Forecasting vs. Fortune Telling

Presented to
National Capital Area Skeptics
Promoting Critical Thinking and
Scientific Understanding
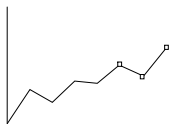20/20 Since 1987
April 14th, 2012

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Benchmark Forecasts
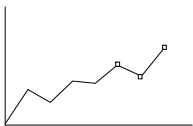
Forecasting vs. Fortune Telling

- How is macroeconomic "scientific" forecasting different from reading tea leaves?

- How well do economic forecasts perform, and why should we feel more confident in them than in psychic predictions?

- I will attempt to describe the scope of modern forecasting, and the tools and assumptions economists use in making forecasts in the Federal government.

- I will discuss how well these forecasts perform and how much confidence we should place in them.
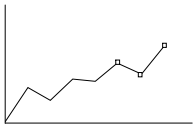
Benchmark Forecasts

Outline

- What is a forecast?

- Where is the U.S. economy today?

- Brief Show of the macroeconomic forecasting record

- What are economic forecasters asked to do?

- Current Outlook

- Government Forecasting and Forecasters

- The Federal Forecasters Consortium

- Traditional vs. New Economic Forecasting Approaches (time available)
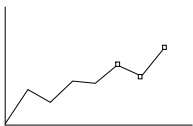
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What is a forecast?

Benchmark Forecasts

1. What is a forecast?

- **"Anything can be forecast, but not everything can be predicted**."

- **Predict** – implies inference from laws of nature, whereas
- **Forecast** – more probabilistic

- **Etymology of "forecast"**
  - **Fore** – is clear, denoting "in front" or "in advance"
  - **Cast** – dice, lots, spells, horoscopes are all cast

- **Casting a fly**, chancing one's luck, cast about all link the notion of forecasting to gamblers and even charlatans.

Benchmark Forecasts

1. What is a forecast?

- **A forecast is any statement about the future**

- **There are two basic methods of forecasting**

1. **A "crystal ball" that can see the future,**

2. **Extrapolate from present information**

Of course:
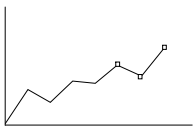
"Never a crystal ball when you need one"

Robert J. Samuelson, *Washington Post,* 6/16/2001

(1) is not available

(2) clearly an inferior method

We adopt a Forecasting Rule:

A systematic operational procedure for

making statements about future events.
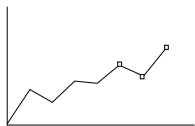
Benchmark Forecasts

1.   What is a forecast?

- Synonyms for forecast, forecasters, forecasting:
- **Augury,**
- **Cassandra** (prophecy without credibility),
- **Clairvoyance** (seeing things not present to the senses),
- **Foreboding,**
- **Foresee,**
- **Foreshadow,**
- **Omen** (sign of a future event),
- **Precognition** (knowing before the occurrence),
- **Presage** (to indicate and event yet to happen),
- **Portend** (to warn in advance),
- **Prescience,**
- **Scry** (crystal gazing and seer)

Benchmark Forecasts
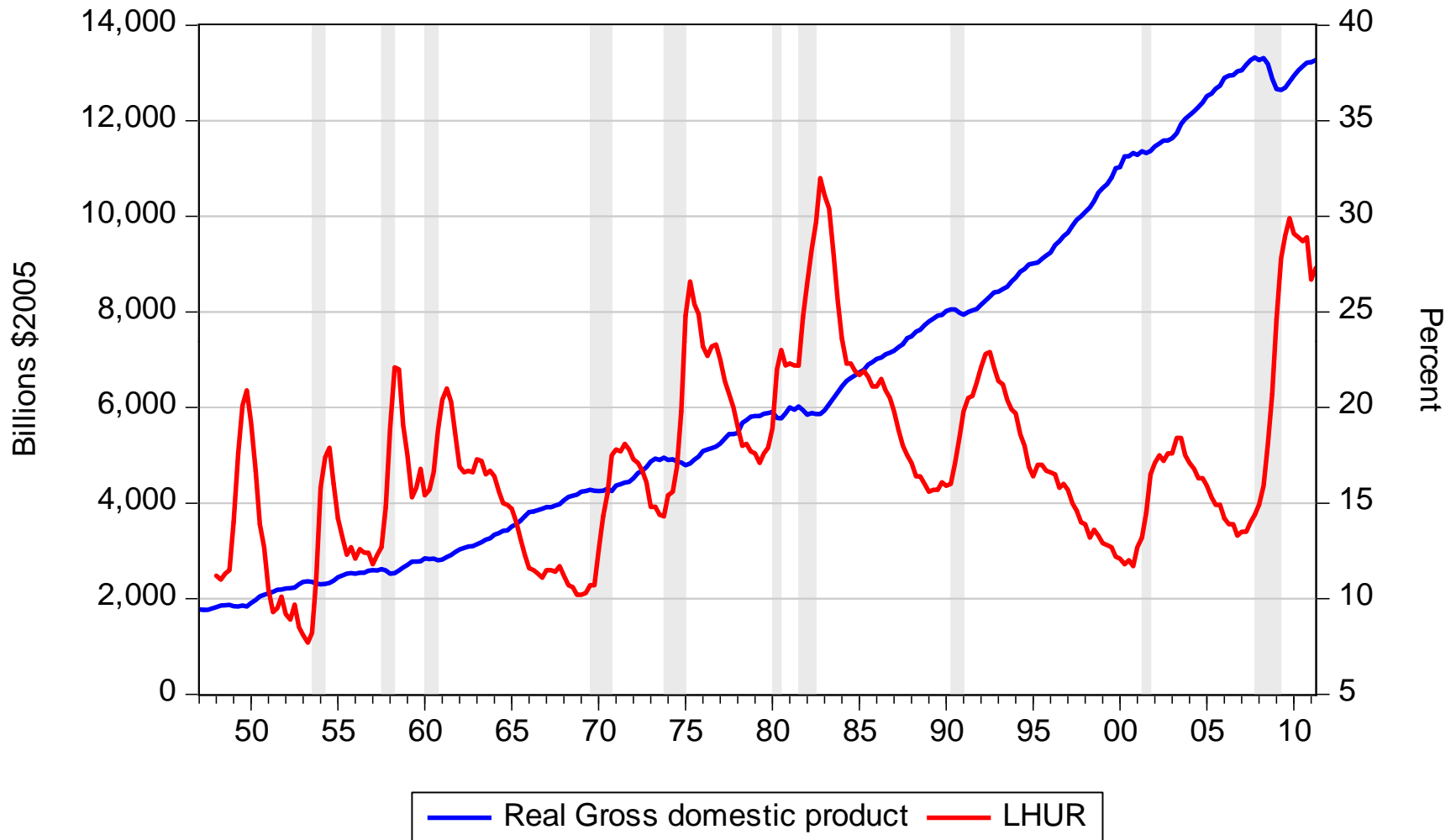
Where are we now and the Great Recession?

The Great Recession

- **NO Macroeconomic Model Predicted it.**
- **BUT There was rising uncertainty by Macroeconomists on the Sustainability of Growth**
- Peak was in December 2007 (according to NBER)
- Trough occurred in June of 2009.
- The recession lasted 18 months, which makes it the longest of any recession since World War II.
- Previously the longest postwar recessions were those of 1973-75 and 1981-82, both of which lasted 16 months.
- Recovery has been going on for 33 months
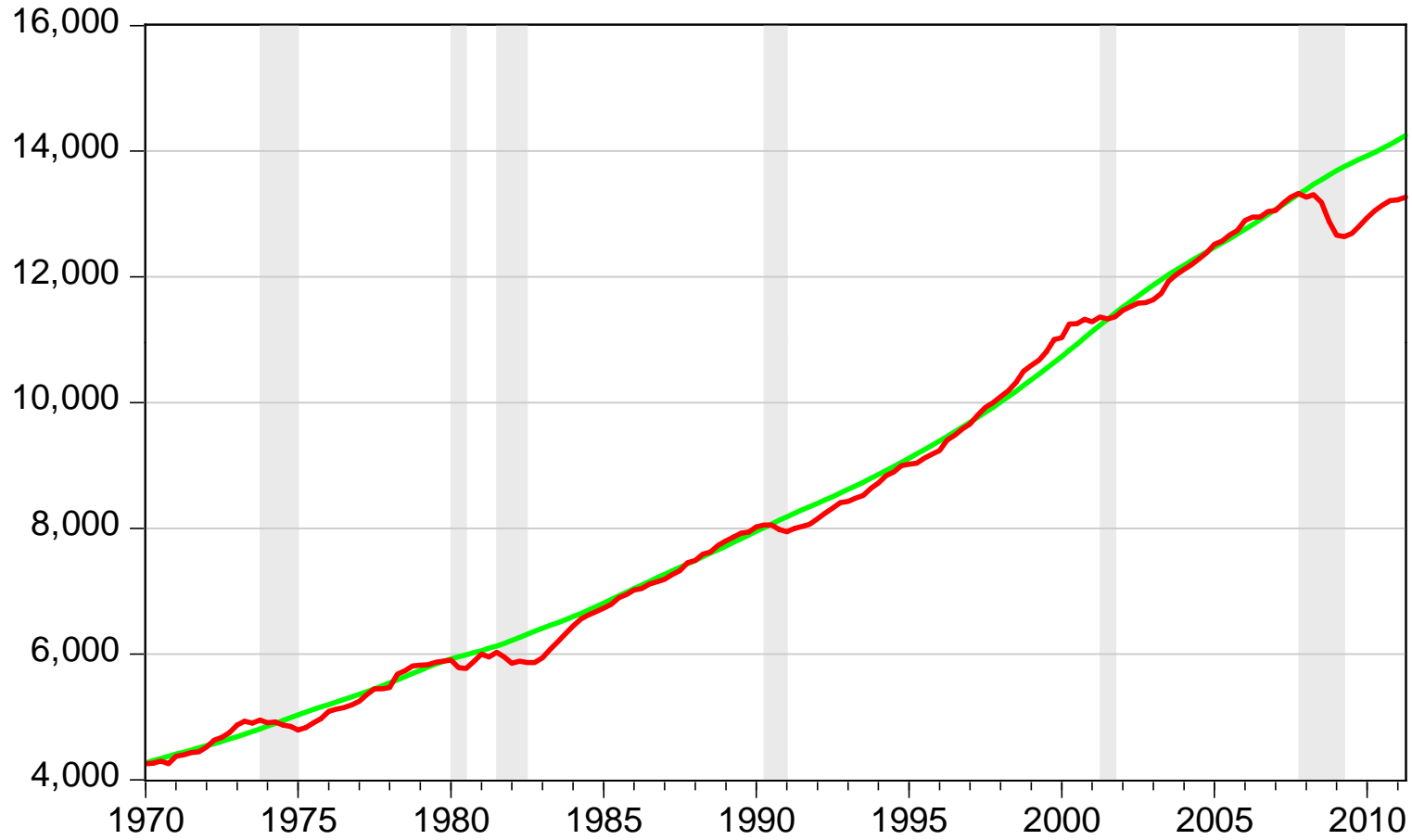- Does it feel like a recovery?

