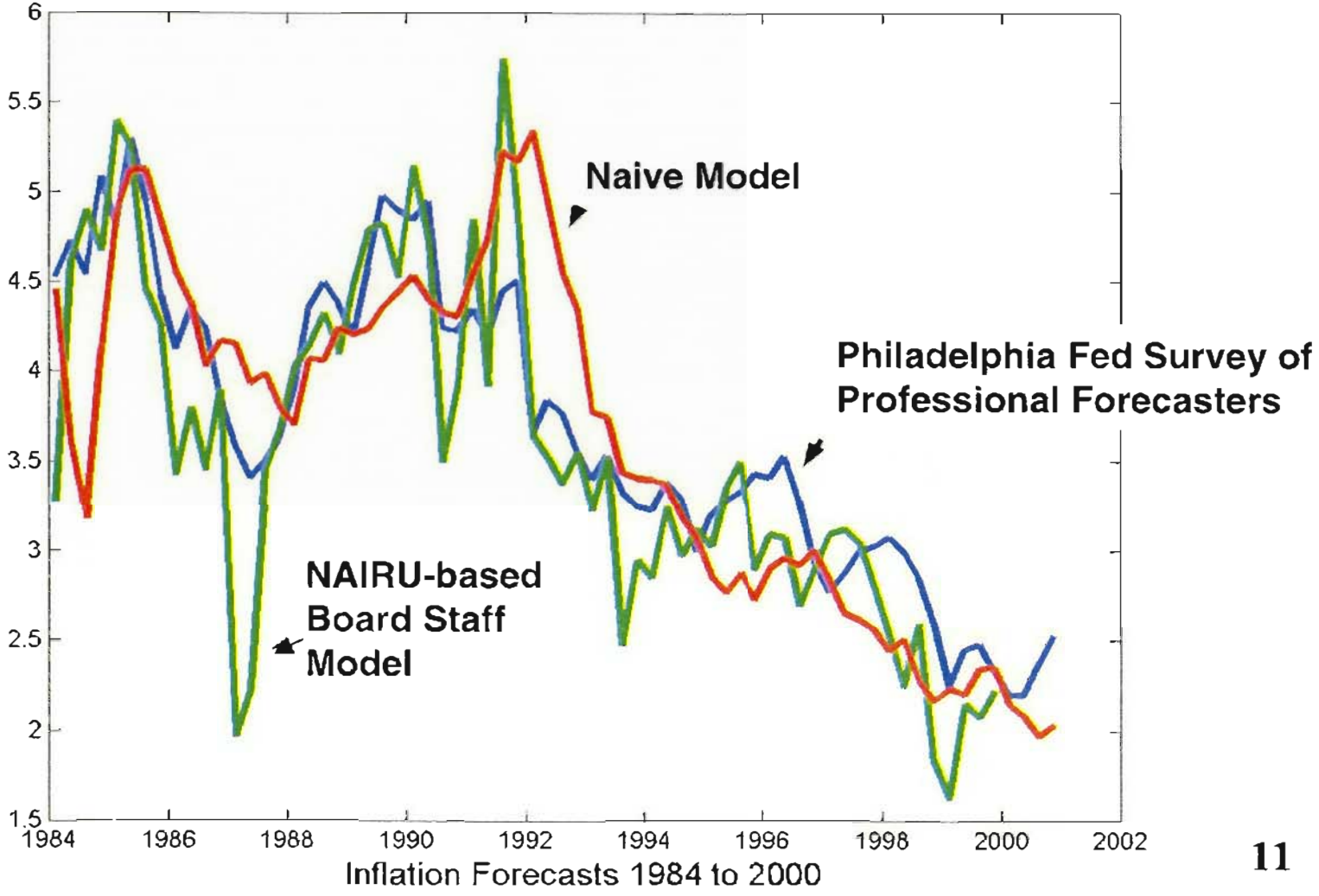
Some economists still insist that unemployment can predict inflation.

The test: Can NAIRU-based models forecast better than a naive model?

The Naive Model

Inflation over the next period is predicted to be equal to inflation over the previous period

NAIRU-based Board Staff Model has not forecasted better than the Naive Model



Evaluating Forecasting Models

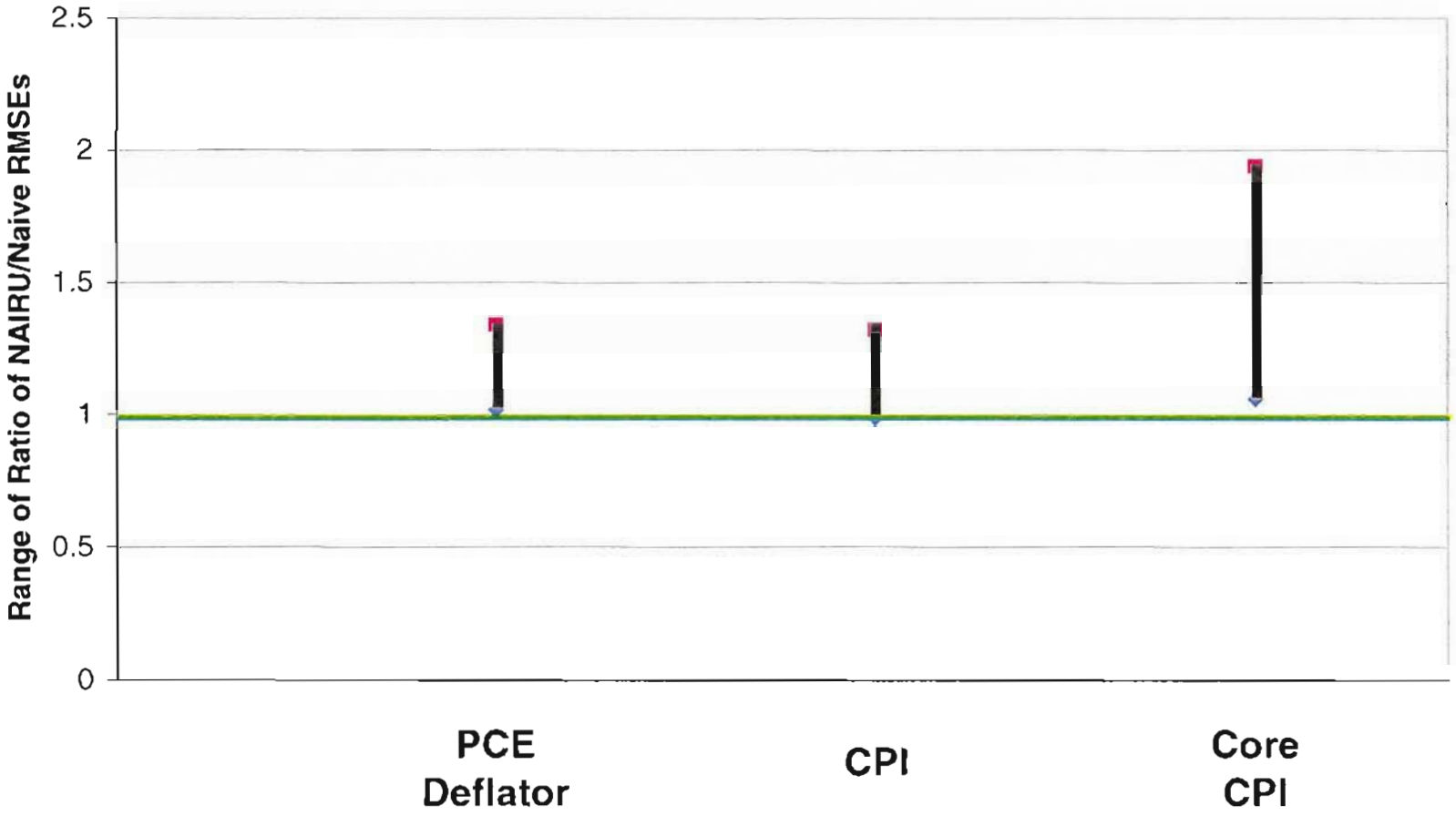
- A better forecasting model has smaller average forecasting error

- The measure of success:

$$\frac{\text{Average Error of NAIRU Model}}{\text{Average Error of Naive Model}}$$

- NAIRU wins if the the measure is less than one

A large class of NAIRU-based models have not forecasted better than the Naive Model

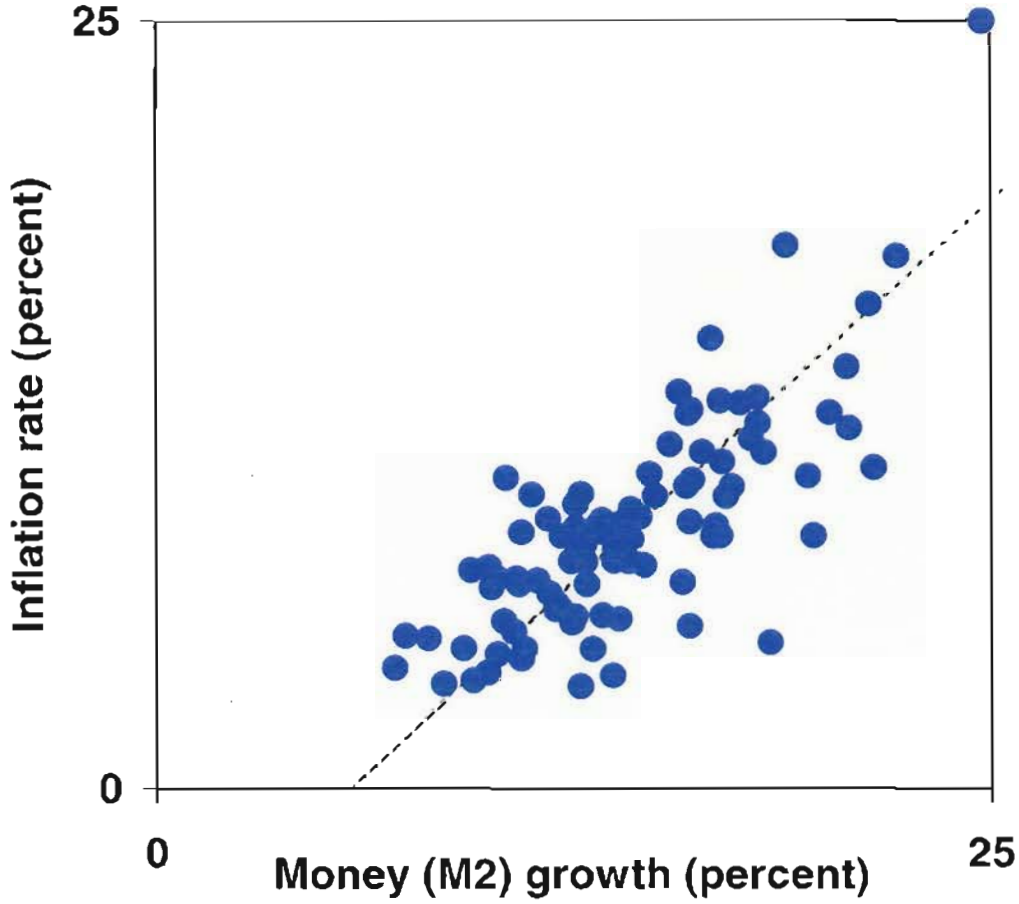


2. Unemployment is not useful for predicting inflation.

The Quantity Theory: International Evidence for 94 Countries 1960-1990

Money growth and inflation are highly correlated over the long-term

(Approximately 25 year averages)



3. In the long run, money growth is a reliable predictor of inflation.

Appendix 3: Materials used by Mr. Roberts and Mr. Lebow

Material for

Board Staff Presentation on Explaining Low Inflation Since the Mid-1990s

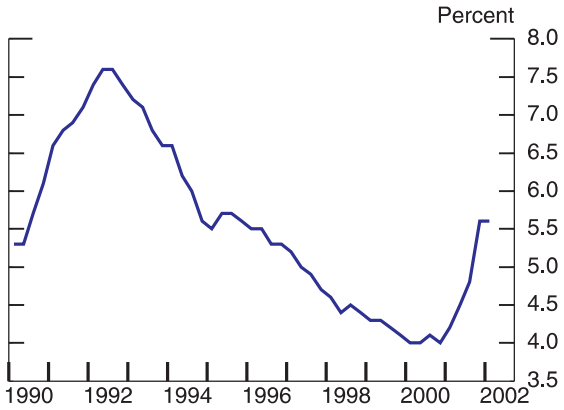
Division of Research and Statistics

June 25, 2002

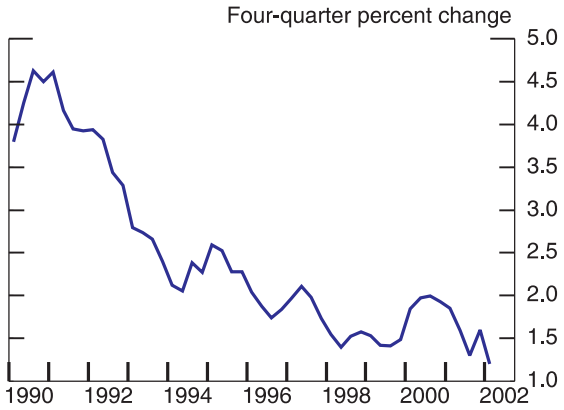
Exhibit 1

Overview

Unemployment Rate



Core PCE Prices



Questions

- Have changes been occurring in the economy, over time, that have altered the inflation process?
- Why did inflation remain so low in the late 1990s when unemployment was also low?
- Can the recent good performance be repeated in coming years?

