Is Gold Overpriced?

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Based on

“Is Gold Overpriced?”

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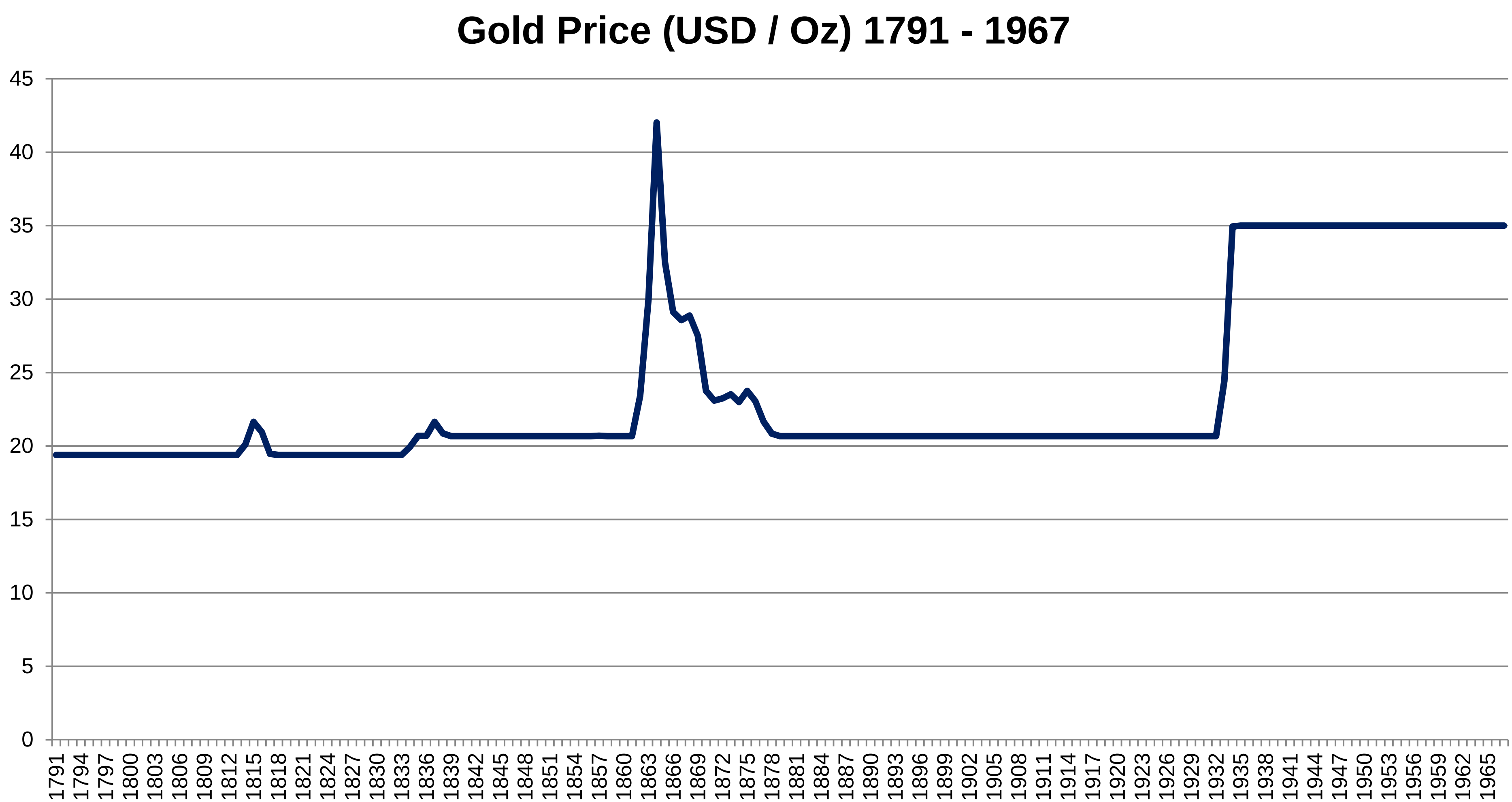
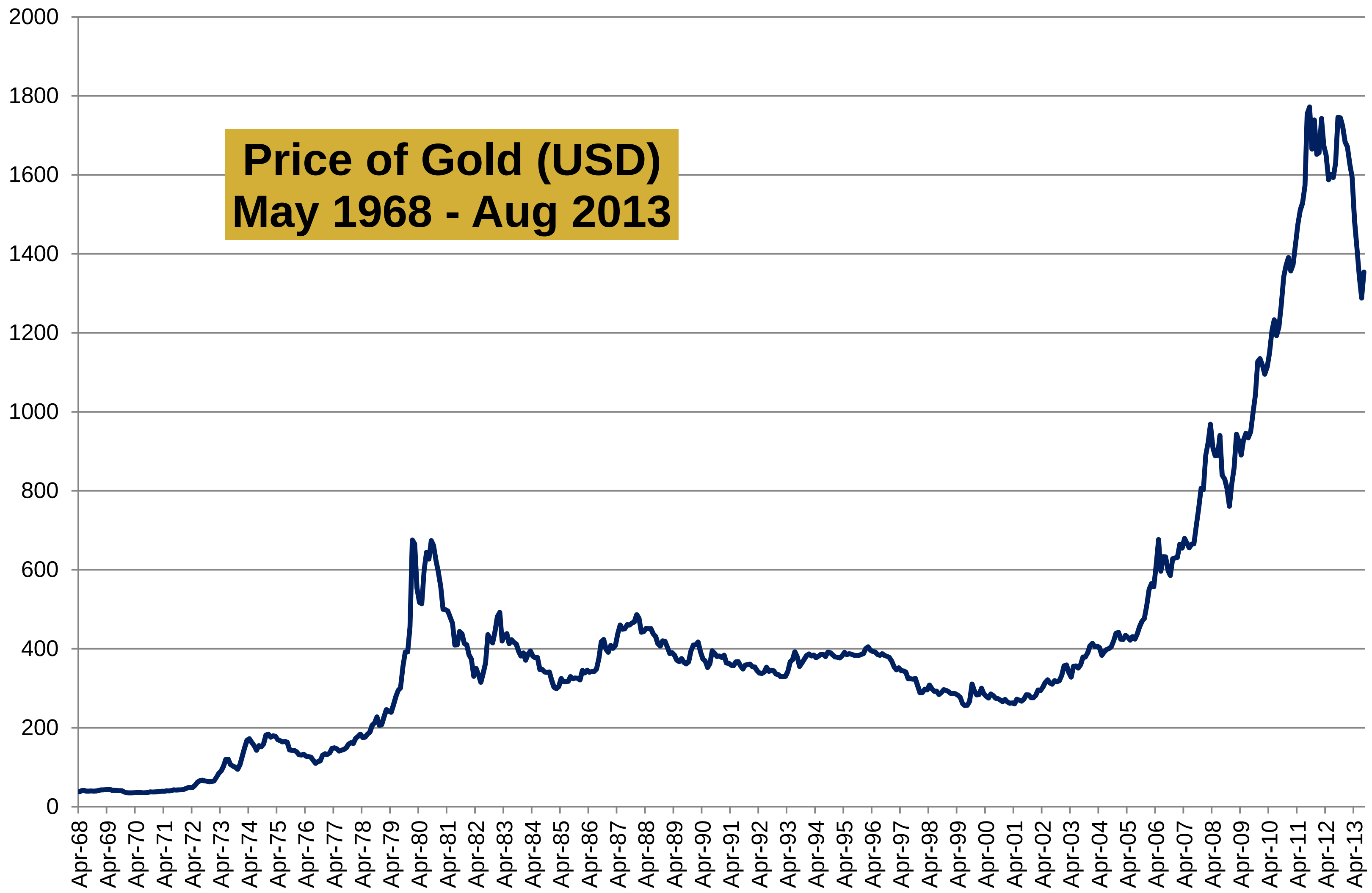
Gold -- A truly unique asset

