Forecasting in Economics

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- Central Banks forecast inflation and output growth in order to decide monetary policy...

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- We want better methods than flipping a coin...

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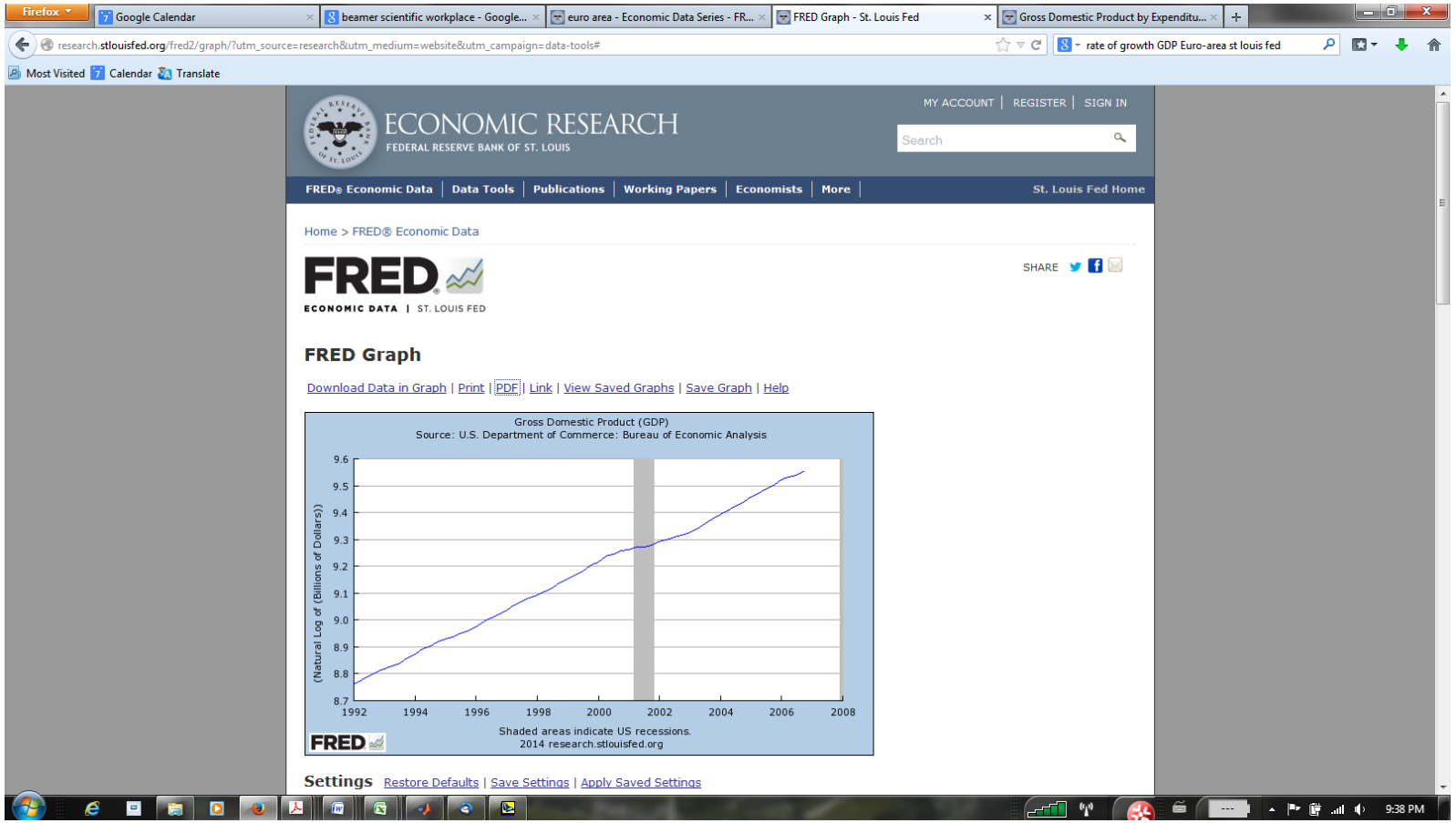
- Uncertainty in forecasts
- Forecasting in practice: the European Central Bank

How do we do forecasts in Economics?

An important quantity we care about in economics is Gross Domestic Product (GDP)
(think about it as a measure of the goods and services we produce)
Here is a picture...