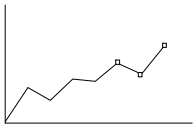Benchmark Forecasts

Real GDP and Unemployment

Legend: Real Gross domestic product — LHUR

Left axis: Billions $2005 (0 to 14,000)
Right axis: Percent (5 to 40)
X-axis: 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 00, 05, 10
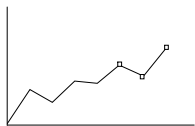
Benchmark Forecasts
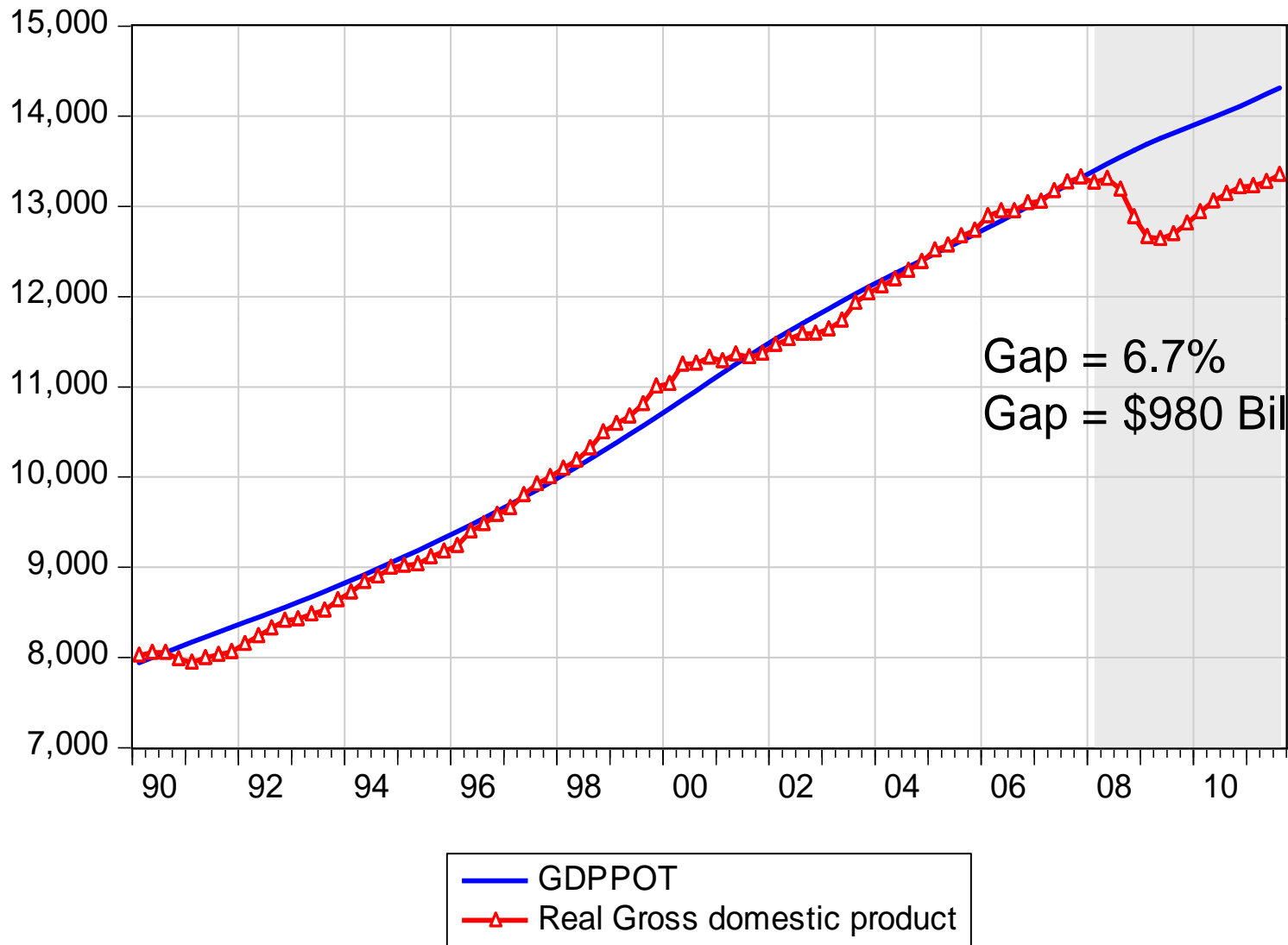
Real vs. Potential GDP

Legend:
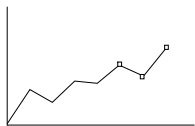— Real Potential Gross Domestic Product, Billions of Chained 2005 Dollars
— Real Gross domestic product

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GDP Gap - If and When it will be made up?

Gap = 6.7%
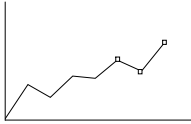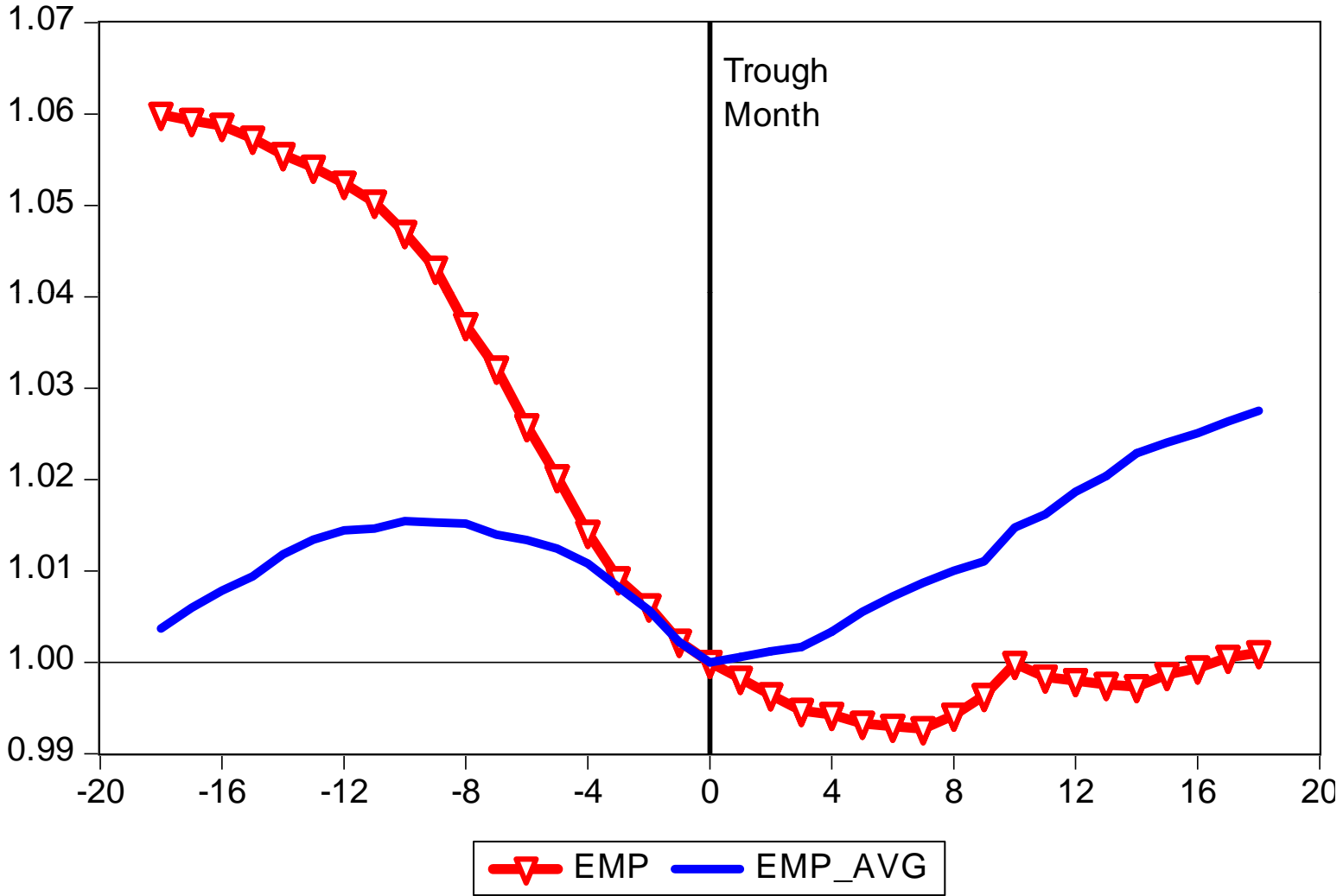Gap = $980 Bil