Three key factors

1.	*Changes in monetary policy*	A relatively small part of the recent story.
2.	*The pickup of productivity growth*	Our main explanation for the late 1990s; effects should diminish over time.
3.	*Labor market developments*	Also important; effects likely to persist.

Exhibit 2

The FRB/US Model of Inflation Dynamics

- $\pi_t = \beta\, \pi_{t-1} + (1-\beta)\, \pi_t^e - \gamma\, (U_t - U_t^n) +$ *relative price shocks + unit labor costs*

  π = rate of price inflation

  π^e = expected rate of price inflation

  U = unemployment rate

  U^n = natural rate of unemployment

  β, γ = coefficients

- π^e reflects knowledge of the structure of the economy, including the conduct of monetary policy.

- How do our factors fit in this model?

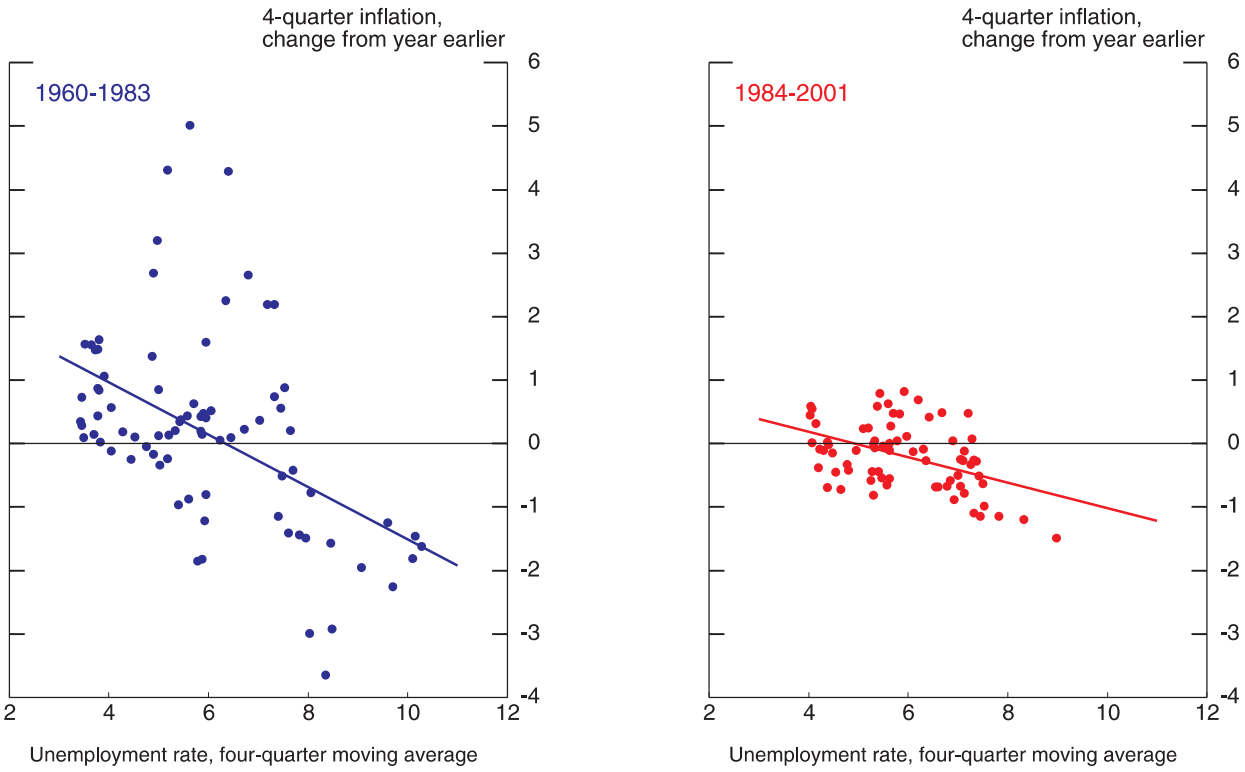
  - Changes in the conduct of monetary policy alter the influence of U on π^e.
  - Changes in labor productivity growth affect inflation through unit labor costs.
  - Labor market developments shift U^n.

- Movements of $(U - U^n)$ explain about 20 percent of the variation of year-to-year changes in inflation.

Exhibit 3

Monetary Policy

Change in Core PCE Inflation vs. Unemployment



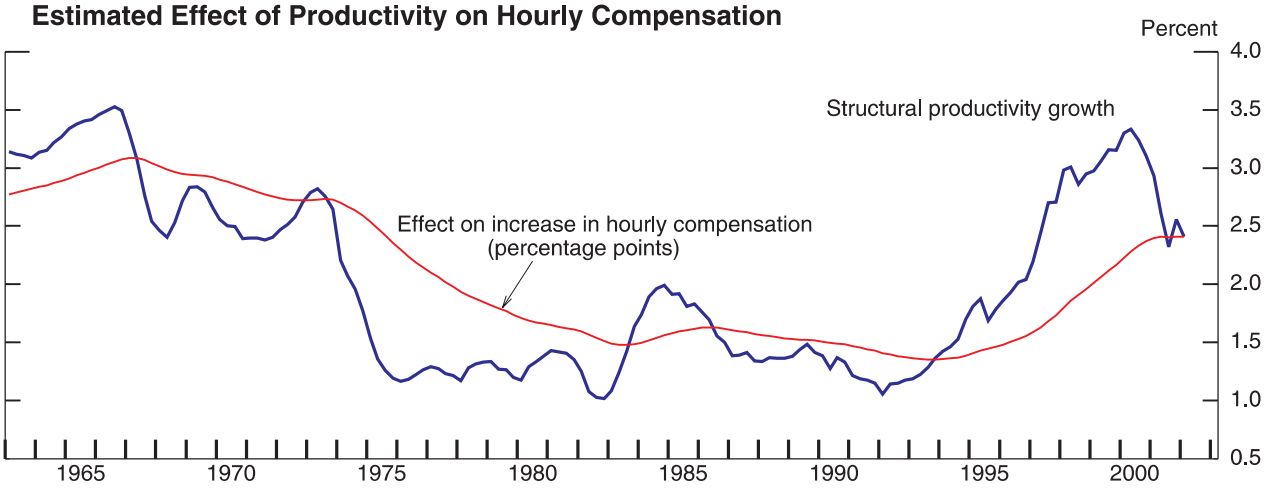
- Since the early 1980s, monetary policy has moved more aggressively to stabilize the economy than in the 1960s and 1970s.
- In FRB/US, such a change reduces the sensitivity of inflation to unemployment.
  - Alters the formation of inflation expectations.
  - Low unemployment is no longer as strong a signal of higher future inflation.
  - Sensitivity reduced by about a third.
- So, low unemployment in the late 1990s induced less deterioration in inflation expectations, and thus in actual inflation.
- But policymakers cannot “exploit” this lower sensitivity.
  - A reversion to a less-aggressive policy would alter how expectations are formed.

Exhibit 4

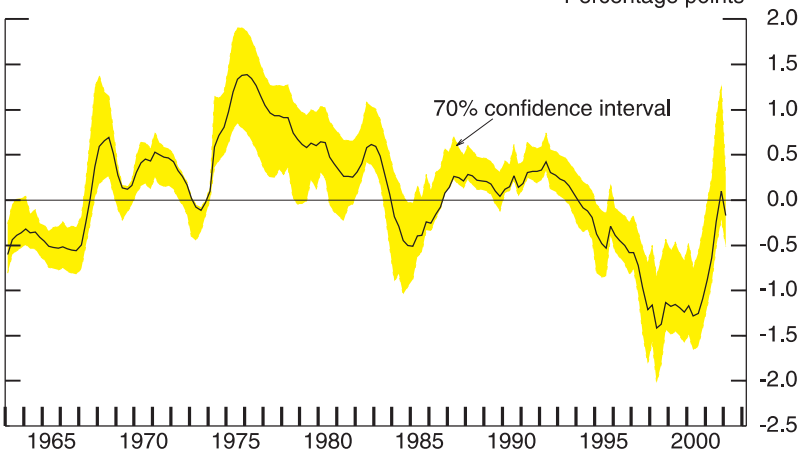
Productivity

- Hourly compensation responds only gradually when productivity accelerates.
  - ▸ Costs of acquiring and processing information.
- Unit labor costs rise less rapidly, helping hold down inflation.
  - ▸ A lower unemployment rate is consistent with stable inflation.
- Effect may be long-lived but not permanent.
- Effect worked in the opposite direction in the 1970s.

Estimated Effect of Productivity on Hourly Compensation



Estimated Effect on the Stable-Inflation Unemployment Rate



Caveats

- Uncertain speed of adjustment
- Results sensitive to measure of structural productivity

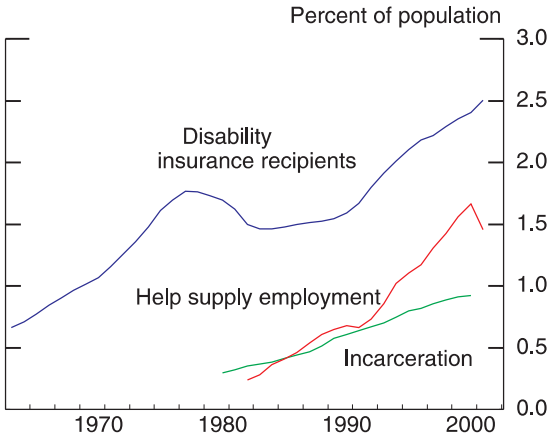
Exhibit 5

Labor Market Developments and the Natural Rate of Unemployment

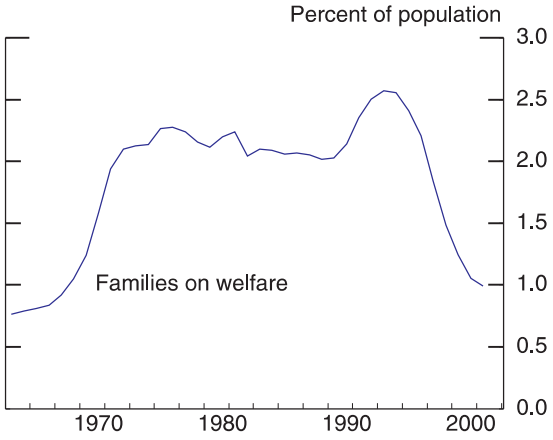
Impact on the Natural Rate of Unemployment In Recent Years

Lower natural rate	*Neutral effect*	*Higher natural rate*
1. Incarceration	1. Minimum wage	1. Welfare reform
2. Disability insurance	2. Unemployment insurance	
3. Help supply	3. Demographics	
4. Worker insecurity		
5. The Internet		

Factors pushing natural rate lower



Factor pushing natural rate higher



On balance:

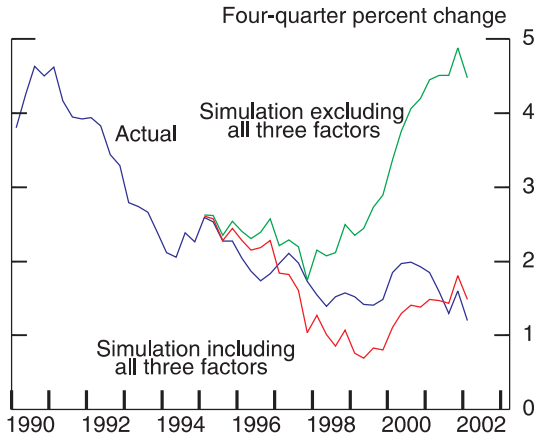
- Demographics aside, the natural rate may be about 1/2 percentage point lower than in the mid-1980s.
- One reason we don't favor a larger number:

  Errors in hourly compensation models have not been large, on average, in recent years.

Exhibit 6

Accounting for Inflation since 1995
(based on dynamic simulations of the FRB/US price-wage sector)

Core PCE Inflation



Contributions to the 2002:Q1 Difference Between the Two Simulations (percent)

Productivity acceleration	63
Labor market developments	25
Change in monetary policy	12

The role of pricing power

- Firms appear to lack "pricing power" in the low-inflation economy.
- This perception may be a natural consequence of accelerating productivity:
  - Innovation may create winners and losers; the losers "lack pricing power."
  - A productivity acceleration causes profit share to rise and then decline.
- Greater competition – from globalization, deregulation, and the low-inflation environment – may also have reduced pricing power.
  - Reduced pricing power may spur firms to seek new technologies.

Looking ahead

- If *monetary policy* remains aggressive, the smaller sensitivity of inflation to unemployment should continue.
- The *productivity effect* will fade, but may persist a while longer.
- *Labor market developments* should have a durable effect.