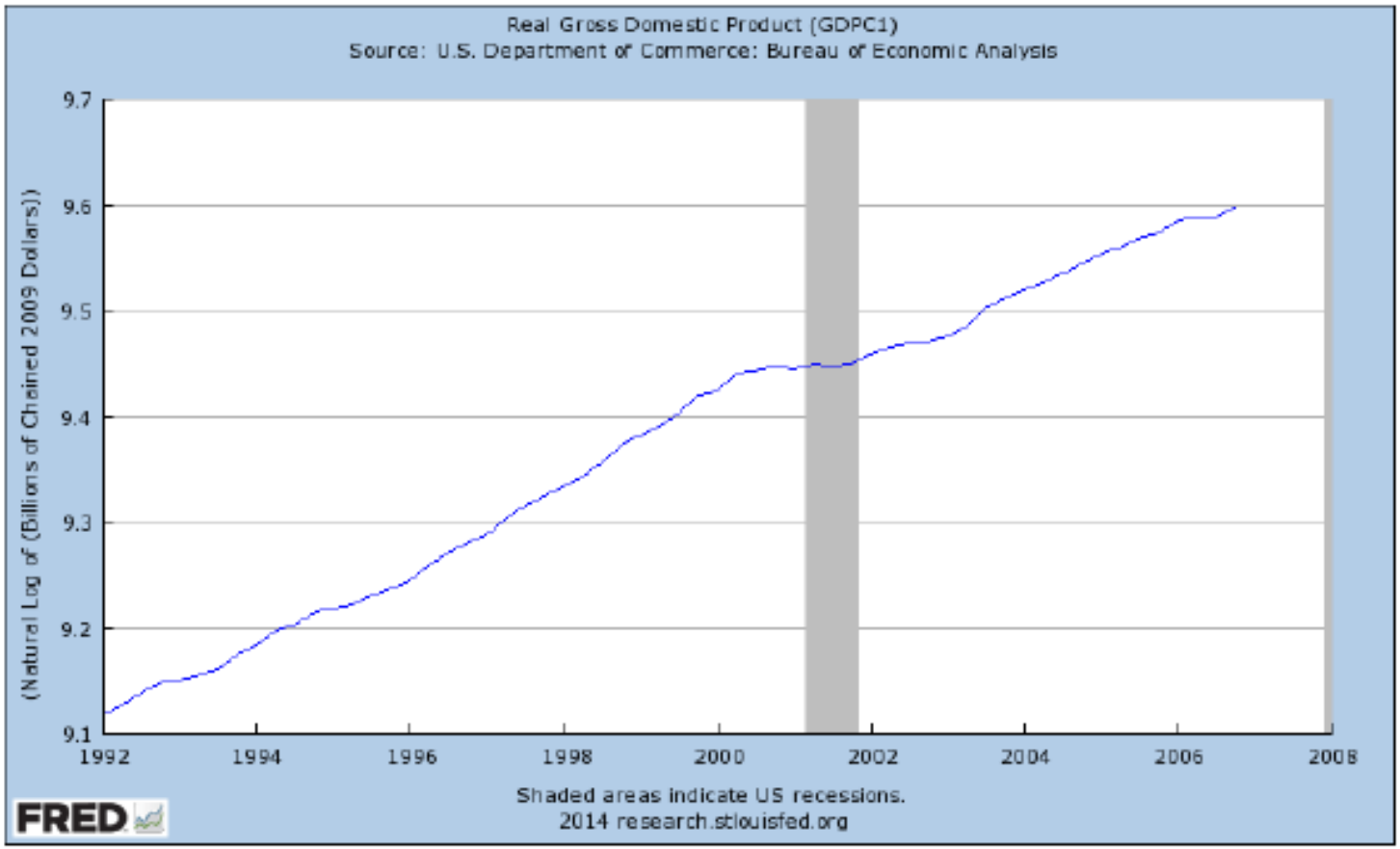
Data

- By the way, a great place to get data is the Federal Reserve Bank of St Louis Database:



Data Transformations

Typically, economists take logs of quantities they are interested in (useful for various reasons... e.g. calculating rate of growth... more later...)
Here is how it looks like:
$y(t) \equiv y_t = ln(GDP(t))$



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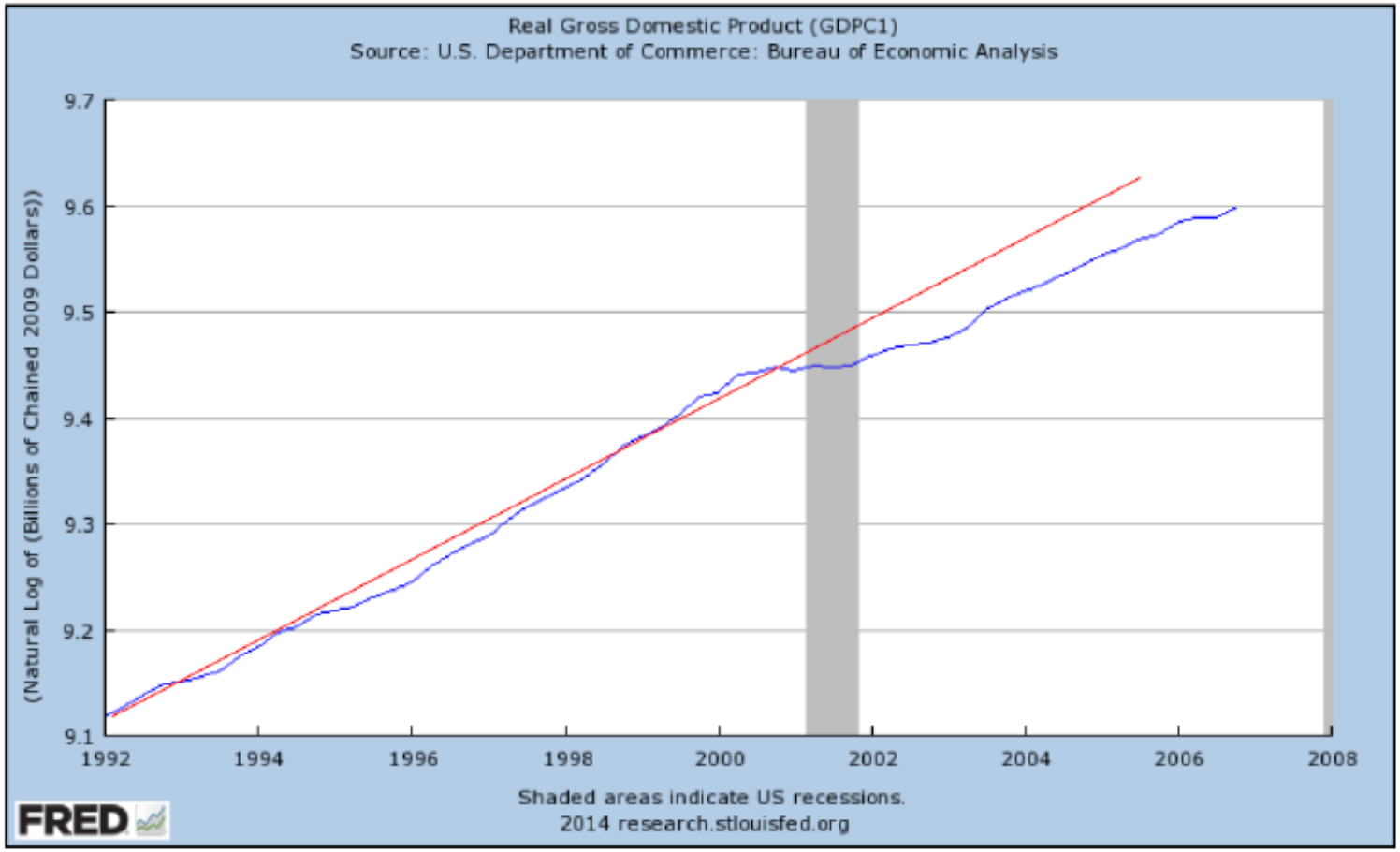
- I could fit a line... e.g $y(t) = k + a \cdot t$... This is called a "deterministic trend"