- Unlike other assets, gold truly is scarce.
- Few industrial uses even today.
- Unique supply & demand features due to hoarding & disposal.
- Most of the gold ever mined still exists in use today, in the form of jewelry or bullion. Jewelry can re-enter the market at the right price.
- Getting more difficult to find.
- Significant lead time to bring on new supply.
- Historical cornerstone of Central Bank reserves.
- Historical precedents in the manner in which it has been “used”.

We have gone from this…



To This…



Price of Gold (USD)
May 1968 - Aug 2013
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Apr-68 Apr-69 Apr-70 Apr-71 Apr-72 Apr-73 Apr-74 Apr-75 Apr-76 Apr-77 Apr-78 Apr-79 Apr-80 Apr-81 Apr-82 Apr-83 Apr-84 Apr-85 Apr-86 Apr-87 Apr-88 Apr-89 Apr-90 Apr-91 Apr-92 Apr-93 Apr-94 Apr-95 Apr-96 Apr-97 Apr-98 Apr-99 Apr-00 Apr-01 Apr-02 Apr-03 Apr-04 Apr-05 Apr-06 Apr-07 Apr-08 Apr-09 Apr-10 Apr-11 Apr-12 Apr-13

Understanding the price of this asset

- Identify key drivers that capture the:
  - Macroeconomy
  - Monetary System
  - Financial markets
  - Other significant commodities – primarily Oil.
- Supply & Demand
- Identify proxies for these variables that:
  - Have the longest and most consistent time series.
  - Accurately capture the drivers that we consider.
- While economic data is reported with a lag, we can reverse the relationship to identify what the price of gold tells us about the current and future economy.

Key Findings

- Gold is not over priced in the recent period, except for a few months at the end of 2011.
- Very different result than if you apply a traditional ordinary least squares technique (OLS), which implies that gold has been over priced for some time.
- Strongest explanatory variables include:
  - Oil
  - US Dollar Index
  - Unemployment
- Evidence of gold being an inflation hedge is limited to a very specific time period.