Appendix 4: Materials used by Mr. Stockton, Mr. Oliner, and Ms. Johnson

Material for

Staff Presentation on the Economic Outlook

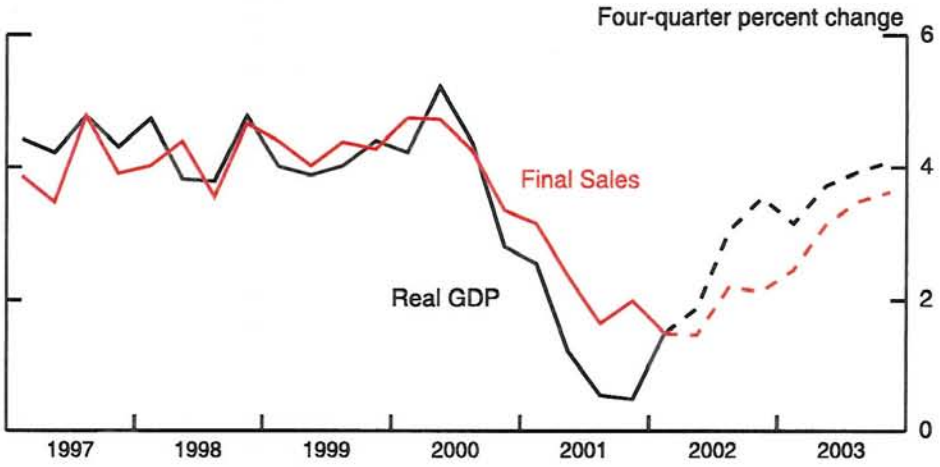
June 25, 2002

Chart 1
Forecast Overview

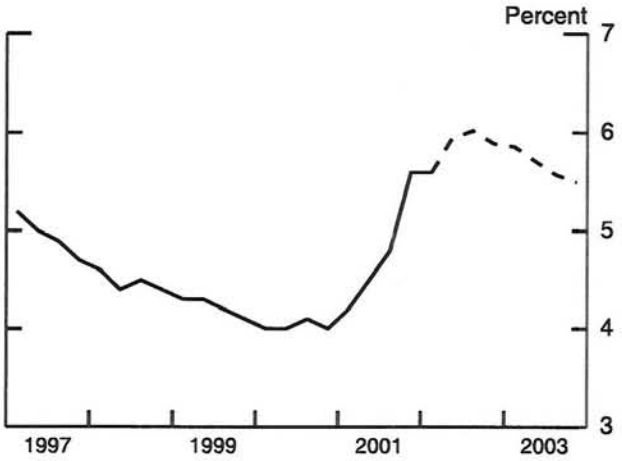
Real GDP
(Percent change, annual rate)

	2002 Q1	2002 Q2
Current	5.7	2.0
(June GB)	*5.5*	*1.8*

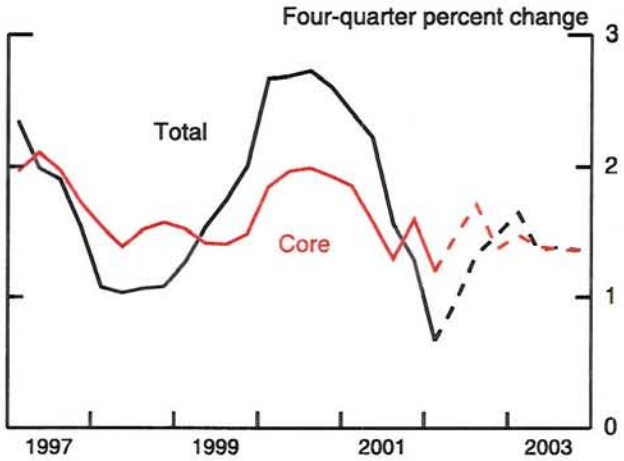
Real GDP and Final Sales



Unemployment Rate



Total and Core PCE Inflation



Staff Projection

		Percent change Q4/Q4 2002	2003
Real GDP	June	3.5	4.1
	(Jan.)	*2.7*	*3.6*
Unemploy-ment Rate	June	5.9	5.7
	(Jan.)	*6.0*	*5.9*
PCE Prices	June	1.5	1.4
	(Jan.)	*1.3*	*1.2*

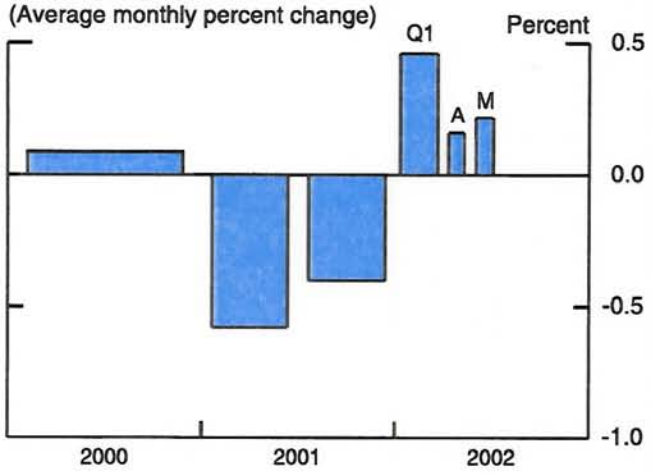
Revision to Projection since January

Percentage points, Q4/Q4	2002
Real GDP	.8
Contributions:	
Household Spending	.5
Business Fixed Investment	.4
Government	.0
Net Exports	.1
Inventories	-.2

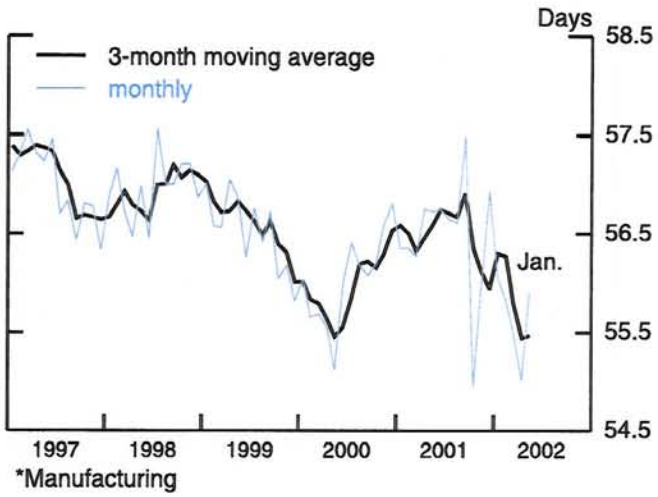
Chart 2

Near-term Indicators

Manufacturing Industrial Production
(Average monthly percent change)

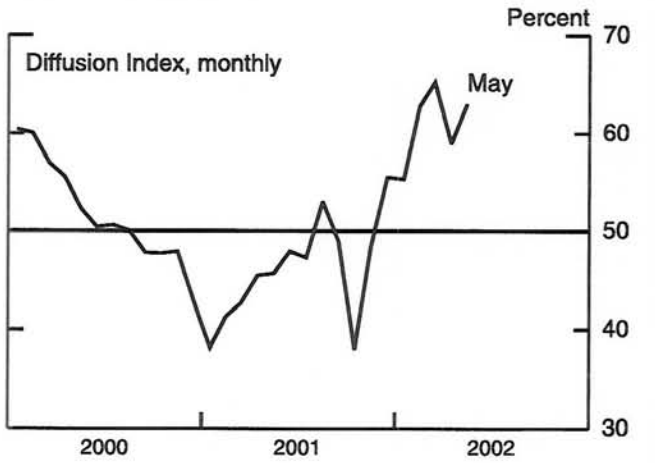


IP-based Days' Supply of Inventories*

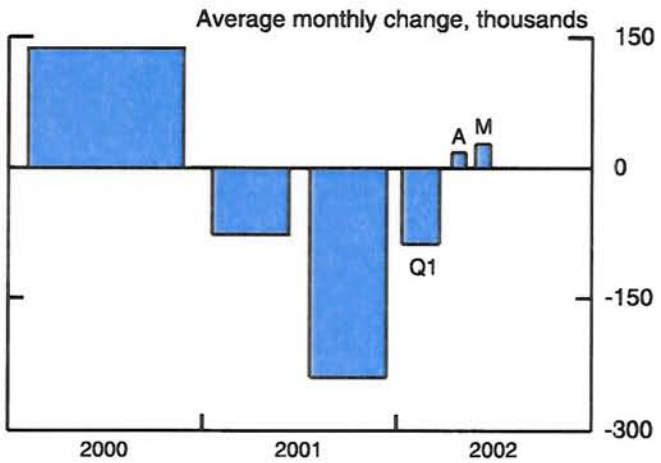


*Manufacturing

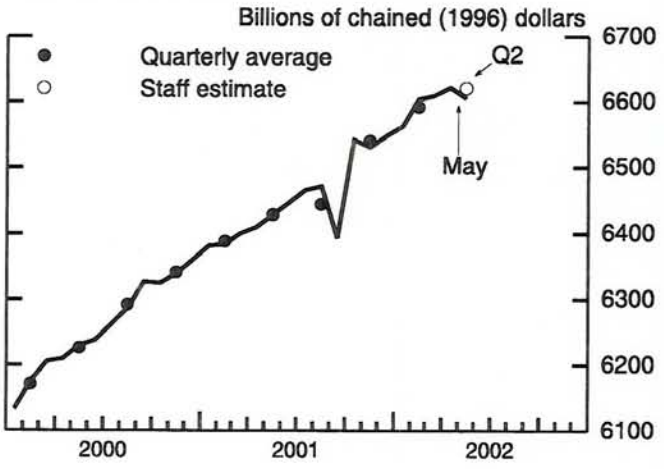
ISM New Orders Index



Private Nonfarm Payroll Employment



Real Personal Consumption Expenditures



Housing Starts

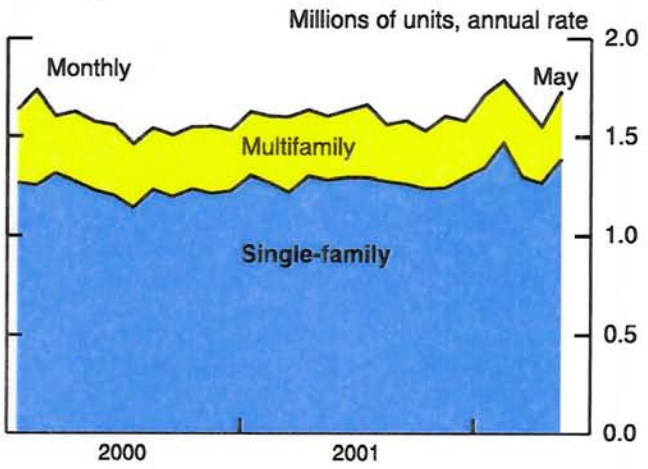
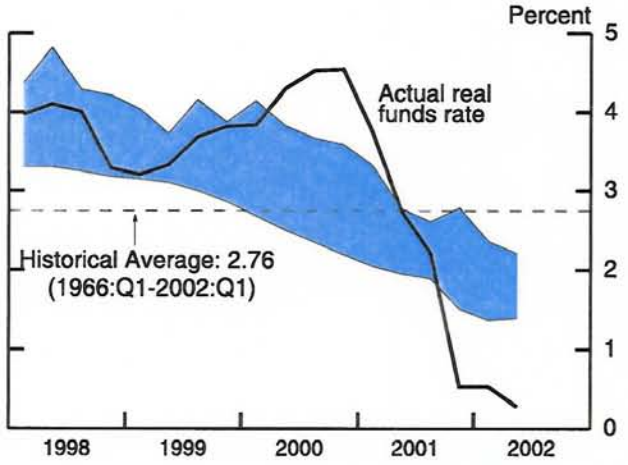


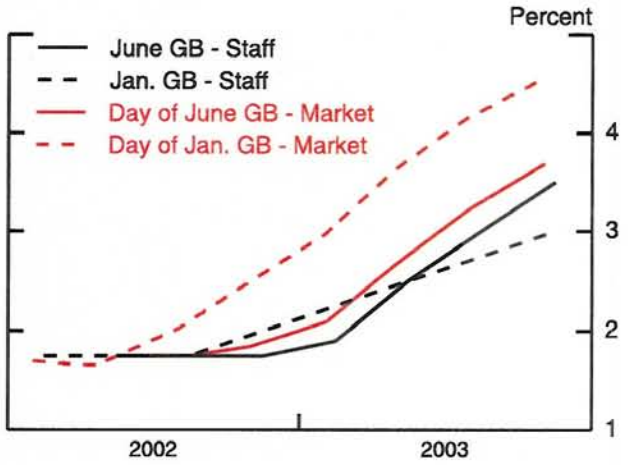
Chart 3

The Policy Setting

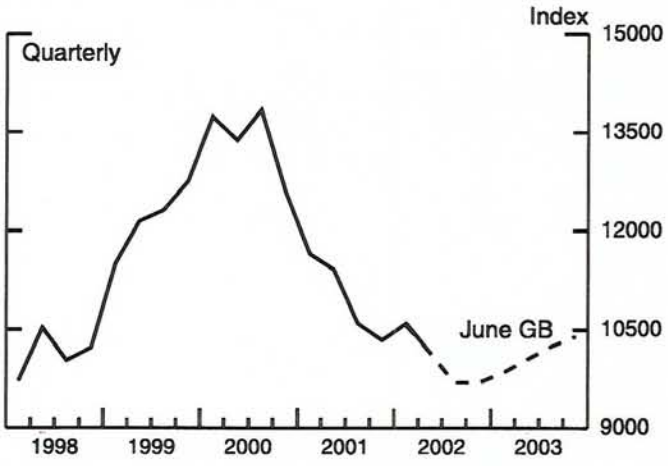
Estimated Equilibrium Real Federal Funds Rate