Problems...

- Trend is the very long-run behavior... and would not work well around 2001-2002...



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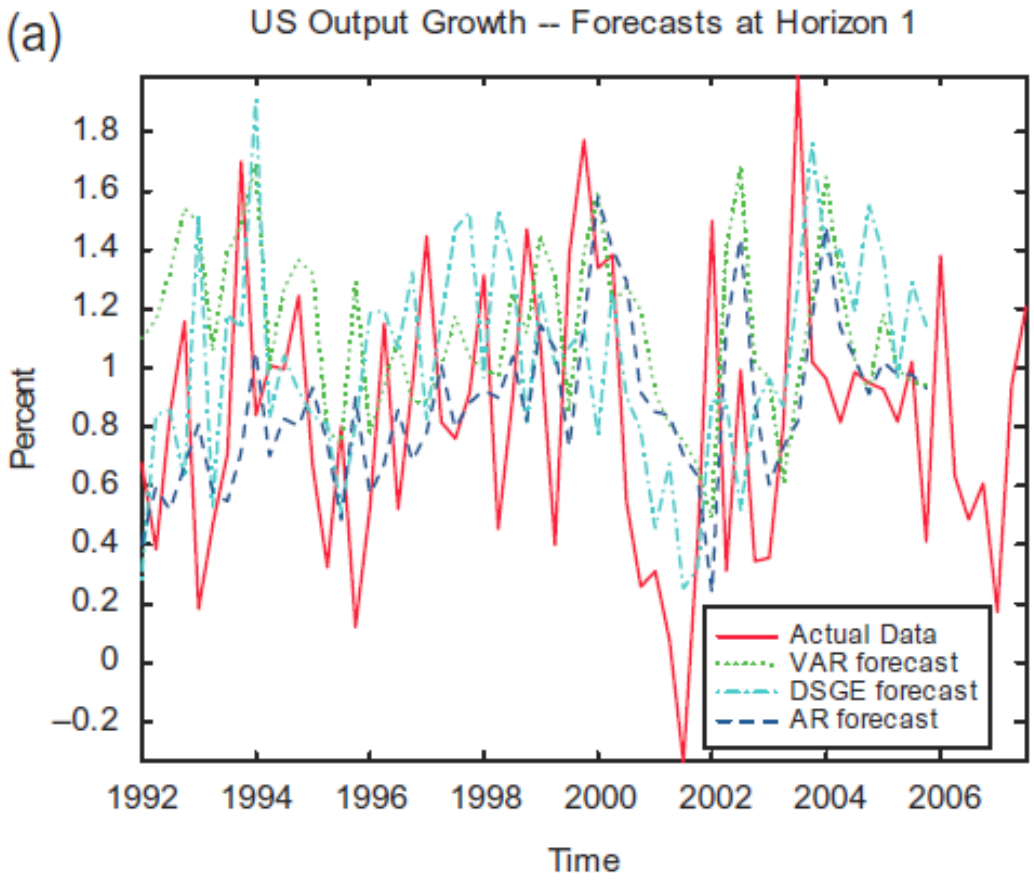
- It's a! That is, rate of growth is constant...

The Rate of Growth of GDP

- Here is the rate of growth of GDP... Is it constant?