Easy reserves have been mined…

← We have gone from this approach

To this approach… →

OLS vs. Quantile Regression

- Least squares captures how the mean of *y* changes with *x*
- Sometimes a single mean response is not enough for various reasons:
  - Some investigations are interested in extreme values, such as how a treatment impacts the extremes of a distribution (ex: Low birth weight risk factors, Educational analysis).
  - The distribution of independent variable may be asymmetric about the mean.
  - Heteroscedasticity.
- Benefits of Quantile Regression
  - Developed as an complement to least squares regression with the explicit purpose of estimating rates of change in all parts of the distribution.
  - We can still connect with the results of more traditional regression approaches.
  - Permit one to also investigate the confidence interval in addition to the response.
  - More general than least squares – non parametric.

Ordinary Least Squares vs. Quantile Regression

OLS:

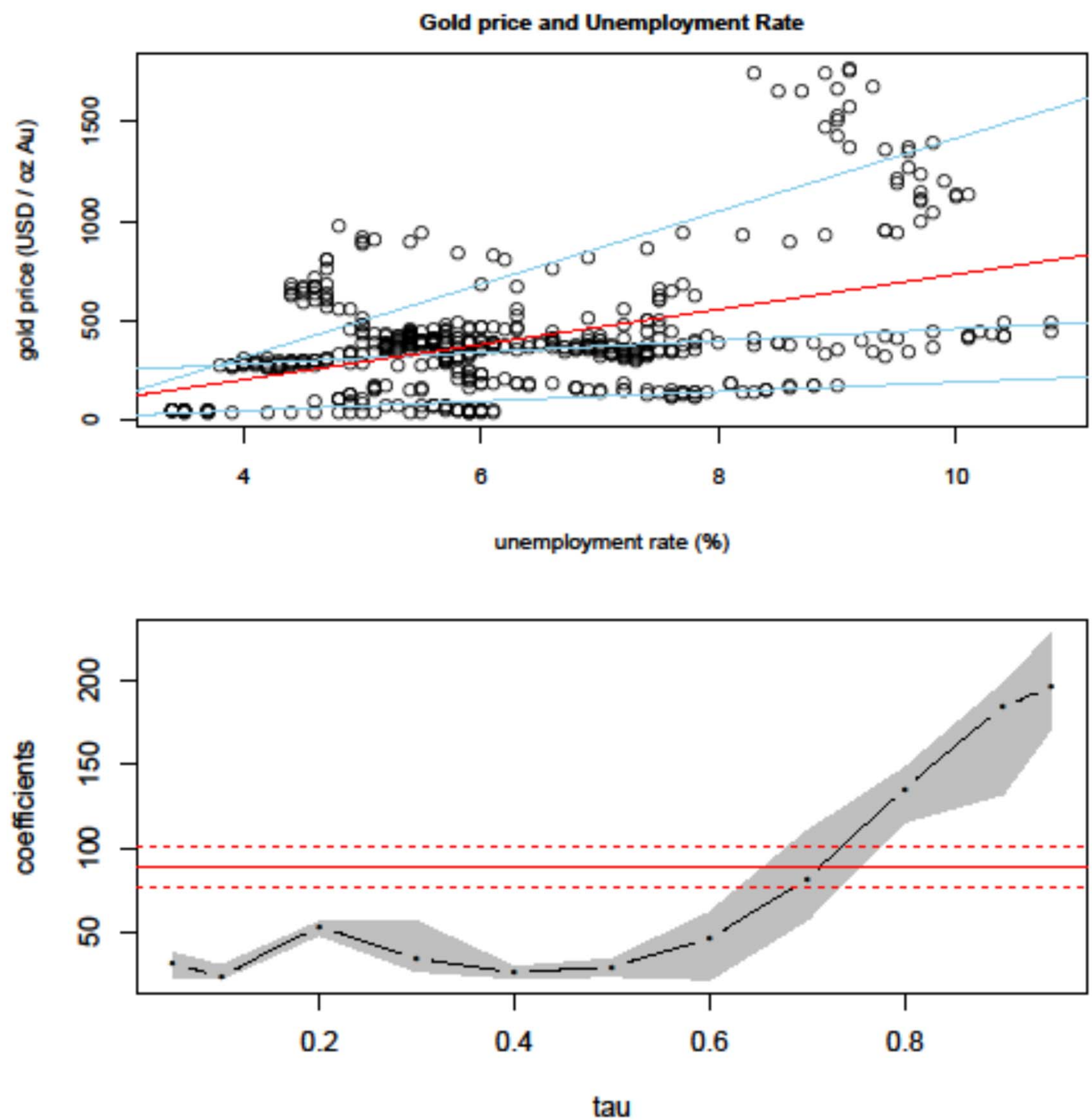
$$y_i = \beta\, x_i + \varepsilon_i$$

$$\hat{\beta} = \operatorname{argmin} \sum_{i=1}^{n} (y_i - x_i\beta)^2$$

QR:

$$y(\tau) = \mathrm{x}\,\beta(\tau) \qquad 0 < \tau < 1$$

$$\hat{\beta}(\tau) = argmin \left[\tau \sum_{y \geq \beta x} (y_i - \beta x_i) + (\tau - 1) \sum_{y < \beta x} (y_i - \beta x_i)\right]$$