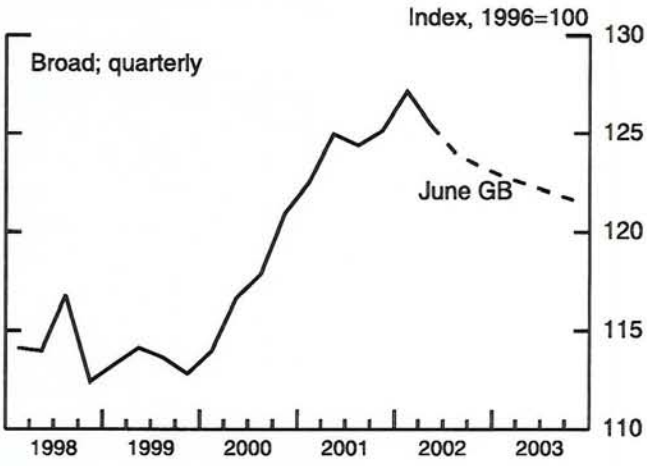
The Federal Funds Rate



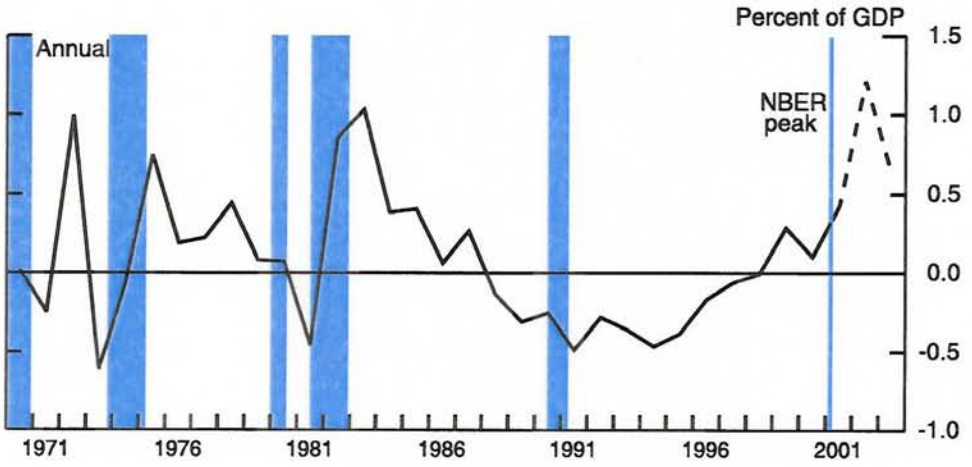
Wilshire 5000



Exchange Value of the U.S. Dollar



Fiscal Impetus

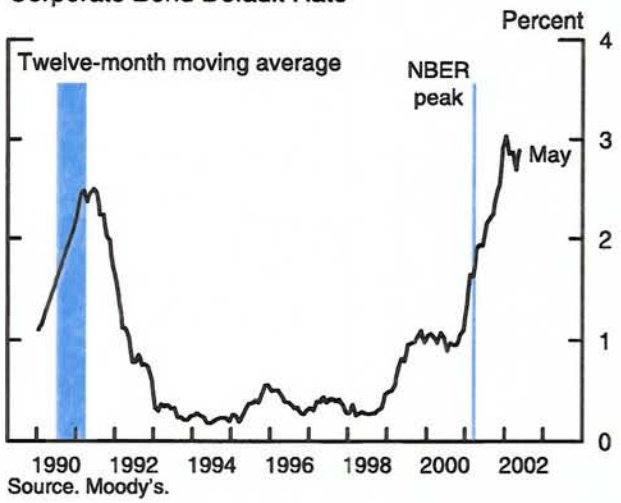


Unified Budget Surplus
(Billions of dollars)

Fiscal year	
2000	236
2001	127
2002	-154
2003	-127

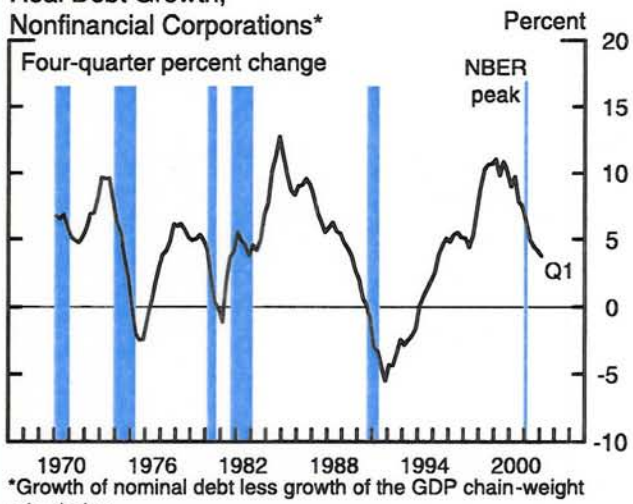
Financial Conditions: Corporate Sector

Corporate Bond Default Rate



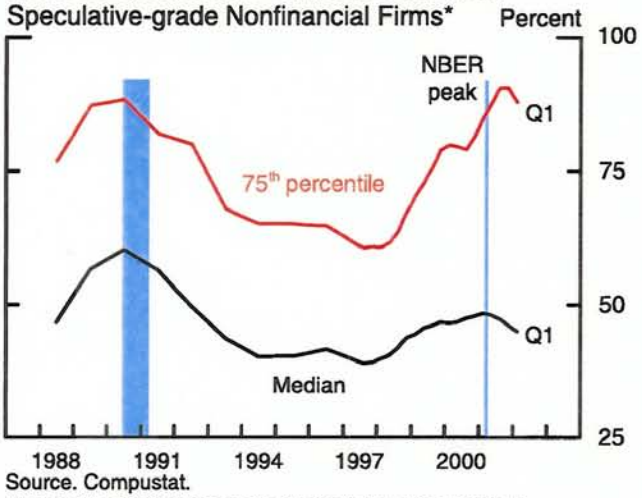
Source. Moody's.

Real Debt Growth, Nonfinancial Corporations*



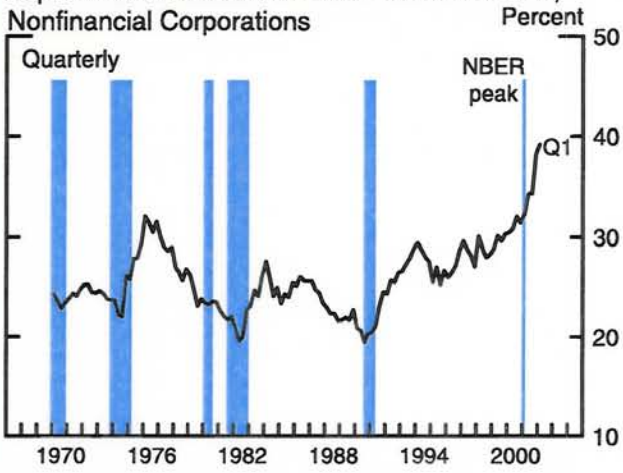
*Growth of nominal debt less growth of the GDP chain-weight price index.

Interest Expense as a Share of Cash Flow, Speculative-grade Nonfinancial Firms*

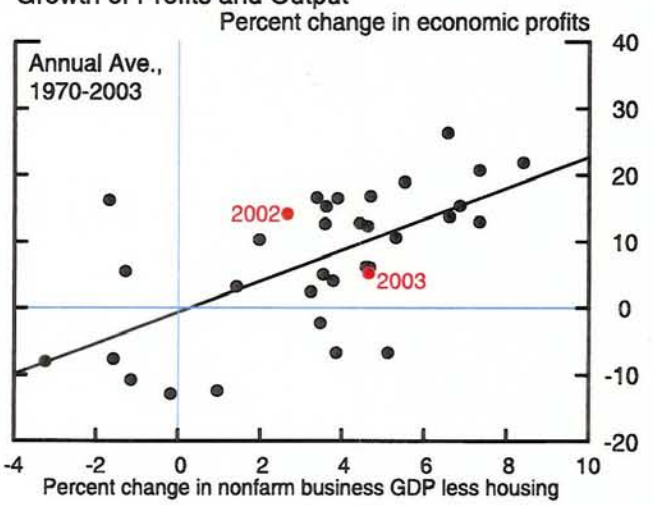


Source. Compustat.
*Annual for 1988-1997 and four-quarter moving average thereafter.

Liquid Assets Relative to Short-Term Liabilities, Nonfinancial Corporations



Growth of Profits and Output



Analysts' Forecasts of Growth in S&P 500 Earnings Per Share*

Percent

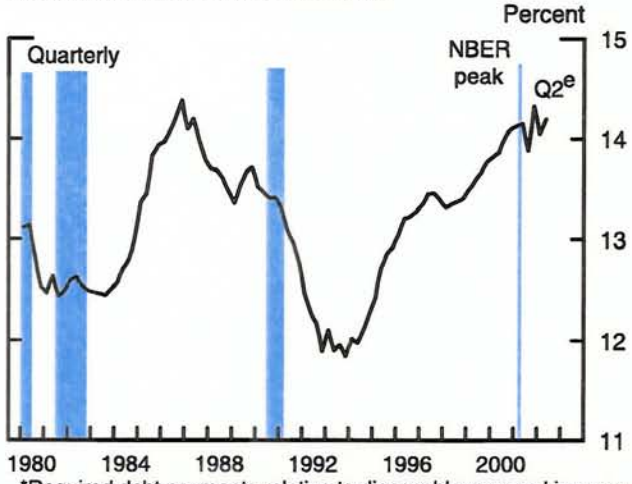
	Forecast	Bias Adjusted
2003	19.6	9 to 14
Long-term growth	12.6	7-1/2 to 9

*As of June 21, 2002.

Chart 5

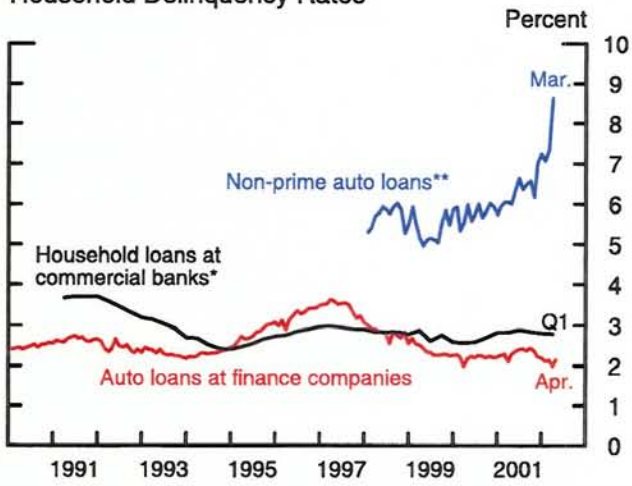
Financial Conditions: Household and Banking Sectors

Household Debt Service Burden*



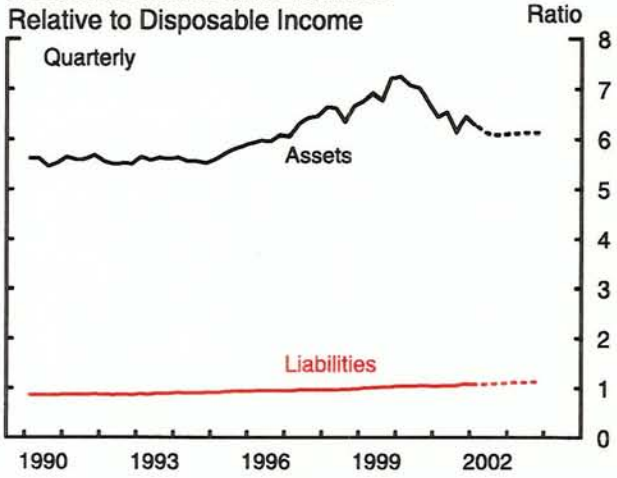
*Required debt payments relative to disposable personal income.

Household Delinquency Rates

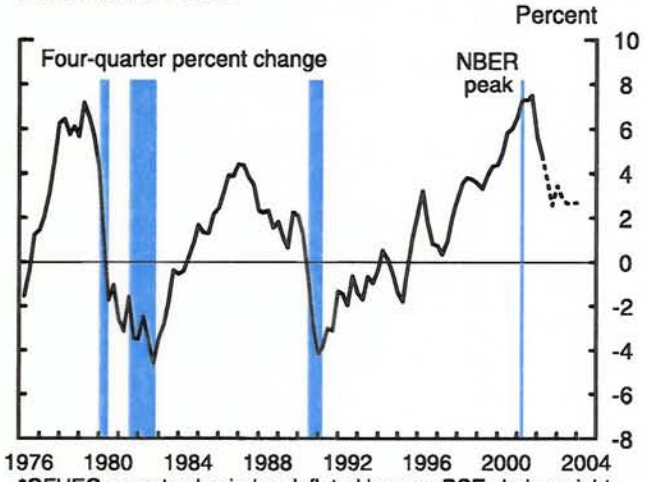


* Consumer loans and residential real estate loans from Call Report.
** Staff calculations using Moody's data.

Household Assets and Liabilities Relative to Disposable Income



Real House Prices*



*OFHEO repeat sales index deflated by core PCE chain-weight price index.

Real House Prices and Income, Coastal Cities*

*Includes Seattle, San Francisco Bay Area, Los Angeles, San Diego, Boston, New York City, Philadelphia, Baltimore, and Washington DC.