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- (Red line = Δy(t) =data; black dotted line = forecast = Δy(t|t-1))

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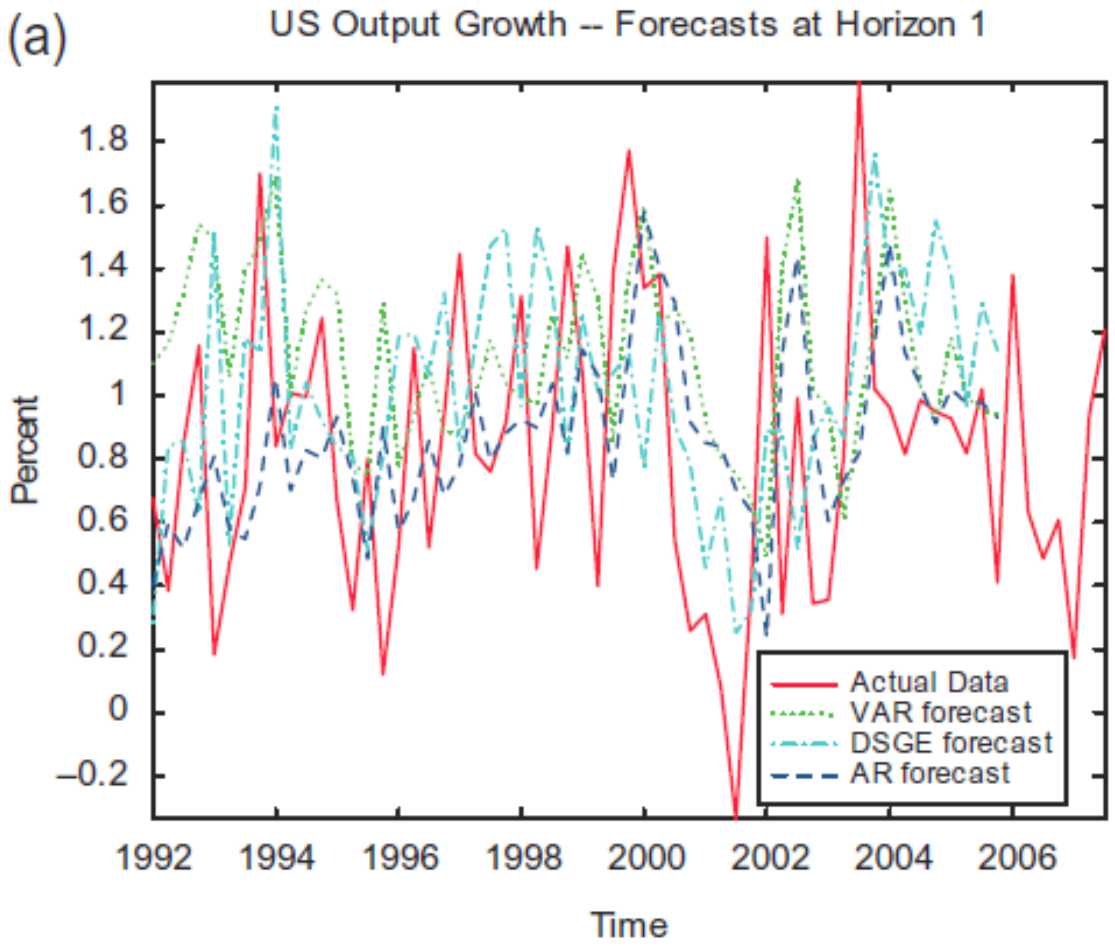
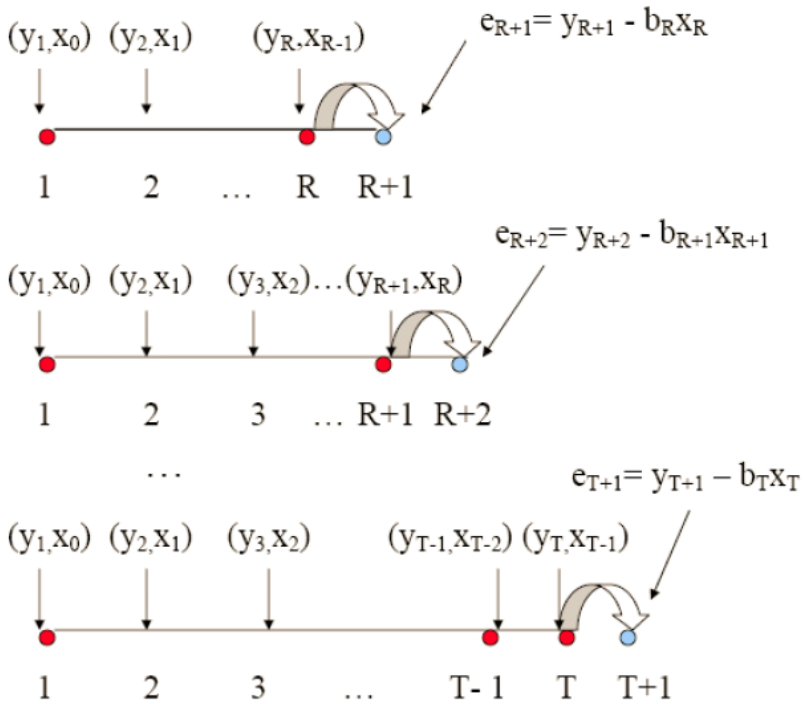

(a)
US Output Growth -- Forecasts at Horizon 1
Percent
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
–0.2
1992
1994
1996
1998
2000
2002
2004
2006
Time
Actual Data
VAR forecast
DSGE forecast
AR forecast

How Were These Forecasts Constructed?