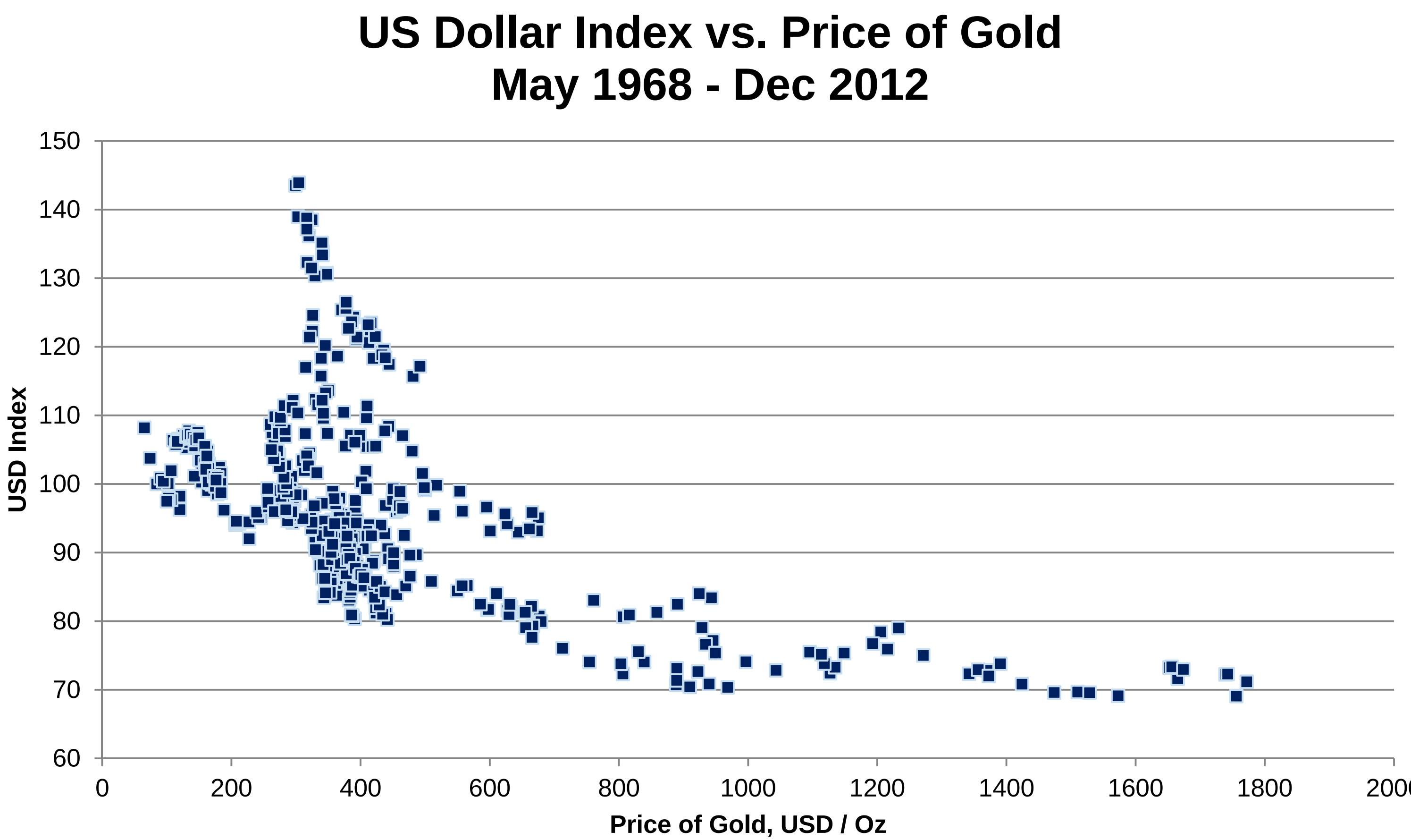
Gold price and Unemployment Rate
gold price (USD / oz Au)
0
500
1000
1500
4
6
8
10
unemployment rate (%)
coefficients
50
100
150
200
0.2
0.4
0.6
0.8
tau

Key drivers / correlations

Pooled correlations between the price of gold & key variables in this study
April 1968 – March 2012

Variable	Correlation with the Price of Gold
Oil	0.876
Unemployment	0.462
DJIA	-0.021
TBILL	-0.196
Inflation	-0.235
GDP	-0.364
USD Index	-0.587

Hedge against a weak dollar? Yes!