GDPPOT
Real Gross domestic product

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12

Non-Farm Employment, 1000s

Lost Decade

Benchmark Forecasts

13
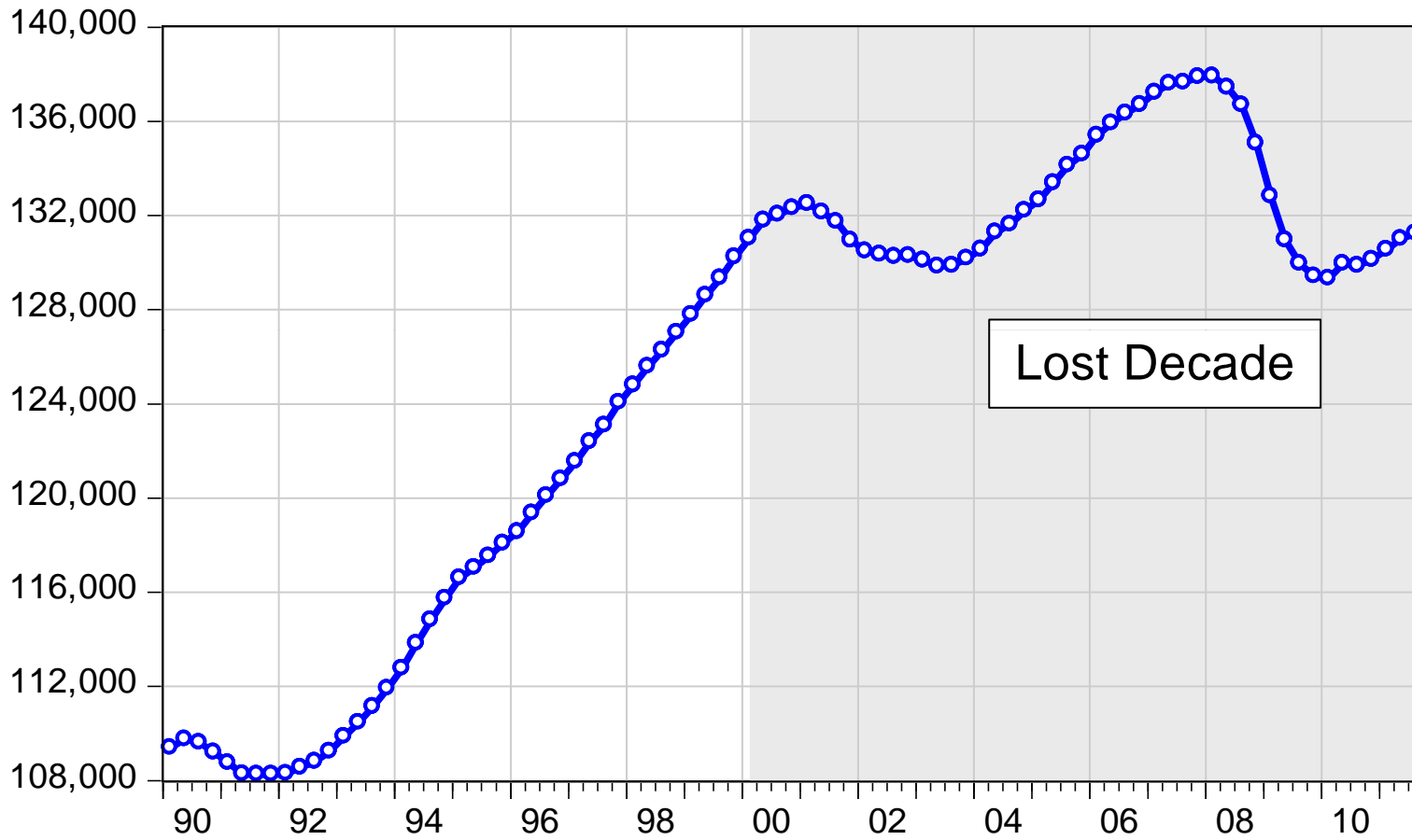
Employment in Great Recession
Compared to Average of Previous 7 Recessions

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Brief Show of Macroeconomists' Record

We make a distinction between the **accuracy** and **precision** of a forecast.

The former relates to **correctness** and the later relates to **uncertainty**.

In general macroeconomic forecasters have difficulty forecasting **turning points.**

Turning points are when the economy moves between expansions and recessions and the reverse

Unbiasedness and variance (or MSFE) are often the measures.

Even with these as the metric it is difficult to declare a winner outright.

Does the competition involve multiple horizons or variables?
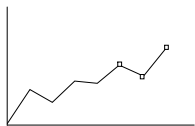
Benchmark Forecasts

Summary Statistics for Real GDP Growth by SPF
Forecast Error = Actual (t+h) – Forecast(t,h)

```
H        ME(S)  MAE(S)  RMSE(S)  RMSE(S/NC)  F

                History: Initial Release
1985:01-2009:03
         1   0.28   1.12    1.38      0.64
         2  -0.04   1.40    1.78      0.72
         3  -0.17   1.58    2.01      0.80
         4  -0.31   1.58    2.13      0.86
         5  -0.35   1.57    2.13      0.83
1985:01-1996:04
         1   0.19   1.00    1.20      0.62
         2  -0.11   1.16    1.42      0.73
         3  -0.16   1.30    1.59      0.71
         4  -0.35   1.21    1.65      0.70
         5  -0.27   1.23    1.64      0.71
1997:01-2009:03
         1   0.36   1.24    1.53      0.65
         2   0.03   1.63    2.06      0.72
         3  -0.19   1.84    2.34      0.85
         4  -0.28   1.91    2.49      0.96
         5  -0.41   1.88    2.50      0.88
```
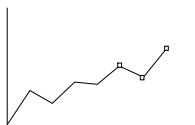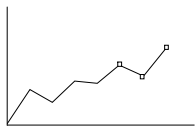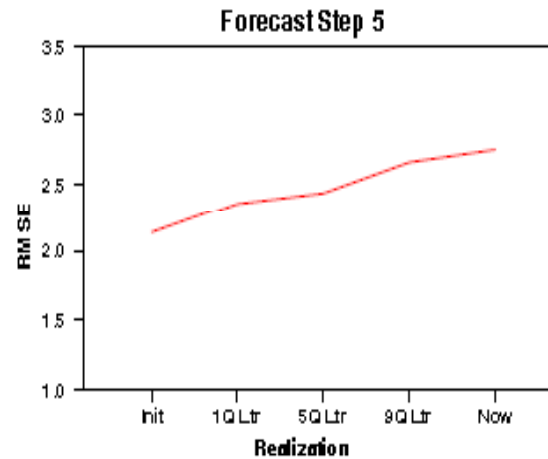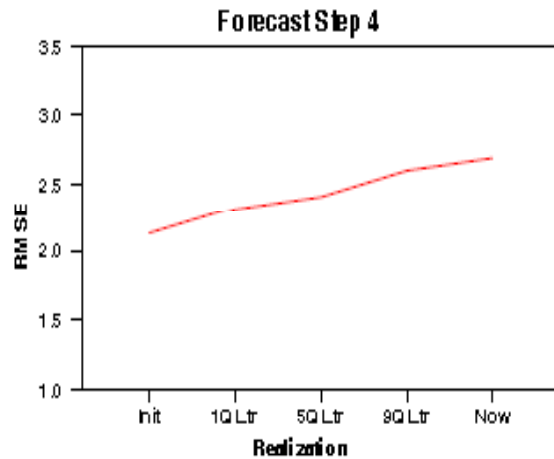
ME – Mean Error