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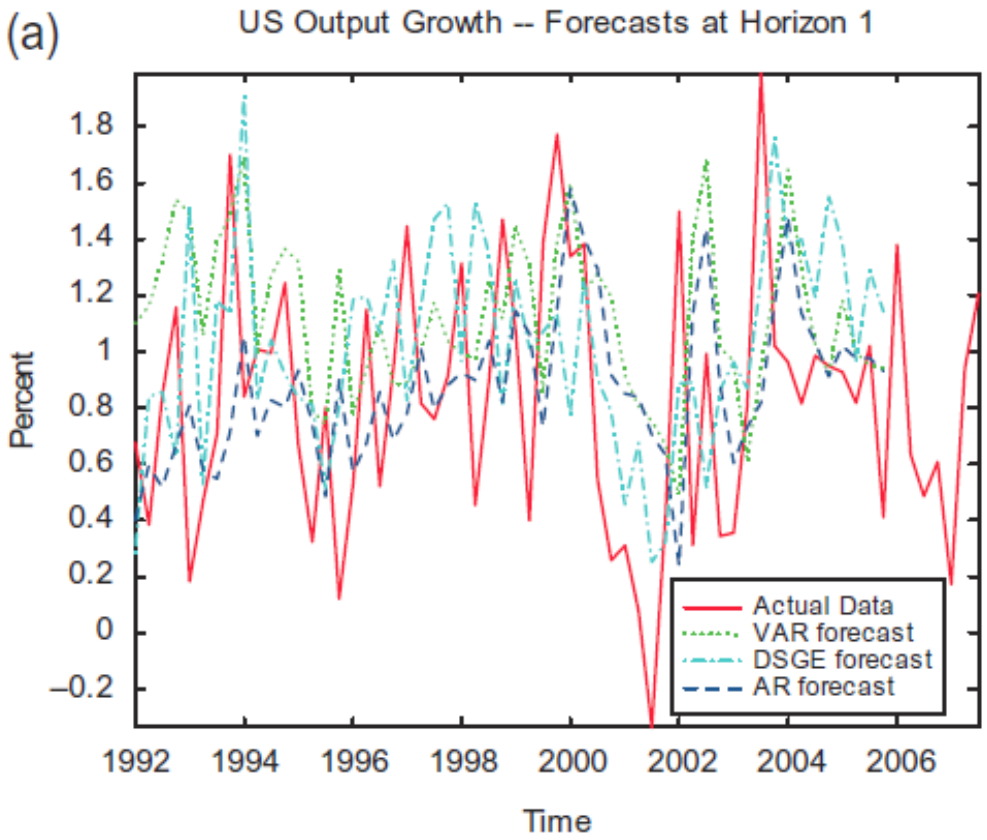
- (this is one equation of a model called VAR...)

The VAR model's forecasts



- You could try other models... For example, DSGE is a complicated economic model...

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	Output				
	RMSFE			DM: Model-DSGE	
h	DSGE	VAR	AR	VAR	AR
1	0.54	1.09	0.94	0.45	0.61
2	0.46	1.31	1.11	0.04	0.20
3	0.46	1.41	1.16	0.05	0.20
4	0.46	1.46	1.15	0.06	0.16
5	0.48	1.24	0.98	0.06	0.87
6	0.48	1.39	1.09	0.22	0.29

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0.23	1.05	0.93	0.64	0.22
0.26	0.95	0.80	0.34	0.00
0.26	1.09	0.83	0.42	0.00
0.28	1.20	0.85	0.30	0.01
0.29	1.38	0.90	0.20	0.11
0.30	1.31	0.89	0.26	0.02
0.31	1.37	0.88	0.25	0.01

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- [Note: this work is taken from Gurkaynak, Kisacikoglu and Rossi (2013), Do DSGE Models Forecast More Accurately Out-of-Sample than Reduced-Form Models?]

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- ... the best forecast of exchange rates tomorrow is the exchange rate today...

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- Which predictor would you suggest?
- There is no shortage of predictors used in the literature: prices, interest rates, output, money supply, trade balance, net foreign asset positions, commodity prices, etc.
- Are any of these predictors is capable of forecasting future exchange rates better than simply using the exchange rate value today, which is what the random walk would predict?

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- Example: (agnostic) forecast combination: try all the predictors you have, say n, one-at-a-time, and get a bunch of forecasts: $\Delta y_{t+1|t}\left(x_{i,t}\right)$; then your (equal weight) forecast combination is: $\frac{1}{n}\sum_{i=1}^{n}\Delta y_{t+1|t}\left(x_{i,t}\right)$

Forecasting Issues III

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- For example, should one use forecasts based on revised or real-time data. Should they be filtered, de-trended or raw? Which frequency and countries should be considered and at what forecast horizon?