Health of the Banking Sector

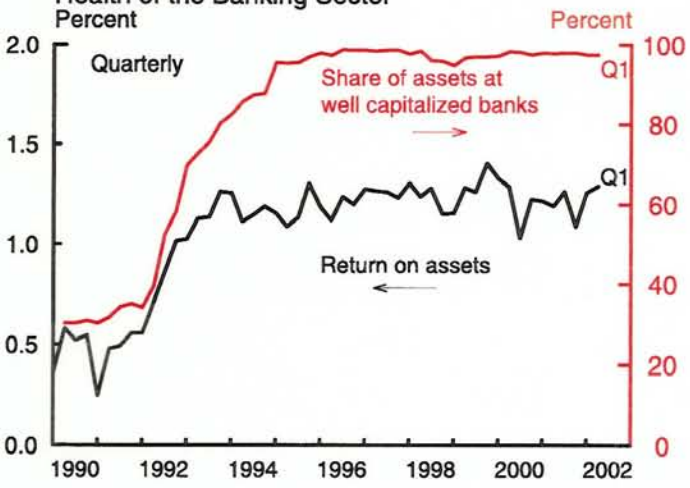


Chart 6

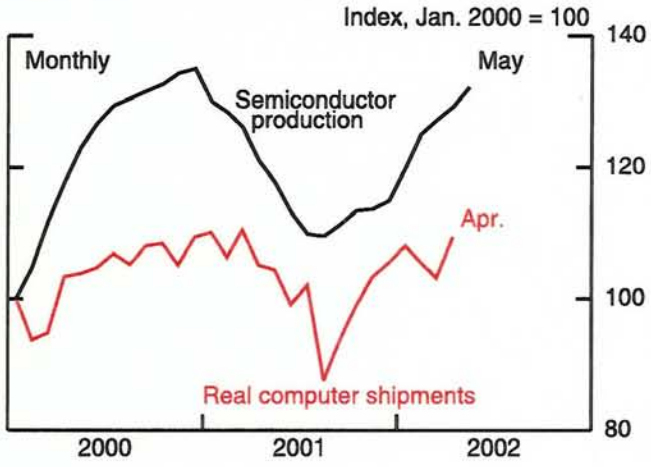
Business Investment

Real Business Fixed Investment

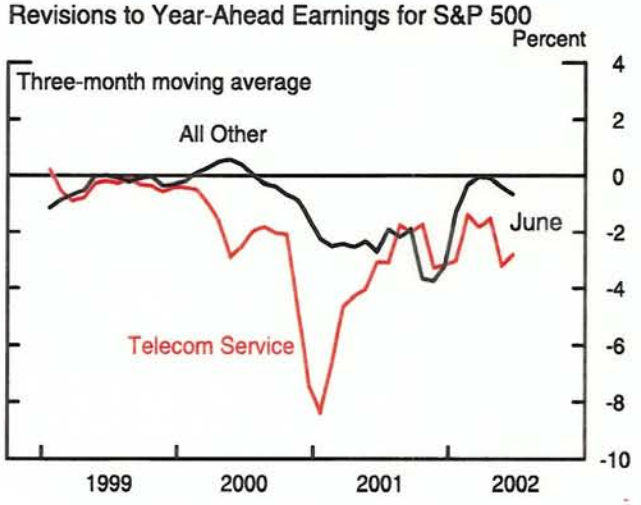
(Percent change, annual rate)

	2002			2003
	Q1	Q2	H2	
1. Total BFI	-8	1	5	11
2. E&S	-2	4	8	13
3. NRS	-23	-7	-2	4

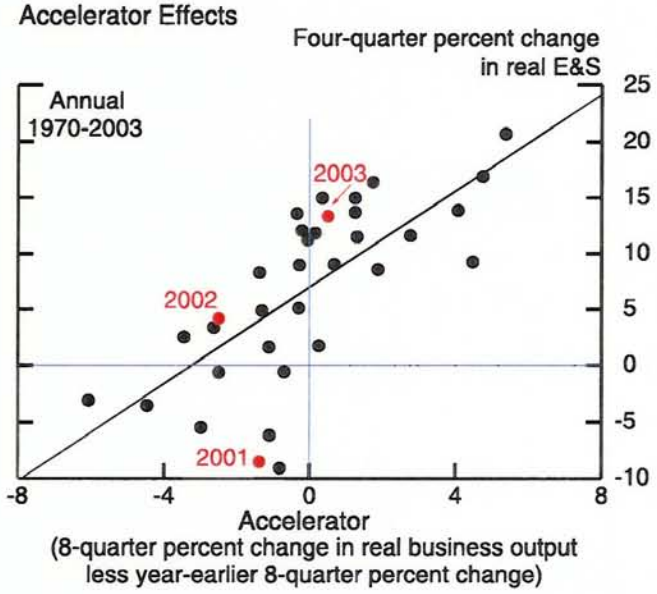
Semiconductors and Computers



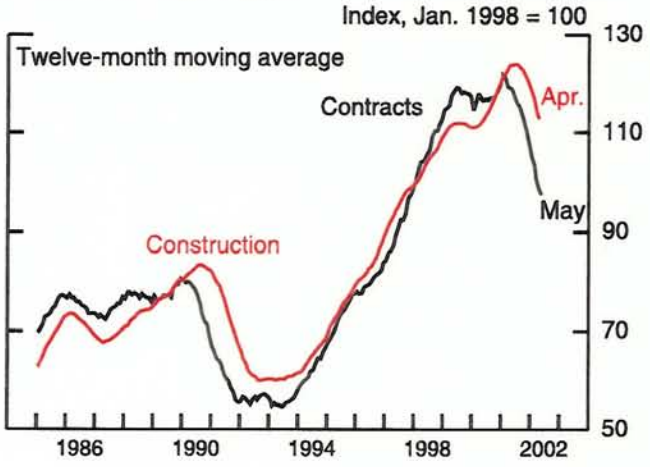
Revisions to Year-Ahead Earnings for S&P 500



Accelerator Effects



Nonresidential Buildings



Office Buildings

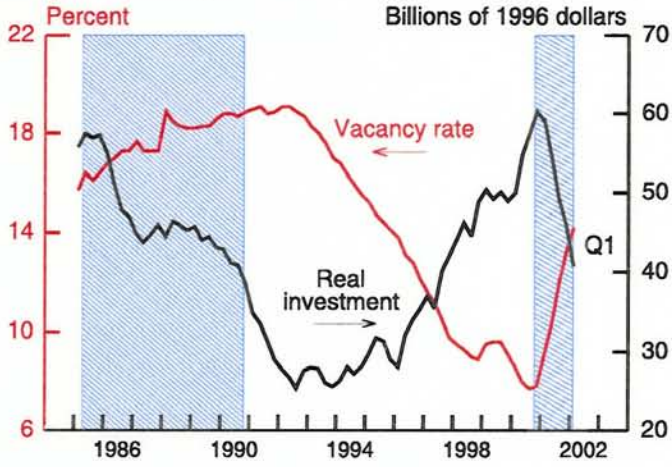


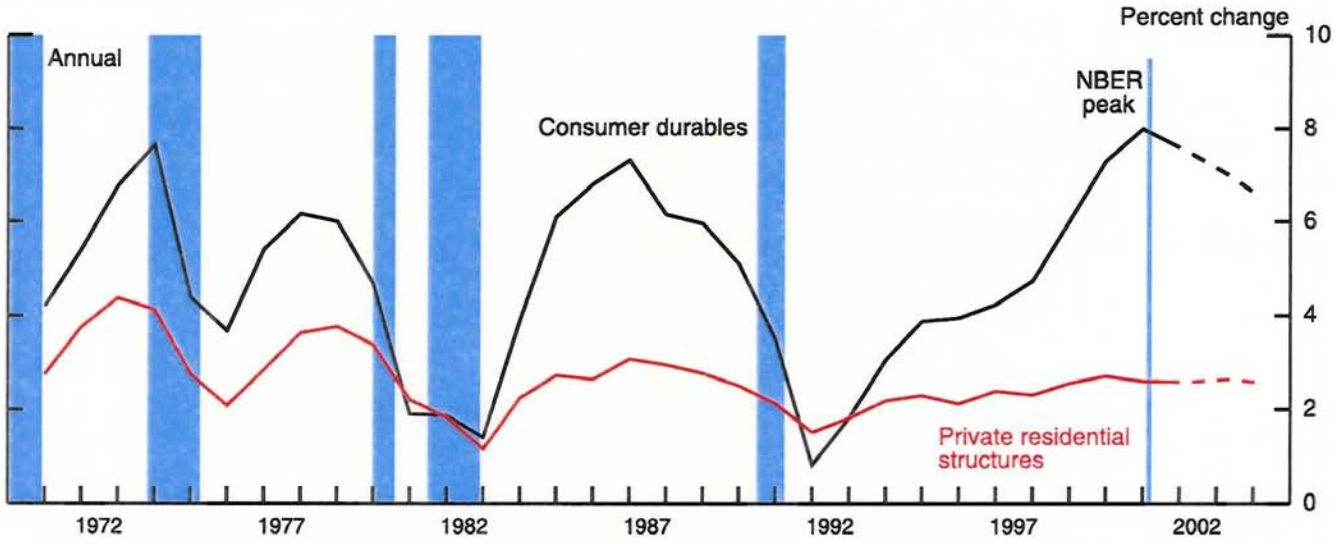
Chart 7
Household Spending

Growth in Real PCE and Residential Investment
(Percent, annual rate)

	Four quarters ending at peak	Recession	Four quarters after trough
1. Average in previous cycles	2.0	-.5	6.3
2. Current cycle and forecast	3.2	3.3	2.5

Note. Previous cycles include all postwar peaks and troughs through 1991. Trough of current cycle is assumed to be 2002:Q1.

Growth of Real Capital Stocks



Growth of Real Disposable Income and Labor Productivity

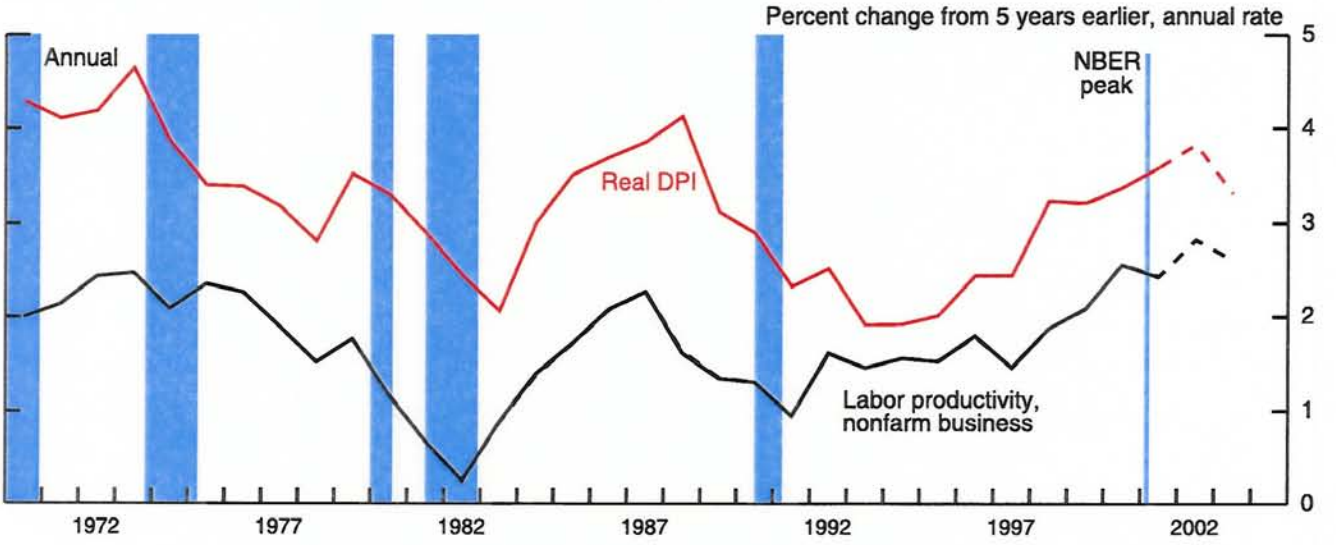
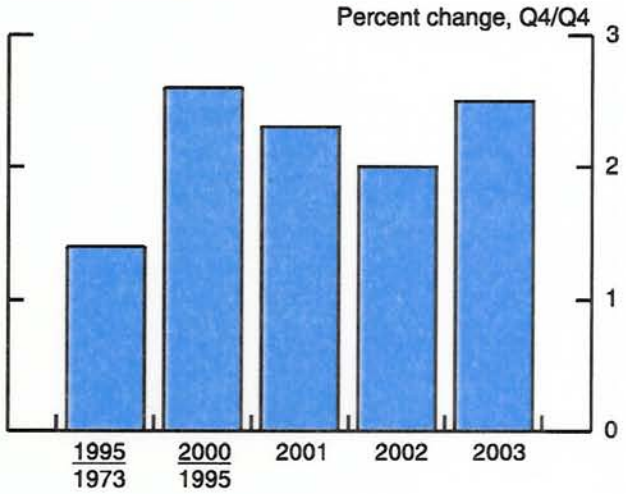


Chart 8
Productivity

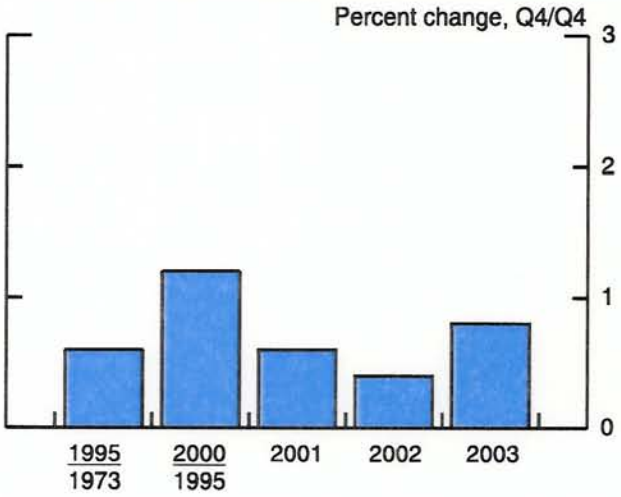
Alternative Estimates of Labor Productivity
(Percent change)