MAE – Mean Absolute Error

RMSE – Root Mean
      Squared Error

RMSE(S/NC) – RMSE
   Compared to No
   Change in Growth

Benchmark Forecasts

Root-Mean-Square Errors: 1985:01-2009:03

SPF Projections for Real GNP/GDP, Transformation: Q/Q Growth Rate
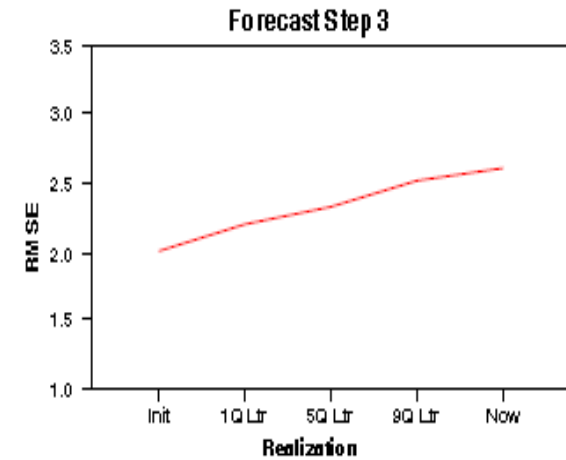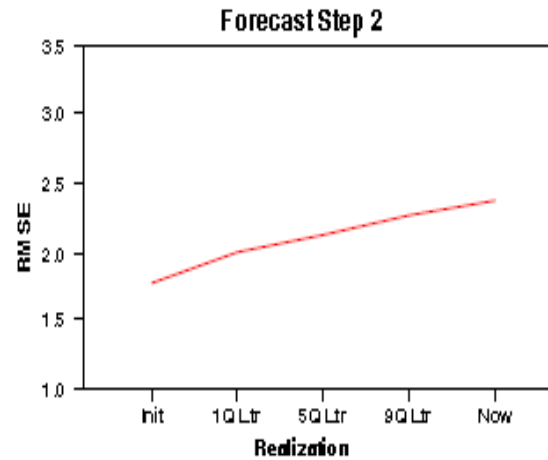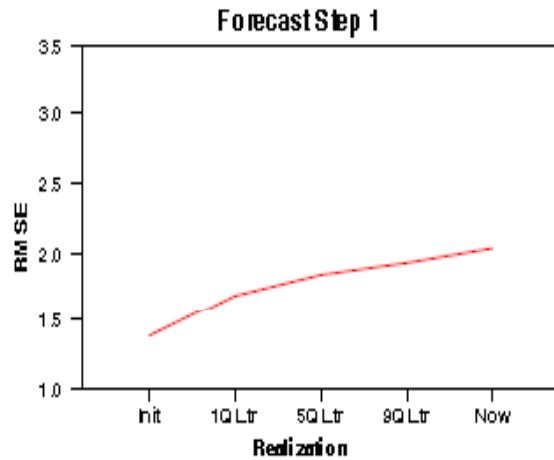
The importance of available information when forecasts are made.

Benchmark Forecasts

Root-Mean-Square Errors: 1997:01-2009:03

SPF Projections for Real GNP/GDP, Transformation: Q/Q Growth Rate
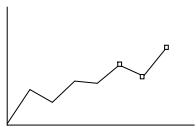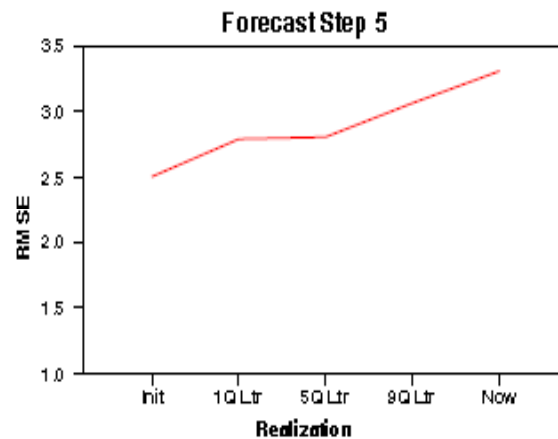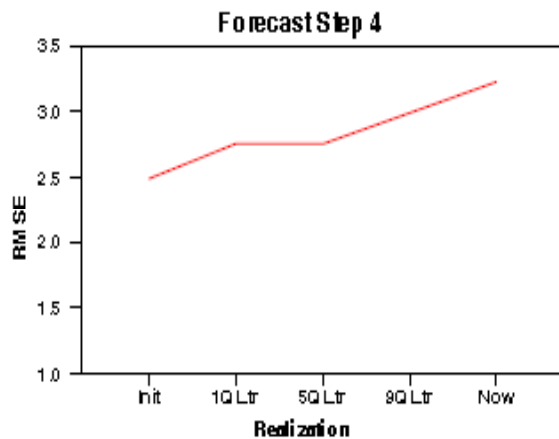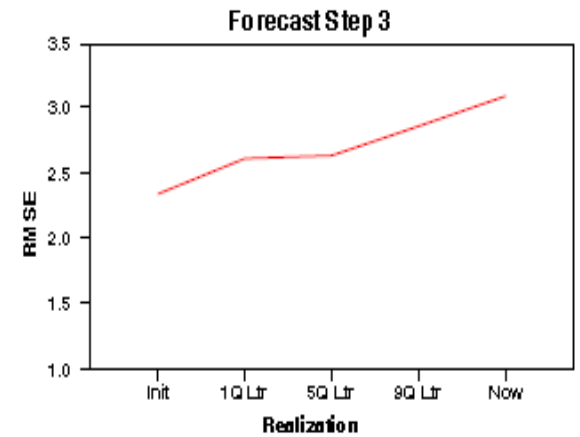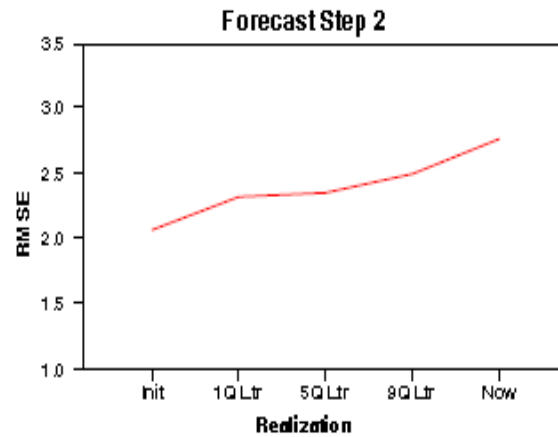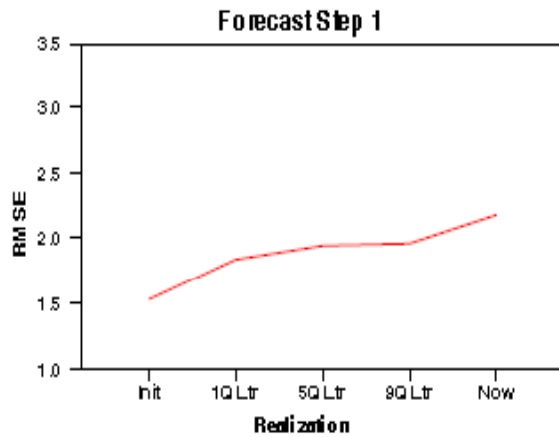
Benchmark Forecasts

Figure 1 Current Situation Graph
Ifo Present Situation Index (Left Axis) and Real GDP Growth Rate (Right Axis)
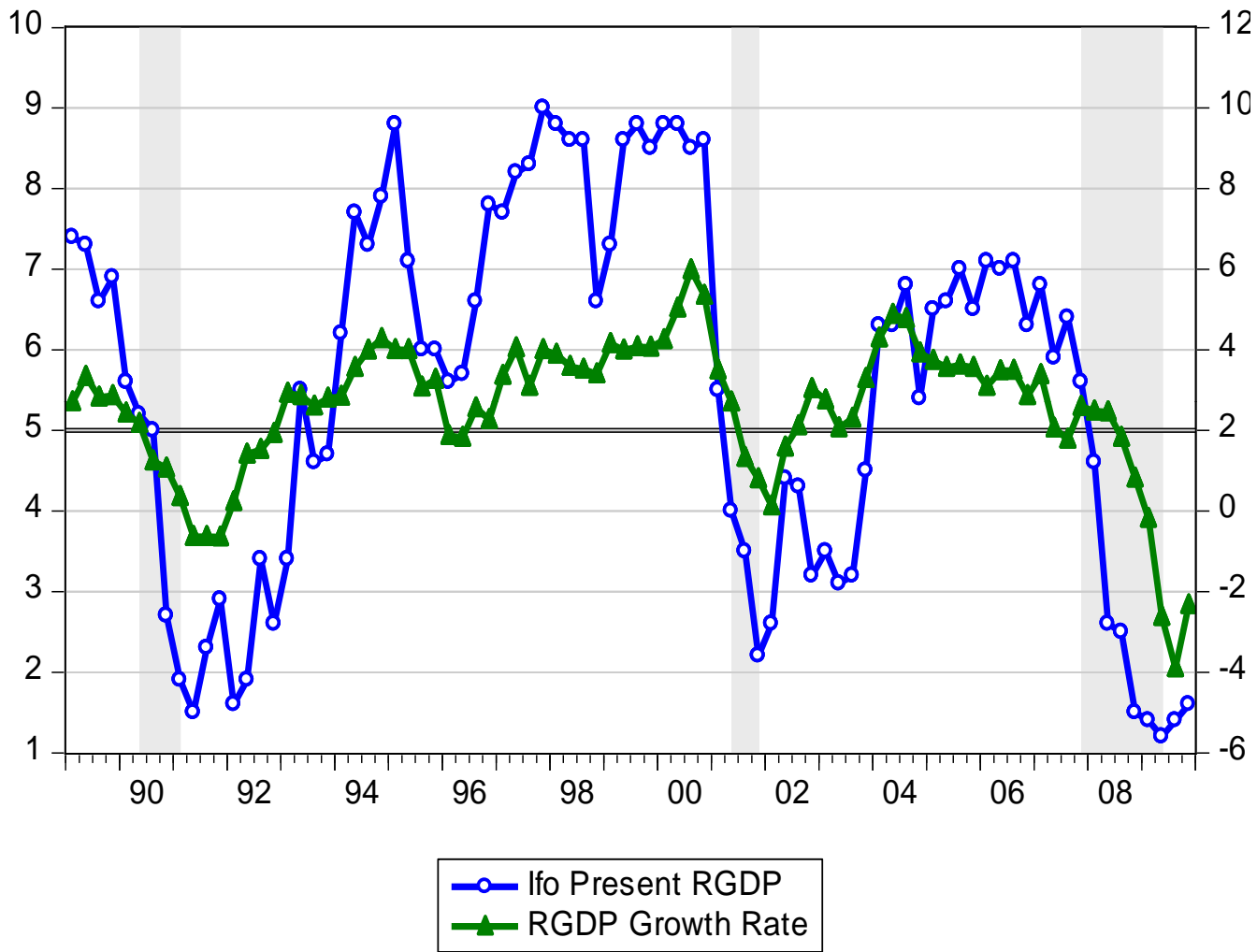
NBER Recession Dates in Shaded Areas; Ifo Index greater than 5 indicates optimism – less than 5 pessimism. Source: Interpreting and Evaluating CESIfo's World Economic Survey Directional Forecasts," by Mark Hutson, Fred Joutz, and Herman Stekler (2011)