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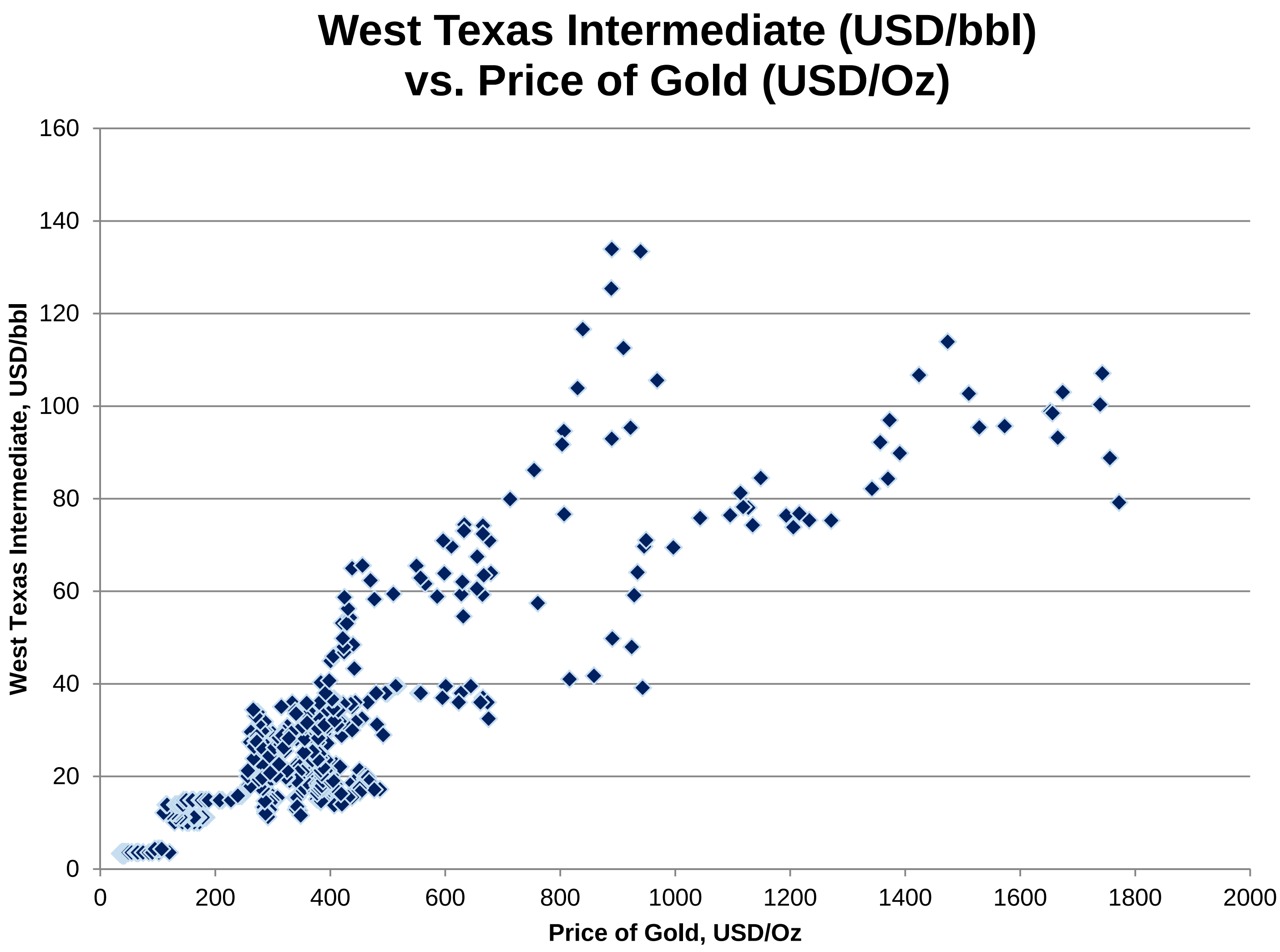
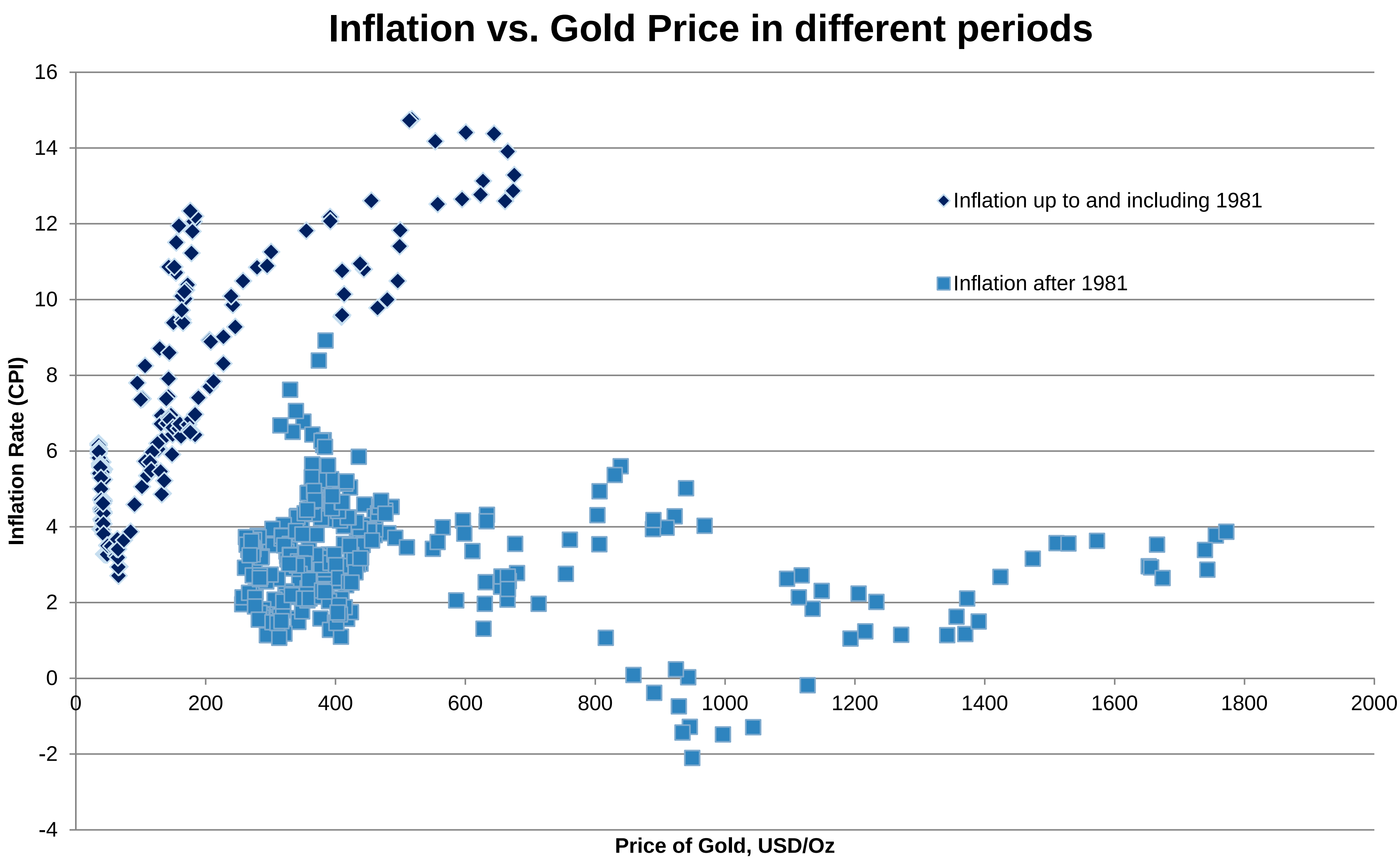
Correlated with oil? Yes!