	2001:Q1 / 2000:Q1	2002:Q1 / 2001:Q1
Product side:		
Establishment hours	2.6	4.2
Household hours	2.2	3.4
Income side:		
Establishment hours	2.7	5.1
Household hours	2.3	4.3

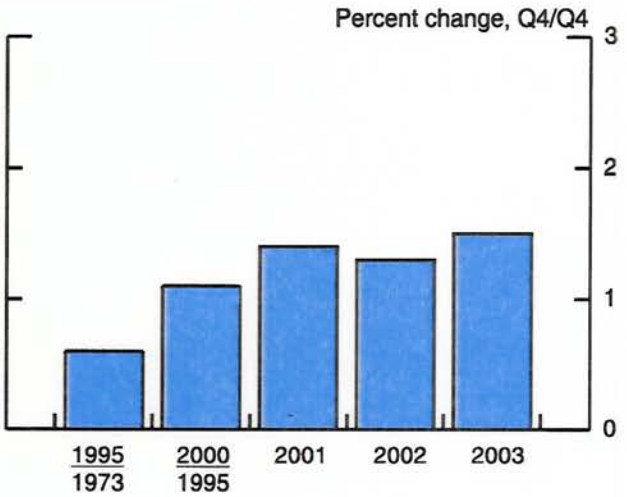
Structural Labor Productivity



Contribution of Private Capital Deepening



Multifactor Productivity

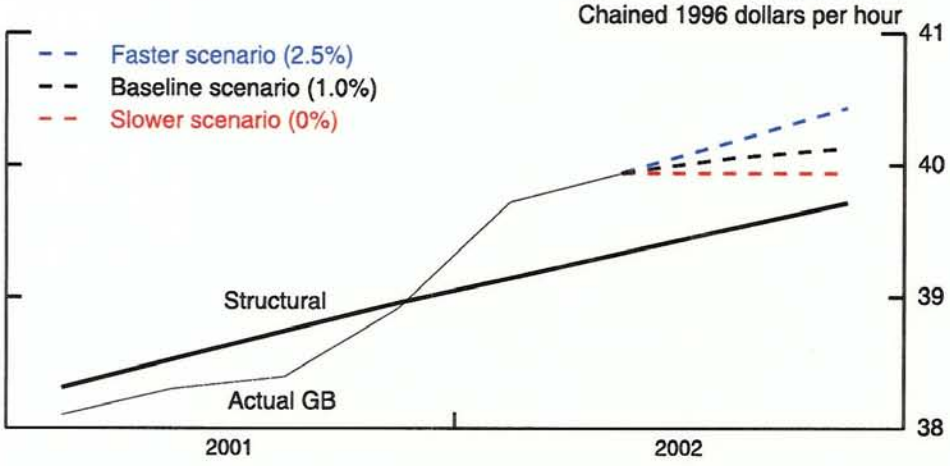


Adjustment Costs and Labor Productivity
(Percent change, Q4/Q4)

		1998	1999	2000	2001	2002	2003
1.	Measured productivity	2.9	3.0	2.6	2.1	3.1	1.8
	Productivity net of adjustment costs:						
2a.	Low adjustment costs	3.0	3.0	2.7	2.0	3.2	1.9
2b.	High adjustment costs	3.3	3.2	2.9	1.8	3.2	2.2

Chart 9
Labor Markets

Labor Productivity

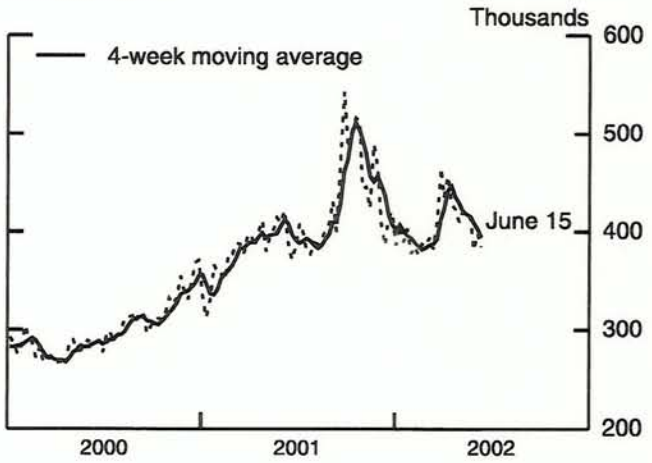


Effects on Employment

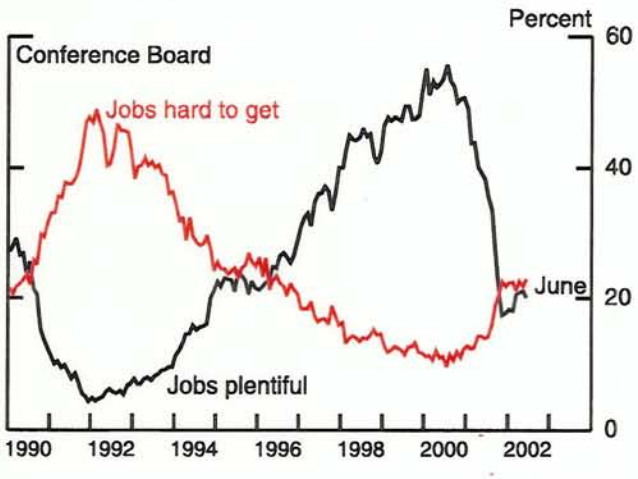
	Change in Payroll* ('000s)		Unemployment Rate
	---average monthly---		
	Q3	Q4	Q4
Faster	-60	40	6.6
Baseline	150	200	5.9
Slower	320	240	5.5

* Private

Initial Claims



Current Employment Conditions



Hourly Labor Compensation

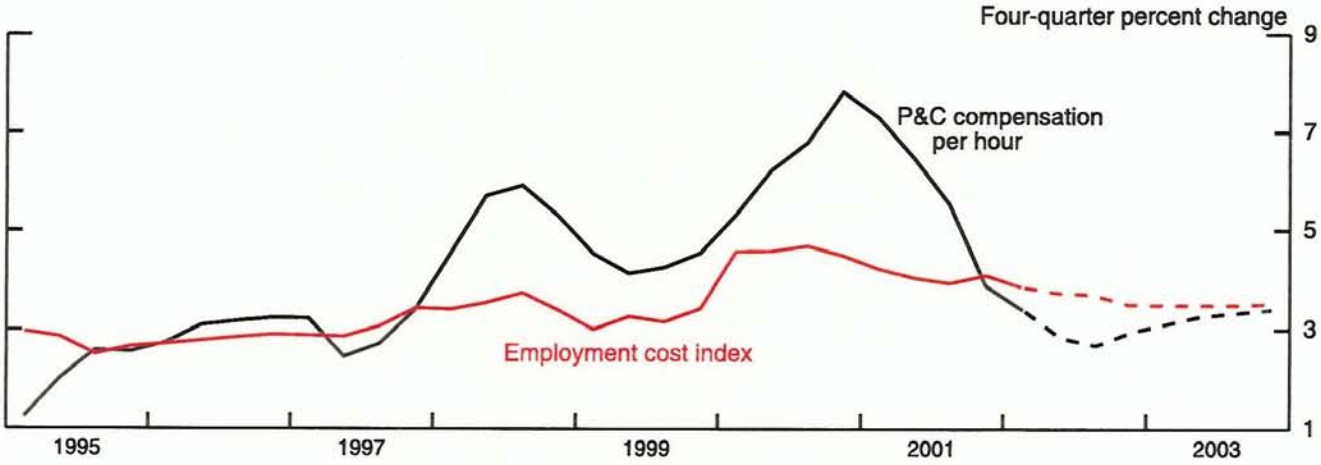
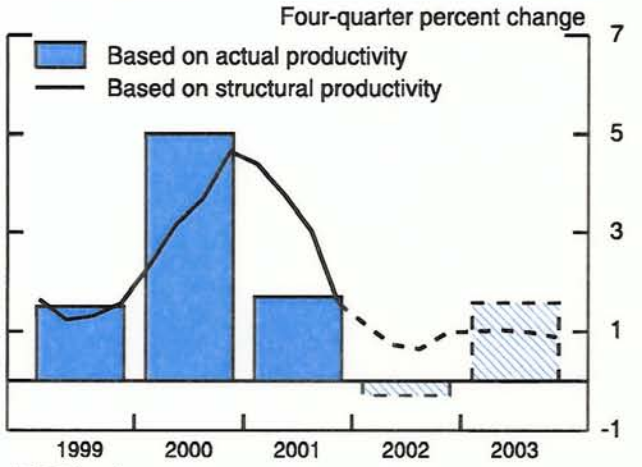


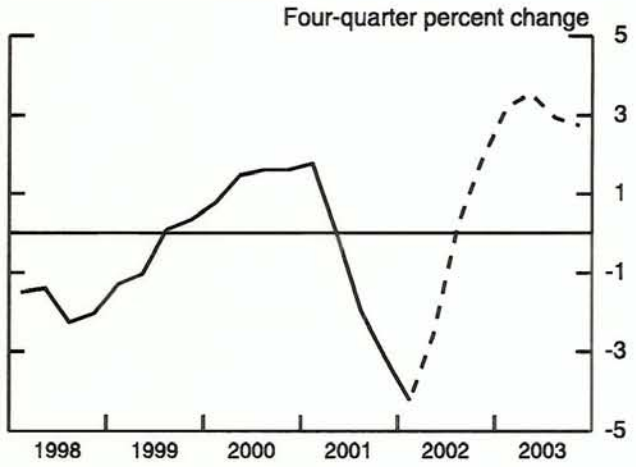
Chart 10
Prices

Unit Labor Costs*

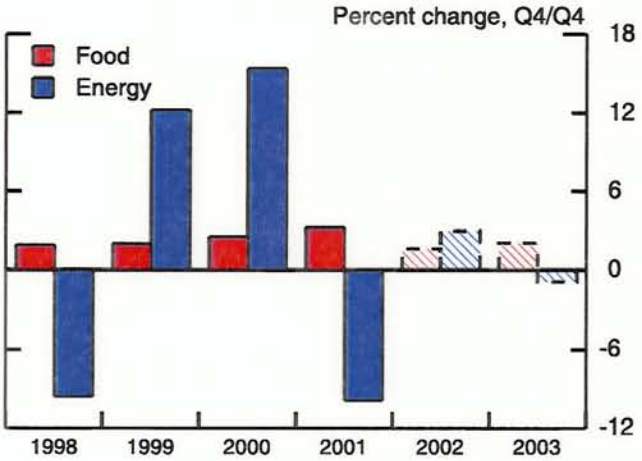


*P&C basis.