Benchmark Forecasts

What are economic forecasters asked to do?
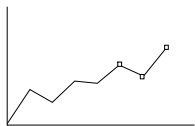
Benchmark Forecasts

What are economic forecasters asked to do?
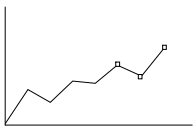
- Macroeconomic forecasting models are asked to perform well in

1. a complex environment

2. with numerous interrelated actions and decisions occurring simultaneously by heterogeneous agents with competing and conflicting agendas.

3. Modern economies are evolving; there is

4. both gradual and sudden structural change and

5. shifts due to institutional, technological, financial, international competitiveness, political, social, and legal change.

Benchmark Forecasts

What are economic forecasters asked to do?

- Forecasting models are supposed to capture these factors empirically in an environment where
- the data are non-stationary – the statistical distributions are changing
-
- the degree of model misspecification is unknown for the DGP, but no doubt large.
- The onus of congruence is a heavy one.
- The data available may be
- inaccurate,
- a proxy for theoretical constructs and
- Firms' and Households' decision making criteria,
- produced with a lag, and
- subject to revision.

- For example, models based on seasonally adjusted data and ignoring the first two data problems incur a further problem as the seasonal factors for the most recent observations are subject to change as well.

Benchmark Forecasts

Successful forecasting requires that:

1. There are regularities to be captured,

2. The regularities are informative about the future,

3. The proposed method captures those regularities, and yet

4. It excludes non-regularities.

===> Build Congruent Models
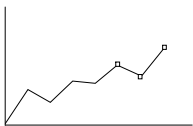
Benchmark Forecasts

Forecast Uncertainty is Intrinsic and Ubiquitous

- Maxine Singer (1997) *"Thoughts of a Nonmillenarian"*
- Two reasons on why forecasting the future is uncertain

1. Because of the things we don't know [that] we don't know, the future is largely unpredictable. **(This <u>uncertainty is not measurable</u>.)**

2. Because some developments can be anticipated, or at least imagined, on the basis of existing knowledge. **(This is known as <u>measurable uncertainty</u>.)**

- The first source is the basic problem. The second one can make us too confident or arrogant of our ability to forecast. But it can also provide warnings about forecasters confidence about forecasts.

Benchmark Forecasts

"Because of the things we don't know [that] we don't know, the future is largely unpredictable."

For example, suppose that you engage in a game of dice with Tony Soprano.

You know the probability any pair of numbers will be face up.

What you don't know and will not know is whether the dice are loaded.

Benchmark Forecasts

Methods of Economic Forecasting

1. **Guessing, rules of thumb**,

2. **Extrapolation**

3. **Leading indicators**

4. **Surveys**

5. **Time series models**

6. **Econometric forecasting models**

Benchmark Forecasts

Examples of Leading Indicators

- Leading indicators come from surveys or are composites of series associated with leading the business cycle.

- They are imperfect.

- They yield false positives for turning points. Compare the suggested downturns and upturns with the NBER recession dates.

- Also, they do not always agree on the outlook for the economy. See the directions suggested for the most recent data.

Benchmark Forecasts

ISM Manufacturing: New Orders Index (NAPMNOI)
Source: Institute for Supply Management
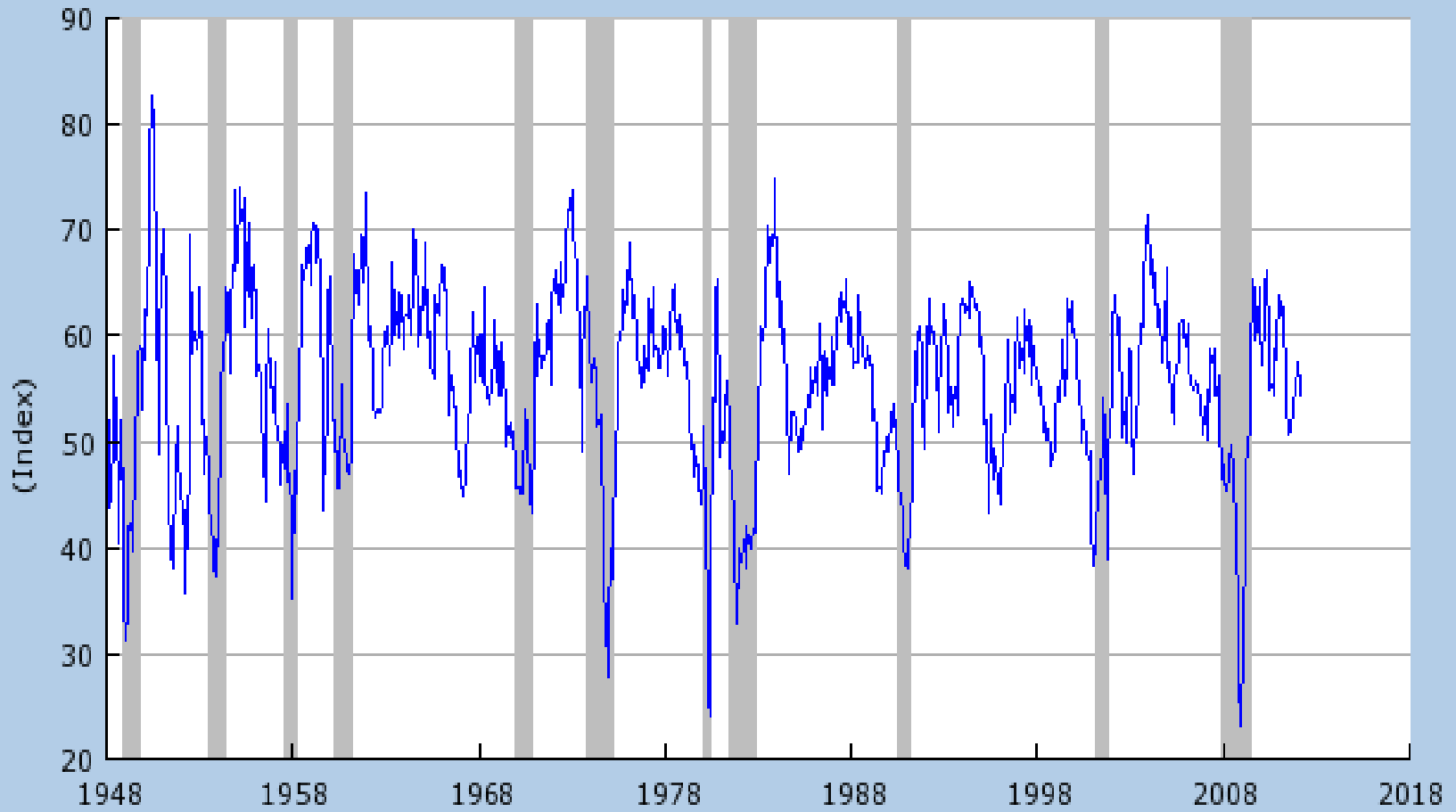
Shaded areas indicate US recessions.
2012 research.stlouisfed.org
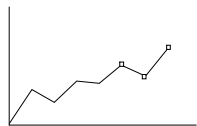
Benchmark Forecasts