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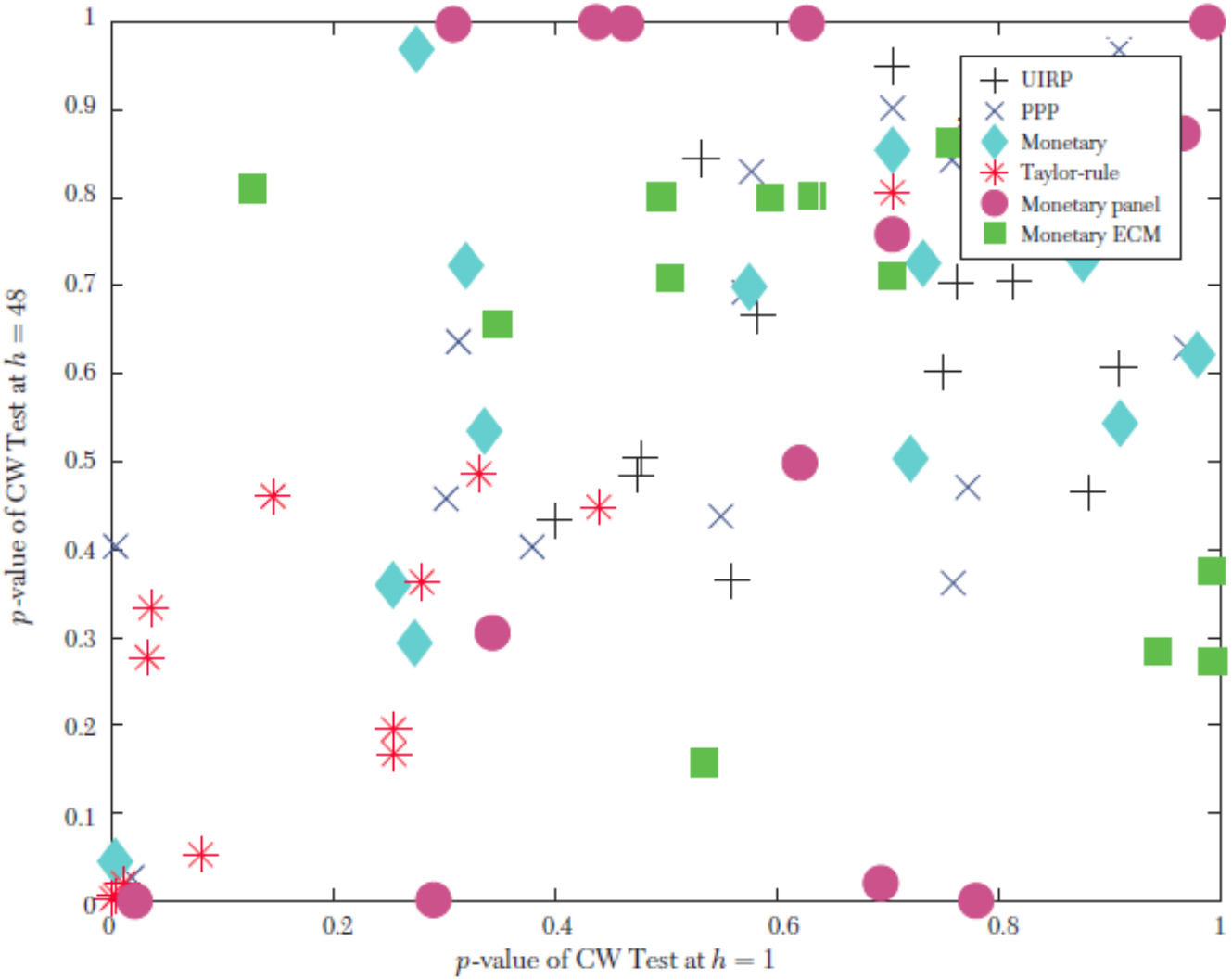
- Should one use mean squared forecast error, mean absolute errors, utility-based or direction of prediction measures? Should the focus be on in-sample or out-of-sample tests? What about measures of relative or absolute forecasting performance, etc?
- Example: RMSFE$=\frac{1}{T}\sum_{t=1}^{T}\left(\Delta y\left(t\right)-\Delta y\left(t|t-1\right)\right)^{2}$ versus RMAFE$=\frac{1}{T}\sum_{t=1}^{T}\left|\Delta y\left(t\right)-\Delta y\left(t|t-1\right)\right|$ versus asymmetric losses...

Which Predictors Work in Forecasting Exchange Rates?



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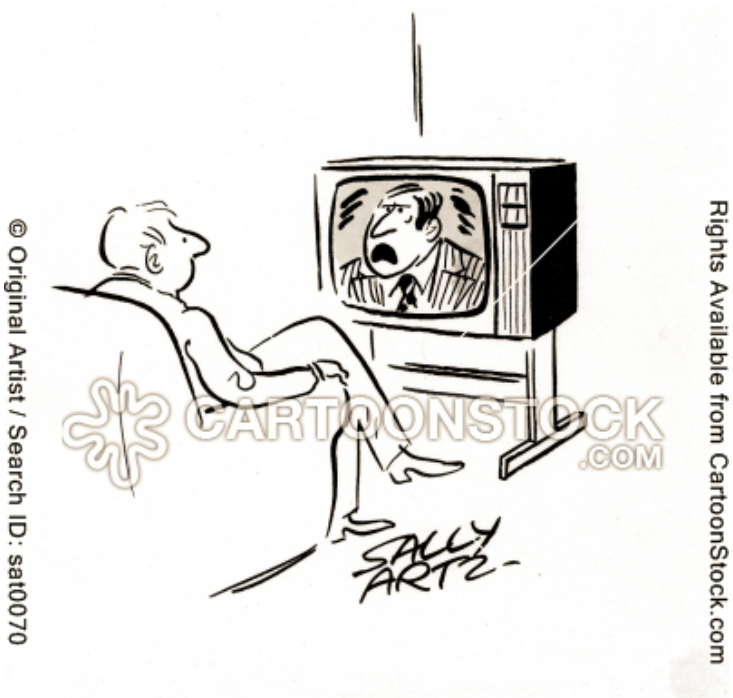
- Ideally, we would like forecasts that are very precise...