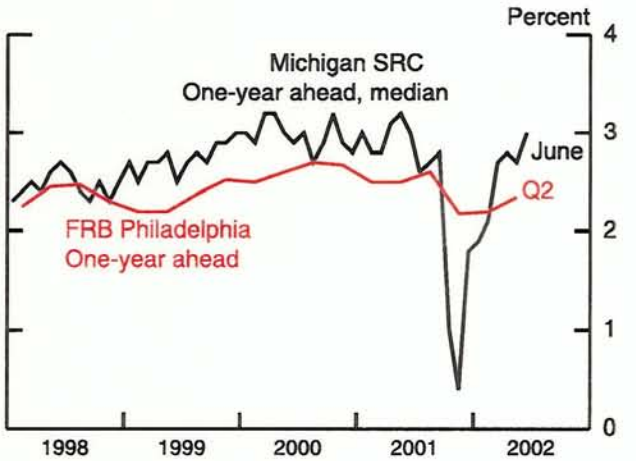
Core Non-oil Import Prices



PCE Food and Energy Prices



Inflation Expectations



Core Consumer Prices

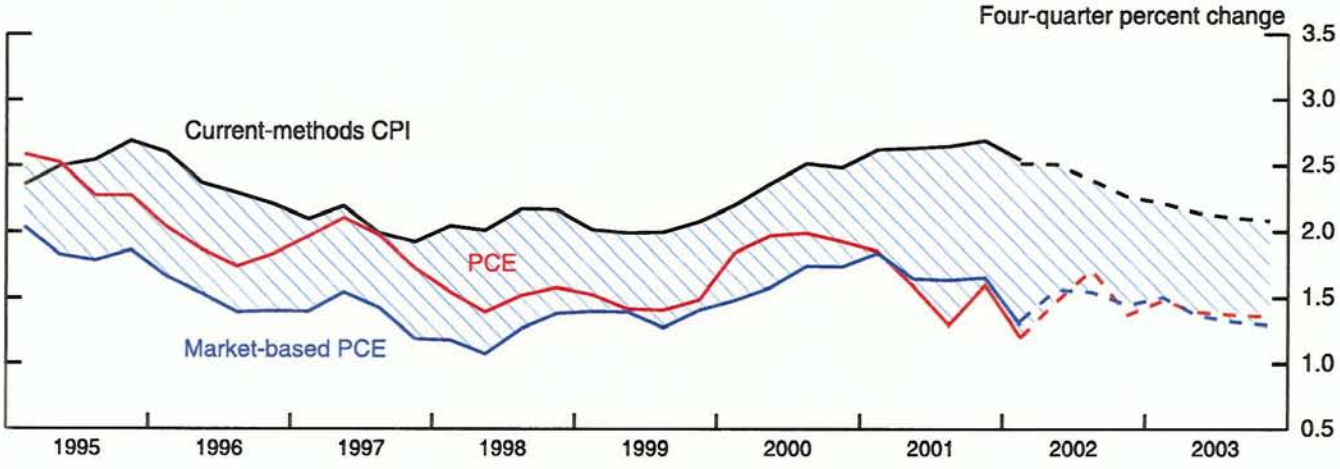


Chart 11

Financial Developments

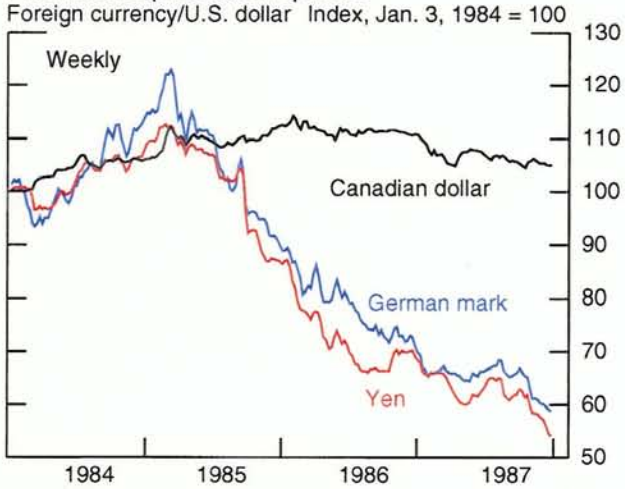
Nominal Exchange Rates

Foreign currency/U.S. dollar Index, Jan. 3, 2000 = 100

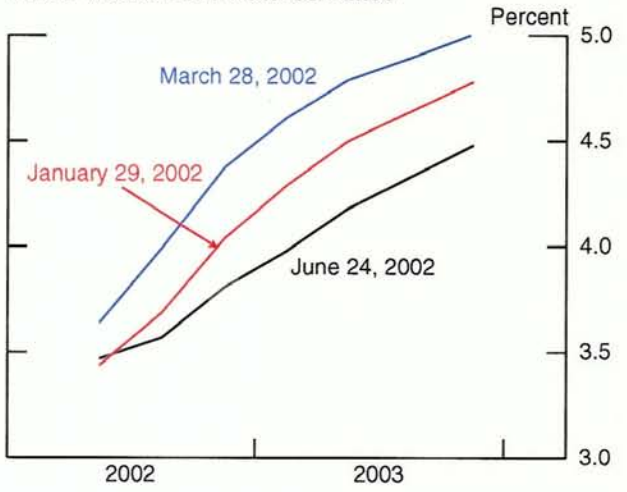
*Trade-weighted average against major currencies.

Previous Depreciation Episode

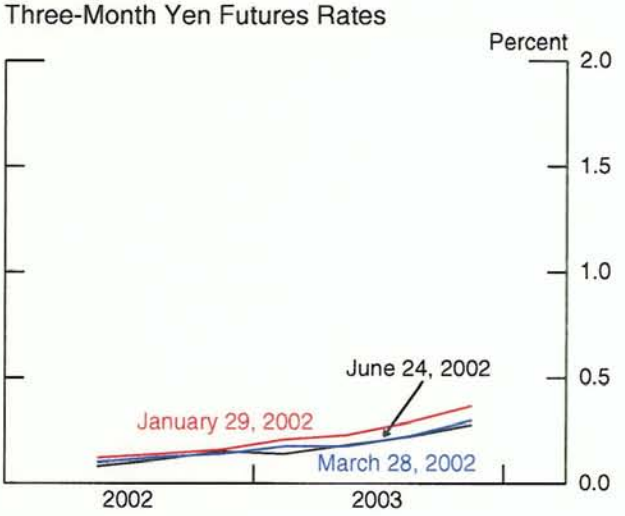
Foreign currency/U.S. dollar Index, Jan. 3, 1984 = 100



Three-Month Euro Futures Rates



Three-Month Yen Futures Rates



Interest Rates

	Level 6/24/02	Change 1/29/02 to 6/24/02
Three-Month		
1. Euro	3.46	0.09
2. Japan	0.02	-0.02
3. United States	1.81	0.01
Ten-Year		
1. Germany	4.93	-0.08
2. Japan	1.32	-0.15
3. United States	4.84	-0.18

Broad Stock Price Indexes

Index, Jan. 3, 2000 = 100

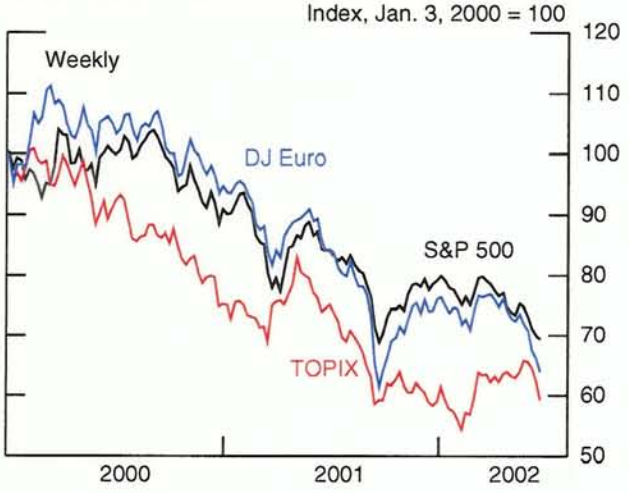
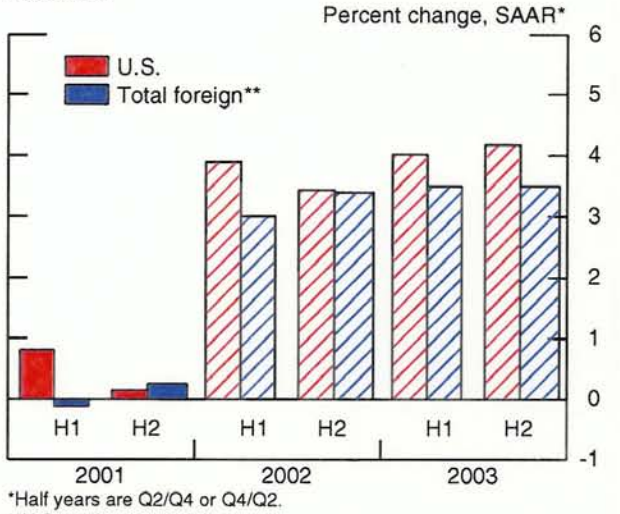


Chart 12

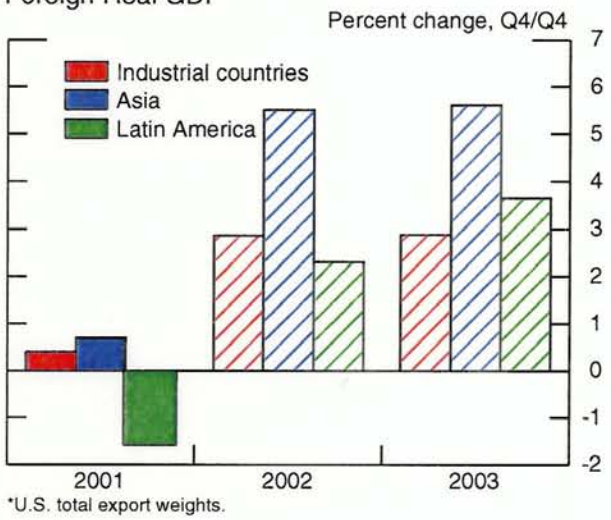
Foreign Outlook

Real GDP



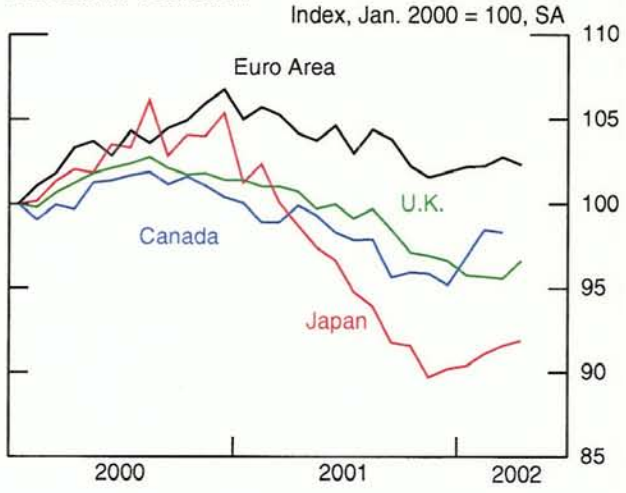
*Half years are Q2/Q4 or Q4/Q2.
**U.S. total export weights.

Foreign Real GDP*

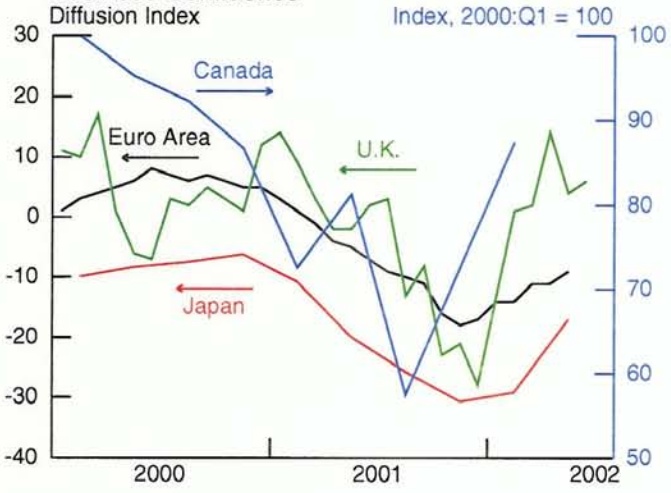


*U.S. total export weights.

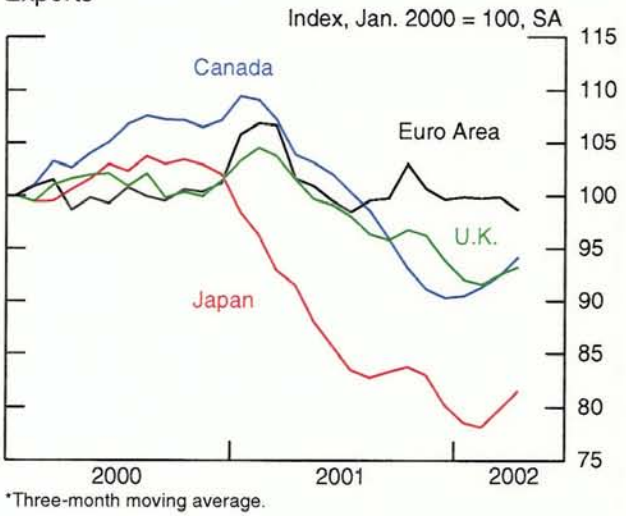
Industrial Production



Business Confidence



Exports*



*Three-month moving average.

Real GDP Growth
Percent, SAAR*

	2001 H2	2002 H1	2002 H2	2003
1. Indust. countries**	0.1	2.7	3.0	2.9
2. Euro Area	-0.4	1.2	2.8	2.7
3. Japan	-3.5	0.5	0.8	1.2
4. Canada	1.2	4.7	3.6	3.5
5. United Kingdom	0.8	1.9	3.3	2.9

*Years are Q4/Q4; half years are Q2/Q4 or Q4/Q2.
**U.S. total export weights.

Chart 13

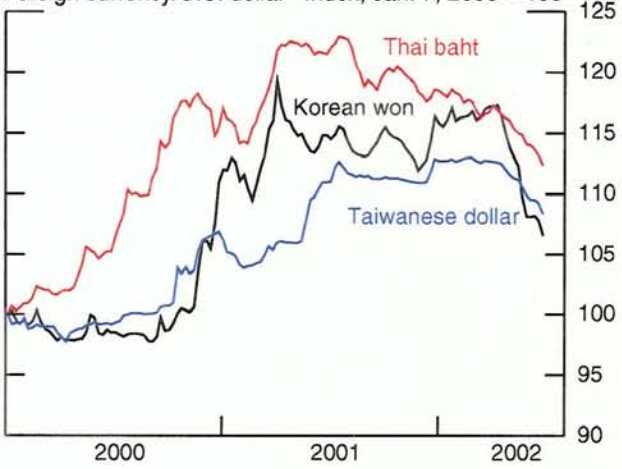
Emerging Market Countries

(Weekly data)

Asia

Nominal Exchange Rates

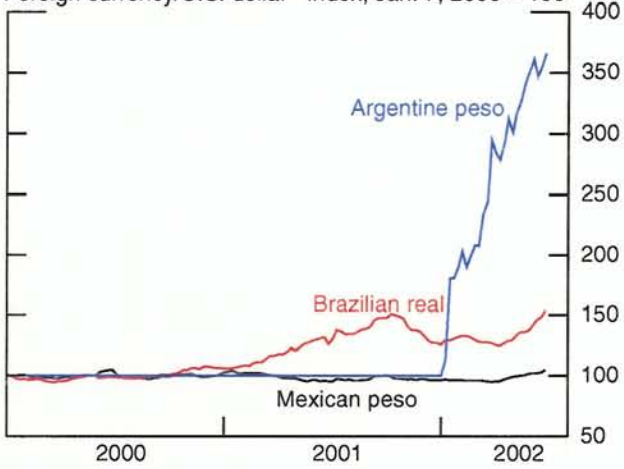
Foreign currency/U.S. dollar Index, Jan. 7, 2000 = 100



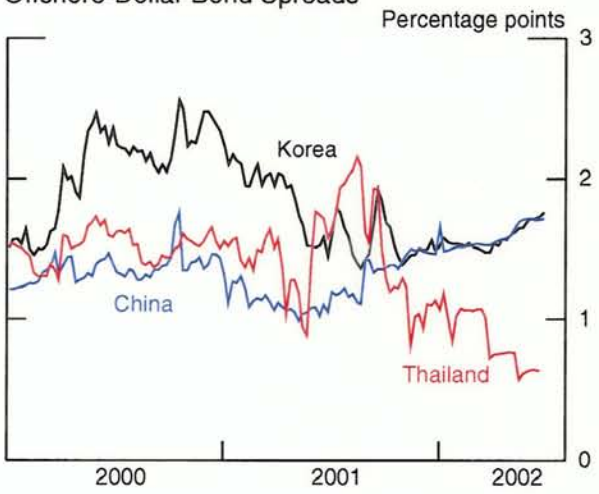
Latin America

Nominal Exchange Rates

Foreign currency/U.S. dollar Index, Jan. 7, 2000 = 100



Offshore-Dollar Bond Spreads



Brady Bond Spreads

Real GDP Growth

Percent, SAAR*

	2001 H2	2002 H1	2002 H2	2003
1. Developing Asia**	3.1	5.7	5.2	5.6
of which:				
2. China	7.1	7.8	7.2	7.5
3. Korea	5.8	6.9	5.5	6.0
4. Taiwan	2.3	6.7	5.0	5.0
5. Thailand	3.4	7.1	4.5	4.5

*Years are Q4/Q4; half years are Q2/Q4 or Q4/Q2.
**U.S. total export weights.