Leading Index for the United States (USSLIND)
Source: Federal Reserve Bank of Philadelphia
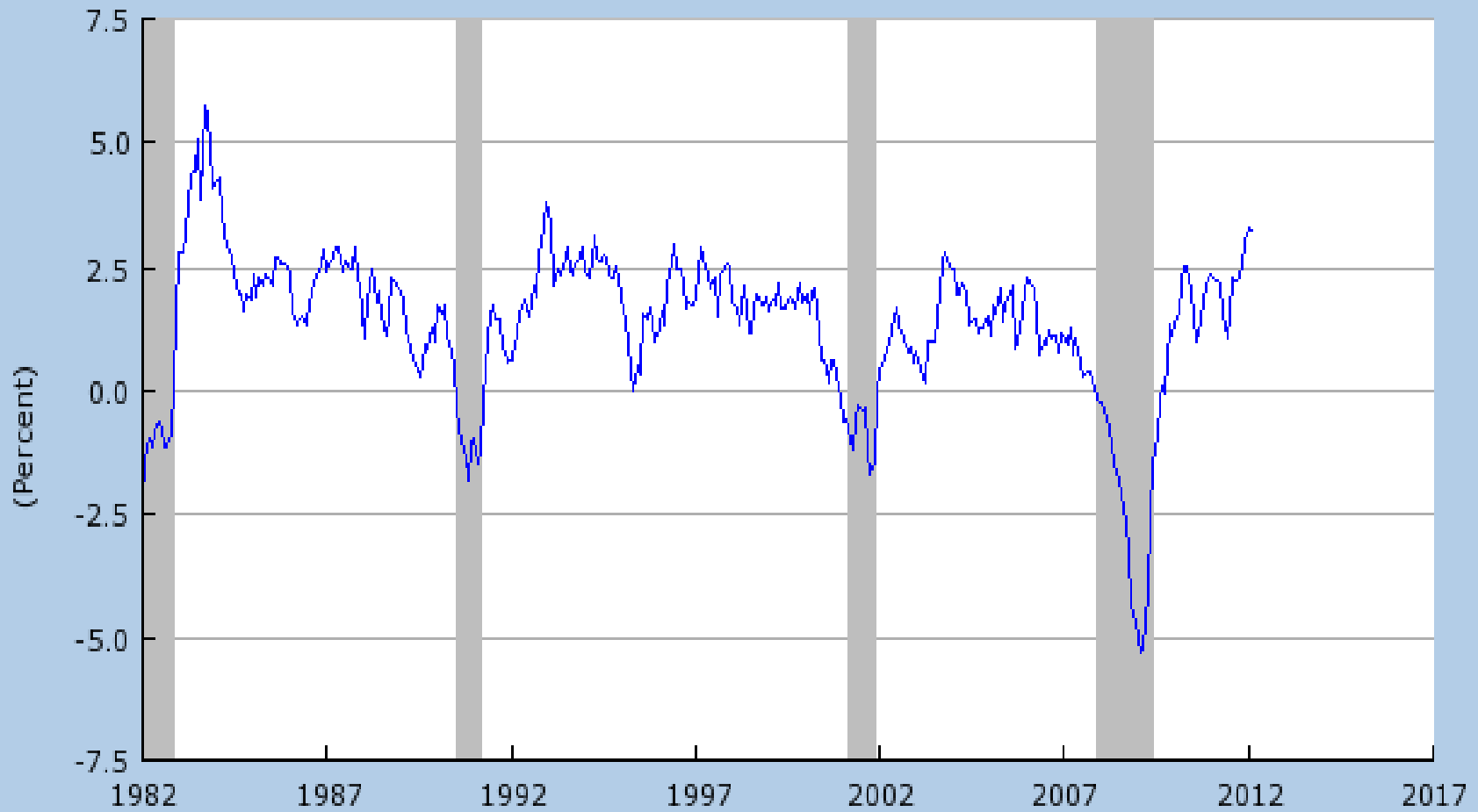
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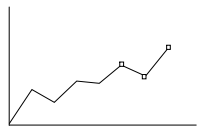
Benchmark Forecasts

University of Michigan: Consumer Sentiment (UMCSENT)
Source: Thomson Reuters/University of Michigan

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

FRED
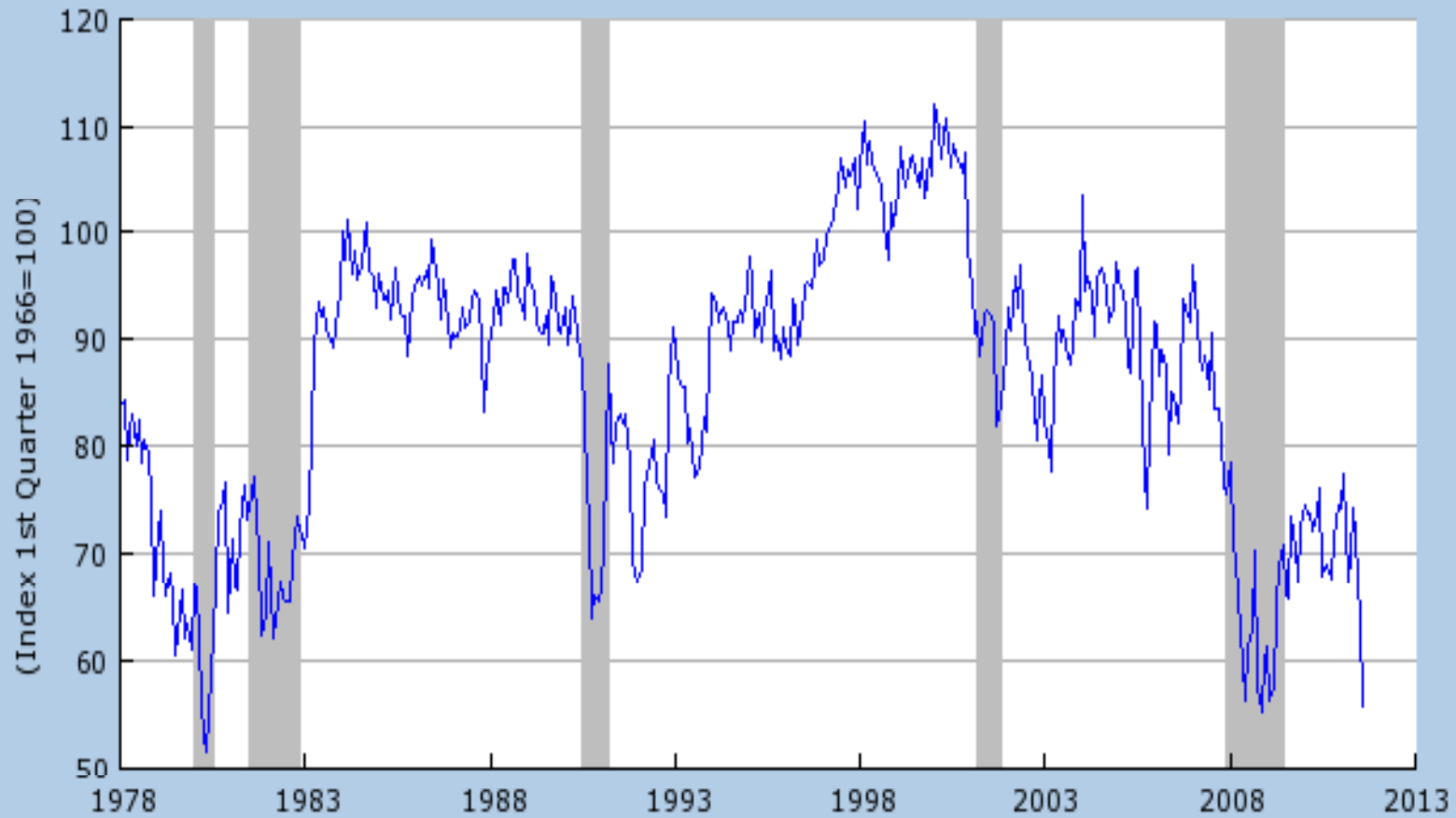
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Current U.S. Macro Economic Outlook
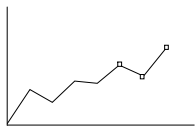
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Survey of Professional Forecasters

- The Survey of Professional Forecasters is the oldest quarterly survey of macroeconomic forecasts in the United States.

-

- The survey began in 1968 and was conducted by the American Statistical Association and the National Bureau of Economic Research and directed by Victor Zarnowitz.

- The Federal Reserve Bank of Philadelphia took over the survey in 1990 initially directed by Dean Croushore (U. Richmond) and now Tom Stark.

- The Survey of Professional Forecasters' web page offers the actual releases, documentation, mean and median forecasts of all the respondents as well as the individual responses from each economist. The individual responses are kept confidential by using identification numbers.