Inflation – The need for structural breaks

Real Inflation Rate (CPI) over Time

Inflation hedge? Not recently…



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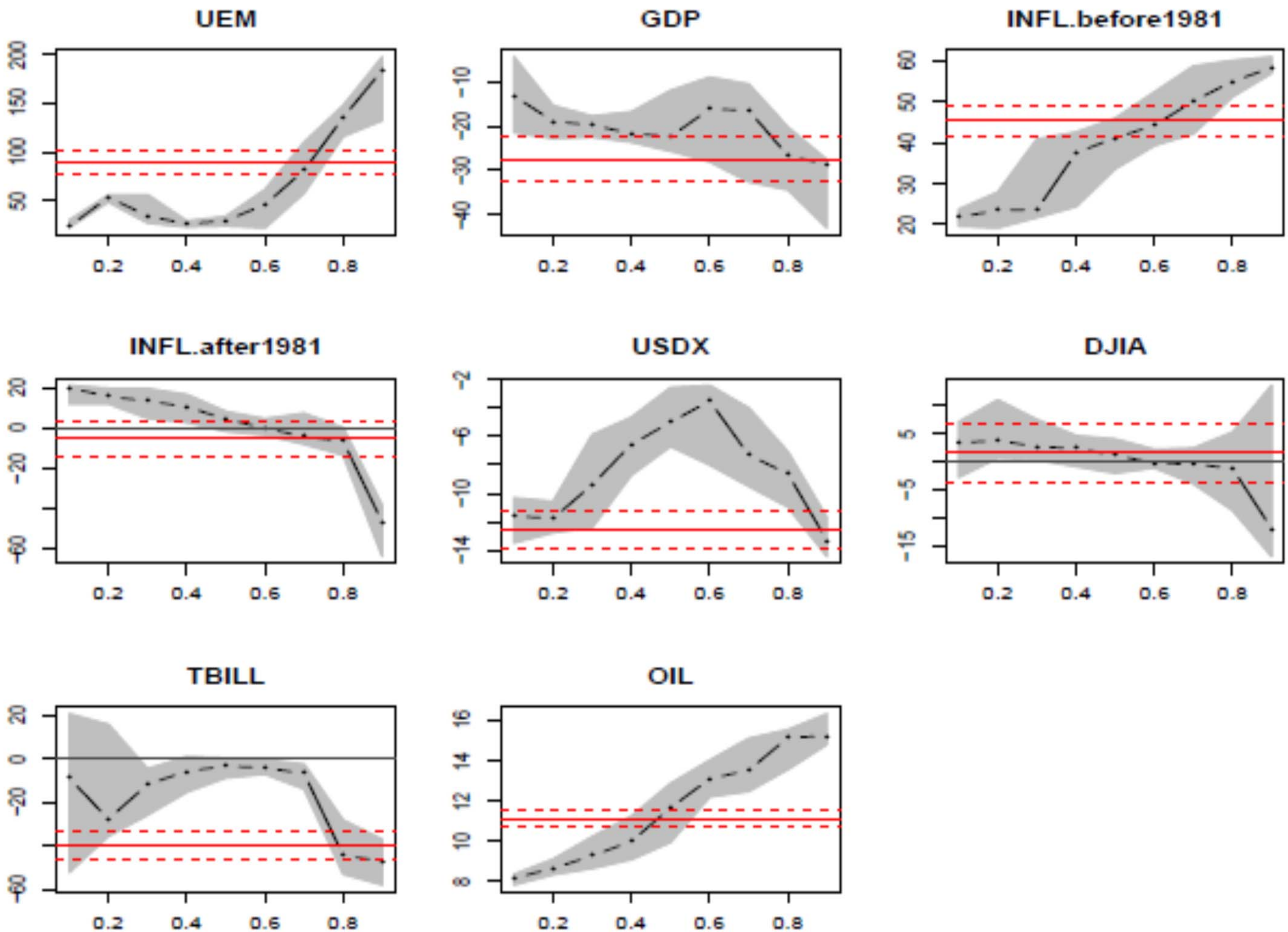
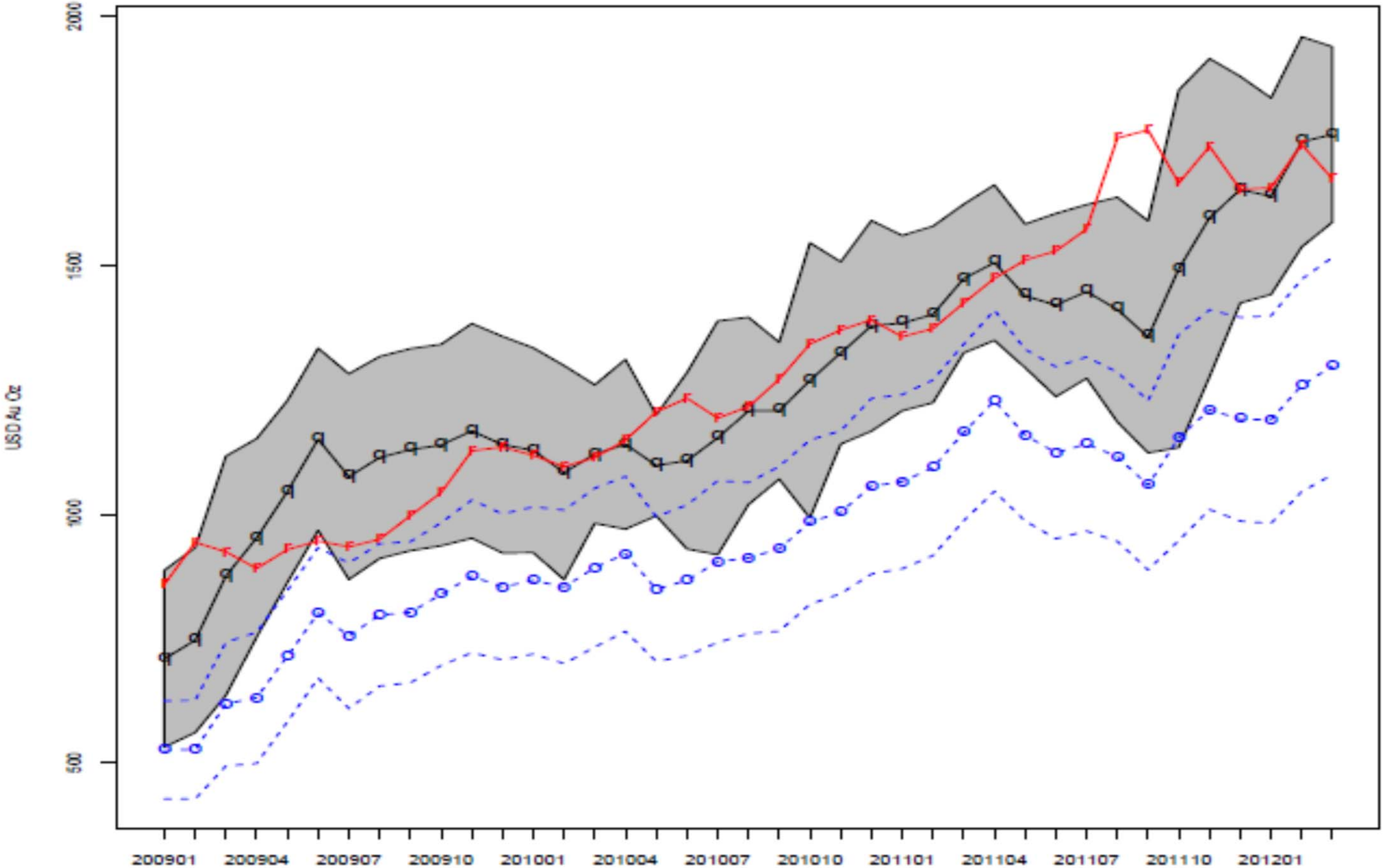