How Precise Are GDP Forecasts?

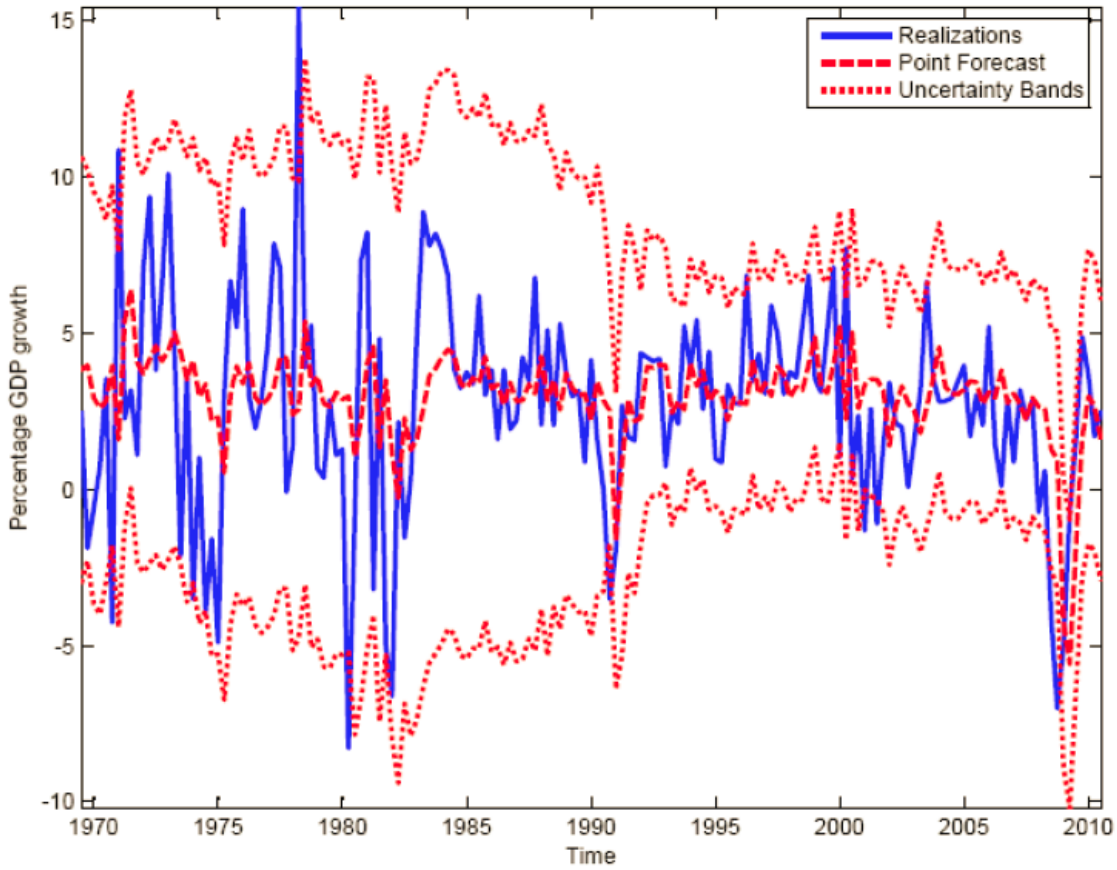
- An example of a useless forecast



"The long-range forcast includes rain, sunshine, fog, snow, mild spells and high winds - now prove that wrong!"

Forecasts and Confidence Bands

Figure 3. One Quarter-ahead Forecasts of Annualized U.S. Real GDP Growth, Their Uncertainty and Actual Realizations



Forecasting in Practice

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- 2. The CEPR Business Cycle Dating Committee

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Macroeconomic projections for the euro area[1)]

(annual percentage changes)

	December 2016			
	2016	2017	2018	2019
Real GDP [1)]	1.7	1.7	1.6	1.6
	[1.6 - 1.8] [2)]	[1.1 - 2.3] [2)]	[0.6 - 2.6] [2)]	[0.4 - 2.8] [2)]
Private consumption	1.7	1.5	1.5	1.4
Government consumption	2.0	1.3	1.1	1.1
Gross fixed capital formation	3.0	3.1	3.1	2.7
Exports [3)]	2.7	3.7	3.9	4.0
Imports [3)]	3.3	4.1	4.3	4.1
Employment	1.4	1.1	0.8	0.8
Unemployment rate (percentage of labour force)	10.0	9.5	9.1	8.7
HICP	0.2	1.3	1.5	1.7