Benchmark Forecasts

Real GNP/GDP

History, Forecasts, and Ranges for the SPF of 2012:01

Q/Q Growth Rate

(Ranges Cover 25 to 80 Percent Confidence)
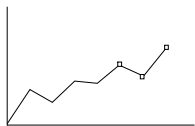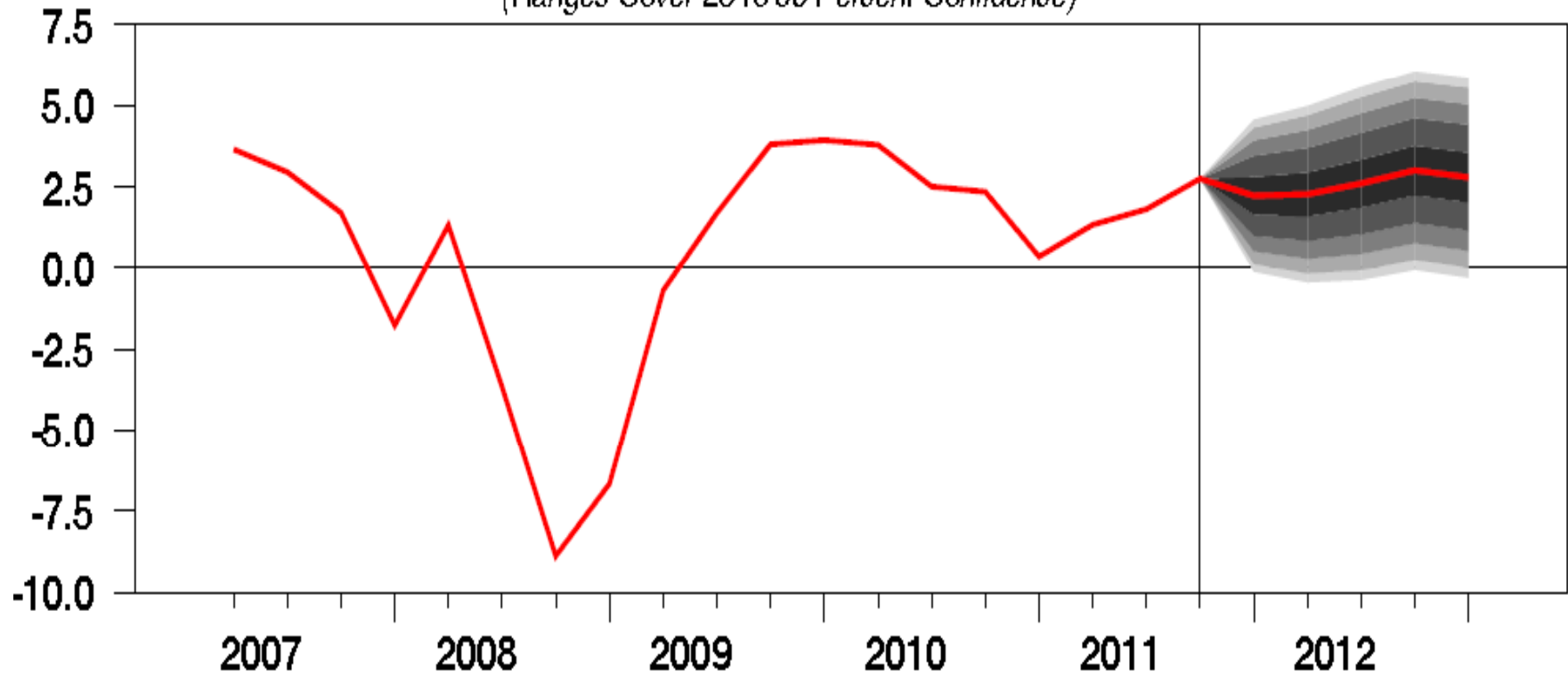
Benchmark Forecasts

Mean Probabilities for Real GDP Growth in 2012

Previous made early November 2010 Current in February 2012
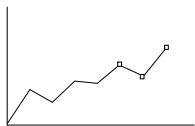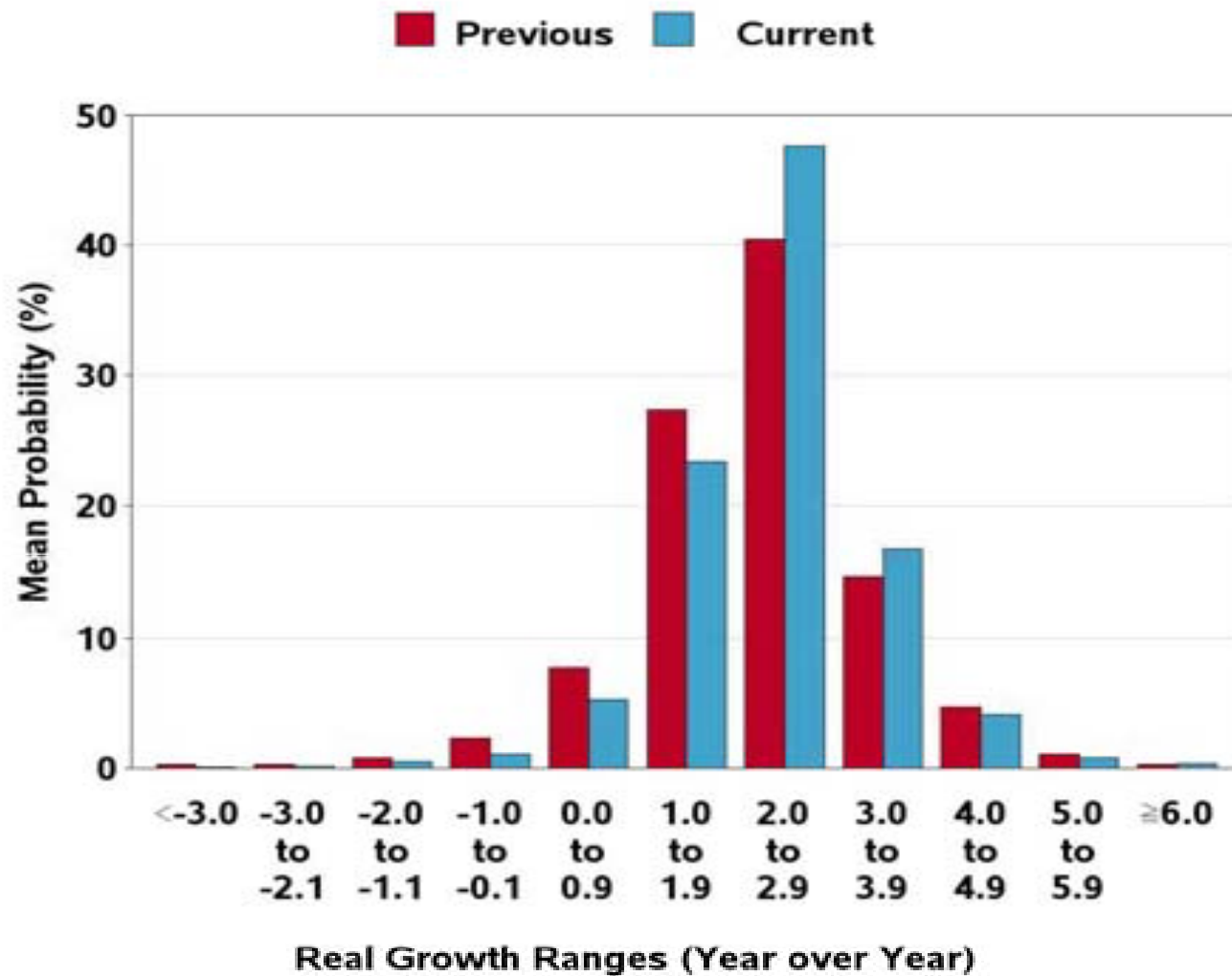
Benchmark Forecasts

Mean Probabilities for Unemployment Rate in 2012
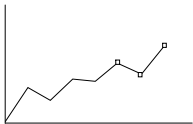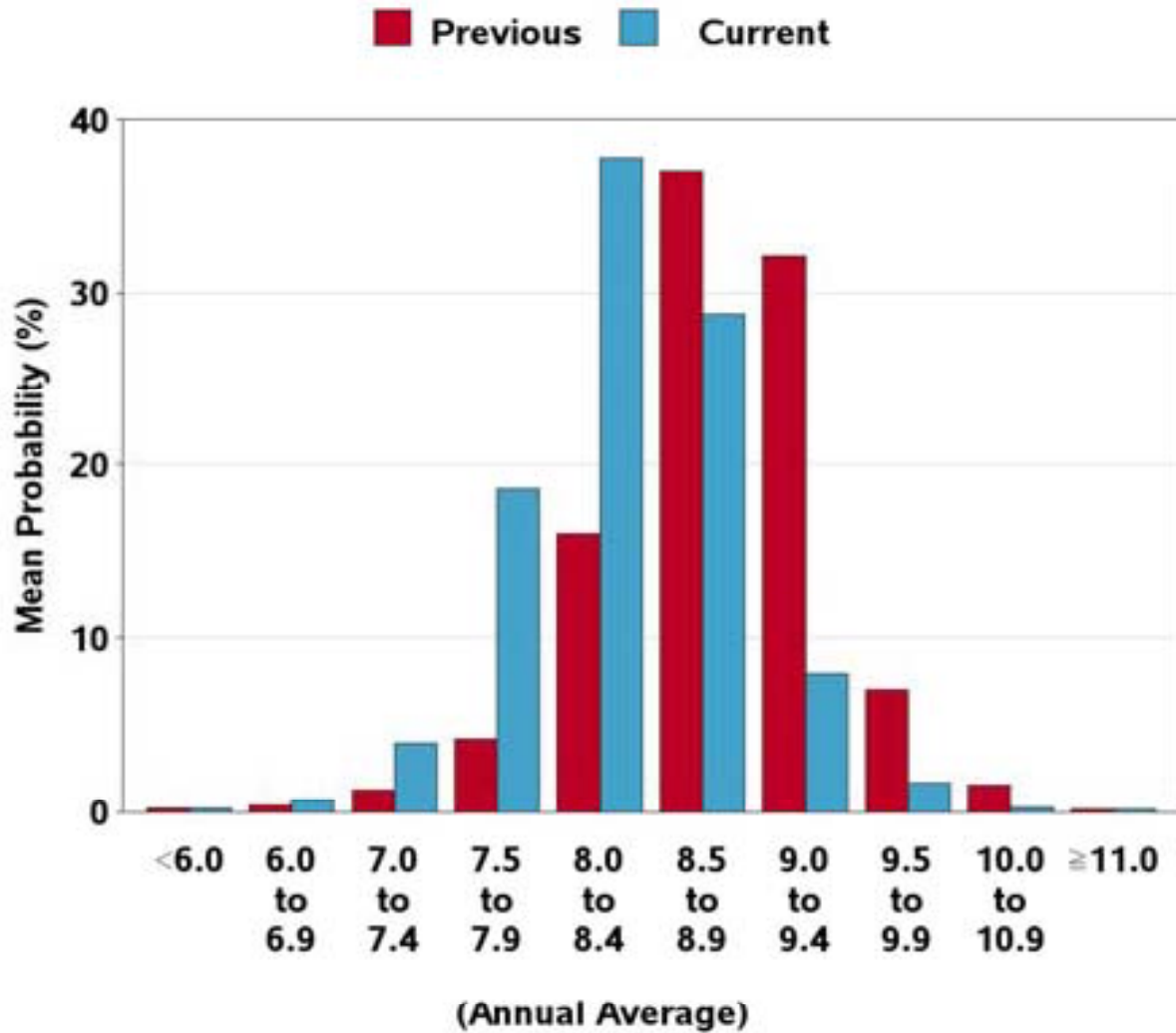
Previous made early November 2010 Current in February 2012

Benchmark Forecasts

Government Forecasting

Benchmark Forecasts

Government Forecasters

A Few Examples of what they are asked to do.
They are not necessarily economic.
- Population
- Occupations
- Government Revenues and Expenditures
- Medicare and Medicaid
- Veteran's Medical Needs and Medical Expenses
- Grave Sites in Veterans Cemeteries
- Social Security Expenditures and Contributions
- Weather
- Education Needs
- Natural Resource Base
- Defense Readiness
- Agricultural Output
- Social Safety Nets: Food Stamps and UE Insurance
- Housing Finance
- Transportation Infrastructure
- Energy Consumption, Production, and Prices
- ….