Real GDP Growth

Percent, SAAR*

	2001 H2	2002 H1	2002 H2	2003
1. Latin America**	-1.8	1.4	3.2	3.6
of which:				
2. Mexico	-1.6	2.2	4.1	4.3
3. Brazil	-0.7	3.7	0.7	2.1
4. Argentina	-17.5	-8.5	-5.0	-0.3

*Years are Q4/Q4; half years are Q2/Q4 or Q4/Q2.
**U.S. total export weights.

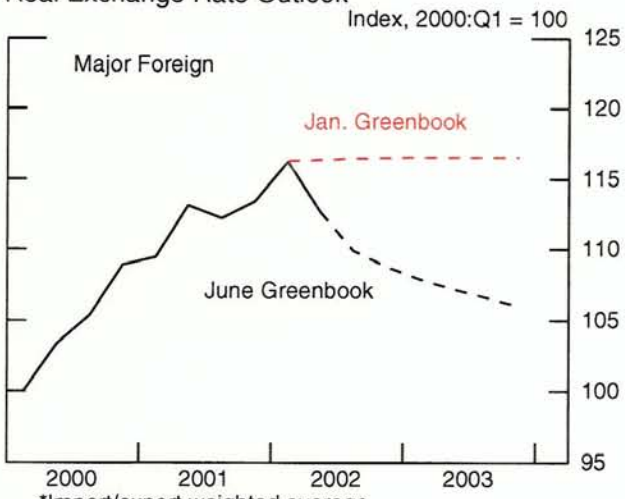
Chart 14

External Outlook

Recent Developments: Exports and Imports
Billions of dollars, SAAR

	2002:	Q1	April
1.	Goods Exports	659	683
	of which:		
2.	Capital goods	284	290
3.	Services	276	279
4.	**Total Goods and Services**	**934**	**961**
5.	Goods Imports	1084	1162
	of which:		
6.	Oil	77	111
7.	Capital goods	277	285
8.	Services	230	231
9.	**Total Goods and Services**	**1314**	**1393**
10.	**Balance**	**-379**	**-431**

Real Exchange Rate Outlook*



*Import/export weighted average.

Real Export Growth
Percent, Q4/Q4

	2000	2001	2002	2003
Growth of real exports				
1. G & S	**7.0**	**-10.9**	**6.0**	**8.4**
Percentage point contribution				
2. Services	1.2	-2.0	2.4	1.9
3. Goods	5.8	-8.8	3.6	6.5
of which:				
4. Core*	3.5	-5.8	2.4	3.8

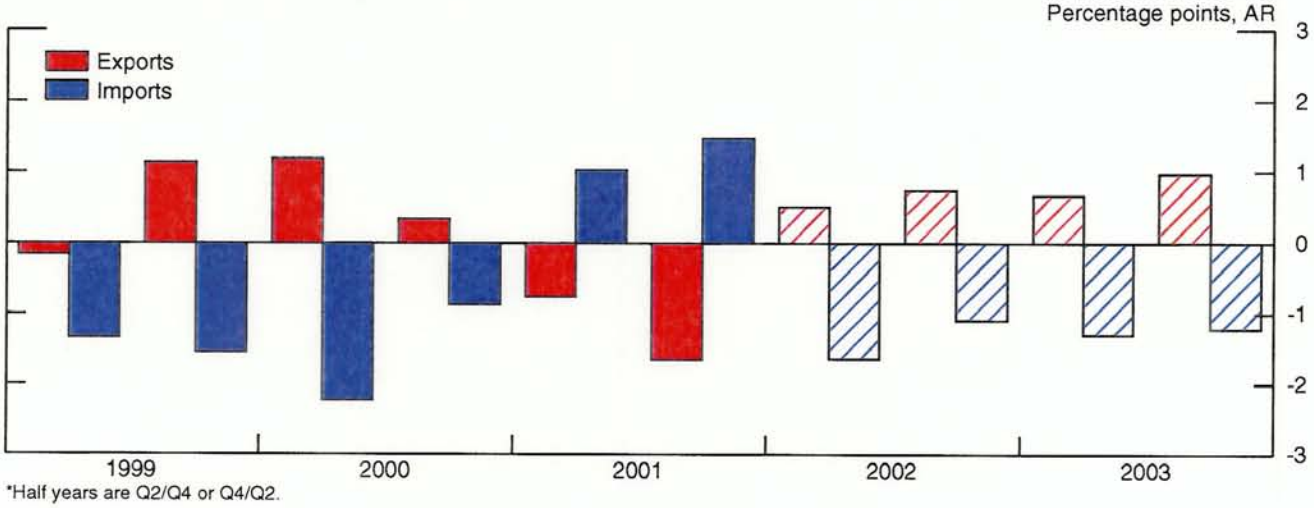
*Excludes computers and semiconductors.

Real Import Growth
Percent, Q4/Q4

	2000	2001	2002	2003
Growth of real imports				
1. G & S	**11.3**	**-8.5**	**9.4**	**9.2**
Percentage point contribution				
2. Services	1.9	-2.4	1.2	0.6
3. Goods	9.5	-6.4	8.1	8.4
of which:				
4. Core*	7.1	-3.9	5.8	5.8

*Excludes computers, semiconductors, and oil.

Contribution to U.S. GDP Growth*

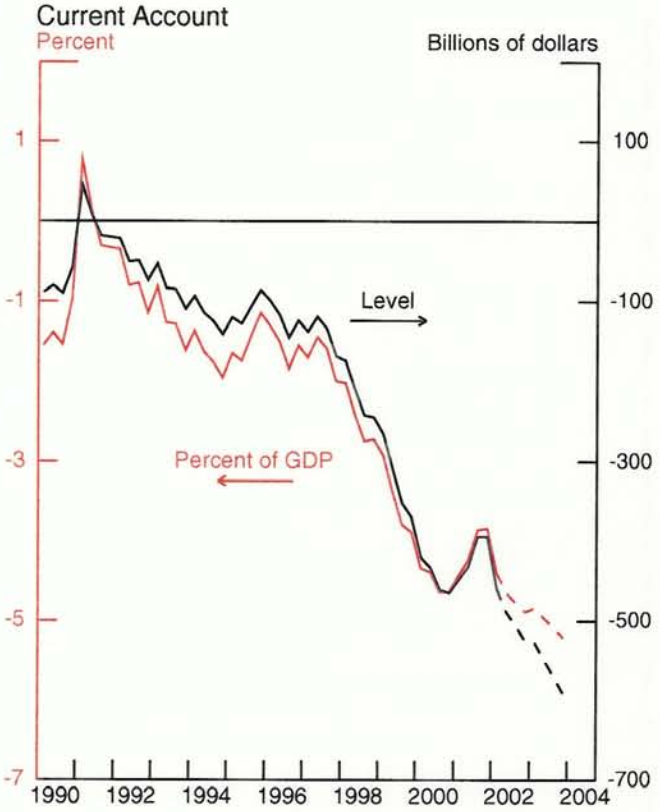


*Half years are Q2/Q4 or Q4/Q2.

Chart 15

External Sector

Current Account



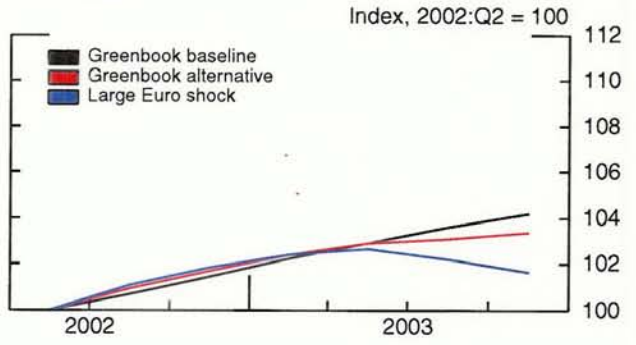
Capital Flows

Billions of dollars, SAAR

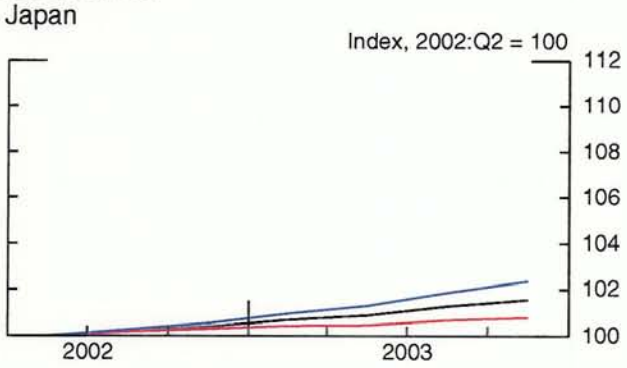
	2001 H1	2001 H2	2002 Q1
1. Official capital, net	-37	37	39
2. Private capital, net	414	350	359
of which:			
3. For. purch. of U.S. sec.	448	352	259
4. *of which stocks*	*148*	*91*	*100*
5. U.S. purch. of for. sec.	-157	-32	8
6. *of which stocks*	*-155*	*-59*	*6*
7. For. D.I. in U.S.	189	72	103
8. U.S. D.I. abroad	-117	-138	-90
9. Statistical discrepancy	37	-15	51

Real GDP; Simulation Results

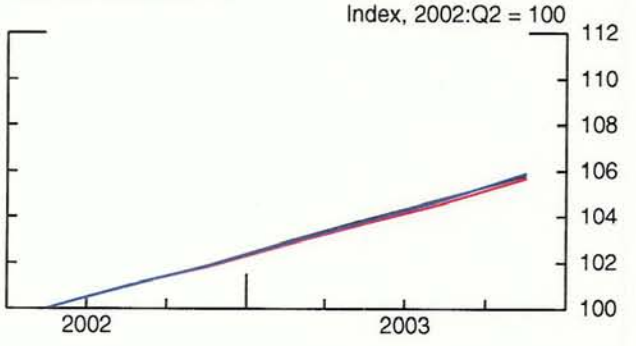
Euro Area



Japan



Canada and Mexico



Developing Asia

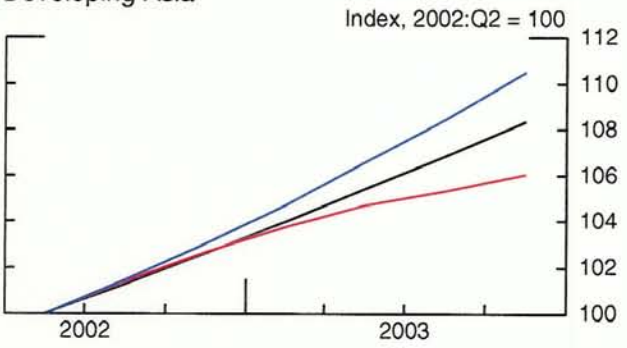


Chart 16

ECONOMIC PROJECTIONS FOR 2002

	FOMC		
	Range	Central Tendency	Staff
	----------Percentage change, Q4 to Q4----------		
Nominal GDP	4½ to 5½	4¾ to 5¼	4.7
February 2002	(3½ to 5½)	(4 to 4½)	(4.3)
Real GDP	3 to 4	3½ to 3 ¾	3.5
February 2002	(2 to 3½)	(2½ to 3)	(2.7)
PCE Prices	1¼ to 2	1½ to 1¾	1.5
February 2002	(1 to 2)	(About 1½)	(1.3)
	----------Average level, Q4, percent----------		
Unemployment rate	5½ to 6¼	5¾ to 6	5.9
February 2002	(5¾ to 6½)	(6 to 6¼)	(6)

Central tendencies calculated by dropping high and low three from ranges.

ECONOMIC PROJECTIONS FOR 2003

	FOMC		
	Range	Central Tendency	Staff
	----------Percentage change, Q4 to Q4----------		
Nominal GDP	4½ to 6	5 to 5¾	5.6
Real GDP	3¼ to 4¼	3½ to 4	4.1
PCE Prices	1 to 2¼	1½ to 1¾	1.4
	----------Average level, Q4, percent----------		
Unemployment rate	5 to 6	5¼ to 5½	5.5