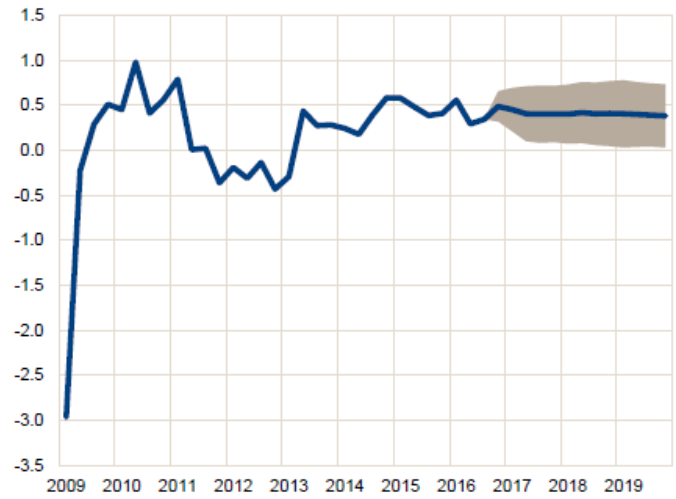
Forecasting at the European Central Bank (ECB)

Macroeconomic projections[1)]

(quarterly data)

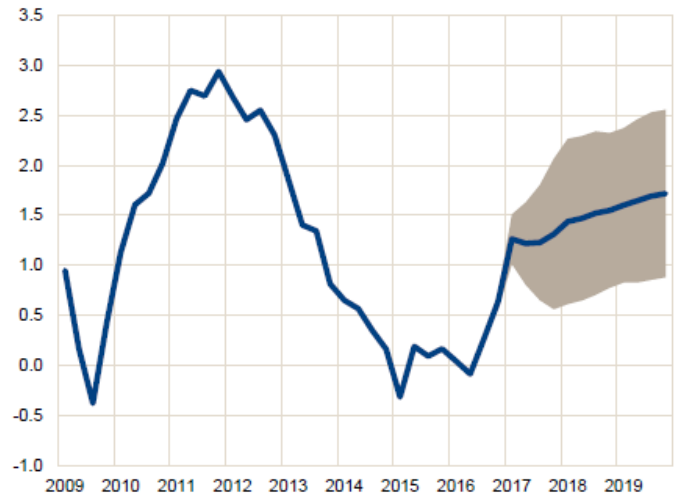
Euro area real GDP[2)]

(quarter-on-quarter percentage changes)



Euro area HICP

(year-on-year percentage changes)



Forecasts at other Institutions

Comparison of forecasts for euro area real GDP growth and HICP inflation

(annual percentage changes)

	Date of release	GDP growth			HICP inflation		
		2016	2017	2018	2016	2017	2018
Eurosystem staff projections	December 2016	1.7	1.7	1.6	0.2	1.3	1.5
		[1.6-1.8]	[1.1-2.3]	[0.6-2.6]	[0.2-0.2]	[0.8-1.8]	[0.7-2.3]
European Commission	November 2016	1.7	1.5	1.7	0.3	1.4	1.4
OECD	November 2016	1.7	1.6	1.7	0.2	1.2	1.4
Euro Zone Barometer	November 2016	1.6	1.3	1.4	0.3	1.3	1.6
Consensus Economics Forecasts	November 2016	1.6	1.3	1.4	0.2	1.3	1.5
Survey of Professional Forecasters	October 2016	1.6	1.4	1.5	0.2	1.2	1.4
IMF	October 2016	1.7	1.5	1.6	0.3	1.1	1.3

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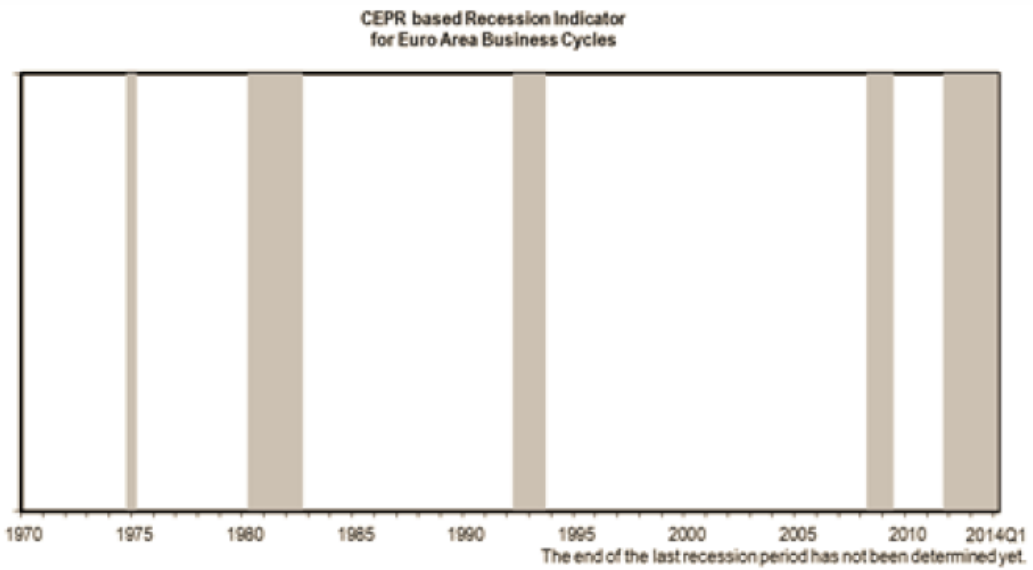

The Euro-Area Business Cycle Dating Committee

- How can we be sure we are out of a recession?

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- www.thetimes.co.uk/tto/business/economics/article4176930.ece

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- We want better methods than flipping a coin...
- Economic research in forecasting is helping us getting there... and it is a very exciting area to work on!!!

THANKS!