U.S. Energy Information Administration

- SHORT-TERM ENERGY AND SUMMER FUELS OUTLOOK (1-8 QUARTERS
- http://www.eia.gov/forecasts/steo/

- AEO2012 EARLY RELEASE OVERVIEW (25 YEAR PROJECTIONS)
- http://www.eia.gov/forecasts/aeo/er/
-
- INTERNATIONAL ENERGY OUTLOOK 2011 (25 YEAR PROJECTIONS)
- http://www.eia.gov/forecasts/ieo/

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Other U.S. Government Agencies

- <u>Bureau of Labor Statistics</u>

- Occupational Outlook Quarterly 2010-20

- http://www.bls.gov/opub/ooq/images/ooqban.gif

- <u>Bureau of Census</u>

- Population Projections (Short-term to Decadal)

- http://www.census.gov/population/www/projections/

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The Federal Forecasters Consortium
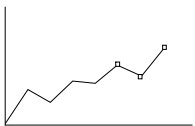
Benchmark Forecasts

Federal Forecasters Consortium

- The Federal Forecasters Consortium is a voluntary collaborative effort of employees in agencies of the United States Government, as well as other interested parties in the academic and not-for-profit communities, who share an interest in the practice, planning, and use of forecasting activities by and within the Federal Government.

- In this context forecasting is taken to mean advance planning, decision-making, and the description of expected outcomes, all for unknown future situations.

- The art of forecasting encompasses many disciplines and utilizes many tools, all applied with the intent of predicting and evaluating alternative futures.

- The Consortium provides an environment in which forecasters can network, present papers, take courses, attend seminars, and otherwise improve their ability to prepare meaningful and timely forecasts of occurrences in today's complex and changing world.

Benchmark Forecasts

Federal Forecasters Consortium

- **The 19th Federal Forecasters Conference (FFC/2012) — September 27, 2012 — Washington, DC**

- **Conference Theme: <u>The Value of Government Forecasts</u>**

- Government forecasts are necessary and valuable for understanding the fiscal tradeoffs and implications of different policies to the public and private sector.

- The President, Congress, and policy analysts rely on forecasts for allocating government resources and budgets.

- Federal forecasters make projections across a broad array of issues including <u>population</u>, the <u>labor force</u>, <u>defense requirements</u>, <u>medical costs</u>, <u>agricultural programs</u>, <u>energy supply and demand</u>, <u>tax revenues</u>, <u>pollution</u>, <u>transportation</u>, <u>infrastructure investments</u>, <u>social insurance</u>, and <u>regulatory programs</u>. They provide this critical input using analytical and quantitative models under varying degrees of uncertainty.

- The 2012 Federal Forecasters Conference will examine how government forecasters face these challenges and how policy-makers and other decision-makers use forecasts to make decisions.

Benchmark Forecasts

Federal Forecasters Consortium

- Charter | FFC Papers and Proceedings | FFC Brown Bag Seminars |
- Conference Announcement
- **Previous Conference Papers and Proceedings**

Benchmark Forecasts

Traditional vs. New Economic Forecasting Approaches

Benchmark Forecasts

How is forecasting done generally?

Based on two key assumptions

1. The econometric model is a good representation of the economy
2. The structure of the economy remains relatively constant.

Successful forecasting requires that:

1. there are regularities to be captured,

2. the regularities are informative about the future,

3. the proposed method captures those regularities, and yet

4. it excludes non-regularities.

Benchmark Forecasts

Three Basic Components of Forecasting Models

1. **Deterministic terms** like intercepts, trends, seasonal factors, or other factors with known values,

2. **Observed stochastic variables** which the model attempts to characterize and have unknown future values, and

3. **Past, present, and future** innovations.

- Each component is vulnerable to many types of mistakes; among them are inaccurate measurement, misspecification, inaccurate estimation, fluctuations in unexpected ways.

- This suggests there are twelve possible types of mistakes: three components and four types each.
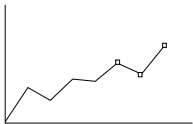
Benchmark Forecasts

Traditional Theory of Economic Forecasting

- Clearly, this theory has failed.

- At best forecasting models are crude approximations of the true data generating process, DGP.

- The economy is subject to major unanticipated shifts.

- Inaccurate forecasts are far too common.

- ***We often hear that macroeconomic forecasters have predicted 8 of the last 3 recessions***

- The degree of uncertainty accompanying a forecast can suggest that its value or degree of confidence ranges from highly informative or utterly useless. Again, this is important information that needs to be used, not just point estimates

Benchmark Forecasts

Failure of Traditional Theory of Economic Forecasting

- Macroeconomic forecasting models are asked to perform well in a <u>complex environment</u> with numerous interrelated actions and decisions occurring simultaneously by heterogeneous agents with competing and conflicting agendas.

- Modern economies are <u>evolving</u>; there is <u>both gradual and sudden structural change and shifts</u> due to institutional, technological, financial, international competitiveness, political, social, and legal change.

Benchmark Forecasts

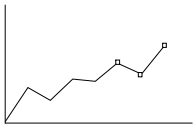# Failure of Traditional Theory of Economic Forecasting

- Forecasting models are supposed to capture these factors empirically in an environment where the data are non-stationary; the degree of misspecification is unknown for the DGP, but no doubt large.

- The onus of congruence is a heavy one.

- The data available may be 1) <u>inaccurate</u>, 2) a <u>proxy for theoretical constructs and agent's decision making criteria</u>, 3) <u>produced with a lag, and subject to revision.</u>

- For example, models based on seasonally adjusted data and ignoring the first two data problems incur a further problem as the seasonal factors for the most recent observations are subject to change as well.
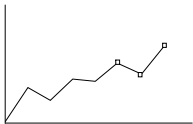
Benchmark Forecasts

Failure of Traditional Theory of Economic Forecasting

- Non-stationarities and infrequent large structural shocks can lead to forecasting problems and **forecasting failure** – a significant deterioration in the forecast performance relative to the anticipated outcome.

- The goal is to avoid systematic forecast failure.

- A theory of economic forecasting must have the realistic assumptions that

  1. **Forecasting models may be incorrect in unknown ways.**
  2. **The economy itself is complicated.**
  3. **The economy is changing over time – I(1) rather than I(0).**
  4. **The economy is often measured inaccurately.**

Benchmark Forecasts

A Taxonomy of the Sources of Model-Based Forecast Error	
<u>**Predictable Uncertainty**</u> *"What we know that we don't know"*	2. <u>**Unpredictable Uncertainty**</u> *"What we don't know that we don't know"*
(a) discounted accumulation of future shocks (innovations) to the economy	(a) currently unknown future changes in the economy
(b) inaccuracies in the forecast model parameters	(b) mis-specification in the forecast model
	(c) mis-measurement of the base period data

Source: Ericsson (2002) p.22

Benchmark Forecasts
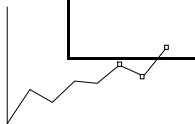
"New" Economic Forecasting Theory

- The "new" economic forecasting theory focuses on the first four problems as the primary source of forecast failure.

- It does not support claims for imposing restrictions from economic theory to improve forecast accuracy.

- In addition, it does not necessarily support inventing "better" estimation methods.

- Since true shocks cannot be forecast, it is better to have an adaptive forecasting process, to incorporate the information and avoid a sequence of poor forecasts.

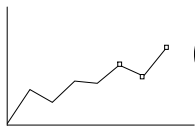- **Economic Forecasters need to account for (structural) shifts and breaks**
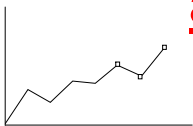
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Conclusions and Questions

Forecasting or Fortunetelling

- Is scientific or macroeconomic forecasting different from reading tea leaves?

- How well have economic forecasts performed, and why should we feel more confident in them than in psychic predictions?

- I have attempted to describe the scope of modern forecasting, and the tools and assumptions economists use in making forecasts in the Federal government.

- Real Estate Motto: Test Forecasting Models, Test Forecasting Models, Test Forecasting Models, Be Creative

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Thank you

- I appreciate the opportunity to speak before the National Skeptics.

- I encourage you to visit the web sites provided and consider submitting and or attending the FFC Conference in September.

- All comments and suggestions are welcome

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