UEM
GDP
INFL.before1981
INFL.after1981
USDX
DJIA
TBILL
OIL

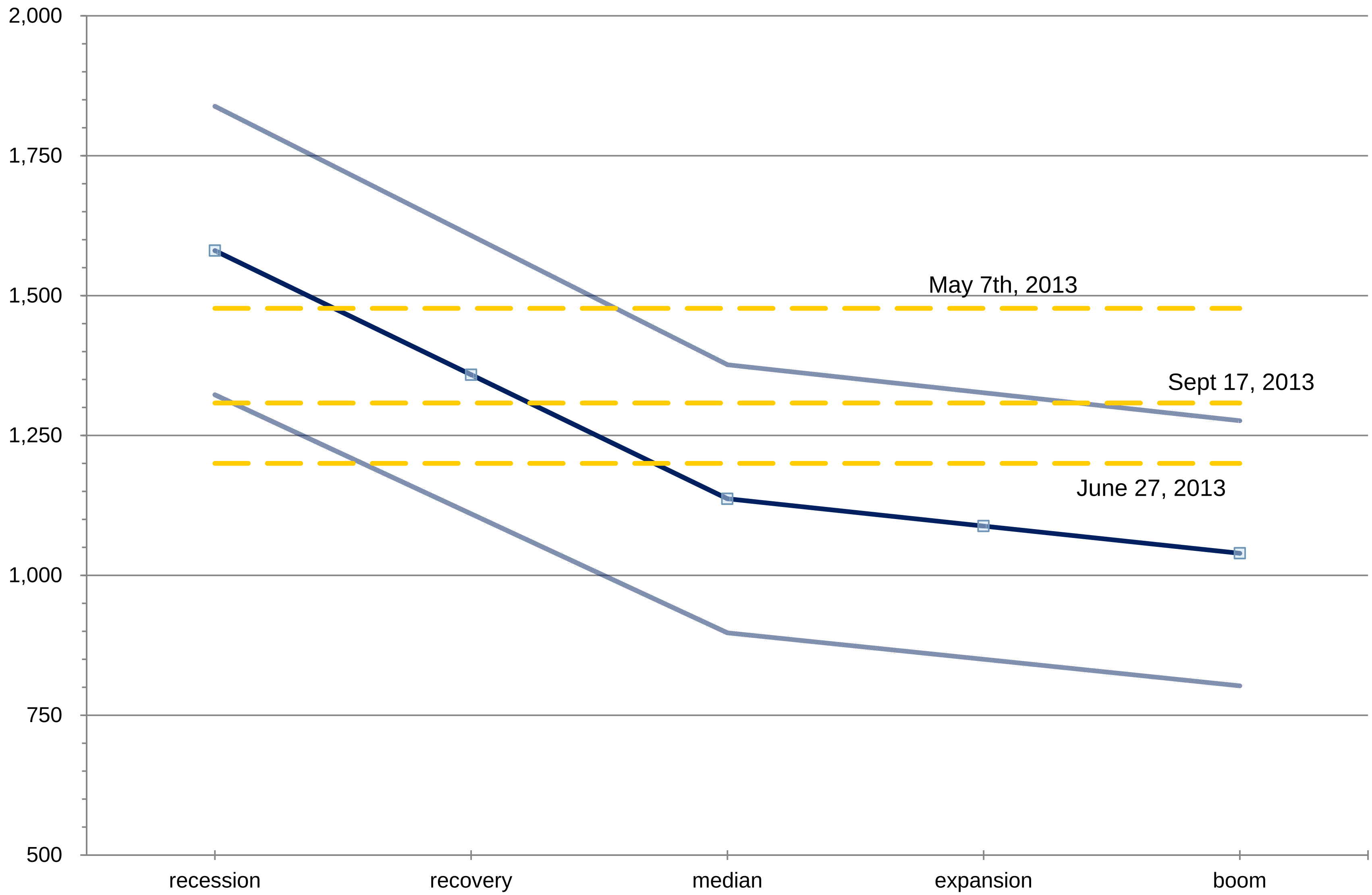


2000
1500
1000
500
USD Au Oz
200901
200904
200907
200910
201001
201004
201007
201010
201101
201104
201107
201110
201201

Out of Sample - Economic Scenarios

Economic Scenario	Real Inflation	Expected Inflation	Unemployment	Nominal GDP	T-bill yield	USD Index	WTI
Recession	3.32	1.54	8.91	3.9	0.04	71.16	98.06
Recovery	2.99	2.02	7.16	4.31	1.77	78.76	90.57
Median	2.65	2.49	5.4	4.71	3.49	86.36	83.08
Expansion	2.69	2.55	5.23	4.98	3.6	88.66	80.98
Boom	2.72	2.61	5.05	5.24	3.7	90.96	78.87

Out of Sample Economic Indicator



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